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MARKET QUALITY OF KANSAS POTATOES AS DETERMINED BY FEDERAL INSPECTION

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TABLE OF CONTENTS

MARKET QUALITY OF KANSAS POTATOES AS DETERMINED BY FEDERAL INSPECTIONS[1]

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Introduction

The quality of Kansas potatoes is controlled, to a large extent, by the producer. As a market factor, the quality and condition of potatoes when they reach the terminal market or the consumer are of the utmost importance.

For some years Kansas potatoes on terminal markets have brought much lower prices than potatoes from competing areas. This study is an attempt to determine reasons for the failure of Kansas potatoes to meet quality competition of potatoes from other states.

Quality products always command a premium. A few Kansas potato producers in the past, unfortunately, have failed to realize the importance of grading their potatoes for a quality product or any effort to grade out inferior stock has been carelessly done. The reputation of a producing area influences the price that will be bid on the terminal market for products from that area. Particularly is this true if competition is keen, as is the case with potatoes. A producer may grade and pack a superior product but receive a relatively low price on the terminal market because buyers are influenced by experiences with potatoes from the area. Therefore, it is to the interest of every commercial potato producer in Kansas to have his product well graded and conditioned before it is sent to market. If producers in Kansas successfully compete with growers in other potato producing areas, they must build a reputation for a quality product.

Federal-state inspectors have found that Kansas potatoes generally are not well graded and have many defects that cause trouble before they reach the consumer. If an effort is made to improve the quality, there is reason to believe that Kansas potatoes can successfully meet price competition on terminal markets for potatoes and establish a favorable reputation.

The importance of inspection in revealing quality defects in potatoes and in stimulating the production and marketing of a high-quality product, is clearly indicated by the experiences of Kansas potato growers. For this and other important reasons, a brief history of potato inspection services in Kansas follows.

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1. Contribution No. 109 from the Department of Agricultural Economics.
This report is a summary of a study conducted during the early part of 1940 by the Agricultural Economics Department of the Kansas Agricultural Experiment Station under cooperative arrangements with the Coöperative Division of the Farm Credit Administration, Washington, D. C.
2. Wm. H. Winner, Research Assistant in Agricultural Economics, assisted in the collection and preparation of data.

Development of Potato Inspection Work in Kansas

In 1915 the Bureau of Markets of the United States Department of Agriculture inaugurated an experimental telegraphic market news service on fruits and vegetables. It was immediately decided that if this service were to be practical, prices must be based on definite standards. Potatoes, because of their importance as a food crop, were one of the first crops to receive consideration. By the time the United States entered the World War, potato grades had been well established.

At first, inspections were made only in receiving markets but, beginning July 1, 1922, the service was extended to shipping points. For a number of years shipping-point inspection was carried out largely with the cooperation of the various states. The federal government usually licensed and supervised the inspectors, but the grades were established by each state. However, most states adopted the suggested United States grades outright or in a slightly modified form.

FIG. 1.—Federal potato inspectors working at a potato loading dock near Topeka, Kan., in July, 1939.

Kansas was one of the first states to see the value of shipping-point inspection for potatoes. In the fall of 1922 a movement for this service was in progress in Kansas and, as a result, a contract was entered into by the Extension Service of the Kansas State Agricultural College and the Bureau of Agricultural Economics of the United States Department of Agriculture for voluntary shipping-point inspection of potatoes, to begin in 1923.

Because many growers and dealers failed to use this inspection service, the measure lost much of its effectiveness and the potato growers of Kansas requested the Kansas legislature to pass a law requiring the inspection of all carloads of potatoes during the heavy marketing season.

The state legislature in 1927 authorized the State Board of Agriculture to fix and promulgate official standards for grading and classifying all Kansas-grown Irish potatoes offered for carlot shipment in Kansas. The compulsory feature of the law was in effect from June 15 to September 1 of each year, The State Board of Agriculture, through its secretary, was to arrange for official government inspection, to determine grades of such carlot shipments,

and to make the necessary rules and regulations for the purpose of carrying out the provisions of the act.

The compulsory potato law was in effect from 1927 to 1932, inclusive. It was repealed by the legislature in 1933 with the exception of the first section, which was left and is still on the statute books, The section remaining relates to the establishment of official classifications and grades.

The law was passed as a result of the demands of a majority of the potato growers in the Kaw Valley who believed that this was the best way to improve the commercial potato industry in Kansas. The law was repealed because a group in one section of the Kaw Valley objected to the compulsory features.

In recent years potato inspection has been on a voluntary basis under cooperative arrangements between the Agricultural Marketing Service and the Extension Division of Kansas State College.

Proportion of Potatoes Inspected

During the 10-year period 1930-1939, a total of 18,042 cars of Irish potatoes were shipped from Kansas. More than 90 percent were shipped from the Kaw Valley. Of the total carlot shipments, approximately two-thirds were federally inspected. This high proportion of inspections is partly a result of compulsory inspection during the first three years of this period. It is interesting to observe that during 1932, the last year of compulsory inspections, only about 90 percent of the potatoes were inspected (Table 1). This apparent inconsistency is explained by the fact that the compulsory feature of the potato inspection law was in effect only from June 15 to September 1 of each year. In some years, and 1932 is an example, a number of uninspected cars were shipped after September 1.

TABLE 1. *Carlot shipments and inspections of Kansas potatoes, 1930-1939*

YEAR.	Total carlot shipments.	Inspected carlot shipments.	Inspected cars in percentage of total.
1930	3,856	3,828	99.3
1931	2,710	2,643	97.5
1932	3,132	2,835	90.6
1933	1,657	426	25.8
1934	357	72	20.2
Totals	**11,712**	**9,804**	**(Av.) 66.7**
1935	595	233	39.2
1936	1,262	520	41.2
1937	1,359	640	47.1
1938	2,078	1,257	60.5
1939	1,036	419	40.5
Totals	**6,330**	**3,069**	**(Av.) 48.5**

When voluntary inspection was reinstated in 1933, only about one-fourth of the potatoes were inspected. This indicated that the majority of growers preferred to ship their potatoes uninspected. The

trend of inspected cars in percentage of total shipments is significant (Table 1). Each year since 1932, with the exception of 1934 and 1939, a greater proportion of potatoes have been voluntarily inspected. In 1934 and 1939 the quality of the crop was extremely poor because of drought or excessive heat at harvesting time. As a result, such a small percentage of the crop graded U. S. No. 1 that many growers felt it to their advantage to ship uninspected stock. Because potato buyers and handlers are increasingly demanding inspected stock, it appears that in the future an even larger proportion of Kansas potatoes will be inspected.

VARIETIES SHIPPED

The Irish Cobbler is the principal potato variety shipped from Kansas. During the 10-year period 1930-1939, almost 97 percent of total inspected shipments were Cobblers. This compares with 2 percent Bliss Triumphs, 0.3 percent Warbas, 0.2 percent Early Ohios, and 0.6 percent all other varieties.

Varieties other than Cobblers are becoming increasingly popular, as indicated by the 1939 inspection reports which show 87.8 percent of inspected potatoes as Cobblers compared with 10 percent Bliss Triumphs, 0.4 percent Warbas, and 1.8 percent other varieties. There is a growing market demand for a red potato, and Triumphs are meeting that demand more than any other variety grown in Kansas.

A comparison of inspected potatoes by varieties for the five-year periods 1930-1934 and 1935-1939 indicates a tendency on the part of growers to produce more of the Triumphs and Warbas although the relative proportion to Cobblers remains small.

TABLE 2. *A comparison of inspected Kansas potatoes by varieties for the five-year periods 1930-1934 and 1935-1939*

(Percentage of total inspections)

YEAR.	Cobblers.	Triumphs.	Warbas.	Early Ohios.	All others.*
1930-'34	97.80	1.20	0.00	0.40	0.60
1935-'39	95.90	2.70	0.55	0.03	0.82

* Includes cars of mixed varieties.

CLASSIFICATION BY GRADES OF INSPECTED POTATOES

It is the aim of every progressive potato grower to market a high-quality product. The extent to which growers have been successful in producing quality potatoes is indicated in figure 2.

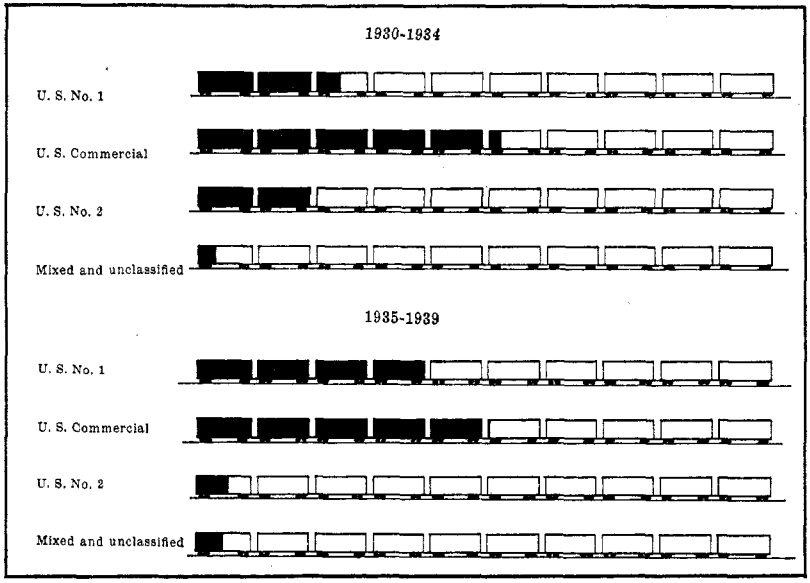

FIG. 2.—Percentage of Kansas inspected potatoes classified in the various grades during 1930-1934 and 1935-1939. (Each car represents 10 percent of total shipments. The shaded cars represent the percentages of total inspections in various grades.)

In the first five-year period, 1930-1934, only 24.8 percent of inspected potatoes graded U. S. No. 1 compared with 39.7 percent classified as U. S. No. 1 during the second five-year period, 1935-1939 (Table 3). This may indicate that growers have been doing better grading in recent years, or it may be due partly to the shift from compulsory to voluntary inspections, with only the better stock offered for inspection. Because inspections were compulsory during a large part of the 1930-1934 period, comparison with the 1935-1939 period may not be entirely comparable in certain aspects.

There is great variation from year to year in the percentages of the crop in the different grades. For example, in 1931 only 10.6 percent of all inspected potatoes were classified in the top grade, compared with 69.6 percent in 1936. In 1933, when 142 cars were inspected, not one car was below a U. S. No. 2 grade. This compares with 12.5 percent of inspections designated as "unclassified" in the summer of 1934 (Table 3). This wide variation from year to year in the quantity of potatoes in the different grades is due to many

TABLE 3. *A comparison of the number and percentage of inspected cars of Kansas potatoes in the different grades, 1930-1939*

YEAR.	Total number of inspections.	Grade.									
		U. S. No. 1.		U. S. Commercial.		U. S. No. 2.		Unclassified.		Mixed.	
		Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.
1930-'39	6,337	2,028	32.0	3,260	51.4	804	12.7	195	3.1	50	0.8
1930-'34	3,268*	811	24.8	1,715	52.5	643	19.7	80	2.4	19	0.6
1935-'39	3,069	1,217	39.7	1,545	50.4	161	5.2	115	3.7	31	1.0
1930	1,276	487	38.2	671	52.6	71	5.5	38	3.0	9	0.7
1931	881	93	10.6	425	48.3	336	38.1	25	2.8	2	0.2
1932	945	130	13.7	580	61.4	219	23.2	14	1.5	2	0.2
1933	142	91	64.1	34	23.9	12	8.5	0	0.0	5	3.5
1934	24	10	41.7	5	20.8	5	20.8	3	12.5	1	4.2
1935	233	85	36.5	119	51.1	25	10.7	3	1.3	1	0.4
1936	520	362	69.6	103	19.8	17	3.3	19	3.7	19	3.6
1937	640	417	65.2	204	31.9	13	2.0	2	0.3	4	0.6
1938	1,257	327	26.0	850	67.6	18	1.4	57	4.6	5	0.4
1939	419	26	6.2	269	64.2	88	21.0	34	8.1	2	0.5

* During this five-year period only every third inspection report was analyzed. The actual number of inspections, therefore, was three times the number shown.

factors, chief of which is the direct or indirect effect of weather on growing and harvesting conditions. For example, ample moisture early in the growing season followed by a period of dry weather, then rains a few weeks before digging, promotes second growth. Excessive moisture encourages certain potato diseases. In other years temperatures at harvesting time near or above 100° F. are conducive to rapid development of decay. When more than 1 percent of the potatoes are affected with decay, they are unclassified. Decay was the principal cause of the relatively high percentage of potatoes which were unclassified in the extremely hot, dry summer of 1934.

During the 10-year period 1930-1939 a total of 51.4 percent of the inspected potatoes were graded U. S. Commercial. This grade allows for about the same defects as the U. S. No. 1 except that the tolerance for defects is 20 percent instead of 6 percent, and more dirt is allowed (See Appendix, U. S. Standards of Potatoes, page 31). The variation from year to year in the percentage of inspected potatoes in this grade classification is not so great when compared with the other grades (Table 3).

DEFECTS OF POTATOES

Potato inspectors find that too often Kansas potatoes are not well graded and include many defects which cause trouble at the terminal and retail markets. The extent to which the most important defects have occurred in a recent 10-year period is shown graphically in figure 3.

It is significant that a man-made injury—cuts—has been mentioned as a grade defect by the inspectors more often than any other defect. Of 6,337 potato inspections, 3,480 (54.9 percent) were designated as having cut potatoes to a greater or less degree. Bruises and mechanical injury—other man-made injuries—were listed as grade defects in about 36 percent of the inspections (Table 4). Cuts, bruises, and mechanical injury occur during digging and subsequent handling. In many cases this damage could be reduced if growers practiced more careful methods of harvesting and marketing. In other cases mechanical injury in itself may not be sufficient to lower the grade, but the general appearance of the potatoes is affected. This tends to lower the price received. Some growers use rubber-covered picking baskets and have rubber-padded diggers and weighing scales to reduce this damage (Fig. 4).

Second growth is much worse in some years than in others. It is mentioned as a grade defect in 43.2 percent of the inspections during the 10-year period 1930-1939. Removal during the grading of more potatoes having second growth would help to place potatoes in the higher grades.

Scab is one of the most common defects in Kansas potatoes. It is useless to try to build up the reputation of Kansas potatoes unless the more noticeable scabby potatoes are sorted out.

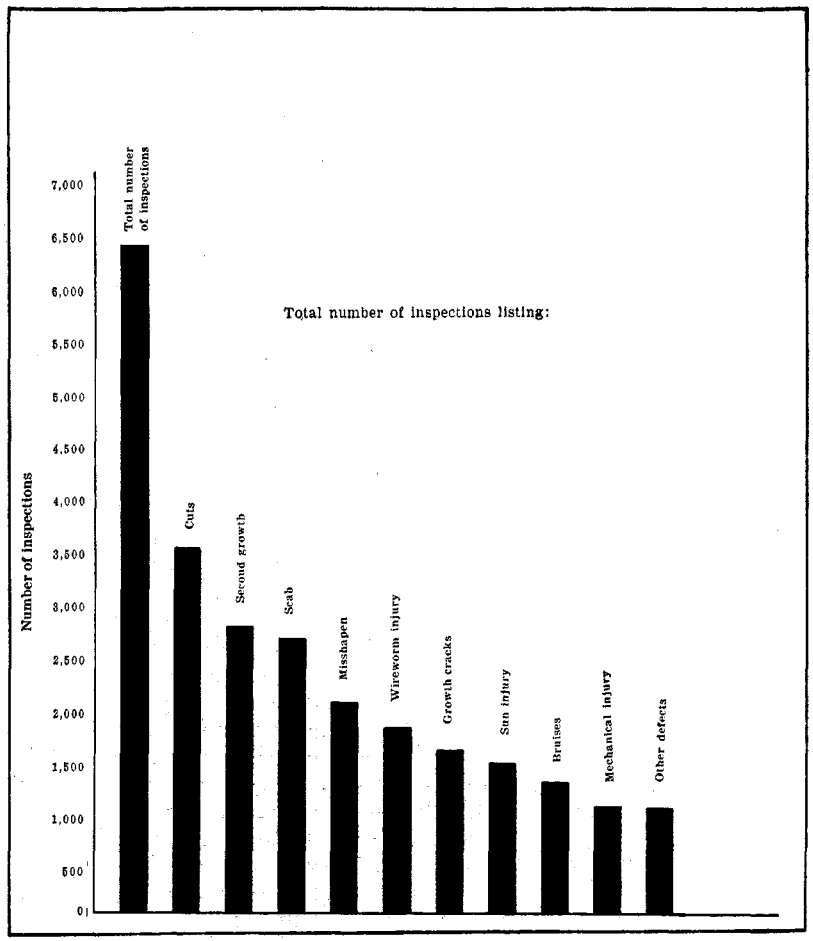

FIG. 3.—Number of inspections of Kansas potatoes showing extent of specified grade defects for the period 1930-1939.

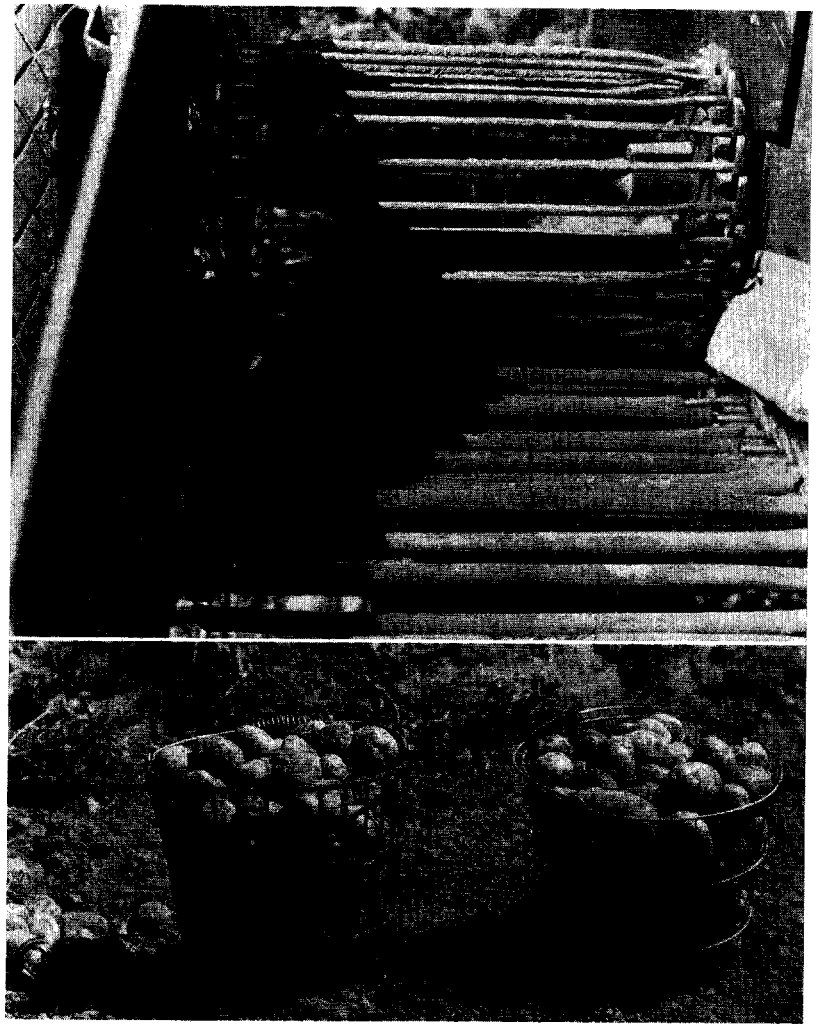

FIG. 4.—Mechanical injury to potatoes can be lessened by the use of rubber-covered equipment as shown above.

TABLE 4. *Percentage of Kansas inspected potatoes showing specified grade defects, 1930-1939*

YEAR.	Grade defects.									
	Cuts.	Second growth.	Scab.	Mis-shapen.	Wireworm injury.	Growth cracks.	Sun injury.	Bruises.	Mechanical injury.	Other injury.
1930-'39	54.9	43.2	41.2	31.7	28.2	24.7	22.9	19.9	16.3	16.2
1930-'34	63.2	49.3	46.8	28.6	18.7	32.5	14.8	18.4	0.3*	23.1
1935-'39	46.1	36.7	35.3	35.0	38.4	16.5	31.5	21.5	33.4	8.9
1930	60.4	28.6	41.6	15.4	26.2	59.2	28.7	20.6	0.4	20.9
1931	66.7	82.9	39.2	31.6	10.1	4.2	5.4	14.4	0.2	15.1
1932	61.5	46.0	60.5	34.9	16.0	28.2	6.4	14.5	0.3	34.5
1933	74.6	52.1	48.6	80.3	12.7	0.7	4.2	43.0	0.0	14.1
1934	79.2	25.0	45.8	62.5	70.8	4.2	8.3	62.5	0.0	33.3
1935	38.6	51.9	19.3	25.3	72.5	41.6	24.9	8.6	48.5	6.9
1936	73.8	9.2	29.0	37.5	56.3	3.1	27.7	43.1	14.8	14.0
1937	71.7	54.4	31.1	46.4	45.0	5.2	25.5	34.7	3.4	5.6
1938	33.8	31.7	36.1	23.4	27.1	22.4	36.9	13.4	46.2	6.6
1939	13.6	50.6	55.6	54.4	20.8	18.6	33.2	6.4	55.1	15.3

* During this five-year period mechanical injury was not differentiated from cuts to any extent; this explains the relatively small percentage of cases listed as mechanical injury.

Damage by wireworm is much more severe in some seasons than in others. In 1934 and 1935 more than 70 percent of the inspected potatoes had wireworm injury, compared with only 10 and 16 percent in 1931 and 1932 (Table 4).

Sun injury or sun scald is a serious defect resulting from exposure of the potato to the direct rays of the sun. A potato that has sun injury is susceptible to the attacks of rot-producing organisms. For this reason, it is important that potatoes be handled in such a way as to avoid direct exposure to the sun. In almost one-fourth of the inspections during the 1930-1939 period, exposure to the sun was listed as having caused more or less damage. Many growers follow the practice of digging only in the early morning or late evening to avoid sun injury to the potatoes. Sacked potatoes left in the hot sun for a short time will sustain sun injury (Fig. 5). Such potatoes

FIG. 5.—An illustration of the undesirable practice of leaving large quantities of potatoes exposed to the hot sun. This photograph was taken during the noon hour when the air temperature was 104° F.

loaded into cars may deteriorate rapidly when decay starts. In some areas the inspector puts the temperature reading on his report. This may influence the buyer to call for reinspection upon arrival if there is evidence of heat in the potatoes.

Occasionally an inspector will state in his report that a particular defect was chiefly responsible for lowering the grade of a carload of potatoes. Of 6,337 inspections during the 1930-1939 period, 255 (4 percent) designated a particular defect as the chief cause for lowering the grade. Decay, dirt, sun injury, and undersize were most often mentioned specifically as lowering grade. Decay is the defect mentioned most often as placing potatoes in the unclassified category. In almost 17 percent of inspections that were unclassified, decay was given specifically as the only reason for failure to meet requirements of the grade.

TABLE 5. *Number and percentage of total inspections in which one grade defect was designated specifically as placing the potatoes in a lower grade, 1930-1939*

GRADE.	Total number of inspections.	Defects.							
		Undersize.		Dirt.		Sun injury.		Decay.	
		Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.	Number of inspections.	Percentage of total.
U. S. Commercial	3,260	1	0.1*	133	4.1	2	0.1*	.....	.....
U. S No. 2	804	12	1.5	47	5.8	5	0.6	.....	.....
Unclassified	195	2	1.0	4	2.0	6	3.1	33	16.9
Mixed	50	3	6.0	1	2.0	1	2.0	2	4.0

* 0.1 percent or less.

Dirt is a defect often entirely responsible for lowering the grade from U. S. No. 1 to a lower classification. About 4 percent of U. S. Commercials and 6 percent of U. S. No. 2's were reduced to those grades principally because of dirt (Table 5).

An analysis of defects reported for U. S. No. 1, U. S. Commercial, U. S. No. 2, and unclassified grades brought out some interesting information. For example, it might be assumed that a U. S. No. 1 potato would be relatively free from defects. However, nearly two-thirds of the potatoes which graded U. S. No. 1 during the 1930-1939 period had cuts as a grade defect; about one-third were affected by second growth, bruises, scab, wireworm injury, or were misshapen; and nearly one-fifth had some growth cracks and sun injury (Fig. 6).

A casual examination of figure 6 might suggest that grade defects in U. S. No. 1 potatoes were as serious as in the lower grades. A reference to the United States Standards for Potatoes in the ap-

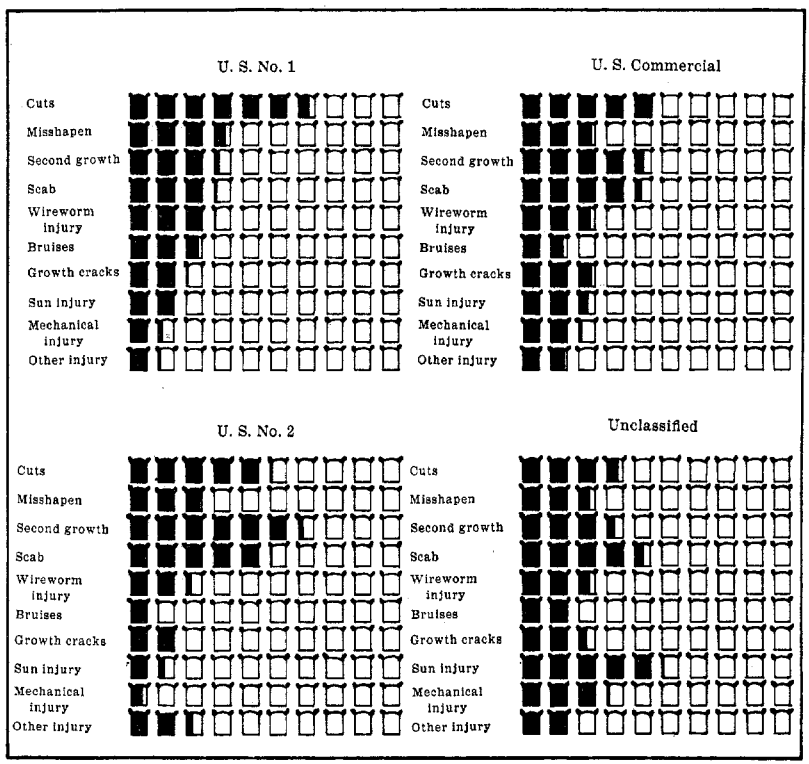

FIG. 6.—Comparison of patoto defects by grades for the 10-year period 1930-1939. Each sack represents 10 percent of total inspections. The shaded part represents the proportion of total inspections having specific defects. (To understand the significance of this illustration, the reader should be familiar with U. S. Standards for Potatoes. See appendix.)

pendix indicates that differences in grades result principally from differences in damage and in tolerance for the different grades. For example, a 6-percent tolerance on most defects is allowed on a U. S. No. 1 potato as compared with a 20-percent allowance in the U. S. Commercial grade (see, appendix, U. S. Standards for Potatoes, page 31). As indicated, Kansas potatoes classified as U. S. No. 1 have numerous defects. These defects cause U. S. No. 1 Kansas potatoes to be at or near the bottom of this grade as almost every inspection shows only 94 to 95 percent of U. S. No. 1 quality. More careful grading would improve U. S. No. 1 potatoes, and more potatoes would be in this grade.

Figure 6 illustrates graphically the kind and extent of defects of the different potato grades. Cuts, second growth, and scab have been mentioned most often in inspectors' reports as defects of potatoes grading U. S. Commercial. Almost 50 percent of the inspections in this grade mentioned these as grade defects. Misshapen stock, wireworm injury, bruises, growth cracks, sun injury, and mechanical injury were mentioned as occurring in 20 to 30 percent of the total inspections. The sum total of these defects was sufficient in most cases to exceed the tolerance of the U. S. No. 1 grade and, therefore, the potatoes were classified as U. S. Commercial.

Potatoes that grade U. S. No. 2 or are unclassified have defects which are much more serious than for U. S. No. 1 or U. S. Commercial grades, or they are potatoes which have exceeded the tolerance allowable in the better grades. Cuts, misshapen stock, second growth, and scab were the principal defects over a period of 10 years for U. S. No. 2 potatoes. (Decay, dirt, and undersize are considered separately as grade defects).

Sun injury and scab are important defects mentioned most frequently about potatoes that failed to make a grade. However, decay is the most important reason why potatoes are below grade. This defect is considered in the following section.

DECAY AS A GRADE DEFECT

Decay probably is the most serious potato defect. Potatoes that have not more than 1 percent soft rot or wet breakdown may receive a grade classification of U. S. No. 2 or better, but if decay is more than 1 percent the potatoes are automatically thrown out of grade and are termed unclassified, Of 195 cars of potatoes that were graded as unclassified during the 1930-1939 period, 156 cars—about 80 percent—were out of grade because of decay in excess of 1 percent.

During this 10-year period there was no decay reported in nearly one-half the inspections. About one-fourth of the reports showed 0.5 percent or less decay. The remaining one-fourth of inspections showed from 0.5 percent to 1 percent. Only 2.5 percent of the 6,337 cars of potatoes inspected during the 10-year period had decay in excess of 1 percent (Fig. 7 and Table 6). It is doubtful, however, that this percentage would be correct for total Kansas potato

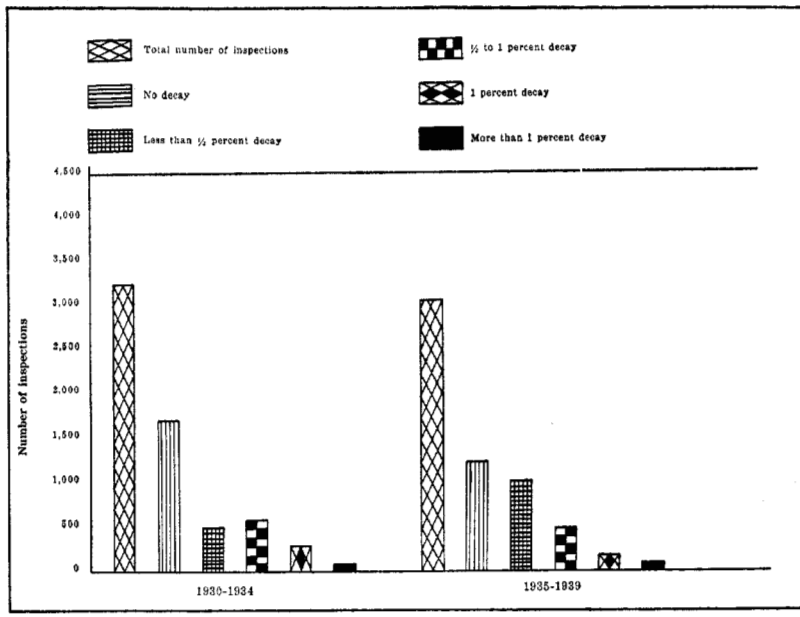

FIG. 7.—Number of cars of Kansas potatoes showing different percentages of decay during 1930-1934 and 1935-1939.

shipments, as growers do not find it to their advantage to call for inspection of potatoes which carry any noticeable amount of decay.

The number of cars or percentage of total inspections with different percentages of decay varies greatly from year to year. In some years growing conditions are conducive to decay. For example, during the extremely hot, dry summer of 1934 three out of 24 inspections had decay in excess of 1 percent. Of a total of 419 inspections in 1939, 27 (6.4 percent) showed decay in excess of 1 percent. In contrast, there were four years in the 10-year period (1930-1939) when less than 2 percent of all inspections showed decay in excess of 1 percent. In 1933 and 1937 there was no evidence of decay in approximately 70 percent of inspections (Table 6).

Decay, as a grade-lowering defect for Kansas potatoes, is illustrated graphically in figure 8. Less than one car in 20 that graded U. S. No. 1 during the 1930-1939 period had 1 percent decay. This compares with about one car in 10 of U. S. Commercial potatoes that had 1 percent decay and approximately one car in seven of U. S. No. 2 that had 1 percent decay. However, about 77 percent of inspections which were unclassified showed decay in excess of 1 percent (Table 7).

As might be expected, U. S. No. 1 potatoes showed a much higher proportion of potatoes with no decay than did the other grades. During the 10-year period, 61.3 percent of U. S. No. 1 potatoes had no decay compared with 40.5 percent for U. S. Commercial, 48 per-

TABLE 6. *Number and percentage of cars of Kansas inspected potatoes showing specified percentages of decay, 1930-1939*

YEAR.	Total number of cars inspected.	Decay.									
		None.		½ percent.		½ to 1 percent.		1 percent.		More than 1 percent	
		Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.
1930-'39	6,337	2,988	47.1	1,567	24.7	1,104	17.4	522	8.3	156	2.5
1930-'34	3,268	1,735	53.1	538	16.5	605	18.5	318	9.7	72	2.2
1935-'39	3,069	1,253	40.8	1,029	33.5	499	16.3	204	6.6	84	2.8
1930	1,276	551	43.2	228	17.9	305	23.9	161	12.6	31	2.4
1931	881	521	59.1	136	15.4	132	15.0	70	8.0	22	2.5
1932	945	562	59.5	143	15.1	149	15.8	77	8.1	14	1.5
1933	142	101	71.1	19	13.4	14	9.9	6	4.2	2	1.4
1934	24	.....	.....	12	50.0	5	20.8	4	16.7	3	12.5
1935	233	69	29.6	107	45.9	43	18.5	10	4.3	4	1.7
1936	520	342	65.8	108	20.8	45	8.6	12	2.3	13	2.5
1937	640	445	69.5	138	21.6	46	7.2	10	1.5	1	0.2
1938	1,257	315	25.0	517	41.1	255	20.3	130	10.4	40	3.2
1939	419	82	19.6	159	37.9	110	26.3	41	9.8	27	6.4

TABLE 7. *A comparison of specified percentages of decay in various grades of federally inspected Kansas potatoes, 1930-1939*

YEAR.	Percentage of decay by grades.															
	U. S. No. 1.				U. S. Commercial.				U. S. No. 2.				Unclassified.			
	None.	½ percent.	Less than 1 percent.	1 percent.	None.	½ percent.	½ to 1 percent.	1 percent.	None.	½ percent.	½ to 1 percent.	1 percent.	None.	½ percent.	½ to 1 percent.	1 percent.	More than 1 percent.
1930-'39	61.3	24.1	11.3	3.3	40.5	26.9	22.2	10.4	48.0	21.2	17.0	13.8	5.6	10.8	4.1	2.6	76.9
1930-'34	63.7	15.9	16.7	3.7	50.7	17.4	20.4	11.5	52.3	16.3	17.9	13.5	6.2	1.2	3.8	2.5	86.3
1935-'39	59.7	29.5	7.8	3.0	29.3	37.2	24.4	9.1	31.0	40.4	13.7	14.9	5.2	17.4	4.4	2.6	70.4
1930....	56.3	18.5	20.3	4.9	37.8	19.0	26.8	16.4	21.1	14.1	29.6	35.2	7.9	.....	7.9	2.6	81.6
1931....	77.4	9.7	10.8	2.1	60.9	16.7	15.1	7.3	55.6	16.4	17.3	10.7	8.0	4.0	.....	4.0	84.0
1932....	77.7	8.5	13.1	.7	57.4	16.6	16.9	9.1	58.0	16.4	15.1	10.5	.....	.....	.....	.....	100.0
1933....	76.9	14.3	6.6	2.2	64.7	11.8	14.7	8.8	58.4	8.3	25.0	8.3	.....	.....	.....	.....	.....
1934....	.....	60.0	30.0	10.0	.....	40.0	40.0	20.0	.....	60.0	.....	40.0	.....	.....	.....	.....	100.0
1935....	40.0	50.6	8.2	1.2	24.4	45.4	25.2	5.0	24.0	40.0	24.0	12.0	.....	.....	.....	.....	100.0
1936....	75.7	18.5	5.0	.8	38.8	29.2	23.3	8.7	64.7	23.5	5.9	5.9	26.3	15.7	5.3	.....	52.7
1937....	73.9	19.6	5.8	.7	59.3	26.5	10.8	3.4	100.0	.....	.....	.....	50.0	.....	.....	.....	50.0
1938....	32.4	45.6	12.8	9.2	23.6	41.1	24.0	11.3	27.8	22.2	27.8	22.2	.....	22.8	7.0	.....	70.2
1939....	15.4	69.2	15.4	.....	23.0	33.1	35.7	8.2	17.0	53.4	11.4	18.2	.....	11.8	.....	8.8	79.4

cent for U. S. No. 2 and only 5.6 percent for unclassified potatoes (Table 7).

There is much variation in the extent of decay in the different grades from year to year. For example, in almost one-half the years from 1930 to and including 1939, there were approximately three-fourths of the grade of U. S. No. 1 inspection which showed no decay. However, in 1934, a drought year, every inspected car showed some decay and in 1939 only 15.4 percent of the U. S. No. 1 inspections were without decay (Table 7). There were three years, 1932, 1934, and 1935, when unclassified potatoes had more than 1 percent decay in every instance. This indicates that decay could have been largely responsible for failure to make a grade in these years.

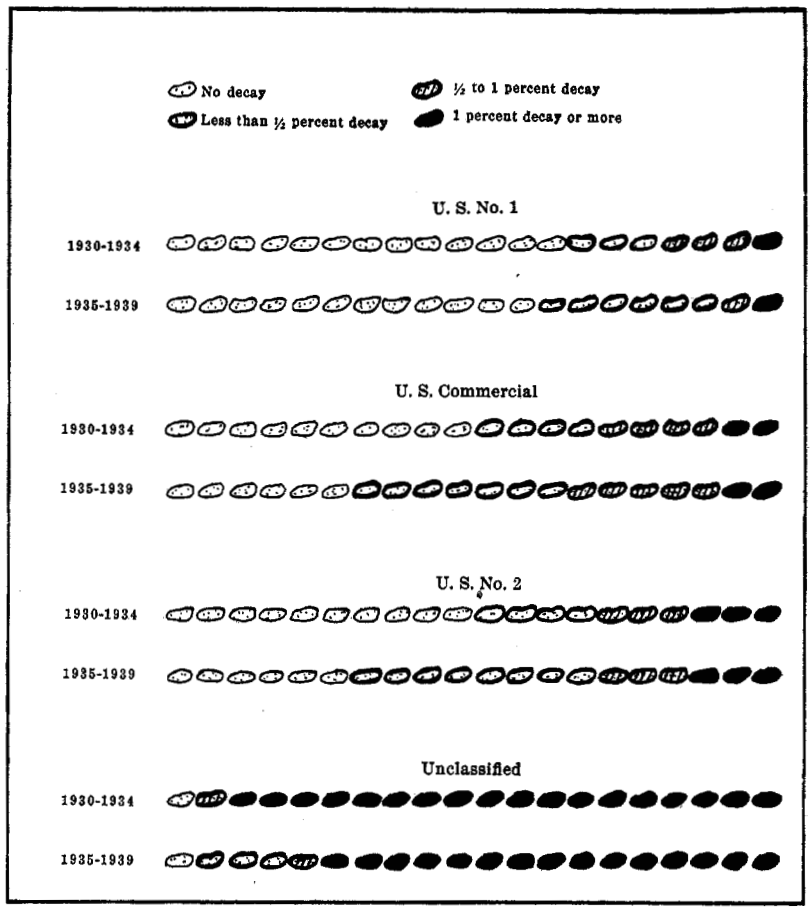

FIG. 8.—Percentage of Kansas inspected potatoes showing different percentages of decay, 1930-1934 and 1935-1939. (Each potato represents 5 percent of total inspections for that grade. Percentages were rounded to the nearest whole number 5.)

There is indication from an analysis of these inspection reports that decay was more serious and prevalent in 1935-1939 than in the previous five-year period (Fig. 8). However, this probably is a result of climatic conditions more favorable to decay during this last five-year period rather than poorer grading on the part of growers.

CLEANNESS

Potatoes are said to have dirt damage when the general appearance of the potatoes is more than slightly dirty or stained, when individual potatoes are badly caked with dirt or badly stained, or when other foreign matter is present which materially affects the appearance of the potatoes. Potatoes that have dirt damage in excess of the tolerance of that grade are placed in a lower grade. Potatoes that are dirty seldom make a U. S. No. 1 grade, and potatoes that are said to be slightly dirty are classified as U. S. No. 1 in less than 20 percent of inspections (Fig. 9).

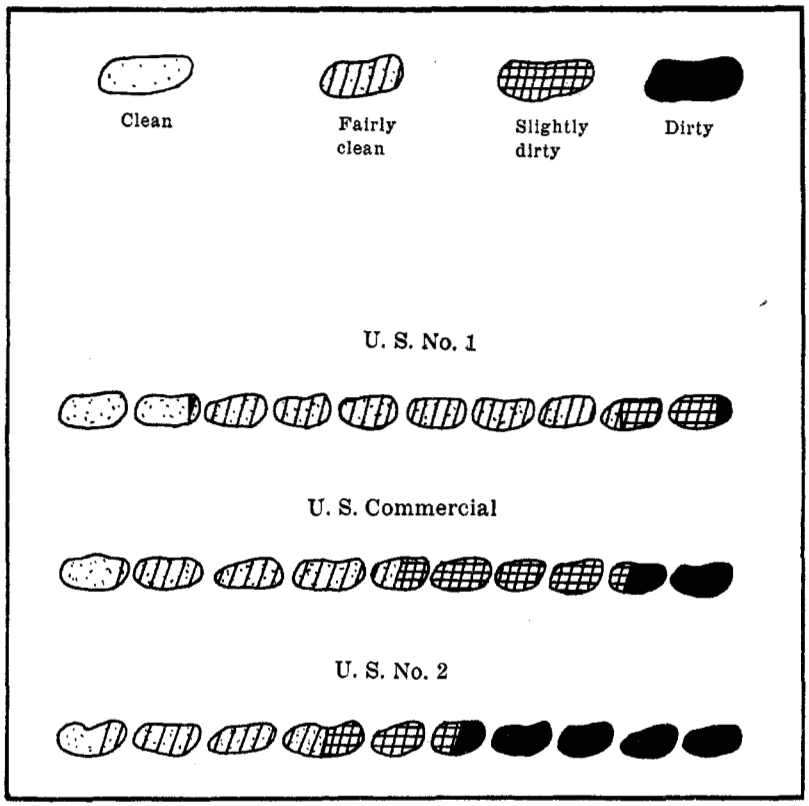

FIG. 9.—Percentage of inspections of Kansas potatoes showing specified degrees of cleanness, 1930-1939. (Each sack represents 10 percent of total inspections.)

For years Kansas and Missouri potatoes on the terminal markets have been conspicuously dirty. It is only during the last year or two that any serious attempt has been made to clean the potatoes by washing. Cleaning potatoes by washing is recommended where it is possible to precool or dry the potatoes before shipment.

During the 10-year period 1930-1939, only 19 percent of U. S. No. 1 potatoes were classified as clean. This compares with 9.8 percent for U. S. Commercial and 6.7 percent for U. S. No. 2. For this same period, only 0.2 percent of U. S. No. 1 potatoes were classed as dirty, compared to 16.4 percent of U. S. Commercial and 42.7 percent of U. S. No. **2** (Table 8). The data indicate that dirty potatoes have been an important factor in lowering the grade of Kansas potatoes. This is particularly true of the U. S. No. 2 potatoes where such a large proportion are graded as dirty.

As with other defects, there is a great variation from year to year in the degree of cleanness of Kansas potatoes. When the soil is dry at digging time, potatoes are much cleaner than when the soil is wet. During the extremely hot, dry summer of 1934, 70 percent of U. S. No.1 potatoes were graded clean and in that year 40 percent of U. S. No. 2 potatoes were clean. During 1932, only 13.1 percent of U. S. No. 1 potatoes were clean. During this particular year 71.2 percent of U. S. No. 2 potatoes were graded as dirty (Table 8).

TABLE 8. *Percentage of Kansas inspected potatoes, by grades, showing specified degrees of cleanness, 1930-1939*

YEAR.	Grade.											
	U. S. No. 1.				U. S. Commercial.				U. S. No. 2.			
	Clean.	Fairly clean.	Slightly dirty.	Dirty.	Clean.	Fairly clean.	Slightly dirty.	Dirty.	Clean.	Fairly clean.	Slightly dirty.	Dirty.
1930-'39	19.0	64.3	16.5	.2	9.8	35.8	38.0	16.4	6.7	29.0	21.6	42.7
1930-'34	28.4	46.1	24.9	.6	16.2	31.9	36.3	15.6	7.1	20.7	21.0	51.2
1935-'39	12.7	76.5	10.8	.....	2.7	40.3	39.8	17.2	5.0	62.1	24.2	8.7
1930	33.3	48.7	17.6	.4	29.9	38.8	24.7	6.6	33.8	46.5	15.5	4.2
1931	12.9	43.0	43.0	1.1	10.4	32.2	40.9	16.5	4.2	19.9	25.9	50.0
1932	13.1	38.5	46.9	1.5	4.7	22.6	47.2	25.5	1.4	11.0	16.4	71.2
1933	35.2	51.6	13.2	.....	11.8	47.1	23.5	17.6	25.0	58.4	8.3	8.3
1934	70.0	.....	30.0	.....	40.0	40.0	20.0	.....	40.0	40.0	.....	20.0
1935	21.2	76.5	2.3	.....	9.2	84.9	5.9	.....	.....	68.0	32.0	.....
1936	14.4	85.6	.....	.....	4.9	95.1	.....	.....	.....	100.0	.....	.....
1937	19.2	78.4	2.4	.....	8.3	85.3	6.4	.....	7.7	92.3	.....	.....
1938	1.2	64.2	34.6	.....	.6	19.5	57.1	22.8	.....	33.3	50.0	16.7
1939	.....	73.1	26.9	.....	1.5	30.8	40.9	26.8	7.9	54.6	25.0	12.5

There is considerable difference between the 1930-1934 and 1935-1939 periods as to the percentage of cleanness in the different grades. During the latter five-year period a much smaller number of reports indicated "clean" and "dirty" potatoes, but there was a much larger proportion of potatoes showing "fairly clean" or "slightly dirty" in the different grades. This variation during the two five-year periods may be a result of difference in climatic condition or it may be partly a result of inspection standards, as degree of cleanness in potatoes is largely a matter of individual judgment.

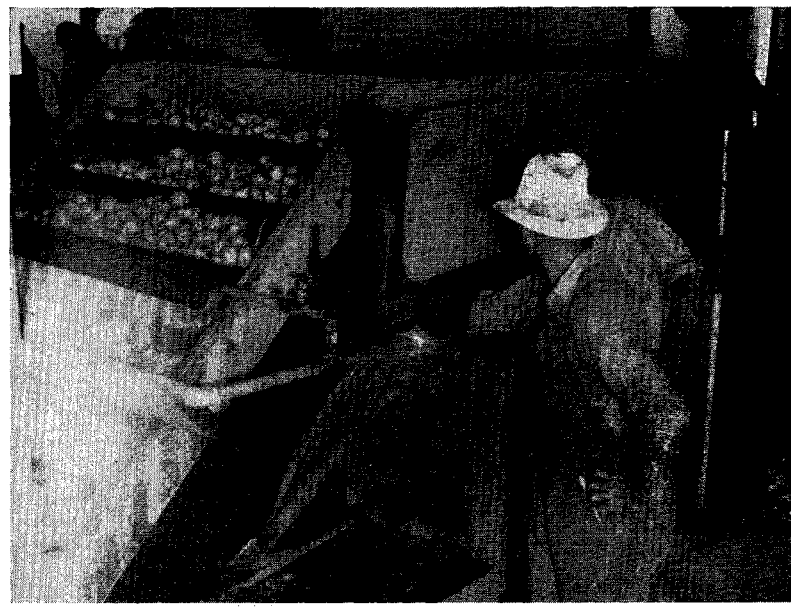

FIG. 10.—Potato-washing machines such as this will prevent Kansas potatoes from having the grade lowered because of dirt.

SIZE

When potatoes are designated as "U. S. No. 1," "U. S. Commercial," or "U. S. No. 2" without specifying a size classification, it usually is understood that not more than 5 percent of the potatoes are less than 1 7/8 inches in diameter, but that no definite percentage of the potatoes must be larger than this minimum size. Sometimes, however, potatoes are classified in the various grades as 1¾ or 1½ inch minimum size, which means that the tolerance applies from these designated minimums (See appendix, page 31, U. S. Standards for Potatoes).

During the 1932-1939 period, only about three-fourths of Kansas potatoes graded 1 7/8 inch minimum or better. About one-fifth were

TABLE 9. *Number and percentage of inspections of Kansas potatoes in various size classifications, 1932-1939*

YEAR.	Total number of cars.	Size in inches.							
		1⅞ or more.		1¾ to 1⅞.		1⅝ to 1¾.		Less than 1⅝.	
		Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.	Number of cars.	Percentage of total cars inspected.
1932-'39	4,180	3,236	77.4	855	20.5	77	1.8	12	0.3
1932	945	912	96.5	23	2.4	9	1.0	1	0.1
1933	142	64	45.1	32	22.5	43	30.3	3	2.1
1934	24	10	41.7	12	50.0	2	8.3	.....	.....
1935	233	213	91.4	19	8.2	1	0.4	.....	.....
1936	520	334	64.2	175	33.7	7	1.3	4	0.8
1937	640	433	67.7	203	31.7	4	0.6	.....	.....
1938	1,257	941	74.9	309	24.6	5	0.4	2	0.1
1939	419	329	78.5	82	19.6	6	1.4	2	0.5

specified as 1¾ to 1 7/8 inch minimum, and only 1.8 percent of Kansas potatoes were inspected which showed a 1½ inch minimum size (Table 9). According to grading standards, if potatoes were smaller than 1½ inches and exceeded the tolerance for that grade, they were put in a lower grade or were unclassified. Of 4,180 cars of potatoes inspected during this eight-year period, only 12 (0.3 percent) were below the 1½ inch minimum requirement. This indicates that most of the growers use graders which take out all undersized potatoes.

Many other potato areas are putting up a pack with 2 inch minimum stock. Still others are putting up two packs, one with the large sizes of 2¼ to 2½ inch minimums and another from 1 7/8 to 2½ inches. Kansas growers may find it to their advantage to adopt such a practice.

METHODS OF LOADING

Most Kansas potatoes have been loaded into cars "summer style." During the 10-year period 1930-1939, about 94 percent of the cars were loaded "summer style," but there is a trend away from this method (Table 10 and Fig. 11).

TABLE 10. *Number and percentage of Kansas inspected cars of potatoes loaded "summer" and "pyramid" style, 1930-1939*

YEAR.	Method of loading.			
	Summer style.		Pyramid style.	
	Number of cars.	Percentage of total.	Number of cars.	Percentage of total.
1930-'39	5,963	94.1	374	5.9
1930-'34	3,208	98.2	60	1.8
1935-'39	2,755	89.8	314	10.2
1930	1,248	97.8	28	2.2
1931	868	98.5	13	1.5
1932	927	98.1	18	1.9
1933	141	99.3	1	0.7
1934	24	100.0	0	0.0
1935	233	100.0	0	0.0
1936	414	79.6	106	20.4
1937	493	77.0	147	23.0
1938	1,239	98.6	18	1.4
1939	376	89.7	43	10.3

The principal disadvantage to the "summer style" method of loading is that unless it is well done—that is, unless the sacks are put at just the right slant in the car—the load will become disarranged during shipment.

When potatoes are loaded "summer style" many sacks fall into the center aisle and the potatoes are bruised and, as a result, the appearance of the car is not attractive to buyers. Potatoes loaded in the "pyramid" method carry well in transit and undoubtedly this method will be used to an increasing extent by Kansas potato growers. Some shippers use the 5-3-2-1 "pyramid" style of loading, which allows a maximum of ventilation per sack.

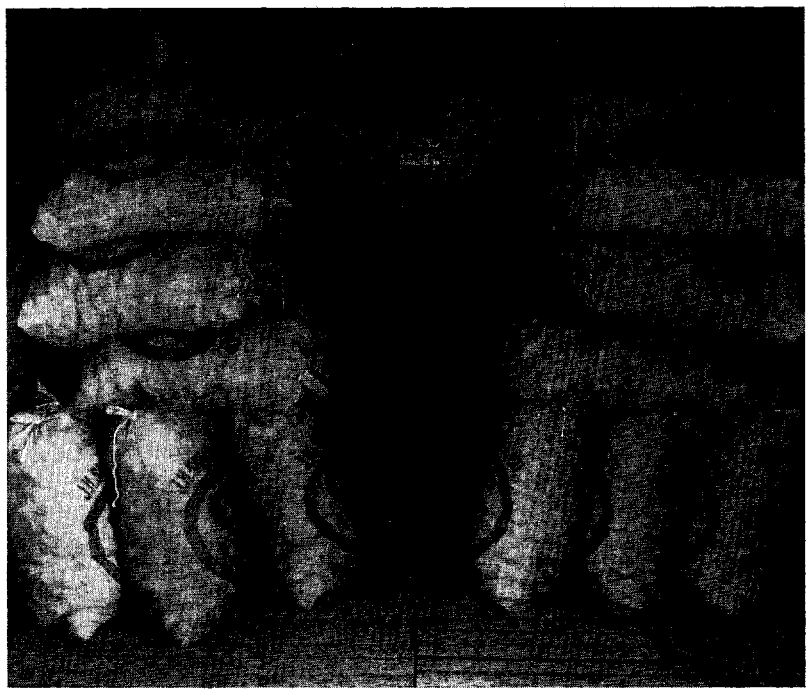

FIG. 11.—The "summer style" method of loading used extensively in past years by Kansas potato shippers.

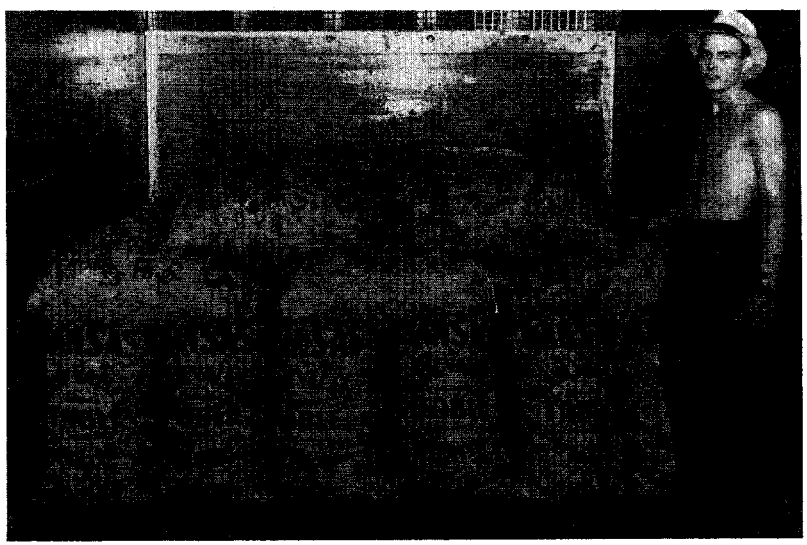

FIG. 12.—The "pyramid 6-3-2" method of loading potatoes. When loaded by this method there is no shifting of the load during transit and adequate ventilation is afforded each sack of potatoes.

SUMMARY AND CONCLUSIONS

Shipping-point inspection for Kansas potatoes was started in 1923. Compulsory potato inspection was in effect during the years 1927 to 1932, inclusive, the work being administered by the Kansas State Board of Agriculture. Since 1932, potato inspection has been on a voluntary basis, with the Extension Division of Kansas State College supervising the work.

During the five-year period 1935-1939, almost one-half of the potatoes shipped out of Kansas were federally inspected. Potato growers apparently are using this service to an increasing extent because of quality competition from other areas.

Almost 97 percent of inspected potatoes shipped from the state during the 10-year period 1930-1939 were Irish Cobblers. There is an increasing use in recent years of the Bliss Triumph and Warba varieties.

Thirty-two percent of Kansas inspected potatoes were U. S. No. 1 quality during the 1930-1939 period. More than one-half were U. S. Commercial quality. About 3 percent were unclassified. There is a wide variation from year to year in the proportion of potatoes in the different grades.

Man-made injuries such as cuts, bruises, and mechanical injury make up a substantial part of the grade defects of Kansas potatoes. Proper handling and marketing methods would reduce materially the losses from such causes.

Only 19 percent of all U. S. No. 1 potatoes were graded as "clean" during the 1930-1939 period. More than 42 percent of U. S. No. 2 potatoes were graded as dirty. Dirt has been mentioned more often than any other specific cause for lowering the grade to U. S. Commercial or U. S. No. 2. The recently adopted practice of washing potatoes reduces the grade loss caused by dirt, but care must be taken that the wet potatoes are dried or properly conditioned before shipment, especially in hot weather.

Decay is the most serious potato defect. Eighty percent of the unclassified potatoes were put in this classification because of decay in excess of 1 percent. Potatoes grading U. S. Commercial and U. S. No. 2 usually have much more decay than potatoes grading U. S. No. 1.

Approximately three-fourths of Kansas inspected potatoes were designated as 1 7/8 inch minimum size. The remainder had lower minimums. The larger potatoes meet a better market demand. Marketing potatoes in two size classifications should be profitable.

Most Kansas potatoes have been loaded "summer style." Potatoes loaded by this method do not carry satisfactorily, as the load becomes disarranged during transit. There is a growing trend toward the use of the "pyramid" method of loading.

Potatoes, as well as many other products, sell to a certain extent by reputation. Information obtained at terminal markets indicates that some cars of Kansas potatoes are as good as those from any other region. However, potatoes from some other regions sell at a

premium and often are taken in preference to Kansas stock because of a better reputation for all potatoes from those regions. Reputation for good quality is one of the best salesmen the potato producer can have. Rejections because of inferior quality cause slow sales and relatively low prices.

The reputation of Kansas potatoes should be improved. No potatoes should be sent to market unless they have been carefully graded and inspected. Kansas potato growers will not receive the returns to which they are entitled unless they grade their potatoes more carefully and eliminate a larger percentage of the man-made grade defects.

Since potatoes sell largely on appearance, perhaps Kansas potatoes should be graded and packed in two or more grades. The best grade should be attractive and should be sold to those dealers and consumers who demand a top No. 1 potato. There are outlets for the lower grades of potatoes to which the less attractive stock could be directed.

By knowing the kind of product demanded by the buyer and by marketing it at less cost, Kansas potato growers should be able to compete successfully with growers from other states. When a reputation for quality potatoes has been established, it should be maintained.

APPENDIX

UNITED STATES STANDARDS FOR POTATOES

Numbers and letters in parentheses following grade terms indicate where such terms are defined under Definitions of Terms.

All percentages shall be calculated on the basis of weight.

The tolerances for the standards are on a container basis. However, if the averages for the entire lot, based on sample inspection, are within the tolerances specified in the standards, the contents of individual packages in the lot may vary from the specified tolerances subject to the following limitations.

FOR PACKAGES CONTAINING OVER 15 SPECIMENS

When the tolerance specified is 10 percent or more, not over one-tenth of the individual packages in the lot may contain more than one and one-half times the tolerance, but no package may contain more than four times the tolerance for soft rot or wet breakdown.

When the tolerance specified is less than 10 percent, not over one-tenth of the individual packages in any lot may contain more than double the tolerance specified, but no package may contain more than four times the tolerance for soft rot or wet breakdown.

FOR PACKAGES CONTAINING 15 SPECIMENS OR LESS

Not over one-tenth of the individual packages in any lot may contain more than double any tolerance specified, except that at least one defective specimen shall be permitted in a package.

GRADES

U. S. FANCY shall consist of potatoes of one variety or similar varietal characteristics which are firm, mature (1), bright (2), well shaped (3), free from freezing injury, blackheart, shriveling, sprouting, soft rot or wet breakdown (4), and hollowheart, and free from injury (5) caused by dirt or other foreign matter, sunburn, second growth, growth cracks, air cracks, cuts, scab, blight, dry rot, rhizoctonia, other disease, insects or mechanical or other means (5).

The diameter (6) of each potato shall be not less than 2 inches.

For long varieties such as Burbank, Russet Burkanck, Early Ohio, Pride of Wisconsin, or other similar varieties, not less than 40 percent of the potatoes in any lot shall be 6 ounces or more in weight.

For round or intermediate shaped varieties such as Irish Cobbler, Bliss Triumph, Green Mountain, or other similar varieties, not less than 60 percent of the potatoes in any lot shall be 2¼ inches or larger in diameter.

The size of the potatoes may be stated in terms of minimum diameter or minimum weight, or of range in diameter or weight, or of a certain percentage over a certain size, following the grade name, but in no case shall the potatoes be below the sizes specified for this grade. (See Tolerance for Size.)

Tolerance for defects.—In order to allow for variations other than size incident to proper grading and handling, not more than 6 percent of the potatoes in any container may be below the requirements of the grade but not to exceed one-sixth of this amount, or 1 percent, shall be allowed for potatoes affected by soft rot or wet breakdown.

U. S. EXTRA No. 1 shall consist of potatoes of one variety or similar varietal characteristics which are fairly well shaped (7), fairly clean (8), free from freezing injury, blackheart, and soft rot or wet breakdown (4) and from damage (9) caused by sunburn, second growth (9a), growth cracks (9a), air cracks (9b), hollow heart, cuts, shriveling (9c), sprouting (9d), scab (9e and f), blight, dry rot, rhizoctonia (9g), other disease (9), insects or mechanical or other means (9).

Unless otherwise specified, size of potatoes (see Size Classification and Tolerance for Size) shall be as follows:

The diameter (6) of each potato shall be not less than 1 7/8 inches.

For long varieties such as Burbank, Russet Burbank, Early Ohio, Pride of Wisconsin, or other similar varieties, not less than 60 percent of the potatoes in the lot shall be 6 ounces or larger, of which not less than one-half, or 30 percent, shall be 10 ounces or more in weight.

For round or intermediate shaped varieties such as Irish Cobbler, Bliss Triumph, Green Mountain, or other similar varieties, not less than 60 percent of the potatoes in the lot shall be 2¼ inches or larger, of which not less than one-half, or 30 percent, shall be 2¾ inches or larger in diameter.

Tolerance for defects. In order to allow for variations other than size incident to proper grading and handling, not more than 6 percent of the potatoes in any container may be below the requirements of the grade but not to exceed one-sixth of this amount, or 1 percent, shall be allowed for potatoes affected by soft rot or wet breakdown. In addition not more than 5 percent may be damaged by hollow heart.

U. S. No. 1 shall consist of potatoes of one variety or similar varietal characteristics which are fairly well shaped (7), free from freezing injury, blackheart,-and soft rot or wet breakdown (4), and from damage (9) caused by dirt (9h) or other foreign matter (9h), sunburn, second growth (9a), growth cracks

(9a), air cracks (9b), hollow heart, cuts, shriveling (9c), sprouting (9d), scab (9e and f), blight, dry rot, rhizoctonia (9g), other disease (9), insects or mechanical or other means (9).

Unless otherwise specified the diameter (6) of each potato shall be not less than 1 7/8 inches. (See Size Classification and Tolerance for Size.)

Tolerance for defects. In order to allow for variations other than size incident to proper grading and handling, not more than 6 percent of the potatoes in any container may be below the requirements of the grade, but not to exceed one-sixth of this amount, or 1 percent, shall be allowed for potatoes affected by soft rot or wet breakdown. In addition, not more than 5 percent may be damaged by hollow heart.

U. S. COMMERCIAL shall consist of potatoes which meet the requirements of U. S. No. 1 grade except that they shall be free from serious damage by dirt (l0a) and except for the increased tolerance for defects specified below.

Unless otherwise specified the diameter (6) of each potato shall be not less than 1 7/8 inches. (See Size Classification and Tolerance for Size.)

Tolerance for defects. In order to allow for variations other than size and sprouting incident to proper grading and handling, not more than a total of 30 percent of the potatoes in any container may be below the requirements of this grade, but not more than 5 percent may be seriously damaged by hollow heart and not over 6 percent may be below the remaining requirements of U. S. No. 2 grade, provided that not more than one-sixth of this amount, or 1 percent, shall be allowed for potatoes,affected by soft rot or wet breakdown. In addition, not more than 10 percent of the potatoes may be damaged by sprouting, provided, that if all of the 20 percent tolerance is not used for other defects, the unsued part of the tolerance may also be used for potatoes having sprouts over three-fourths inch long but which are not seriously damaged by shriveling.

U. S. No. 2 shall consist of potatoes of one variety or similar varietal characteristics which are free from freezing injury, blackheart, and soft rot or wet breakdown (4) and from serious damage (10) caused by dirt (l0a) or other foreign matter, sunburn, second growth, growth cracks, air cracks, hollow heart, cuts (l0b), shriveling (10c), scab (10d and e), blight, dry rot, other disease, insects or mechanical or other means (10).

Unless otherwise specified the diameter (6) of each potato shall be not, less than 1½ inches. (See Size Classification and Tolerance for Size.)

Tolerance for defects. In order to allow for variations other than size incident to proper grading and handling, not more than 6 percent of the potatoes in any container may be below the requirements of the grade, but not to exceed one-sixth of this amount, or 1 percent, shall be allowed for potatoes affected by soft rot or wet breakdown. In addition, not more than 5 percent may be seriously damaged by hollow heart.

UNCLASSIFIED shall consist of potatoes which have not been classified in accordance with any of the foregoing grades. The term "unclassified" is not a grade within the meaning of these standards but is provided as a designation to show that no definite grade has been applied to the lot.

SIZE CLASSIFICATION FOR ALL GRADES EXCEPT U. S. FANCY

When the potatoes are designated as "U. S. No. 1," "U. S. Commercial," or "U. S. No. 2" without specifying a size classification, it is understood that the potatoes meet the minimum size specified in the grade but that no definite percentage of the potatoes is required to be larger than this minimum size.

When potatoes meet the requirements of either size A or size B as described below, the size classification may be specified in connection with any of the U. S. grades except Fancy, as: "U. S. No. 1, size A"; "U. S. No. 1, size B"; "U. S. No. 2, size A"; or "US. No. 2, size B" in accordance with the facts. When size A or size B is used in connection with the grade, it is not permissible to specify any smaller sizes than those specified under these designations.

SIZE A. For long varieties such as Burbank, Russet Burbank, Early Ohio, Pride of Wisconsin, or other similar varieties, the diameter of each potato shall be not less than 1⅞ inches and not less than 40 percent of the potatoes in the lot shall be 6 ounces or more in weight.

For round or intermediate shaped varieties such as Irish Cobbler, Bliss Triumph, Green Mountain, or other similar varieties, the diameter of each potato shall be not less than 1⅞ inches and not less than 60 percent of the potatoes in the lot shall be 2¼ inches or larger in diameter.

SIZE B. For all varieties the size shall be from 1½ inches to not more than 2 inches in diameter.

OTHER SIZES. When either of the above size designations is not used in connection with U. S. No. 1, U. S. Commercial, or U. S. No. 2 grades, it is permissible to specify any other minimum size such as "1½ inches minimum," "2 inches minimum," or both a minimum and a maximum size as "1⅞ inches to 3 inches," "6 to 10 ounces," or to specify a certain percentage over a certain size as "25 percent or more 2¼ inches and larger," "50 percent or more 6 ounces and larger."

Tolerance for size. In order to allow for variations incident to proper sizing, not more than 5 percent of the potatoes in any container may be below any specified minimum size except that in order to meet the requirements of size A classification, U. S. Fancy, or U. S. Extra No. 1 grades, any lot of potatoes shall have not more than 3 percent below the minimum size specified. In addition, not more than 15 percent may be above any specified maximum size.

When a percentage of the potatoes is specified to be of a certain size and larger, no part of any tolerance shall be used to reduce such a percentage for the lot as a whole, but individual containers may have not more than 15 percent less than the percentage required or specified provided that the entire lot averages within the percentage specified. For example, a lot specified as 25 percent 2½ inches and larger may have containers with not less than 10 percent 2½ inches and larger provided the lot as a whole averages 25 percent 2½ inches and larger.

DEFINITIONS OF TERMS

As used in these standards:

(1) "Mature" means that the outer skin (epidermis) does not loosen or "feather" readily during the ordinary methods of handling.

(2) "Bright" means practically free from dirt or other foreign matter, and that the outer skin (epidermis) has the attractive color normal for the variety.

(3) "Well shaped" means the normal shape for the variety and that the potato is not pointed, dumbbell-shaped, excessively elongated, or otherwise ill-formed.

(4) "Soft rot or wet breakdown" means any soft, mushy, or leaky condition of the tissue such as slimy soft rot, leak, or wet breakdown following freezing injury or sunscald,

(5) "Injury" means any defect which more than slightly affects the appearance of the individual potato or the general appearance of the potatoes in the container, or which cannot be removed without a loss of more than 2 percent of the total weight of the potato including peel covering defective area.

(6) "Diameter" means the greatest dimension at right angles to the longitudinal axis. The long axis shall be used without regard to the position of the stem (rhizome),

(7) "Fairly well shaped'' means that the appearance of the individual potato or the general appearance of the potatoes in the container is not materially injured by pointed, dumbbell-shaped, or otherwise ill-formed potatoes.

(8) "Fairly clean" means that from the viewpoint of general appearance the potatoes in the container are reasonably free from dirt or other foreign matter and that individual potatoes are not materially caked with dirt or materially stained.

(9) "Damage" means any injury or defect which materially injures the appearance of the individual potato or the general appearance of the potatoes in the container, or which cannot be removed without a loss of more than 5 percent of the total weight of the potato including peel covering defective area, Loss of outer skin (epidermis) shall not be considered as damage unless the skinned surface is materially affected by very dark discoloration. Any one of the following defects, or any combination of defects, the seriousiness of which exceeds the maximum allowed for any one defect shall be considered as damage:

(a) Second growth or growth cracks which have developed to such an extent as to materially injure the appearance of the individual potato or the general appearance of the potatoes in the container.

(b) Air cracks which are deep, or shallow air cracks which materially injure the appearance of the individual potato or the general appearance of the potatoes in the container.

(c) Shriveling when the potato is more than moderately shriveled, spongy, or flabby.

(d) Sprouting when more than 10 percent of the potatoes have sprouts over three-fourths of an inch long.

(e) Surface scab which covers an area of more than 5 percent of the surface of the potato in the aggregate.

(f) Pitted scab which affects the appearance of the potato to a greater extent than the amount of surface scab permitted or causes a loss of more than 5 percent of the total weight of the potato including peel covering defective area.

(g) Rhizoctonia when the general appearance of the potatoes in the container is materially injured or when individual potatoes are badly infected.

(h) Dirt when the general appearance of the potatoes in the container is more than slightly dirty or stained, or when individual potatoes are badly caked with dirt or badly stained, or other foreign matter which materially affects the appearance of the potatoes.

(10) "Serious damage" means any injury or defect which seriously injures the appearance of the individual potato or the general appearance of the potatoes in the container, or which cannot be removed without a loss of more than 10 percent of the total weight of the potato including peel covering defecive area. Any one of the following defects or any combination of defects the seriousness of which exceeds the maximum allowed for any one defect shall be considered as serious damage:

(a) Dirt when the general appearance of the potatoes in the container is seriously affected by tubers badly caked with dirt or other foreign matter which seriously affects the appearance of the potatoes.

(b) Cuts when both ends are clipped or when more than an estimated one-fourth of the potato is cut away from one end or when the remaining portion of the clipped potato weighs less than 6 ounces.

Other cuts which seriously affect the appearance of the individual potato or which cannot be removed without a loss of more than 10 percent of the total weight of the potato including peel covering defective area.

(c) Shriveling when the potato is excessively shriveled, spongy, or flabby.

(d) Surface scab which covers an area of more than 50 percent of the surface of the potato in the aggregate.

(e) Pitted scab which affects the appearance of the potato to a greater extent than the amount of surface scab permitted, or causes a loss of more than 10 percent of the total weight of the potato including peel covering defective area.