OPERATING COSTS AT FOUR POTATO PACKING PLANTS

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PREFACE

This study is part of a continuing research program of the Agricultural Marketing Research Institute, Agricultural Research Service, designed to find more efficient and less costly methods of handling, processing, packaging, and transporting agricultural products from the producer to the consumer.

Appreciation is expressed to the potato packing firms that participated in this research.

The engineering firms of Stearns, Conrad, and Schmidt of Long Beach, Calif., and the Paul F. Shaffer Company of Miami, Fla., supplied the basic data for this report.

This work was done under the general direction of John C. Bouma, Chief, Market Operations Research Laboratory, Agricultural Marketing Research Institute.

CONTENTS

	Page
Summary	1
Introduction	1
Methodology	2
Description of grades of potatoes	2
Operating characteristics of four potato packing firms	3
Firm A	3
Firm B	4
Firm C	6
Firm D	8
Labor requirements	11
Firm A	11
Firm B	13
Firm C	13
Firm D	13
Production rate at four potato packing firms	13
Total costs of labor, materials, and equipment at four potato packing firms	14
Appendix	19
Allocation of labor costs per hour	19
Material costs	25
Equipment costs	25
Ownership and operating costs	26

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OPERATING COSTS AT FOUR POTATO PACKING PLANTS

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SUMMARY

This report is concerned with the costs of labor, materials, equipment, and ownership operation at four potato packing plants.

The man-hour production rate at the four firms studied during 1974 ranged from 709.5 to 1,131.4 pounds of potatoes. The highest production occurred at one of the smaller volume potato firms; however, the lowest production was at the firm with the least volume.

In this study the production rate was not necessarily dependent on volume but on other factors, such as (1) scheduling of field and plant crews, (2) unloading area capacity to avoid delays in feeding the production line, (3) plant layout, (4) crew skill, (5) automatic bag filling and closing, (6) mechanized handling, (7) palletization, and (8) grade-out variation of potatoes.

The costs per unit for labor, materials, and equipment for packing potatoes in master containers with ten 5-pound bags were $0.971 at firm A and $0.915 at firm B. Firms C and D were packing six 8-pound and five 10-pound bags in master containers at $0.986 and $1.027, respectively.

INTRODUCTION

Of all fresh vegetables packaged and shipped for fresh consumption, potatoes have the largest volume. In 1974, approximately 34 billion pounds of potatoes were produced in the United States. This represents 5.2 percent of the world's production and places the United States as the fourth leading producer behind the U.S.S.R., Poland, and West Germany, respectively. The United States' production was valued at over $800 million in 1974.

Individual consumption patterns for potatoes are changing in the United States. A definite trend toward greater consumption of processed potato products and away from fresh potatoes is in evidence. In 1956, per capita potato consumption was 102.7 pounds, with 88.7 pounds or 86.4 percent consumed as fresh and 14.0 pounds or 13.6 percent used for processing. By 1974, per capita consumption had risen to 118.0 pounds, with 45.9 pounds or 38.9 percent for fresh consumption and 72.1 pounds or 61.1 percent for processing into canned, frozen, chipped, or dehydrated products.

This study is part of a total systems evaluation of the costs of marketing potatoes from the producing area to the retail food store.

This report includes the operations at the packing plant after the potatoes are harvested and prior to transportation to the receiver-wholesaler warehouse and is concerned only with table stock potatoes, which are marketed fresh. Most of the table stock is washed and packed in plants usually close to the producing area. The operations consist of (1) washing, (2) damp-drying, (3) presizing, (4) grading, (5) sizing, and (6) packaging. Since small packing plants tend to be antiquated and costly, the trend is toward larger centralized plants. These may be grower-owned or privately owned firms operated by someone not engaged in growing potatoes.

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METHODOLOGY

In this study, ownership and operating costs were analyzed at four potato plants, two in Florida and two in California. Additional operating costs and data were also collected from other firms in Florida, California, Virginia, New York, and Maine.

The labor hours and their respective costs were allocated to the appropriate potato grade in accordance with the function performed by the packing plant personnel. For example, all the labor required to pack 5-, 8-, and 10-pound consumer bags in 48- to 50-pound master containers was allocated by percentage of weight of a given size of consumer bag packed to the total weight of potatoes processed during the study period. Whenever a function served more than one grade of potato, the direct labor hours were allocated among those grades by percentage of weight of a particular grade to the total weight of the grades involved. All other labor costs were allocated by percentage of weight of the grade packed to the total weight handled per hour. A detailed breakdown of the labor cost calculations is given in the appendix.

Material costs were obtained directly from the manufacturers in 1975. Equipment costs were depreciated on a straight-line basis, with a 10-year life expectancy. The production line hourly rate was an average for the total length of the study (4–16 hours) at the four packing plants. The material, equipment, and ownership and operating costs are given in the appendix.

DESCRIPTION OF GRADES OF POTATOES

In the U.S. standards for grades of potatoes, all potatoes not meeting the grade specifications [2] are called "unclassified." According to the standards, in section 51.1544 the term "unclassified" is not a grade but is a designation to show that no grade has been provided for potatoes in this category.

TABLE 1.—*U.S. standards for grades of potatoes*

Size designation	Minimum diameter [1] or weight		Maximum diameter [1] or weight	
	In	*Oz*	*In*	*Oz*
Size A [2]	1–7/8	(3)	(3)	(3)
Size B	1–1/2	(3)	2–1/4	(3)
Small	1–3/4	(3)	2–1/2	6
Medium	2–1/4	5	3–1/4	10
Large	3	10	4–1/4	16

[1] Diameter means the greatest dimension at right angles to the longitudinal axis, without regard to the position of the stem end.

[2] In addition to the minimum size specified, a lot of potatoes designated as size A shall contain at least 40 percent of potatoes that are 2–1/2 inches in diameter or larger or 6 oz in weight or larger.

[3] No requirement.

[2] For details on grade specifications, see "United States Standards for Grades of Potatoes, Effective September 1, 1971, as Amended February 5, 1972." This publication can be obtained from the Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Besides disease, shape, damage, and other factors, which are listed in detail in the pamphlet on U.S. standards, size is also a criterion. The following information concerning size can be found in section 51.1545 on page 3 of this publication:

The minimum size or minimum and maximum sizes may be specified in connection with the grade in terms of diameter or weight of the individual potato, or in accordance with one of the size designa-

TABLE 2.—*U.S. weight standards for count potatoes*

Size designation [1]	Minimum weight	Maximum weight
	Oz	*Oz*
Under 50	15	--
50	12	19
60	10	16
70	9	15
80	8	13
90	7	12
100	6	10
110	5	9
120	4	8
130	4	8
140	4	8
Over 140	4	8

[1] Count per 50-lb carton.

tions in table 1 or table 2 provided that sizes so specified shall not conflict with the basic size requirements for the grade.

When size is specified in terms of the customary sizes of potatoes packed to count in standard 50-pound cartons, the weight ranges shown in table 2 shall apply. These size designations may be applied to potatoes packed in any size containers provided that the weight ranges are within the limits specified.

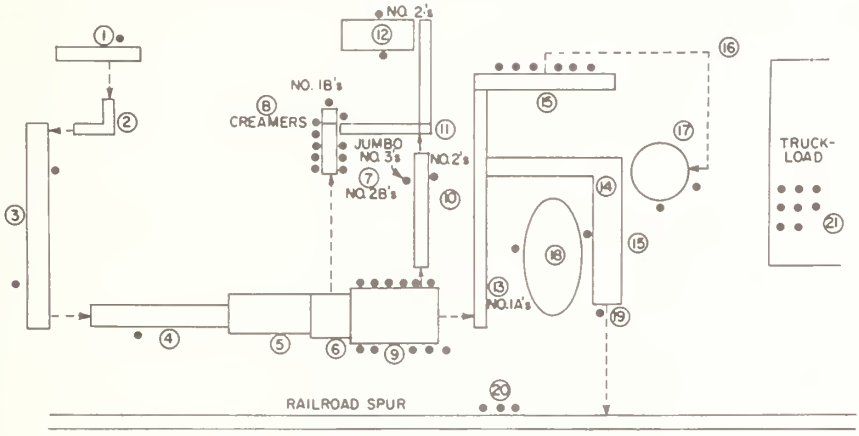
OPERATING CHARACTERISTICS OF FOUR POTATO PACKING FIRMS

Firm A

Firm A is in southern Florida. A layout of the production line is shown in figure 1. At this plant the potatoes arrive in field trucks, which are unloaded into a hydraulic flume [3] system (*1*, *2*), where they receive a preliminary washing (fig. 2). The potatoes are moved to the main washing area by an 18-inch-wide power roller conveyor (*3*). There are two stations along this conveyor line where stems, rocks, and culls are removed. The potatoes pass through a soak tank onto a roller conveyor inspection station, where culls, clods, and rocks are removed, through a spray washer, over water extractor rollers, and into the dryer (*4*, *5*). Emerging from the dryer, they pass over a 2-inch-diameter screen conveyor-sizer (*6*), where the size B potatoes fall through and are conveyed to a grading-sizing station (*7*). Culls are removed and the remaining potatoes pass over a 1-1/4-inch-diameter screen conveyor-sizer (*8*), where the creamers fall through and into field crates. The No. 1B's are placed in 50-pound baler bags at a double-head bag-filling station (*7*). The filled bags are conveyed to the bag-closing station (*11*).

The No. 1A potatoes pass over the 2-inch-diameter screen conveyor-sizer (*6*) onto the main grading-sizing table (*9*). Culls are removed and sent by chute to an under-the-floor conveyor system. No. 2 and No. 3. (Jumbo) potatoes are removed and conveyed to a grading-sizing table (*9*). No. 3's are placed in a chute and manually bagged into 100-pound burlap bags (*10*). Some of the No. 2 potatoes are manually bagged at the same location. The remaining No. 2's are conveyed to the automatic bag-

[3] A trough with water moving through it at high velocity. In addition to the potatoes being given a preliminary washing, rocks and other debris fall to the bottom of the trough. The velocity of the water carries the potatoes to the main conveyor line.



1 UNLOADING FIELD TRUCKS
2 FLUME
3 18-INCH-WIDE CONVEYOR
4 SCREEN, SOAK TANK, WASH, WATER EXTRACTOR
5 DRYER
6 2-INCH-DIAMETER SCREEN CONVEYOR-SIZER
7 GRADING AND BAGGING NO. 1B's, NO. 2B's, AND CREAMERS
8 1-1/4-INCH-DIAMETER SCREEN CONVEYOR-SIZER
9 MAIN GRADING TABLE
10 MANUALLY BAGGING NO. 2's AND NO. 3's
11 AUTOMATIC BAG-CLOSING STATION
12 FOUR-POSITION AUTOMATIC BAGGING STATION FOR NO. 2's
13 MANUALLY BAGGING NO. 1A's - 50-LB BALER BAGS
14 FOUR-POSITION AUTOMATIC BAGGING STATION FOR NO. 1A's
15 BAGGING 5- AND 10-LB CONSUMER PACKAGES
16 AUTOMATIC WIRE BAG-CLOSING STATION
17 PLACING CONSUMER PACKAGES IN BALER BAGS AND CLOSING THEM
18 50-LB BALER BAGS MANUAL OPERATION, OVAL CONVEYOR
19 AUTOMATIC 50-LB BALER FILLER AND BAG-CLOSING STATION
20 LOADING RAILCARS
21 LOADING TRAILERS
• SHED WORKER

FIGURE 1.—Plant layout of firm A.

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FIGURE 2.—Potatoes being moved by flume and conveyor to main washing area.

filling station (*12*). The No. 2 and the No. 1B potato baler bags are closed with automatic wire bag-closing equipment (*11*). They are separately transported by two-wheel trucks to storage or into the trailers (*21*).

The No. 1A potatoes are moved from the main grading table (*9*) on a conveyor. The first bagging station (*13*) has four double-head, manual, bag fillers (fig. 3). The filled baler bags are moved onto an oval accumulating conveyor (*18*), which moves them to a bag-closing station (*19*). The second group of bagging stations for No. 1A potatoes is equipped with four-position automatic baler fillers (*14*). The bags are closed with wire loops (*19*) and moved by conveyor to a telescoping belt conveyor, which is used in loading trailers and railcars. The third bagging station for No. 1A potatoes is a four-position double-headed bagging line for 5- and 10-pound consumer bags (*15*). The filled 5- and 10-pound bags are moved on an L-type belt conveyor to an automatic wire closer (*16*). The bags are conveyed to a rotary table (*17*) and manually placed in baler bags. The closed baler bags are handtrucked to trailers or railcars for loading (*20*, *21*).

Firm B

Firm B is in southern Florida. A layout of the production line is shown in figure 4. Potatoes are unloaded from the field trucks into a hydraulic flume, which moves them to the initial inspection station, where clods, rocks, and culls are removed (*1*, *2*, *3*, *4*). The remaining potatoes then go into the washer, the water eliminator, and the dryer (*5*). After drying they pass over a 2-inch-diameter diamond-shaped chain conveyor (*6*), where all No. 1B's, No. 2B's, and creamers fall through and onto a conveyor-sizer (*8*).

The No. 2B potatoes are removed and placed in a chute, which terminates at the double-head bag-filling station (*7*). The No. 1B's and creamers then pass over the 1-1/4-inch-diameter chain conveyor (*8*), where the creamers fall through onto a chute, which leads to a single-head bag-filling station (*9*). The remaining 1B potatoes after passing over the

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FIGURE 3.—Potatoes being moved to station having four baler bag fillers.

screen (*8*) are conveyed to a double-head baler bag-filling station (*10*), where they are placed in 50-pound baler bags. The bags are closed by an automatic wire closing machine (*11*) and then conveyed to the palletizing area (*19*).

The No. 1A potatoes pass over the 2-inch-diameter chain conveyor (*6*) and onto the main grading table (*13*) (fig. 5). Culls are removed and conveyed to a bin. The No. 2A and No. 3 (Jumbos) potatoes are moved to a grading conveyor, where

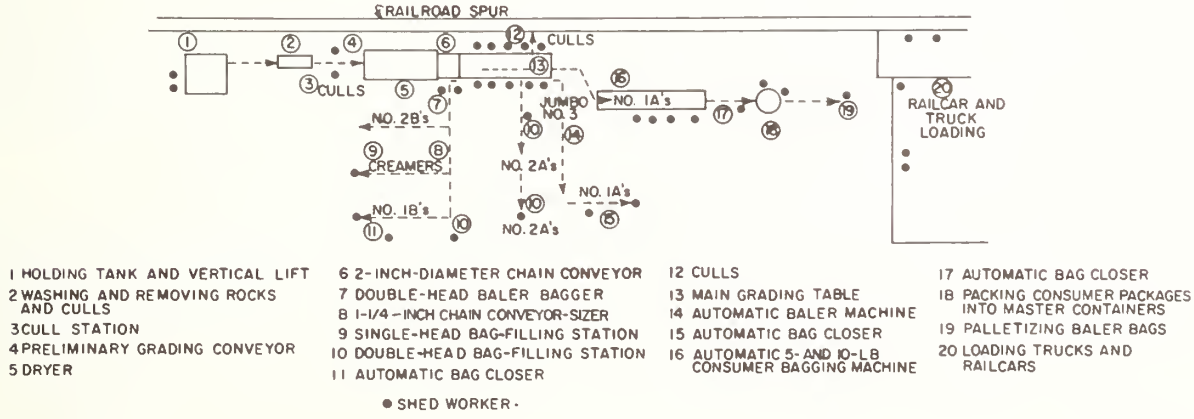

FIGURE 4.—Plant layout of firm B.

FIGURE 5.—Main grading station.

the No. 3's are placed in 50-pound bags at a double-head baler bag-filling station (*14*). The No. 2A potatoes are conveyed to a double-head bagging station (*15*) and placed in 50-pound bags. The bags are then closed and palletized (*19*).

The No. 1A potatoes are moved from the main grading table (*13*) either to the six-head packaging line for 5- and 10-pound consumer plastic bags (*16*) or to the bulk 50-pound automatic baler bag-filling machine (*14*) (fig. 6).

The 5- or 10-pound consumer bags are closed by an automatic closing machine (*17*) and are moved by conveyor to a rotary table (*18*), where they are manually placed in 50-pound baler bags. These filled bags are closed by an automatic wire closure machine and palletized (*19*).

The 50-pound baler bags with No. 1A potatoes are also closed by an automatic wire closure machine (*15*) and conveyed to a palletizing station in the loading area (*19*). They are palletized and moved to trailers, railcars, or temporary storage by a forklift truck (*20*).

Firm C

Figure 7 shows a plant layout of firm C, which is in California. Incoming potatoes are unloaded from the field truck by using a high velocity water stream, which forces them out of the truck and into a flume. The potatoes are moved by the flume to the initial sizing area, where the B's and "pee wees" [4] are separated (*1*, *2*, *3*). The pee wees are conveyed to pallet bins (*23*), where they are stored for processing as canned potatoes. The B's are conveyed to an automatic bagging machine (*19*) and then to the railcar loading area (*22*).

The main stream of potatoes has only No. 1's and No. 2's. They are washed and pass through a roller sizer (*7*), where small No. 1's are separated from large No. 1's (*8*). The small No. 1's are packed in 8- or 10-pound consumer bags and placed in 48- and 50-

[4] "Pee wees," a term used to describe potatoes that are less than 1-1/4 inches in diameter.

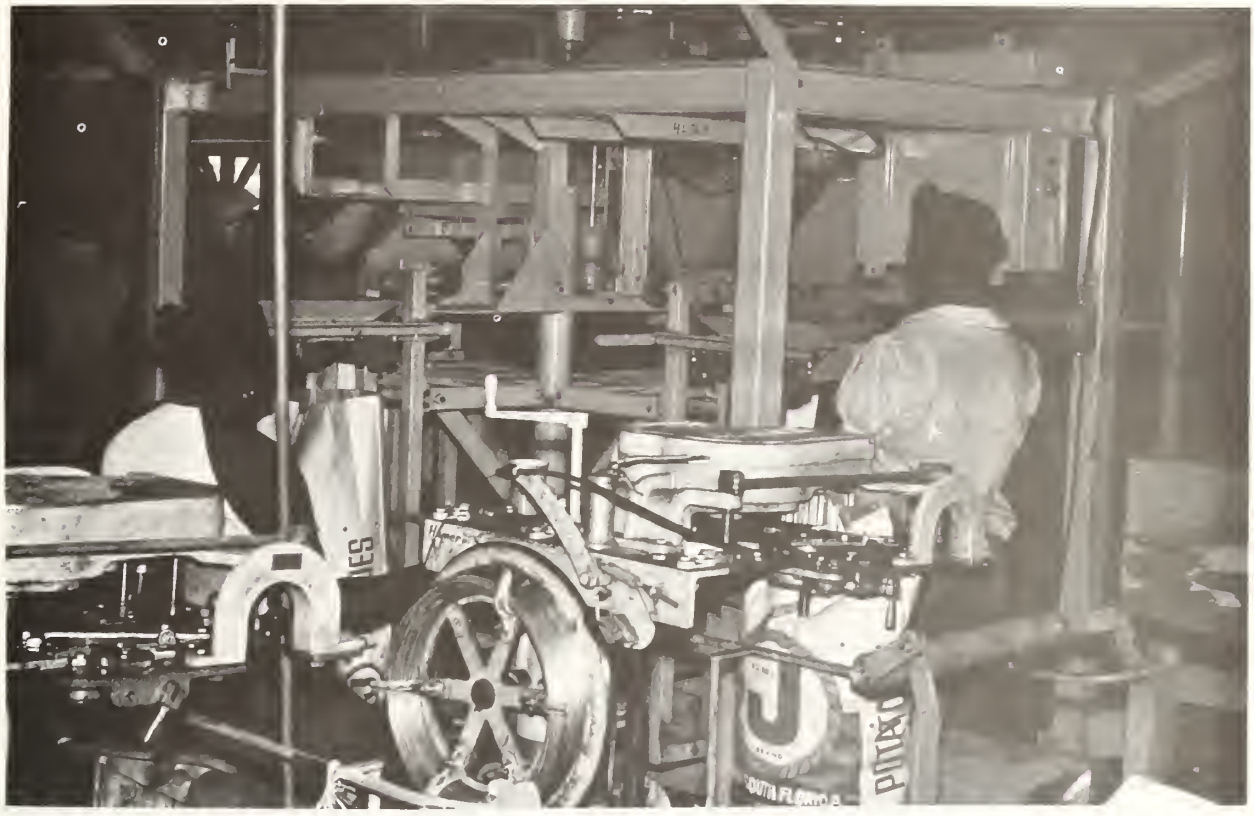

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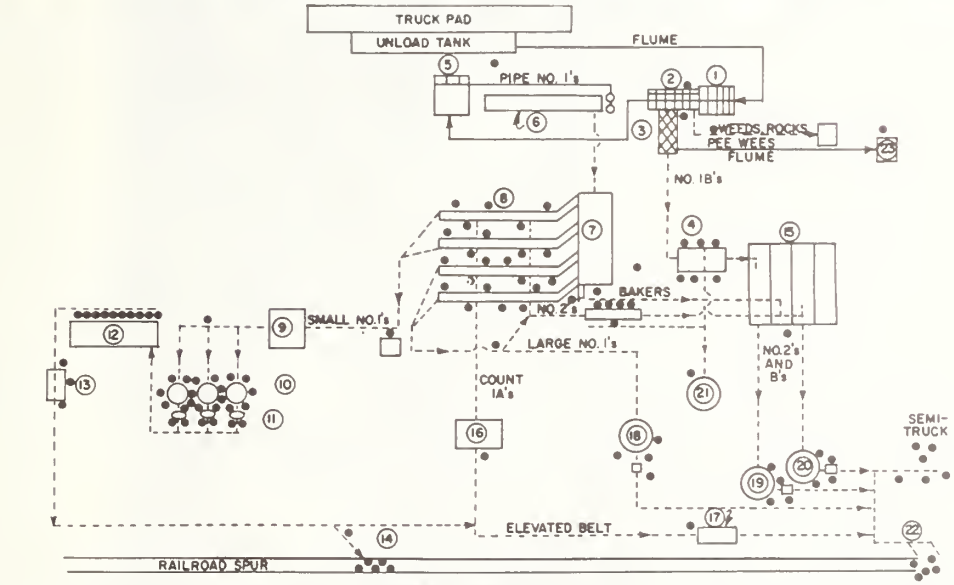
FIGURE 6.—50-pound baler bagging and closing station



1 LIFT CONVEYOR
2 CHAIN SIZER SEPARATING B's FROM NO. 1's
3 CHAIN SIZER SEPARATING PEE WEES FROM B's
4 HAND SEPARATING CULLS FROM B's
5 SURGE TANK
6 SPRAY CONVEYOR
7 ROLLER SIZER
8 MAIN NO. 1 GRADERS
9 STORAGE HOPPER
10 BAG-FILLING MACHINES (15- AND 10-LB BAGS)
11 MACHINE BAG SEAMERS
12 HAND PLACING BAGS INTO MASTER CARTONS
13 MASTER CARTON SEALER MACHINE
14 RAILCAR LOADING
15 STORAGE BINS FOR BAKERS, B's, AND NO. 2's
16 FILLING MACHINE FOR COUNT CARTONS
17 COUNT CARTON SEALING MACHINE
18 NO. 1's 100-LB SACK-BAGGING MACHINE
19 BAGGING MACHINES FOR 50- AND 100-LB SACKS FOR NO. 2's AND B's
20 BAGGING MACHINES FOR 50- OR 100-LB SACKS
21 CULL WATER TANK
22 RAILCAR AND TRUCK LOADING
23 PEE WEE PALLET BINS
● SHED WORKER

FIGURE 7.—Plant layout of firm C.

pound master containers, respectively. The bakers,[5] count potatoes,[6] and No. 2's are manually removed from the large No. 1's and conveyed to their respective packing areas and from there to the loading areas (*14*, *22*). The large No. 1's are automatically packed in 100-pound burlap bags (fig. 8) and conveyed to the loading area (*14*). Cull potatoes are removed from each stream of potatoes and eventually conveyed to the cull water tank (*21*).

All potato packaging and bag stitching at firm C were accomplished with automatic bagging and weighing devices (fig. 9) and sewing machines (*10*, *11*). The only exception was the manual packing of 8- and 10-pound bags into master containers.

[5] Large No. 1A potatoes that usually are sold to institutional firms.

[6] See table 2.

Most of the packages are transported by conveyor directly to the loading vehicle. At times, handtrucks are used to move burlap bags to the loading area (*14*, *22*).

Firm D

Figure 10 shows the plant layout of firm D in California. The packing operations at this plant were similar to those at firm C except for the following variations: (1) The potatoes were unloaded from the field truck by gravity. A lift hoist (*1*) at the unloading area tilted the truck body to allow the potatoes to roll into the unloading bin. (2) All burlap bags were stitched manually (*7*) (fig. 11). (3) The count potatoes were machine sorted (*17*) for packaging in count cartons (*18*, *19*). (4) All packages were taken to the transport vehicle by a handtruck (fig. 12).

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FIGURE 8.—No. 1 potatoes being packed in 100-pound burlap bags.

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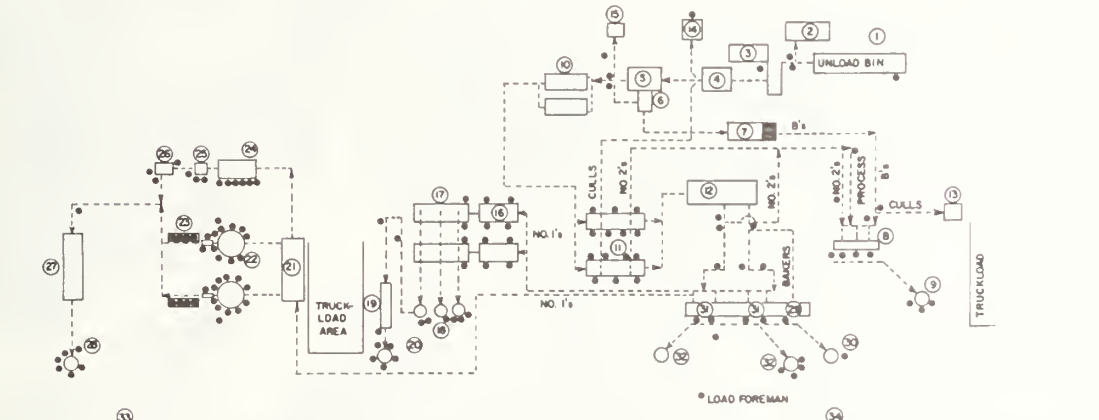
FIGURE 9.—Potatoes being conveyed to automatic bagging station.



1 UNLOADING HOIST
2 FLATBED TRUCK FOR ROCKS AND WEEDS
3 FLUME WATER STORAGE TANK
4 POTATO HOLDING TANK
5 CHAIN SIZER SEPARATING 8's FROM NO.1's
6 WASHER FOR 8's
7 HAND BAGGING AND SEWING - 100-LB BURLAP BAGS FOR 8's, NO. 2's, AND NO. 3's
8 DOLLYMEN FOR 8's, NO. 2's, and NO. 3's
9 GRADING BELTS
10 WASHERS FOR NO. 1's
11 MAIN NO. 1 GRADING BELTS
12 ROLLER SIZER
13 CULL BIN OFF 8's LINE
14 ELEVATED CULL BIN
15 PEE WEE BINS
16 SORTING RACKS FOR COUNT POTATOES
17 CUP-SORTING MACHINE FOR COUNT POTATOES
18 FILLING MACHINES FOR COUNT POTATOES
19 CARTON-SEALING MACHINE
20 DOLLYMEN TO LOAD COUNT CARTONS
21 HOPPER STORAGE FOR 10-LB BAGS
22 AUTOMATIC BAGGING MACHINES
23 BAGS MANUALLY PLACED INTO MASTER CARTONS
24 HAND BAGGING AND MANUALLY WEIGHING (10-LB BAGS)
25 SEWING MACHINE
26 10-LB BAGS PLACED IN MASTER CARTONS
27 SEAMER
28 DOLLYMEN TO LOAD MASTER CARTON INTO RAILCARS
29 HAND BAGGING AND SEWING OF NO. 1 BAKERS
30 DOLLYMAN TO LOAD NO. 1 BAKERS INTO RAILCARS
31 HAND BAGGING AND SEWING OF NO. 1's
32 DOLLYMEN TO LOAD NO. 1's INTO RAILCARS
33 FRONTMEN FOR MASTER AND COUNT CARTONS
34 FRONTMEN FOR NO. 1's
• SHED WORKER

FIGURE 10.—Plant layout of firm D.

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FIGURE 11.—Burlap bags being stitched manually in firm D.

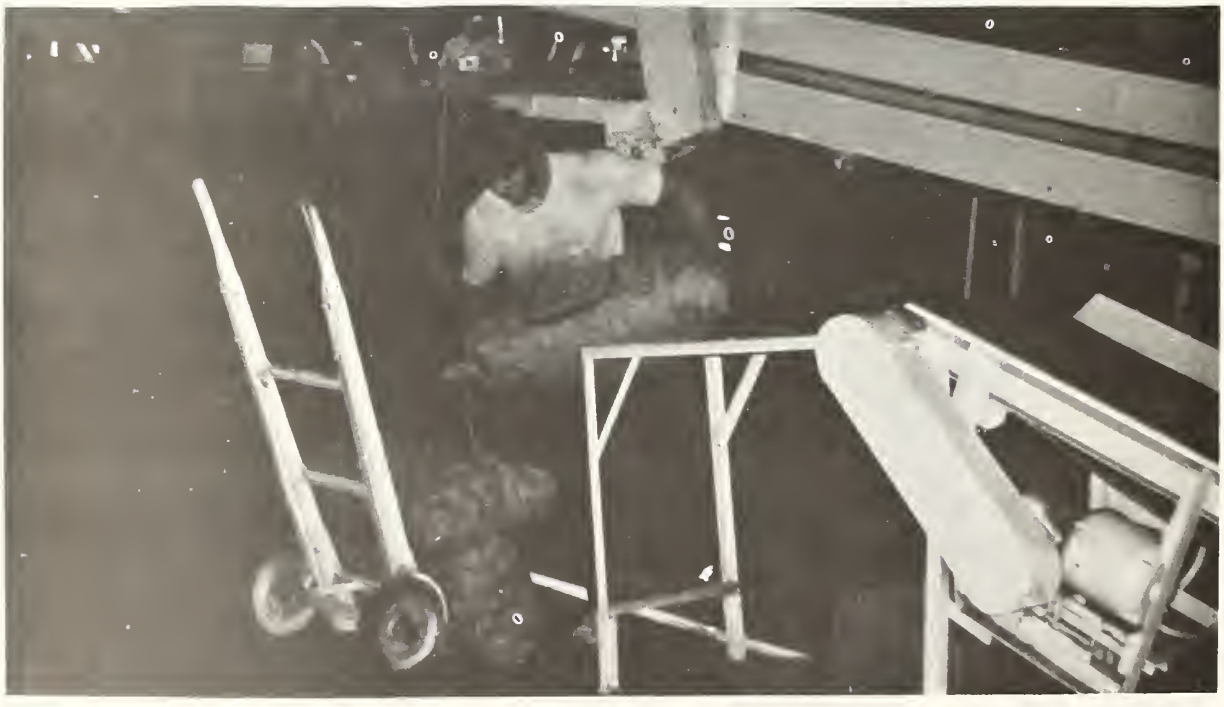

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FIGURE 12.—Bags being loaded on handtruck in firm D.

LABOR REQUIREMENTS

Firm A

The distribution of labor at firm A is shown in table 3 and figure 1. At firm A, 51 persons were employed. The wage rates ranged from $2.25 to $2.75 per hour (table 4) and were comparable with those of the other three firms studied.

TABLE 3.—*Labor distribution in 4 potato packing firms*

Function	Firm A	Firm B	Firm C	Firm D
	Percent	*Percent*	*Percent*	*Percent*
Unloading	2.0	5.4	---	---
Grading	43.1	37.8	34.2	31.4
Packaging	33.3	43.3	47.4	60.4
Loading	21.6	13.5	13.2	4.5
Maintenance	---	---	5.2	3.7
Total	100.0	100.0	100.0	100.0

TABLE 4.—*Labor requirements and wage rates at 4 potato packing firms*

Type of employee	Employees	Allocation of labor by function	Hourly wage rates
	Number	*Percent*	*Dollars*
FIRM A			
Unloader	1	2.0	2.75
Grading:			
Lead graders	2	43.1	2.50
Graders	20		2.25
Packaging:			
Baggers (5- or 10-lb bags)	8	33.3	2.25
Packers	5		2.25
Do	2		2.50
Packers and supervisors	2		2.75
Loading:			
Truckers	5	21.6	2.50
Loaders	6		2.75
Total	51	100.0	---
FIRM B			
Unloaders	2	5.4	2.90
Grading:			
Lead grader	1	37.8	2.75
Graders	13		2.50
Packaging:			
Baggers (5-lb bags)	8	43.3	2.50
Packers	7		2.50
Packer	1		2.75
Loading:			
Loaders	4	13.5	2.75
Forklift operator	1		2.75
Total	37	100.0	---

TABLE 4.—*Labor requirements and wage rates at 4 potato packing firms*—Continued

Type of employee	Employees	Allocation of labor by function	Hourly wage rates
	Number	*Percent*	*Dollars*
FIRM C			
Grading:			
Graders	37	34.2	2.40
Delay monitor	1		2.50
Supergrader	1		2.60
Packaging:			
Baggers (8- and 10-lb bags)	23	47.4	2.40
Crew chief	1		2.50
Baggers (50- and 100-lb bags)	11		2.75
Sealer	1		2.75
Crew chiefs	2		3.00
Master container packers	13		2.75
"Count" carton packers	2		2.75
Pee wee bin operator	1		2.75
Loading:			
Loaders	12	13.2	3.00
Foreman	1		4.80
Do	1		[1] 200.00
Main foreman	1		[2] .005
Maintenance:			
Helpers	2	5.2	2.50
Foreman	1		[3] 700.00
Cleanup and miscellaneous helpers	3	---	2.50
Total	114	100.0	---
FIRM D			
Grading:			
Graders	41	31.4	2.35
Supervisor	1		[1] 125.00
Packaging:			
Baggers	41	60.4	2.35
Master container packers	4		2.35
Pee wee bin operator	1		2.75
Sidemen	27		2.75
Frontmen	8		10.00
Loading:			
Frontmen	3	4.5	10.00
Foremen	3		[4] .03
Maintenance:			
Helper	1	3.7	2.50
Foreman	1		[3] 700.00
Cleanup and miscellaneous helpers	3	---	2.50
Total	134	100.0	---

[1] Per week.
[2] Per hundredweight.
[3] Per month.
[4] Per bag or carton loaded.

Labor requirements and the respective costs were allocated to the appropriate potato grade in accordance with the function performed by the plant workers. For example, all the labor required for bagging 5- and 10-pound paper bags was allocated to packing of master containers. Whenever a function served more than one grade of potato, the labor costs were allocated among those grades on the basis of the respective percentage by weight of a particular grade to the total weight of the grades involved.

For a detailed breakdown of allocating labor costs, see the appendix.

At firm A, 43.1 percent of the 51 men in the labor force were graders and 21.6 percent loaders. Packaging occupied 33.3 percent, the lowest percentage in the study for this operation. The remaining 2.0 percent were unloaders. The primary functions of the firm—grading and packaging—occupied 76.4 percent of the floor labor force. The size of the loading crew, 21.6 percent, seemed excessive when compared with that of the other firms.

Firm B

At firm B, 37 persons were employed, with wage rates from $2.50 to $2.90 an hour (table 4). The distribution of the labor force is shown in table 3 and figure 4.

At this firm, 43.3 percent were assigned to packaging, 37.8 percent to grading, 13.5 percent to loading, and 5.4 percent to unloading. The unloading crew was the largest for the four firms, but it also had some inspection duties. About 81.1 percent of the floor labor force were in grading and packaging operations, the primary functions of the firm.

Firm C

At firm C, 114 persons were employed as direct labor. The wage rates ranged from $2.40 to $3.00 an hour (table 4). The supervisor of the graders was paid $2.60 hourly. One floor foreman was paid $200 weekly and another $4.80 hourly. The foreman of the maintenance section was paid $700 monthly. The main foreman received a salary based on the volume of potatoes handled at a rate of $0.005 per hundredweight.

The distribution of the labor force at firm C is shown in table 3 and figure 7.

At this firm, 47.4 percent of the floor labor force were in packaging, 34.2 percent in grading, 13.2 percent in loading, and 5.2 percent in maintenance. This meant that 81.6 percent of the floor labor force were assigned to grading and packaging, the primary functions of the firm.

Firm D

Firm D used 134 persons, and its wage rates ranged from $2.35 to $10.00 an hour (table 4). The three foremen in the loading section were paid $0.03 for each bag or carton loaded.

The distribution of the labor force at firm D is shown in table 3 and figure 10.

At this firm, 60.4 percent were in packaging, 31.4 percent in grading, 4.5 percent in loading, and 3.7 percent in maintenance. This was the only firm with most of its floor labor force in the packaging operation. The primary function of grading and packaging occupied the attention of 91.8 percent of the floor labor force with the remaining 8.2 percent in loading and maintenance. The 4.5 percent in loading was small compared with the 16.1-percent average for the other three firms.

PRODUCTION RATE AT FOUR POTATO PACKING FIRMS

During the study the labor force and plant production per hour and per man-hour were as follows at the four firms:

Firm	*Labor*	*Production per—*	
		Hour	*Man-hour*
	Number	*Lb*	*Lb*
A	51	57,700	1,131.4
B	37	26,250	709.5
C	114	96,040	842.5
D	134	136,900	1,021.6

These results show that the man-hour production rate is not necessarily dependent on the hourly volume of the operation. Firm A had the highest man-hour production rate of the four firms studied and yet its total hourly volume of 57,700 pounds was about one-half the volume of firms C or D. Therefore the production per man-hour seems to be affected by other factors, such as (1) crew scheduling, (2) potato supply, (3) unloading space, (4) plant layout, (5) crew skill, (6) automatic bag-filling and bag-closing equipment, (7) mechanized handling, (8) palletization, and (9) grade-out variation of potatoes.

Detailed studies were not made on what factors affect the production rate in potato packing plants. However, observations and time studies were made of operations at other plants in Florida, California, Virginia, New York, and Maine. The results indicated that some of the following factors could affect the production rate.

For example, a study was conducted on the downtime of the production line at a potato packing

plant in the Long Island, N.Y., area. The line was not running approximately 20 percent of the time, mainly because of the inefficient layout of the receiving line and scheduling of the harvesting crews.

Enough space should be provided at the receiving line or flume for two trucks, so that as soon as one truck is unloaded, the second truck can be unloaded immediately and thereby prevent interrupting the flow of potatoes to the production line. Considerable time is lost when there is only space for one truck at the receiving line. The next truck to be unloaded has to wait until the first one leaves. Then the second truck has to be positioned at the line or flume before it can be unloaded.

The proper scheduling of harvesting crews is essential to insure that a continuous supply of potatoes arrives at the packing plant while the production line is running.

Of course, enough potatoes should be available to keep the line running continuously. If there is a shortage of potatoes, the crew should be scheduled accordingly.

The layout of the line as well as the skillfulness of the crew can also affect production.

The rate of the production line depends on the type of equipment in the line itself. Automatic bag-filling and weighing and automatic bag-closing equipment are substantially faster than a manual operation. Mechanized handling equipment in conjunction with pallets also increases the efficiency of the operation.

Grade-out variations between potato fields and even within the same field cause the production rate to fluctuate regardless of the factors previously mentioned.

TOTAL COSTS OF LABOR, MATERIALS, AND EQUIPMENT AT FOUR POTATO PACKING FIRMS

At firm A, costs per unit for processing potatoes ranged from $0.289 for No. 1A in 50-pound bags to $0.971 for No. 1A in master containers with ten 5-pound bags (table 5). At firm B, costs per unit ranged from $0.353 for No. 2A in 50-pound bags to $0.915 for No. 1A in master containers with ten 5-pound bags (table 6). At firm C, costs per unit ranged from $0.461 for B's in 50-pound bags to $0.986 for No. 1 in master containers with six 8-pound bags (table 7). At firm D, costs per unit ranged from $0.610 for B's in 100-pound bags to $1.027 for No. 1 in master containers with five 10-pound bags (table 8).

TABLE 5.—*Total cost of handling, packaging, and loading potatoes at firm A*

Production line	Potato grade and container	Containers packed per hour	Weight per hour	Proportion of total weight	Hourly labor cost [1]	Cost per unit				Total cost per—	
						Labor cost per unit	Hourly equipment ownership and operation costs [2]	Depreciated equipment ownership and operation	Material [3]	Total	Truck [4]	Railcar [5]
		Number	*Lb*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
	No. 1A:											
	Master containers:											
1	Five 10-lb bags	173	8,650	15.0	38.26	0.221	8.01	0.046	0.439	0.706	540.09	1,103.48
2	Ten 5-lb bags	110	5,500	9.5	35.97	.327	5.07	.046	.598	.971	742.82	1,517.67
3	50-lb bags	475	23,750	41.3	49.24	.104	22.04	.046	.139	.289	221.09	451.71
4	No. 2A - 50-lb bags	238	11,900	20.6	35.70	.150	10.99	.046	.139	.335	256.28	523.61
5	No. 3 (Jumbos) - 50-lb bags	43	2,150	3.7	6.44	.150	1.97	.046	.148	.344	263.16	537.67
6	No. 1B - 50-lb bags	83	4,150	7.2	17.63	.212	3.84	.046	.139	.397	303.71	620.51
7	No. 2B - 50-lb bags	20	1,000	1.7	4.23	.212	.91	.046	.350	.608	465.12	950.30
8	Creamers - 50-lb bags	12	600	1.0	2.53	.211	.53	.046	.139	.396	302.94	618.95
	Total	1,154	57,700	100.0	---	---	53.36	---	---	---	---	---

[1] For hourly labor cost calculations, see pp. 19–20.
[2] For total hourly depreciated equipment ownership and operating costs of $53.36 for firm A, see p. 26.
[3] For material cost data, see p. 25.
[4] Assumed truckload of 765 master containers (50 or 48 lb) or 400 bags (100 lb).
[5] Assumed railcar load of 1,563 master containers (50 or 48 lb) or 800 bags (100 lb).

TABLE 6.—*Total cost of handling, packaging, and loading potatoes at firm B*

Production line	Potato grade and container	Containers packed per hour	Weight per hour	Proportion of total weight	Hourly labor cost [1]	Cost per unit				Total cost per--	
						Labor cost per unit	Hourly equipment ownership and operation costs [2]	Depreciated equipment ownership and operation	Material [3]	Total	Truck [4]	Railcar [5]
		Number	*Lb*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
	No. 1A:											
1	Master containers (ten 5-lb bags)	156	7,800	29.7	40.00	0.256	12.68	0.081	0.598	0.915	699.98	1,430.15
2	50-lb bags	226	11,300	43.0	32.49	.144	18.37	.081	.139	.364	278.46	568.93
3	No. 1B - 50-lb bags	37	1,850	7.0	7.17	.194	2.99	.081	.139	.414	316.71	647.08
4	No. 2B - 50-lb bags	12	600	2.3	2.33	.194	.98	.081	.139	.414	316.71	647.08
5	No. 2A - 50-lb bags	57	2,850	10.9	7.56	.133	4.66	.081	.139	.353	270.05	551.74
6	No. 3 (Jumbos) - 50-lb bags	35	1,750	6.7	5.14	.147	2.86	.081	.139	.367	280.76	573.62
7	Creamers - 50-lb bags	2	100	.4	.39	.195	.17	.085	.139	.419	320.54	654.90
	Total	525	26,250	100.0	---	---	42.71	---	---	---	---	---

[1] For hourly labor cost calculations, see pp. 20–21.
[2] For total hourly depreciated equipment ownership and operating costs of $42.71 for firm B, see p. 26.
[3] For material cost data, see p. 25.
[4] Assumed truckload of 765 master containers (50 or 48 lb) or 400 bags (100 lb).
[5] Assumed railcar load of 1,563 master containers (50 or 48 lb) or 800 bags (100 lb).

TABLE 7.—*Total cost of handling, packaging, and loading potatoes at firm C*

Production line	Potato grade and container	Containers packed per hour	Weight per hour	Proportion of total weight	Hourly labor cost [1]	Cost per unit				Total cost per—	
						Labor cost per unit	Hourly equipment ownership and operation costs [2]	Depreciated equipment ownership and operation	Material [3]	Total	Truck [4]	Railcar [5]
		Number	*Lb*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
	No. 1:											
	Master containers:											
1	Five 10-lb bags	375	18,750	19.5	75.38	0.201	15.14	0.040	0.730	0.971	742.82	1,517.67
2	Six 8-lb bags	355	17,040	17.7	68.49	.193	13.74	.039	.754	.986	754.29	1,541.12
3	100-lb bags	303	30,300	31.3	60.17	.199	24.55	.081	.350	.630	252.00	504.00
4	50-lb count cartons	39	1,950	2.0	8.31	.213	1.55	.040	.430	.683	522.50	1,067.53
5	B's - 50-lb bags	121	6,050	6.3	34.17	.282	4.89	.040	.139	.461	352.67	720.54
6	No. 2 - 100-lb bags	184	18,400	19.2	49.70	.270	14.91	.081	.350	.701	280.40	560.80
7	Bakers - 100-lb bags	24	2,400	2.5	5.89	.245	1.94	.081	.350	.676	270.40	540.80
8	Pee wees - 1,150-lb bins	1	1,150	1.2	3.68	NA	.93	NA	NA	NA	NA	NA
	Total	1,402	96,040	100.0	---	---	77.65	---	---	---	---	---

[1] For hourly labor cost calculations, see pp. 22–23.

[2] For total hourly depreciated equipment ownership and operating costs of $77.65 for firm C, see p. 26.

[3] For material cost data, see p. 25.

[4] Assumed truckload of 765 master containers (50 or 48 lb) or 400 bags (100 lb).

[5] Assumed railcar load of 1,563 master containers (50 or 48 lb) or 800 bags (100 lb).

TABLE 8.—*Total cost of handling, packaging, and loading potatoes at firm D*

Production line	Potato grade and container	Containers packed per hour	Weight per hour	Proportion of total weight	Hourly labor cost [1]	Cost per unit				Total cost per—	
						Labor cost per unit	Hourly equipment ownership and operation costs [2]	Depreciated equipment ownership and operation	Material [3]	Total	Truck [4]	Railcar [5]
		Number	*Lb*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
1	No. 1:											
	100-lb bags	461	46,100	33.7	137.60	0.299	22.73	0.049	0.350	0.698	279.20	558.40
2	50-lb count cartons	490	24,500	17.9	79.38	.162	12.07	.025	.430	.617	472.01	964.37
3	100-lb bags - bakers	44	4,400	3.2	10.02	.228	2.16	.049	.350	.627	250.80	501.60
4	Master containers (five 10-lb bags)	689	34,450	25.2	187.69	.272	16.99	.025	.730	1.027	785.66	1,605.20
5	No. 2 - 100-lb bags	52	5,200	3.8	11.01	.212	2.56	.049	.350	.611	244.40	488.80
6	B's - 100-lb bags	117	11,700	8.5	24.71	.211	5.73	.049	.350	.610	244.00	488.00
7	No. 3 - 100-lb bags	48	4,800	3.5	10.15	.212	2.36	.049	.350	.611	244.40	488.80
8	Pee wees - 1,150-lb bins	5	5,750	4.2	8.68	NA	2.83	.566	NA	NA	NA	NA
Total		1,906	136,900	100.0	---	---	67.43	---	---	---	---	---

[1] For hourly labor cost calculations, see pp. 23–24.

[2] For total hourly depreciated equipment ownership and operating costs of $67.43 for firm D, see p. 26.

[3] For material cost data, see p. 25.

[4] Assumed truckload of 765 master containers (50 or 48 lb) or 400 bags (100 lb).

[5] Assumed railcar load of 1,563 master containers (50 or 48 lb) or 800 bags (100 lb).

APPENDIX

Allocation of Labor Costs per Hour

FIRM A

Other labor costs to be allocated by potato grade:	
2 primary graders @ $2.25	$4.50
1 unloader @ $2.75	2.75
5 handtruckers @ $2.50	12.50
6 loaders @ $2.75	16.50
2 plant supervisors @ $2.75	5.50
Total	41.75
No. 1A – master containers (five 10-lb bags):	
Direct labor:	
2 lead graders @ $2.50	5.00
9 graders @ $2.25	20.25
3 packers @ $2.25	6.75
Total	32.00
Allocated other labor: $41.75 × 0.15 [1]	6.26
Total labor	38.26
No. 1A – master containers (ten 5-lb bags):	
Direct labor	32.00
Allocated other labor: $41.75 × 0.095 [1]	3.97
Total labor	35.97
No. 1A (50-lb bags):	
Direct labor	32.00
Allocated other labor: $41.75 × 0.413 [1]	17.24
Total labor	49.24
No. 2A (50-lb bags):	
Direct labor:	
2 lead graders @ $2.50	5.00
10 graders @ $2.25	22.50
2 packers @ $2.25	4.50
Total (No. 2A's and No. 3's (Jumbos))	32.00
Allocated direct labor – No. 2A's:	
$\$32.00 \times \frac{11{,}900 \text{ lb}^{2}}{14{,}050 \text{ lb}}$	27.10
Allocated other labor: $41.75 × 0.206 [1]	8.60
Total labor	35.70
Jumbos (50-lb bags):	
Allocated direct labor: $\$32.00 \times \frac{2{,}150 \text{ lb}^{2}}{14{,}050 \text{ lb}}$	4.90
Allocated other labor: $41.75 × 0.037 [1]	1.54
Total labor	6.44
No. 1B (50-lb bags):	
Direct labor:	
7 graders @ $2.25	15.75
2 packers @ $2.25	4.50
Total (No. 1B's, No. 2B's, and creamers)	20.25

See footnotes at end of table.

FIRM A—continued

Allocated direct labor: $20.25 × $\frac{4{,}150 \text{ lb}^2}{5{,}750 \text{ lb}}$		$14.62
Allocated other labor: $41.75 × 0.072 [1]		3.01
Total labor		17.63
No. 2B (50-lb bags):		
Allocated direct labor: $20.25 × $\frac{1{,}000 \text{ lb}^2}{5{,}750 \text{ lb}}$		3.52
Allocated other labor: $41.75 × 0.017 [1]		.71
Total labor		4.23
Creamers (50-lb bags):		
Allocated direct labor: $20.25 × $\frac{600 \text{ lb}^2}{5{,}750 \text{ lb}}$		2.11
Allocated other labor: $41.75 × 0.010 [1]		.42
Total labor		2.53

FIRM B

Other labor costs to be allocated by potato grade:			
2 graders @ $2.50		$5.00	
2 unloaders @ $2.90		5.80	
4 loaders @ $2.75		11.00	
1 forklift operator @ $2.75		2.75	
Total		24.55	
No. 1A – master containers (ten 5-lb bags):			
Direct labor:			
8 packers @ $2.50		20.00	
1 packer @ $2.75		2.75	
Total			$22.75
Method of allocating direct labor by percent mix of potato packages:			
	Pounds [3]	*Percent*	
Master containers (ten 5-lb bags)	7,800	32.9	
50-lb baler bags	11,300	47.7	
No. 2A	2,850	12.0	
No. 3 (Jumbos)	1,750	7.4	
	23,700	100.00	
Allocated direct labor:			
1 lead grader @ $2.75 × 0.329		0.91	
11 graders @ $2.50 = $27.50 × 0.329		9.05	
Allocated other labor: $24.55 × 0.297 [1] [3]		7.29	
Total			17.25
Total labor			40.00
No. 1A (50-lb bags):			
Direct labor: 3 packers (baggers) @ $2.50			7.50
Allocated direct labor:			
1 lead grader @ $2.75 × 0.477		1.31	
11 graders @ $27.50 × 0.477		13.12	
Total			14.43
Allocated other labor: $24.55 × 0.430 [1]			10.56
Total labor			32.49

See footnotes at end of table.

No. 2A (50-lb bags):		
Direct labor: 1/2 packer @ $2.50		$1.25
Allocated direct labor:		
1 lead grader @ $2.75 × 0.120	$ .33	
11 graders @ $27.50 × 0.120	3.30	
Total		3.63
Allocated other labor: $24.55 × 0.109 [1]		2.68
Total labor		7.56
No. 3 (Jumbos) (50-lb bags):		
Direct labor: 1/2 packer @ $2.50		1.25
Allocated direct labor:		
1 loader @ $2.75 × 0.074	.20	
11 graders @ $27.50 × 0.074	2.04	
Total		2.24
Allocated other labor: $24.55 × 0.067 [1]		1.65
Total labor		5.14

No. 1B (50-lb bags):

Method of allocating direct labor by percent mix of 3 potato grades:

	Pounds [3]	*Percent*
No. 1B	1,850	72.6
Creamers	100	3.9
No. 2B	600	23.5
	2,550	100.0

3 packers @ $2.50 = $7.50 × 0.726	5.45
Allocated other labor: $24.55 × 0.070 [1]	1.72
Total labor	7.17

Creamers (50-lb bags):	
Allocated direct labor: $7.50 × 0.039	.29
Allocated other labor: $24.55 × 0.004 [1]	.10
Total labor	.39
No. 2B (50-lb bags):	
Allocated direct labor: $7.50 × 0.235	1.76
Allocated other labor: $24.55 × 0.023 [1]	.57
Total labor	2.33

FIRM C

Other labor costs to be allocated by potato grade:	
25 graders @ $2.40	$60.00
1 supergrader @ $2.60	2.60
2 maintenance helpers @ $2.50	5.00
1 maintenance foreman @ $2.69	2.69
3 miscellaneous helpers @ $2.50	7.50
Total	77.79
No. 1 – master containers (five 10-lb bags and six 8-lb bags):	
Direct labor:	
24 baggers + 1 grader @ $2.40	60.00
13 packers @ $2.75	35.75
5 loaders @ $3.00	15.00
1 foreman @ $200 per week	4.17
Total	114.92

See footnotes at end of table.

FIRM C—continued

Allocated direct labor – master containers (five 10-lb bags):		
$\$114.92 \times \frac{18{,}750 \text{ lb}}{35{,}790 \text{ lb}}$ [1] [4]	$60.21	
Allocated other labor: $\$77.79 \times 0.195$ [1]	15.17	
Total labor	75.38	
Allocated direct labor – master containers (six 8-lb bags):		
$\$114.92 \times \frac{17{,}040 \text{ lb}}{35{,}790 \text{ lb}}$ [1] [4]	54.72	
Allocated other labor: $\$77.79 \times 0.177$ [1]	13.77	
Total labor	68.49	
No. 1 (100-lb bags):		
Direct labor:		
4 baggers @ $2.75	11.00	
1 foreman @ $5.21	5.21	
Total		$16.21
Allocated direct labor:		
11 loaders @ $3.00 = $33.00 $\times \frac{30{,}000 \text{ lb}}{59{,}100 \text{ lb}}$ [5]	16.92	
1 foreman $\frac{96{,}040 \text{ lb per cwt} \times \$0.005}{100 \text{ lb per cwt}} = \$4.80 \times \frac{30{,}300 \text{ lb}}{59{,}100 \text{ lb}}$	2.46	
Total		19.38
Allocated other labor: $\$77.79 \times 0.316$ [1]		24.58
Total labor		60.17
No. 1 (50-lb count cartons):		
Direct labor:		
1 packer @ $2.75	2.75	
1 sealer @ $2.75	2.75	
Total		5.50
Allocated direct labor:		
11 loaders @ $33.00 $\times \frac{1{,}950 \text{ lb}}{59{,}100 \text{ lb}}$ [5]	1.09	
1 foreman @ $4.80 $\times \frac{1{,}950 \text{ lb}}{59{,}100 \text{ lb}}$ [5]	.16	
Total		1.25
Allocated other labor: $\$77.79 \times 0.020$ [1]		1.56
Total labor		8.31
B's (50-lb bags):		
Direct labor:		
6 graders @ $2.40	14.40	
4 baggers @ $2.75	11.00	
Total		25.40
Allocated direct labor:		
11 loaders @ $33.00 $\times \frac{6{,}050 \text{ lb}}{59{,}100 \text{ lb}}$ [5]	3.38	
1 foreman @ $4.80 $\times \frac{6{,}050 \text{ lb}}{59{,}100 \text{ lb}}$ [5]	.49	
Total		3.87
Allocated other labor: $\$77.79 \times 0.063$ [1]		4.90
Total labor		34.17

See footnotes at end of table.

No. 2 (100-lb bags):		
Direct labor:		
4 baggers @ $2.75	$11.00	
5 graders @ $2.40	12.00	
Total		$23.00
Allocated direct labor:		
11 loaders @ $33.00 × $\frac{18{,}400 \text{ lb}^{5}}{59{,}100 \text{ lb}}$	10.27	
1 foreman @ $4.80 × $\frac{18{,}400 \text{ lb}^{5}}{59{,}100 \text{ lb}}$	1.49	
Total		11.76
Allocated other labor: $77.79 × 0.192 [1]		14.94
Total labor		49.70
Bakers (100-lb bags):		
Direct labor: 1 grader @ $2.40		2.40
Allocated direct labor:		
11 loaders @ $33.00 × $\frac{2{,}400 \text{ lb}^{5}}{59{,}100 \text{ lb}}$	1.34	
1 foreman @ $4.80 × $\frac{2{,}400 \text{ lb}^{5}}{59{,}100 \text{ lb}}$	.20	
Total		1.54
Allocated other labor: $77.79 × 0.025 [1]		1.95
Total labor		5.89
Pee wees (small culls) (1,150-lb bins):		
Direct labor: 1 operator @ $2.75	2.75	
Allocated other labor: $77.79 × 0.012 [1]	.93	
Total labor	3.68	
FIRM D		
Other labor costs to be allocated by potato grade:		
27 graders @ $2.35	$63.45	
1 maintenance helper @ $2.50	2.50	
1 maintenance foreman @ $2.69	2.69	
3 cleanup and miscellaneous helpers @ $2.50	7.50	
Total	76.14	
3 foremen $\frac{\$0.03 \times 2{,}170{,}000 \text{ lb}}{50 \text{ lb} \times 20 \text{ h}}$	65.10	
Total labor	141.24	
No. 1 (100-lb bags):		
Direct labor: 9 frontmen (loaders) @ $10.00	90.00	
Allocated other labor: $141.24 × 0.337 [1]	47.60	
Total labor	137.60	
Bakers (100-lb bags):		
Direct labor: 2 sidemen @ $2.75 (1 bagger, 1 loader)	5.50	
Allocated other labor: $141.24 × 0.032 [1]	4.52	
Total labor	10.02	
No. 1 (50-lb count cartons):		
Direct labor:		
12 graders @ $2.35	28.20	
6 sidemen (loaders) @ $2.75	16.50	
4 baggers @ $2.35	9.40	
Total	54.10	
Allocated other labor: $141.24 × 0.179 [1]	25.28	
Total labor	79.38	

See footnotes at end of table.

FIRM D—continued

No. 1 – master containers (five 10-lb bags):	
Direct labor:	
13 sidemen (10 packers, 3 sewers (sidemen)) @ $2.75	$35.75
2 frontmen (loaders) @ $10.00	20.00
41 baggers @ $2.35	96.35
Total	152.10
Allocated other labor: $141.24 × 0.252 [1]	35.59
Total labor	187.69
No. 3 (100-lb bags):	
Direct labor (allocated by percent of weight of No. 2's, No. 3's, and B's):	
1 grader @ $2.35	2.35
6 sidemen @ $2.75	16.50
2 graders @ $2.35	4.70
Total	23.55
Allocated direct labor: $23.55 × 4,800 lb [6] / 21,700 lb	5.21
Allocated other labor: $141.24 × 0.035 [1]	4.94
Total labor	10.15
No. 2 (100-lb bags):	
Direct labor: Allocated direct labor:	
$23.55 × 5,200 lb [6] / 21,700 lb	5.64
Allocated other labor: $141.24 × 0.038 [1]	5.37
Total labor	11.01
B's (100-lb bags):	
Direct labor: Allocated direct labor: $23.55 × 11,700 lb [6] / 21,700 lb	12.70
Allocated other labor: $141.24 × 0.085 [1]	12.01
Total labor	24.71
Pee wees (1,150-lb bins):	
Direct labor: 1 @ $2.75	2.75
Allocated other labor: $141.24 × 0.042 [1]	5.93
Total labor	8.68

[1] Percentage of weight of grade packed to total weight of all potato grades packed. See tables 5–8.

[2] See table 5.

[3] See table 6.

[4] See table 7.

[5] Break up percentagewise among No. 1's, B's, No. 2's, bakers, and counts (see table 7 and footnote 1).

[6] See table 8.

Material Costs

The same material costs were used for all four firms studied in order to make the cost comparisons more valid. These costs for packages commonly used at potato packing plants were as follows:

Types of packages	*Cost per unit* [1]
Consumer paper bags:	
5 lb	$0.045
8 lb	.054
10 lb	.060
20 lb	.094
Consumer plastic bags:	
5 lb	.022
10 lb	.036
Master cardboard containers (50 lb)	.430
Burlap bags:	
50 lb	.290
100 lb	.350

[1] March 1975 costs obtained from Bemis Bag Co., Inc., New York, N.Y., Western Potato Association, Bakersfield, Calif., and other manufacturers of bags and containers in Florida and Maine.

Equipment Costs

The cost of equipment used at the four firms was as follows:

FIRM A

1 hydraulic flume and initial wash	$18,300
1 conveyor, screen rock, spray washer, and water eliminator	18,000
1 soak tank	475
1 drying system	15,000
1 screen sizer, 2-inch	400
1 main grading station	925
1 accumulating conveyor	1,500
1 secondary grading station	450
1 small secondary grading station	385
1 ACC 4-position automatic 50-lb bag filler	12,150
3 metal loop baler bag closers	9,000
1 wire bag closer	2,995
1 rotary table	900
10 single-head and twin-head 50-lb baler bag-filling heads	40,000
5- and 10-lb packaging equipment	16,000
Rubber belt conveyors:	
12 inch (217 ft)	5,208
18 inch (252 ft)	9,072
24 inch (51 ft)	2,448
Roller conveyors:	
24 inch (14 ft)	98
30 inch (12 ft)	84
60 inch (139 ft)	2,780
Total	156,170

FIRM B

6 scale platforms
1 water eliminator
1 dryer
1 screen sizer, 2-inch
1 grading table
2 scales
4 loading dock boards
1 bag scale
2 handtrucks, 2-wheel
1 extension conveyor
1 hydraulic unloading system
1 bagging line - 5- and 10-lb bags
1 clod and rock eliminator system
1 double-head bagger
1 bag rack and blowers for Tew heads
1 bag closer
1 bag-filling holder, 3-position, 50-lb
2 loop bag closers
2 pallet trucks
1 dock board
1 bag closer (wire ring)
410 pallets
1 forklift truck
1 automatic baler bag
1 filler (1970)
1 brush washer
1 belt conveyor, 8-ft
1 conveyor take-away belt
1 grade sizer for B potatoes
2 grade tables for B potatoes
1 bulk feed conveyor
Total estimated cost: $125,000

FIRM C

4 flume pumps	$12,000
2 vibrating chain sizers	3,780
1 washer	6,200
1 roller sizer	16,100
3 weigh-o-matics (8- and 10-lb bagging)	57,000
1 carton filler	5,500
1 vibrator	2,500
2 carton sealers	21,000
3 bagging machines, 50- and 100-lb	45,300
Rubber belt conveyors:	
12 inch (260 ft)	6,240
18 inch (510 ft)	18,360
24 inch (300 ft)	14,400
36 inch (85 ft)	4,590
48 inch (155 ft)	11,160
Aluminum roller conveyors:	
12 inch (25 ft)	175
18 inch (260 ft)	1,820
24 inch (115 ft)	1,035
36 inch (10 ft)	110
Total	227,270

FIRM D

2 vibrating chain sizers, 60-inch	$3,780
3 washers	18,600
1 roller sizer	16,100
1 count sizer, 2 lanes	41,000
2 carton-sealing machines	25,000
2 weigh-o-matics	38,000
1 even flow	5,950
1 rot trap	1,835
Rubber belt conveyors:	
12 inch (234 ft)	5,616
18 inch (120 ft)	4,320
24 inch (337 ft)	16,176
36 inch (115 ft)	6,210
48 inch (15 ft)	1,080
Aluminum roller conveyors:	
12 inch (21 ft)	147
18 inch (21 ft)	147
24 inch (10 ft)	90
36 inch (52 ft)	572
48 inch (20 ft)	300
60 inch (41 ft)	820
Total	185,743

Ownership and Operating Costs

The ownership and operating costs at the four firms were as follows:

	Per year [1]	*Per hour*
FIRM A		
Ownership costs:		
Depreciation [2]	$15,617.00	$26.03
Interest [3]	4,685.10	7.81
Insurance and taxes [4]	6,246.80	10.41
Operating costs:		
Power [5]	3,123.40	5.21
Maintenance [6]	2,342.55	3.90
Total	32,014.85	53.36
FIRM B		
Ownership costs:		
Depreciation [2]	$12,500.00	$20.83
Interest [3]	3,750.00	6.25
Insurance and taxes [4]	5,000.00	8.33
Operating costs:		
Power [5]	2,500.00	4.17
Maintenance [6]	1,875.00	3.13
Total	25,625.00	42.71
FIRM C		
Ownership costs:		
Depreciation [2]	$22,727.00	$37.88
Interest [3]	6,818.10	11.36
Insurance and taxes [4]	9,090.80	15.15
Operating costs:		
Power [5]	4,545.40	7.58
Maintenance [6]	3,409.05	5.68
Total	46,590.35	77.65
FIRM D		
Ownership costs:		
Depreciation [2]	$19,734.30	$32.89
Interest [3]	5,920.29	9.87
Insurance and taxes [4]	7,893.72	13.16
Operating costs:		
Power [5]	3,946.86	6.58
Maintenance [6]	2,960.15	4.93
Total	40,455.32	67.43

[1] Based on 600 h (10 weeks at 60 h per week) per year.
[2] Straight-line depreciation based on 10-yr life expectancy.
[3] At 3 percent of total equipment cost or 6 percent of depreciated balance.
[4] At 4 percent of total equipment costs.
[5] At 2 percent of total equipment costs.
[6] At 1.5 percent of total equipment costs.

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