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B493: Consumer Acceptance of Washed Maine Potatoes

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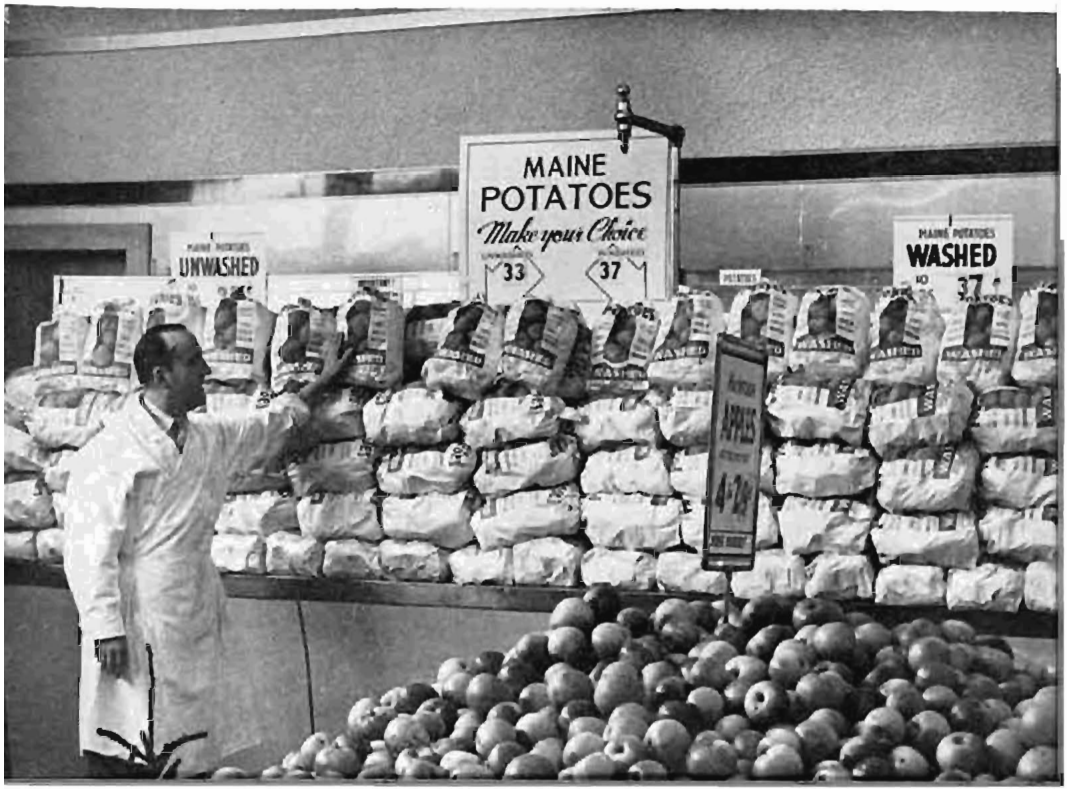
Packages of "You Chuz" brand washed and unwashed potatoes on display in a retail store in the Boston market



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CONSUMER ACCEPTANCE OF WASHED MAINE POTATOES

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For a number of years consumers have expressed a definite preference for washed, fresh fruits and vegetables. It would be difficult today for retail stores to sell dirty carrots, beets, spinach, cucumbers, and tomatoes. To a limited extent the same preference for cleanness is now apparently being expressed for potatoes. California, Idaho, North Dakota, Minnesota, Florida, Virginia, and New Jersey and other areas are marketing potatoes that have been washed. In many markets, these washed potatoes outsell and bring premium prices over dirty potatoes.

PURPOSE OF STUDY

The broad objective of this study was to determine the feasibility as well as the problems associated with washing Maine potatoes. This is particularly important at this time in view of the general preference of housewives for clean potatoes as determined by a national survey by the United States Department of Agriculture[1] and the increasing supplies of washed potatoes from competing areas in markets Maine normally serves. Specific objectives of this study were to determine (1) the keeping qualities of washed potatoes, (2) the costs associated with washing Maine potatoes including equipment, fuel, water, and shrinkage, and (3) the acceptance of washed Maine potatoes by the wholesale and retail trade.

Studies on washing Maine potatoes have been made with two potato crops. On the 1949-50 crop the experimental work, starting in February 1950, consisted of (1) preliminary tests to determine the keeping quality of washed potatoes when stored at different temperatures, (2) the determination of consumer acceptance of washed Maine potatoes in six retail stores in Portland, Maine, and (3) the acceptance

[1] Potato Preferences Among Household Consumers, Bureau of Agricultural Economics, United States Department of Agriculture, Misc. Publication No. 667, August 1948.

of washed Maine potatoes by retailers in the Boston market area. Studies on the 1950-51 crop of potatoes consisted of (1) consumer acceptance of washed potatoes in the Boston market area, (2) studies on the cost of washing, and (3) use of the washing and drying equipment by shippers in Aroostook County.

KEEPING QUALITY OF WASHED POTATOES

Washed and dried Katahdin, Green Mountain, and Kennebec varieties of potatoes were packaged at Aroostook Farm, Presque Isle, and stored under three different conditions with comparable quality unwashed potatoes of the same varieties. In one of these the temperature was automatically controlled at 60° F., in another at 70° F. and in the third, which was ordinary track storage, the temperature ranged from 40° to 45° F. In the 70° F. storage, the humidity was kept as high as possible by keeping the floor wet at all times. Each week over a four-week period a licensed Federal-State potato inspector examined the washed and unwashed potatoes stored under these different conditions in order to determine any development of defects or deterioration which might take place in either lot of potatoes.

It was found that under the above storage conditions there was no apparent difference between the washed and unwashed potatoes either in the development of different types of defects or in total defects when they were stored in the same storage rooms for a four-week period. Katahdin potatoes, both washed and unwashed, that averaged about eight per cent total grade damage when placed in storage still had about this amount of grade damage at the end of the four-week storage period. Although grade defects in Green Mountain potatoes increased considerably during the four-week period, chiefly due to the development of bruises, the increase was no greater for the washed than for the unwashed potatoes. The slight increase in grade defects in the Kennebec potatoes was about the same for the washed as for the unwashed tubers (Table 1).

Also while the studies were being made on the consumer acceptance of washed potatoes in retail stores in the Portland and Boston markets, which are described in the next section, there were no indications that washed potatoes would not keep equally as well as unwashed potatoes.

Although further tests are necessary to draw definite conclusions, there is some indication that there may be a greater weight loss in washed potatoes than in unwashed potatoes when stored under the same conditions.

TABLE 1

Development of External Grade Defects in Washed and Unwashed Potatoes Stored for a Four-Week Period Under Various Storage Conditions, February and March, 1950

Type of Storage	Variety and Type of Potatoes					
	Katahdin		Green Mountain		Kennebec	
	Washed	Unwashed	Washed	Unwashed	Washed	Unwashed
	Per Cent External Grade Defects					
Track Storage:						
When Stored	7.57	8.20	12.44	13.75	19.63	24.72
4 Weeks Later	7.25	8.83	21.98	23.14	21.28	27.10
60° F. Storage:						
When Stored	6.41	8.63	19.77	12.00	21.56	28.85
4 Weeks Later	7.55	8.69	30.49	24.27	24.26	27.33
70° F. Storage -High Humidity:						
When Stored	7.05	7.54	17.77	3.55	18.38	16.76
4 Weeks Later	7.22	8.34	28.15	13.64	20.00	17.33

ACCEPTANCE OF WASHED MAINE POTATOES BY CONSUMERS IN PORTLAND AND BOSTON

Portland Market, March 27 to April 29, 1950

Washed and unwashed potatoes of similar quality were packaged in regular 10-pound paper bags at the experimental potato storage house at Aroostook Farm, Presque Isle, Maine. Both the washed and unwashed potatoes were put up to U. S. No. 1 grade allowing a low tolerance for grade defects. These potatoes were then trucked to Portland and sold in six chain stores over the five-week period starting March 27, 1950. At each store the packages of washed and unwashed potatoes were displayed side by side to give customers an opportunity to choose the type of potatoes they desired. Although each package was plainly labeled as containing either "washed" or "unwashed" potatoes the tubers inside the closed packages were not visible unless the packages were opened. In order to give customers an easy opportunity to distinguish the differences between the washed and unwashed potatoes, small bulk displays of both types of potatoes were set up on a counter near the packaged potatoes. No sales effort was used to promote the sale of either washed or unwashed potatoes.

For the first two weeks the study was being conducted, the washed potatoes sold at 45 cents per bag as compared with 39 cents per bag for the unwashed potatoes. The latter price was the same as the store would have charged for unwashed potatoes in this type of bag. The last three weeks of the study both the washed and unwashed potatoes sold at the same price, 39 cents per 10-pound bag.

When the washed potatoes sold for six cents per bag more than the unwashed potatoes, 38.2 per cent of the total sales of these two types of packages were washed potatoes and 61.8 per cent were unwashed. During the last three weeks, when both the 10-pound bags of washed and unwashed potatoes sold at the same price, the washed potatoes represented 64.7 per cent and the unwashed potatoes 35.3 per cent of their combined sales (Table 2).

There are several factors which may have had an influence on the acceptance of the washed potatoes. The premium of six cents per 10-pounds apparently was considered too large by some of the consumers, although the sales period at this premium may have been too brief to

TABLE 2

Sales of Washed and Unwashed Potatoes in Six Retail Stores in Portland, March 27 to April 29, 1950

Premium and Week of	No. of 10-pound Bags of Test Potatoes Sold		Per Cent Washed Potatoes of	
	Washed	Unwashed	Test Potato Sales	Total Potato Sales*
Washed at 6 cents premium:				
March 27 – April 1	351	550	39.0	11.4
April 3 – April 8	334	560	37.4	9.9
Average for period	342	555	38.2	10.6
Washed & Unwashed at Same Price:				
April 10 – April 15	558	323	63.3	17.4
April 17 - April 22	590	293	65.6	17.7
April 24 -- April 29	551	295	65.1	17.0
Average for period	556	304	64.7	17.3

* Includes the potatoes regularly carried by the stores such as 5-pound, 10-pound, peck, and 50-pound bags as well as the test potatoes in 10-pound packages.

establish preferences. Also some customers may have believed that the general appearance of the unwashed potatoes was better than the washed. This may be explained by the fact that this study was made late in the marketing season after the potatoes had been in storage for about five months. The potatoes had been harvested while immature and were considerably skinned. Each place where the skin had been removed in handling showed a brown discoloration which detracted from general appearance. Although the potatoes had been culled rather thoroughly in grading, the general appearance of the washed potatoes was not too pleasing because of the brown discoloration. This fact may have had some influence on why only 65 per cent of the total sales were for washed potatoes when the price was the same as the unwashed potatoes.

Boston Market, November 20 to December 23, 1950

To determine the customers acceptance of washed Maine potatoes in an out-of-state market and at the same time determine some of the problems of washing potatoes earlier in the marketing season, a study was conducted in the Boston market in the fall of 1950. During the first week of this study in Boston, six stores participated, the following week two more stores were added and the third week another store, making nine in all cooperating. Three stores were in each of the following trade areas, Arlington, Hdye Park, and Quincy.

This study was conducted in a manner similar to the previous study in Portland, Maine, with the exception that both the washed and unwashed potatoes were in 10-pound mesh front or "Vent Vu" bags instead of the regular paper bags. By using "Vent Vu" bags it was not necessary to put up bulk displays since the difference between the washed and unwashed potatoes could be seen through the mesh front of the bags. Also for the Boston study the packages of washed and unwashed potatoes averaged about five per cent external grade defects when they were packaged at Aroostook County as compared with about two per cent external grade defects for the potatoes used in the Portland study.

For the first two weeks of the study (November 20 to December 2) the washed potatoes were priced at 31 cents per 10-pound bag as compared with 29 cents for the 10-pound bag of unwashed potatoes. The last three weeks of the study the washed potatoes were sold at a four-cent premium per bag over the unwashed potatoes. At the two-cent premium washed potatoes represented 58.8 per cent and at the four-cent

TABLE 3

Sales of Washed and Unwashed Potatoes in Six to Nine Retail Stores in the Boston Market Area, November 20 to December 23, 1950

Premium and Week of	No. of Stores	No. of 10-Pound Bags of Test Potatoes Sold		Per Cent Washed Potatoes of	
		Washed	Unwashed	Test Potato Sales	Total Potato Sales
Washed at 2 cents premium:					
Nov. 20 – Nov. 25	6	580	438	57.0	14.3
Nov. 27 – Dec. 2	8	759	498	60.0	14.0
Average for period	7	669	468	58.8	14.1
Washed at 4 cents premium:					
Dec. 4 – Dec. 9	9	879	840	51.1	14.5
Dec. 11 – Dec. 16	9	942	879	51.7	18.5
Dec. 18 – Dec. 23	9	1341	1056	55.9	18.5
Average for period	9	1054	925	53.3	17.2

Display of washed and unwashed potatoes at a retail store in the Boston market area.

premium 53.3 per cent of the combined sales of 10-pound bags of washed and unwashed potatoes (Table 3).

The clerks and produce managers in the stores, where the study was being conducted, developed considerable interest in washed Maine potatoes. Although only 53 per cent of the sales in the last three weeks of the study were washed potatoes the store personnel's interpretation was that more than half the consumers were willing to pay a premium of four cents for a 10-pound bag of washed potatoes. This, coupled with the fact that no complaints were received but many favorable comments were offered on the good qualities of washed potatoes, made a very favorable impression on most of the store personnel that were directly in contact with the study.

There was considerable variation among stores in the percentage that washed potatoes were of the total sales of the washed and unwashed potatoes. When the premium was two cents per 10-pound bag of washed potatoes, the range in the percentage that washed potatoes were of total sales was from 46.9 per cent for a store in Hyde Park Area to 72.1 per cent for another store in Arlington (Table 4). At the four cents per

bag premium the range was from 32.0 per cent for a store in the Arlington Area to 65.2 per cent for another store in the same area.

The customers of certain stores appeared to be very responsive to the change in spread between the price of washed and unwashed potatoes while in other stores the increase in spread did not have much effect on sales. For example a store in the Arlington Area that sold 72.1 per cent washed potatoes at the two-cents premium dropped to 32.0 per cent the next week when the premium increased to four cents. This was in contrast to a store in the Quincy Area that sold 57.7 per cent as washed potatoes at the two-cents premium and then the first week at the four-cents premium declined to 53.5 per cent but by the end of the third week at the four-cents premium were selling 60.8 per cent as washed.

TABLE 4

Variation Among Stores in the Per Cent Washed Potatoes Were of Total Sales of Washed and Unwashed Potatoes Under Test by Weeks, and Areas, November 25–December 23, 1950

Area and Store	Per Cent Washed Potatoes Were of Sales of Test Potatoes				
	2¢ Premium on Washed Potatoes		4¢ Premium on Washed Potatoes		
	Nov. 20-25	Nov. 27-Dec. 2	Dec. 4-9	Dec. 11-16	Dec. 18-23
Arlington Area:					
Store No. 1	60.6	53.3	44.4	51.8	65.2
Store No. 2	54.0	72.1	32.0	53.3	40.4
Store No. 3		—	51.8	50.7	51.0
Average for Area	59.1	56.7	46.9	51.5	57.1
Hyde Park Area:					
Store No. 4	46.9	54.7	48.3	44.4	47.9
Store No. 5	66.4	56.5	54.3	57.7	62.2
Store No. 6	—	55.9	48.0	52.5	63.3
Average for Area	55.3	55.5	50.2	50.7	55.7
Quincy Area:					
Store No. 7	57.3	65.9	59.4	52.6	55.1
Store No. 8	55.4	57.7	53.5	51.6	60.8
Store No. 9	—	64.9	46.6	52.3	53.1
Average for Area	56.9	64.3	54.0	52.3	55.3
Average All Areas	57.0	60.4	51.1	51.7	55.9

ACCEPTANCE OF WASHED MAINE POTATOES BY RETAILERS IN THE BOSTON MARKET

In April 1950 two carloads of washed Maine potatoes in 10 and 50 pound bags were sold on consignment to carlot receivers in the Boston market. These receivers in turn resold the washed potatoes to retail stores in the area. Information was received on the salability of these washed potatoes from 23 retailers who bought these potatoes.

All of the 23 retailers expressed comments that conveyed the impression that the general appearance of the washed potatoes was highly acceptable. Only one retailer mentioned that the potatoes had brown spots where the skin was removed but he contended the appearance was very good and his customers apparently liked these potatoes since there were many requests for washed Maine potatoes after his supply was exhausted. Most retailers judge the acceptability of the products they handle on their salability and the amount of complaints they receive from customers. All the retailers said the washed potatoes sold well and no complaints were voiced by their customers. Thirteen of the retailers said customers came back and asked specifically for the washed potatoes.

Some of the 23 retailers sold the 10-pound packages of washed potatoes at the same price as their regular 10-pound packages of unwashed Maine potatoes. Five of the retailers, however, charged a premium of four to six cents a bag over the price of their regular 10-pound packages. The remainder of the stores (11) did not handle regular 10-pound packages.

COST OF WASHING POTATOES

The costs of washing potatoes that are additional to the cost of putting up unwashed potatoes include (1) the investment and installation of the washing and drying equipment, (2) the installation of running water and a sewage system for the disposal of used water, (3) fuel for heating the dryer to dry the washed potatoes, (4) electric power to run the electric motors on the washing and drying equipment, (5) water to wash the potatoes, and (6) the additional amount of culls due to the potatoes being washed.

Labor requirements may not be any greater in putting up washed than unwashed potatoes. However, if the equipment is operated at capacity, or if a high uniform quality pack is desired, it is advisable to have more than the one man commonly used at the grading table in putting up potatoes. Most storage houses do not have sufficient room to set up the washing and drying equipment without considerable remodeling. It is not desirable to install the equipment on the same floor near bins of stored potatoes because the heat from the dryer will cause early sprouting. The ideal location for this equipment would be in a specially constructed packing house designed with ample room for receiving potatoes to be washed, dried, and packaged.

Investment costs will vary with different situations depending upon the difficulty in installing the equipment and the availability of running

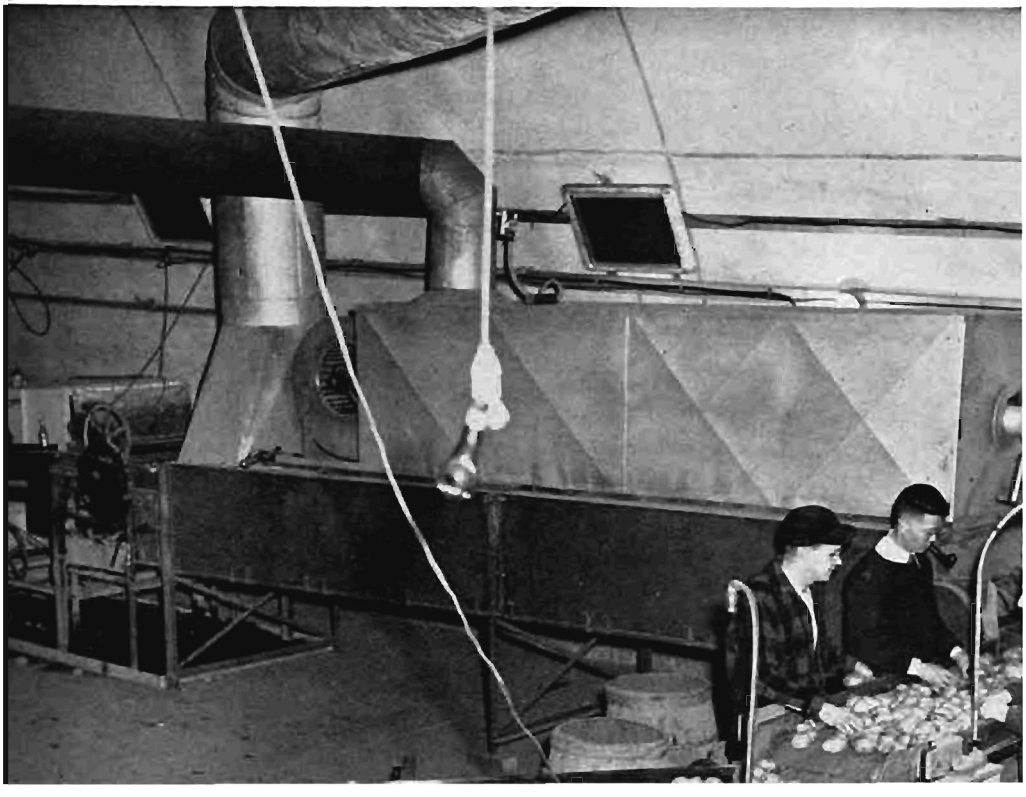
water and a sewer. At current prices it is reasonable to expect an investment of $8,000 to $10,000 in a washer and dryer installed ready for use. The capacity of this washing and drying equipment would be about two carloads a day. If maximum use is made of this equipment throughout the marketing season and over a number of years, the cost of the investment on a carload basis could be a rather minor item. For example, a $9,000 investment amortized at five per cent interest over a 10-year period would amount to an annual cost of $1,165. If 100 to 200 cars were washed during the season, the investment cost would be from $5.82 to $11.65 per car or about 1.5 to 3.0 cents per cwt.

The cost of fuel oil used is rather constant on an hourly basis but may vary widely on a carload basis because of the variations in the volume of potatoes put through the washer and dryer. The burner on the dryer uses an average of 4.5 gallons of fuel oil per hour.

The additional cost of electric power due to washing is rather constant on an hourly basis but will vary on a carload basis according to the

John Bean Equipment Used to Wash and Dry Potatoes at Aroostook Farm, Presque Isle.

Potatoes enter the washer at the extreme left, pass over a foam rubber moisture absorber, then through the dryer to the conveyor at the right that carries the washed and dried potatoes to the grading and packaging equipment.



speed in which the carload of potatoes is washed. On the potatoes packed for use on the Boston study it took about 4.3 kw. more per hour putting up washed potatoes than it did in putting up unwashed potatoes.

The amount of water required to remove the dirt from Maine potatoes is relatively small. At the beginning of washing in the fall of 1950 water was used at the rate of about 11 gallons per minute. The amount of water was reduced to 0.9 gallon per minute and apparently as good results were obtained as with the larger volume. The probable reasons for the low water requirements are (1) Maine potatoes are not particularly dirty and the soil is rather easily removed and (2) in the washing process the potatoes receive a scrubbing effect from the rubber projections on the rollers that carry the potatoes through the washer. As the potatoes pass through the washer they are sprayed from over-head nozzles with water under pressure. No water is reused. The amount of water used to wash a carload depends on the rate the potatoes are put into the washer. On one carload washed in 3¾ hours it took 216 gallons of water to wash 500 cwt. of potatoes. This was an average of 1.7 quarts of water to 100 pounds of potatoes.

There was an average of 4.1 pounds more culls per 10-pound bag in grading the washed potatoes than in the unwashed potatoes used on the Portland study in the late spring of 1950. It took an average of 22.07 pounds of washed potatoes as compared with an average of 17.96 pounds of unwashed potatoes of 2¼ to 3¾ inch potatoes to get a 10-pound package of potatoes. The large amount of culls in grading both the washed and unwashed potatoes indicates that the quality of potatoes from the bins was rather poor and emphasizes that a quality pack cannot be economically obtained from poor stock. The additional culls from washing (4.1 pounds per 10-pound bag) is no doubt excessive for commercial operation but it should be kept in mind that the quality of potatoes used was generally poor and that an attempt was being made to put up a high quality package.

The potatoes used in the Boston study in November and December 1950 were of generally higher quality than those used in the Portland study and might be considered as representing average quality at that time of year. After the potatoes had been sized, an average of 3.7 pounds of culls per 10-pounds of potatoes packaged were removed in grading the washed potatoes as compared with an average of 2.6 pounds for the unwashed potatoes. At prices prevailing during this period the cost of the 1.1 pounds of additional culls from washing averaged about one cent per 10-pound package.

The additional culls from washing potatoes are due to several factors. Grading potatoes both before and after they are washed will result in the

disclosure and removal of defective tubers that were missed in the first grading. This is true whether the potatoes have or have not been washed particularly if uniform quality among packages is an objective of grading. Washing will disclose dirt-hidden defects, particularly sunburn and scab. In addition to the tubers removed because of grade defects other potatoes will be culled after washing not because they have grade defects but because of poor appearance.

It is the belief of Federal-State potato inspectors and others working on these studies that potatoes put up to grade unwashed will still be in grade after they are washed. However, in order to attain uniformity of quality and general appearance among the individual packages in the lot, some off-grade and unattractive potatoes will need to be removed after the potatoes are washed. The amount of potatoes removed will depend chiefly on (1) the maturity of the potatoes when they are harvested and (2) the amount of external defects, particularly bruises.

It is rather difficult to make an accurate estimate of the total cost of washing a carload of potatoes because of the many variables involved. The cost of fuel, electricity and water at 1951 prices will range from about $4.50 to $9.00 a carload depending upon the speed of the operation. Equipment costs, as indicated previously, might vary from about $6.00 to $12.00 a car if 100 or 200 carloads are washed a year over a period of 10 years. The costs of additional culls from washing is more difficult to estimate due to the great variation in the quality of different lots of potatoes, the quality of pack desired, how uniform a pack the shipper is attempting to package, the value of culls, and the shippers interpretation of additional shrinkage. Thus, with the foregoing assumptions, the total cost of washing a carload of potatoes other than culls would range from about $10.50 to $21.00 a carload of 450 cwt., or from about 2½ to 5 cents a cwt.

USE OF WASHING AND DRYING EQUIPMENT BY SHIPPERS

An attempt was made to interest shippers in using the washing and drying facilities at Aroostook Farm to permit them to become acquainted with the washing and drying equipment and to observe the amount of shrinkage occurring with their own potatoes. It is believed that this latter point is an excellent manner in which shippers can be impressed with the tenderness of potatoes.

One shipper washed four carloads of potatoes. These potatoes were first graded and sacked at his own warehouse and then transported to Aroostook Farm for washing. The shipper was primarily interested in (1) the amount of culls after washing and (2) the efficiency of the equipment.

Of the 1,905 cwt. of potatoes washed, 94 cwt. or 4.9 per cent, were culled out after the potatoes were washed. The range in amount of culls per carload was from 7 to 40 cwt. or from 1.4 to 8.2 per cent of the potatoes washed.

The four carloads of potatoes from the shipper, 1,905 cwt., were washed at the average rate of 122.9 cwt. or 204.8 bushels per hour. The average requirements for bagging and loading in cars 450 cwt. of washed potatoes in 3.87 hours was 22.59 gallons of range oil, 224 gallons of water and 34.6 kw. of electricity.

CONCLUSION

It has been demonstrated that washed Maine potatoes will keep as well as unwashed potatoes of similar quality. Potatoes that are in the process of deteriorating because of soft rot or other causes will continue to deteriorate after they are washed the same as though they had not been washed. Caution should be taken in washing potatoes as a salvage operation since any further deterioration is likely to be blamed on the washing rather than on the true cause.

The general appearance of washed Maine potatoes depends chiefly on (1) the degree of maturity when harvested, (2) the amount of bruising occurring in harvesting, storing, grading, and packaging, (3) the amount of disease present including scab, rhizoctonia, and scurf, (4) variety, and (5) length of storage prior to washing. However, maturity and bruising are the most important factors affecting the general appearance of washed potatoes and both of these factors are under the general control of the farmer or the shipper.

To get the maximum benefits from washing (improved appearance as well as cleanness) only potatoes of high quality should be washed. It is almost impossible as well as impractical from a cost standpoint to attempt to separate out the potatoes of high quality from lots of potatoes where quality is generally lacking.

The variation in quality and general appearance among potatoes raised by different farmers or by the same farmer creates a major problem in securing washed potatoes of uniform quality. Potatoes raised by some Maine farmers are so feathered and badly bruised that washing would detract from their appearance because dirt hides many of these defects. It is rather difficult to conclude, however, that it is better to leave the dirt on these potatoes just to cover up their shortcomings since the housewife finds these defects when the potatoes are prepared for cooking.

It is true that washing will clearly disclose all the defects on the tubers. To many in the industry, this appears objectionable. Cleanness,

however, may be more important to the housewife than greater visibility of defects. In the first place, housewives are aware that Maine potatoes have defects even though they may be partly hidden by dirt at the time of purchase. Secondly, housewives appear to be more concerned than formerly about bringing dirt in any form into their modern white kitchens. Thirdly, potatoes are about the only fruit or vegetable the housewife buys that has not had the dirt removed. Women shoppers interviewed at the time the Boston study was conducted said they preferred the washed potatoes mainly because, (1) they keep dirt out of the house, (2) the sink, hands, and fingernails were kept clean when preparing the potatoes for cooking, and (3) the preparation for cooking was easier because of previous washing. Some customers said they preferred the brighter more wholesome appearance of the washed potatoes and believed they were getting better quality.

There could be indirect benefits to the industry from washing potatoes that may not be apparent in the washing operation or the resulting more attractive product. Since only the potatoes that are properly harvested and stored make the most attractive washed potatoes, washing may provide a stimulus in getting a general improvement in external potato quality by making producers and handlers more conscious of those practices that add to or detract from general appearance. Also washing may prove to be one way in which consumers can be induced to eat more potatoes. This is particularly important in view of the declining per capita consumption of potatoes.