Hogs with initial weights up to 130 pounds, when fed a corn-soybean ration in the ratio of 3:1, will not usually produce firm carcasses if slaughtered after a gain of approximately 100 pounds or more has been made on this ration. Only 8 percent were in the medium-hard class, the remainder being medium soft or soft.

Thirty-six percent of the carcasses of hogs fed the 6:1 corn-soybean ration were firm (hard or medium hard). However, heavier hogs having initial weights of 115 pounds or more and gaining at least 1.5 pounds per day when fed for a period of 10 weeks or longer usually produce firm carcasses.

Approximately 50 percent of the carcasses of the hogs fed the 9:1 corn-soybean ration were firm, whereas 65 percent of the carcasses of those fed the 12:1 ration were firm. With these two rations also, the heavier, faster gaining pigs normally produced firm carcasses. When one third part tankage was added to the 12:1 ration, 88 percent of the carcasses were firm, whereas 91 percent of the carcasses of the control group fed the 12:1 corn and tankage rations were firm.

From these results it appears that initial weight, ration, and rate of gain are important factors that influence firmness in the carcass. In general, hogs well grown on nonsoftening feeds to a weight of approximately 115 pounds or more and making subsequent gains of approximately 100 pounds on a corn-soybean ration with gains of 1.5 pounds or more daily, produce firm carcasses when the proportion of soybeans in the ration is not greater than 1 part of soybeans to 6 parts of corn. Of the corn-soybean rations, the 9:1 combination produced the most economical gain.

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Potato Losses in Handling Reduced by Simple Equipment

In the Aroostook area of Maine, the bulk of the potatoes grown must be stored either on the farm or at the trackside, because the existing transportation facilities cannot handle more than a tenth of the crop during the harvest season. Current harvesting and handling methods in that area cause injuries to potatoes averaging about as shown in table 7. The minor bruises prior to storage, affecting about 40 percent of the potatoes harvested, result in grade injuries in storage amounting to 3 percent of the crop stored. Respiration of the potatoes in storage causes a loss of about 5 percent.

Table 7.—*Injuries to potatoes caused by harvesting and handling methods, in Aroostook County, Maine* [1]

Operation	Grade injury	Minor injury	Total injury
	Percent	*Percent*	*Percent*
Digging	2.15	16.16	18.31
Picking into baskets	.36	1.86	2.22
Emptying into barrels	1.94	6.22	8.16
Placing in storage	2.65	16.47	19.12
Moving to grader	1.14	12.13	13.27
Grading	1.75	18.48	20.23
Bagging or barreling	4.41	5.65	10.06
Total	14.40	76.97	91.37

[1] Prepared by William E. Schrumpf, Maine Agricultural Experiment Station.

The grade injuries that occur up to the time the potatoes pass over the picking table, including the increase in injuries caused by storing potatoes with minor injuries, amount to about 13 percent of the total. These should all be removed as the potatoes pass over the table, but the potatoes injured as they drop into bag or barrel will show up only in the market or the kitchen, and while they may not cause an immediate loss to the shipper, they will cause a prejudice against the brand of potatoes he ships, and are thus more serious than the injuries that occur before weighing and selling.

Mechanical Digging Reduces Damage

Mechanical diggers cause fewer injuries than digging by hand. Digger injuries can be reduced by running the continuous-elevator type of digger low at the rear end, and by padding the tines and projections of the shaker-elevator type of digger. Plenty of dirt carried up over the elevator will reduce bruises with either type. The practice of digging every other row of potatoes allows the pickers time to pick up before the digger makes the second trip over, thus saving the potatoes which roll down between the rows and would be in the path of the horses and the digger wheels.

Picking potatoes into baskets of the split-wood variety causes less injury than picking them into metal baskets. The data in table 7 are for potatoes picked into split-wood baskets.

In the Aroostook area practically all of the potatoes are hauled from the field in 11- and 12-peck stave or veneer barrels, and about 2 percent of them are injured in grade when dumped into the barrels. Many farmers have reduced this injury by padding the rims and bottoms with burlap. Barrels are also used in taking potatoes from basement bins, farm storage, and sometimes bins on the same floor, to the grader; and from the grader to the car when potatoes are being shipped in bulk. Since relatively few barrels are used for these purposes it would be profitable to pad the rims, lower sides, and bottoms with sponge rubber.

About half of the potatoes stored in the Aroostook area are dumped from barrels from a "rolling plank", and the other half from barrels through scuttle holes. Much injury is caused by allowing the rolling plank to rest directly upon the potatoes, but the rolling plank may be supported by cross members resting on cleats nailed to the bin wall without injury to the potatoes. After the bins are half full, the rolling planks are removed, and the potatoes are elevated to the floor above the bin and dumped through scuttles. The pile is first built up to the mid point of the ceiling by dumping through a twisted sack chute supported at the scuttle by being nailed to a wood frame or by being sewed to an old tire casing. After the pile is built to the level of the scuttle the sack chute is removed and the potatoes are then dumped through the padded scuttles. Padding around the scuttles helps to prevent bruises.

Rope-Bottomed Hopper

An objection to dumping through scuttles, in addition to the bruising of tubers, is that a pyramid or a wedge of very dirty potatoes is built up under the scuttle holes. Ventilation of this dense mass is difficult, and a good deal of sprouting and rotting results. To correct this condition a large percentage of farm-stored potatoes are run over a slatted

wooden rack or hopper before being dropped through the scuttle. In this way often 5 percent of the harvest is removed in the form of dirt, rocks, and small potatoes; but such racks increase the grade injuries by about 1 percent. To obtain the advantages of the cleaning hopper without its disadvantages, a rope-bottomed hopper was built (fig. 79) consisting of a 2- by 4-inch frame over which ⅜-inch rope is stretched three quarters of an inch apart on centers. At the ends of the hopper the rope is bent around ⅜- by 2-inch iron pins driven 1½ inches into drill holes in the edges of the cross members. The rope is continuous, and slack is taken up at the ends. This hopper was used in connection with a trough-bottomed conveyor (fig. 80) to handle 3,000 barrels of potatoes in the fall of 1933, and

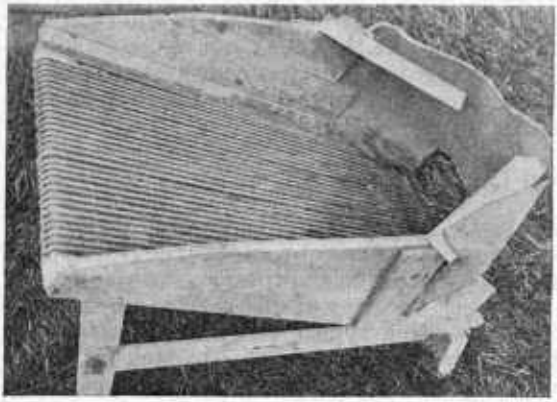

FIGURE 79.—Rope-bottom hopper for freeing potatoes of loose dirt before storage.

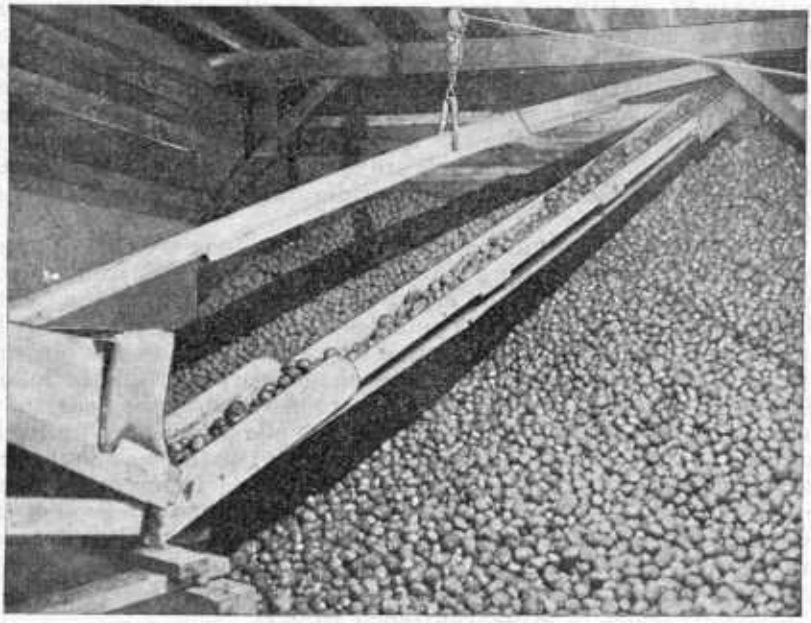

FIGURE 80.—Trough-bottom elevator, without cleats on belt, piling potatoes in storage bin.

over 100 barrels of dirt, rocks, and small potatoes were removed. Very little bruising occurred when this equipment was used.

Cleated canvas conveyors for piling potatoes are on the market, but they are not popular because they are heavy and hard to move around,

and bruising is increased by the cleats as they pass through a filled hopper. The conveyor shown in figure 81 was designed to overcome the disadvantages of the cleated conveyor and of the usual hand methods of dumping through scuttles and from planks. This conveyor worked very satisfactorily in storing the 3,000 barrels mentioned above. It is 18 feet long, and delivered 8 feet higher than the receiving end when a continuous stream of potatoes was fed from the rope hopper. By raising the lower end 2 feet above the floor, potatoes were stored to a depth of 10 feet. A ½-horsepower electric motor, washing machine reduction unit, and 16-inch canvas conveyor belt were used.

The conveyor shown in figure 81 was designed for taking potatoes from the bin and elevating them on to the first grading belt of a grader. It consists of two flights and one continuous conveyor belt. The lower flight is horizontal and fits into a 16-inch by 8-inch conveyor trench that runs the length of the bin; the upper flight elevates the potatoes

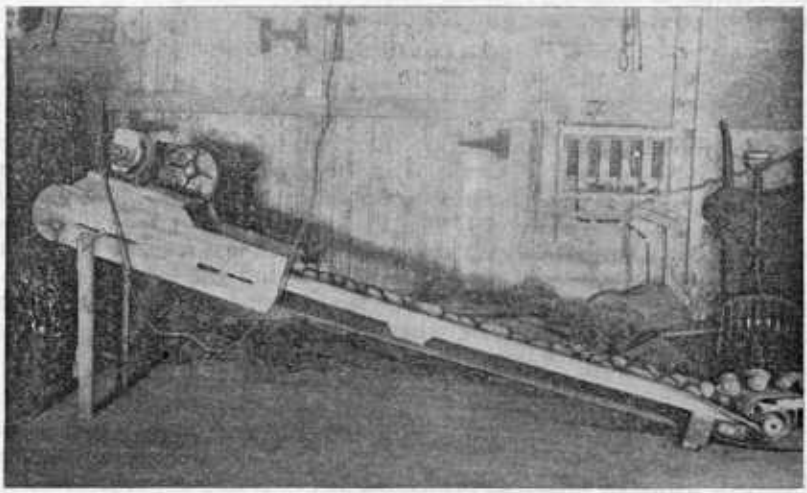

FIGURE 81.—Conveyor elevator for unloading potatoes from storage bin to grader. (Only one end of horizontal flight is shown, at right.)

on to the belt of the grader. The conveyor trench, like those used in cornerribs, has a cover of slats which are removed one at a time as the potatoes cease to run down. The same motor, drive, and belt were used as for the elevator described above. This conveyor was used with a small lot of potatoes in the spring of 1933, and handled them with less bruising than usually occurs with potato forks. Bruising caused by the type of potato fork shown in figure 81 can be reduced by placing old sprayer hose over the back one third of the tines.

Reducing Injury by Graders

Graders cause but little more injury than the usual operation of moving potatoes to the grader hopper, but the average grade injury of about 2 percent may be reduced by padding ramps between runs of conveyor belt and grading chain, and such corners as the moving potatoes might hit. Keeping the grader in adjustment and repair is equally important in preventing grader injury. The greatest injury in grading potatoes occurs in dropping from the grader into the barrels or sacks. The re-

sulting grade injury is about 4 percent, and these injured potatoes are not picked out but go to market, as already noted. Barrels may be padded. When the potatoes are shipped in sacks the most common method of preventing injury is to pad the floor heavily under the bag holder. Another common method is to tie up the bottom until the sack is partly filled, to decrease the drop of the first potatoes. Investigators are experimenting with tilting supports for sacks and barrels to reduce the injury from this source.

In all steps in the handling, it has been found, the temperature of the potatoes affects the amount of injury suffered. If the potatoes have a temperature of 50° F. or above, appreciable less bruising results than when they are handled at lower temperatures. In a storage house one bin may be warmed without affecting the others, by blowing warm air from the main alley into the conveyor trench of the bin to be warmed. This is not the least important means, from the standpoint of either effectiveness or economy, that is suggested for reducing the losses commonly suffered in storing and handling this crop.

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POULTRY Meat Production Costs Reduced by Cross-Breeding and Good Diets

The production of poultry meat and the control of its quality may well begin with breeding for rapid rate of growth and good quality of carcass. The more rapidly a chicken grows the less it costs to raise it. Not only is less feed eaten per pound of gain, but the bird can be marketed at an earlier age. It is also true that the meat of the faster growing chicks is usually of better quality. Once suitable chicks have been obtained, the chief problems are those of management and feeding.

Breeding for Rapid Growth and Quality

Only within recent years has much thought been given to the possibility of utilizing breeding principles in producing rapid growth and high market quality in chickens. One means of doing this is to crossbreed. Several crosses have been tried which seem to have a beneficial effect on rapidity of growth and quality of meat at least up to 10 or 12 weeks of age, although the results have not been adequately verified. These crosses are as follows: Rhode Island Red and White Wyandotte; Rhode Island Red and Light Sussex; Rhode Island Red and Barred Plymouth Rock; and Dark Cornish and Barred Plymouth Rock.

Crosses of the White Leghorn with some of the heavy breeds have produced results that were not so desirable. They are: White Leghorn and Barred Plymouth Rock; White Leghorn and Rhode Island Red; White Leghorn and White Wyandotte; and White Leghorn and Jersey Black Giant.

It is noteworthy that the sex of the chicks resulting from all the crosses of the first group may be ascertained at hatching time by the color of their down. However, practically all the crosses of the second group have no definite indications of the differences between sexes of the day-old chicks.

In the crossbreeding studies carried on at the United States Animal Husbandry Experiment Farm, Beltsville, Md., the cockerels from