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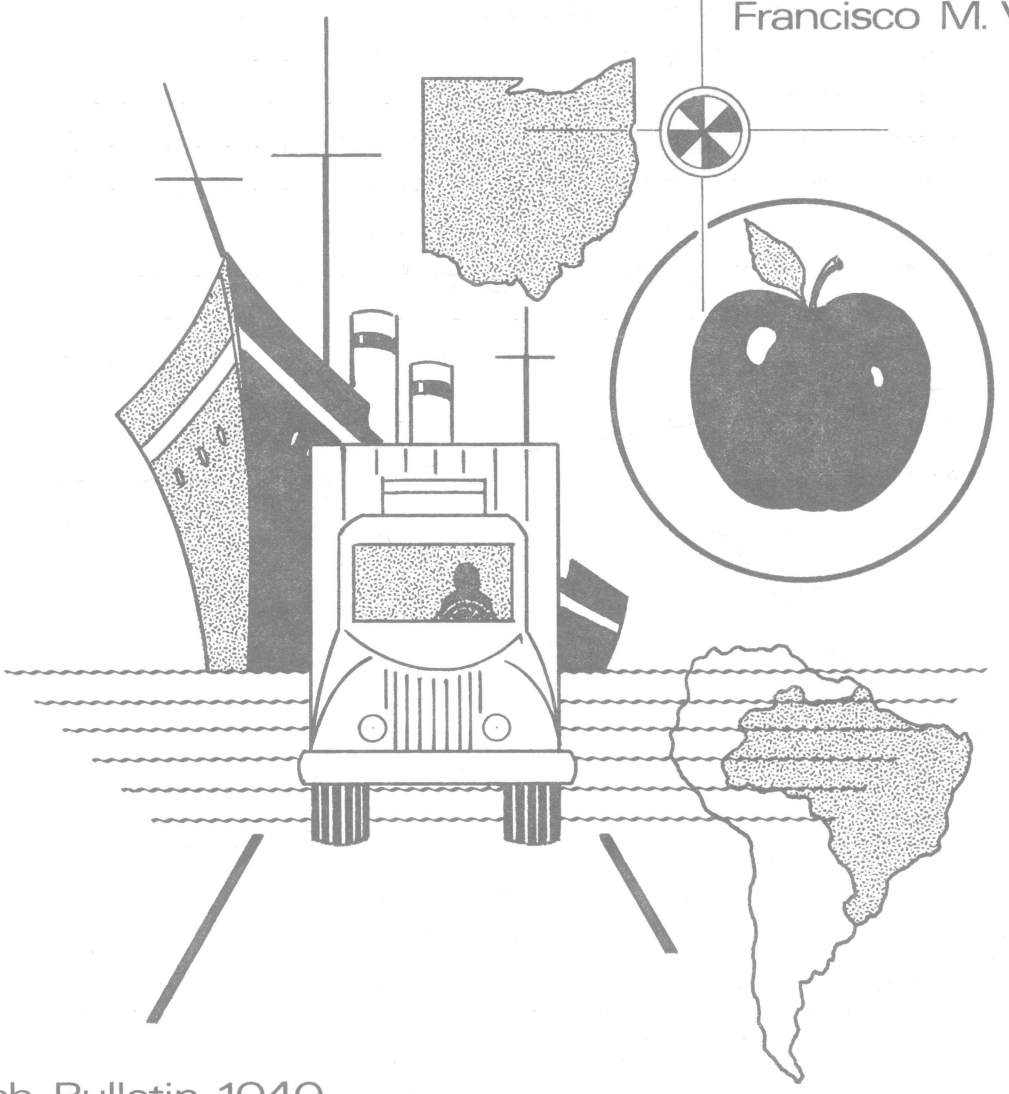

Research Bulletin 1040
October 1970

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
Wooster, Ohio

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ACKNOWLEDGMENTS

The authors are indebted to their colleagues Drs. Ralph L. Baker, M. Eugene Cravens, Jr., and Robert E. Jacobson for many helpful suggestions. The authors take full responsibility for errors made and conclusions drawn, however.

Mr. James D. Dean's assistance in helping gather and analyze apple prices and packing cost data is greatly appreciated. Miss Nancy Friddle deserves special thanks for typing the manuscript so well in its several revisions, as does Miss Nancy Marsh for preparing the graphs and figures. The authors appreciate the contribution of Mr. Newell Hartrum, graphic artist, Dept. of Public Information, who prepared the cover illustration.

Dr. Francis E. Walker, Mr. Lloyd C. Bay, and Mrs. Elizabeth Howard contributed much guidance in data tabulation and analysis problems, for which the authors are most grateful. The authors are also indebted to the apple packing firm executives, exporters, importers, and freight forwarders in Ohio and Brazil who furnished information essential to the completion of this study.

Economic Feasibility of Exporting Apples to Brazil

HOWARD L. STEELE and FRANCISCO M. VERA-FILHO[1]

INTRODUCTION

International trade represents one of the alternative outlets for selling agricultural commodities. Commercial transactions take place as a result of a conducive set of circumstances, among which the profit-making possibility is the fundamental one. Thus, the major objective of this research was to determine if it was profitable to export apples from Ohio to Brazil under the marketing parameters existing at the time of the study and, if so, why such trade was or was not taking place. A secondary objective was to analyze the impact of other *non-economic* variables on the apple export situation. The conclusions drawn from analyses under these objectives will serve as the criteria for judging the present feasibility of exporting apples from Ohio to Brazil.

Statement of the Problem

Ohio produces more than 3 million bushels of apples per year. The northeastern region of the state produces about 40 percent of the state's total production. Apparently Ohio producers have not established a widely recognized group image or trademark for their products as some organizations have in other states. Questions have been raised as to whether Ohio apples can be effectively differentiated and if sufficient efforts have been directed toward the promotion and merchandising of a group or state product image. Ohio has been a net importer of apples in the United States. However, at certain times of the year, Ohio producers face very serious competition from other states when recent harvest supplies arrive on Ohio markets. Differences in consumers' preferences, advertising, and apple varietal competition confound Ohio apple producers' revenue-maximizing problems. To solve this problem, some large Ohio apple producers have exported apples to other countries.

Brazil represents a good commercial market with an increasing importance due to her process of development. Brazilian agriculture supplies about 95 percent of the country's needs for agricultural commodities. Due mainly to climatic conditions, Brazil is not self-sufficient in apple production. The production of apples in Brazil has been approximately 1 million bushels per year during the last 5 years.[2] Such production is not adequate to meet the Brazilian demand for fresh apples due to the low quality and quantity.[3] Therefore, the Brazilian markets for fresh apples are supplied mainly by imported apples. Most of the Brazilian imports of apples come from Argentina.

An analysis of the data in Table 1 shows that the prices of apples in Brazil reach the highest levels during the months of September to March. This is because from April through August, harvests from Southern Hemisphere countries constitute the major portion of the world's supply. Except for occasional scattered shipments, most Southern Hemisphere countries which produce apples usually complete exports by the end of August. Consequently, U. S. apples are in strong demand prior to the competition from other countries. Apparently very few Ohio apples, however, have been exported to Brazil in recent years.

Background

United States exports of apples are at lower levels today than they were three decades ago (Table 2). The erratic nature of production and exports

TABLE 1.—Monthly Apple Prices on the Rio de Janeiro Wholesale Market in 1967.*

Month	Price per Bushel	Month	Price per Bushel
	Dollars†		Dollars†
January	9.11	July	6.11
February	10.18	August	6.18
March	9.78	September	6.20
April	6.48	October	6.67
May	6.32	November	6.47
June	6.11	December	7.22

*Fancy Red Delicious or equivalent.

†All cruzeiro prices were adjusted to the value of the cruzeiro in 1966, then converted by the exchange ratio 2.7 cruzeiros = 1 U. S. dollar.

Source: Brazilian Market News Service reports.

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[2]Anuario Estatistica Do Brasil. IBGE/Conselho Brasileiro De Estatistica, 1967, p. 101.

[3]Most apples produced in Brazil are utilized for processing purposes.

of apples and the lack of relationship between U. S. production and exports are shown in Figure 1.

The U. S. share of world apple production fell from 48.1 percent to 25.3 percent (Table 3), the per capita consumption of apples in the United States fell from 42.1 lb. in 1933 to 24.0 lb. in 1966,[4] and the U. S. share of world exports of apples decreased from 38 percent in the 1934-38 period to 6.3 percent in the 1966-67 period (Table 4).

In 1899, Ohio was the leading apple-producing state, with 14 million bushels. Today, Ohio is eighth in apple production, with about 3 million bushels.[5] Information relative to the distribution of the produc-

[4]Fruits, Fresh-weight Equivalent; Per Capita Consumption, 1910-66. U. S. Dept. of Agriculture, Fruit Situation, August 1967.

[5]Cravens, M. E., Jr. Sept. 1968. Are We Pricing Ourselves Out of World Markets? Ohio Coop. Ext. Serv., Economic Information for Ohio Agriculture, No. 487, p. 1.

TABLE 2.—U.S. Production and Exports of Apples, Selected Years, 1937-1967.

Year	Commercial Production	Exports*
	1,000 bu.	1,000 bu.
1937	153,169	15,517
1942	126,707	2,070
1947	112,892	3,587
1952	94,085	1,743
1957	119,258	8,230
1962	125,794	4,041
1967	120,710	4,316

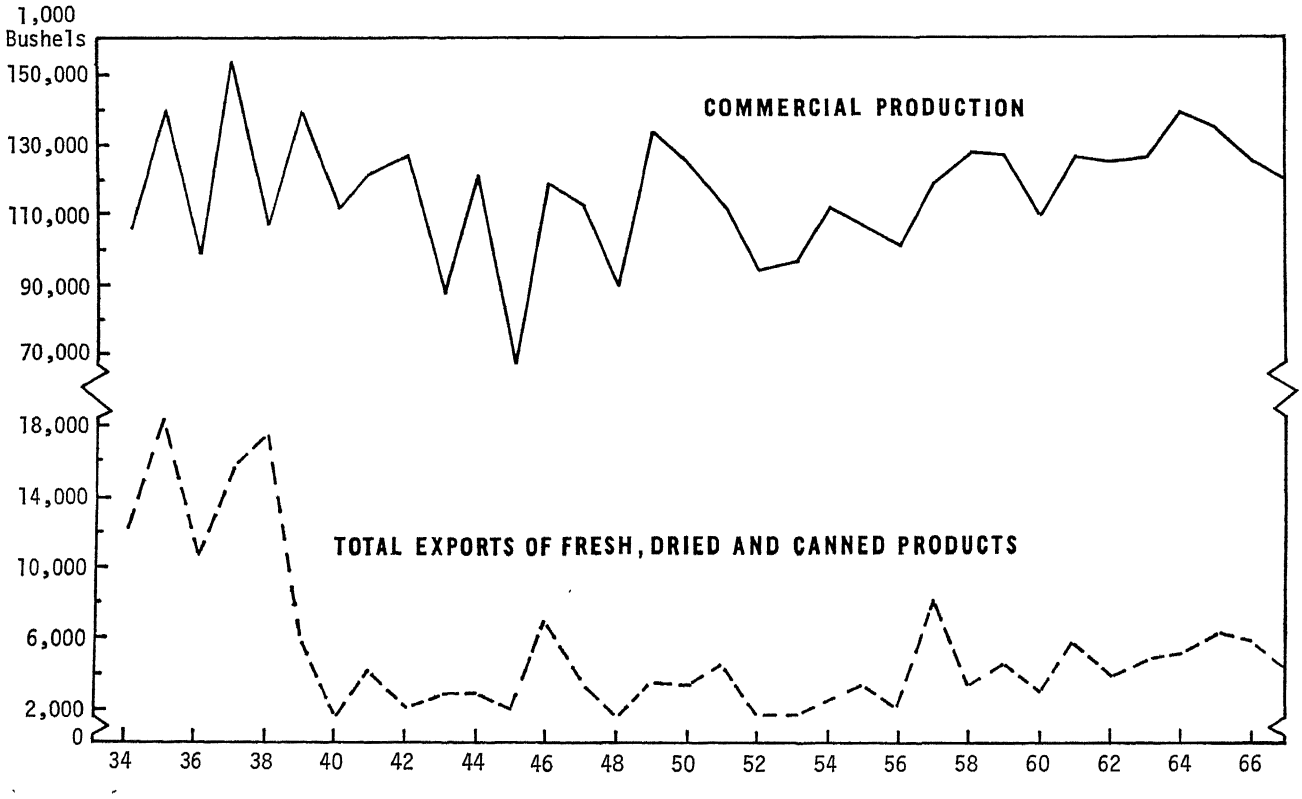
*Total exports of fresh, dried, and canned apples in fresh wt.

Sources: Agricultural Statistics, U. S. Dept. of Agriculture, and Annual Crop Summaries, Crop Reporting Board, Statistical Reporting Service, U.S. Dept. of Agriculture.

TABLE 3.—World Apple Production of Dessert and Cooking Varieties.*

	Average Crop		
	1935-39	1956-60	1962-66
	Million Bushels		
North America	143.1	134.8	156.5
Europe	124.6	288.1	338.3
Asia	12.8	48.3	70.9
South America	2.4	20.7	23.8
South Africa, Australia, and New Zealand	14.5	16.9	29.4
Total	297.4	508.8	618.9
U. S. Share	48.1 %	26.5 %	25.3 %

*Future of United States Foreign Trade Policy. Brief of the International Apple Association, Inc., before the Trade Information Committee, Washington, D.C., March 31, 1968, p. 2.



Source: Agricultural Statistics, Crop Reporting Board, Statistical Research Service, U.S. Dept. of Agriculture.

Fig. 1.—U. S. Production and Exports of Apples and Apple Products, 1934-1967.

tion of apples in Ohio in 1964 is shown in Figure 2. The apple crop is the most valuable fruit crop in Ohio and accounts for approximately 60 percent of the total farm value of fruits and nuts in the state.[6]

The following data are further evidence of the nature of Brazil's growing consumer market.

"Brazil's 1900 population of 17.4 million has doubled and redoubled and is expected to double again before the end of the century. Of the 19 million increase in population in the 1950's, 13 million was urban. The urban population increased from about 36 percent of the total in 1950 to over 48 percent in 1966. These new city dwellers are purchasers rather than producers of food, and provide rapidly growing commercial markets for agricultural production."[7]

Brazil represents an important growing market for apples. The United States exported 43,024 bushels of apples to Brazil in 1966 and 83,984 bushels in 1967.[8] The average C.I.F. prices[9] of U. S. apples were respectively $7.31 and $6.35 per bushel in 1966 and 1967 as compared to the Argentina prices of

[6]Cash Receipts, by Commodity and Commodity Groups, Ohio, 1965 and 1966. **In** Ohio Agricultural Statistics 1967. Ohio Crop Reporting Service, U. S. Dept. of Agriculture, Columbus, Ohio, 1968, p. 7.

[7]Brazil's Position in World Agricultural Trade. Economic Research Service, U. S. Dept. of Agriculture, Foreign Agr. Circ. 190, Oct. 1967, p. 6.

[8]Letter from Dr. Ernane Galveias, Director, Banco Do Brasil S. A., Carteira De Comercio Exterior, Brazil, Jan. 23, 1968.

[9]C.I.F. prices: prices of apples at the Brazilian ports of Rio de Janeiro or Santos, including freight and insurance costs.

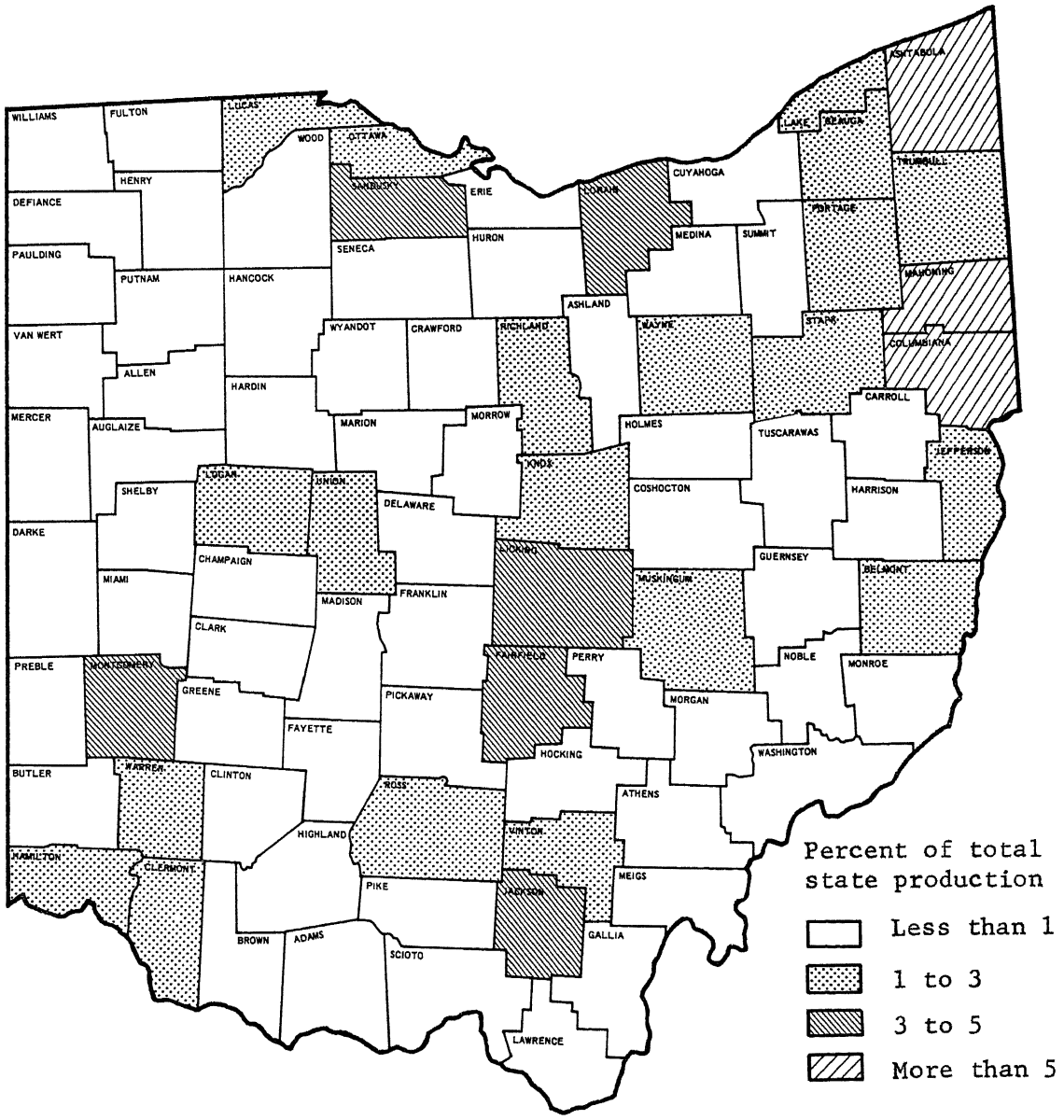


Fig. 2.—Concentration of Ohio Apple Production by Counties, 1964.

TABLE 4.—Percentage of World Apple Exports from Specified Countries.*

	1934-38†	1958-62†	1956-66‡	1966-67‡
	Percent			
Argentina	0.5	11.9	16.9	12.8
Australia	14.9	14.4	10.7	11.4
Canada	25.3	4.6	3.7	4.5
Denmark	0.1	2.1	0.7	0.7
France	1.4	1.8	9.5	12.8
Italy	6.4	46.3	33.5	34.1
Netherlands	1.8	6.1	4.0	4.0
South Africa	0.9	4.4	5.6	7.8
United States	38.0	6.3	9.0	6.3
Other Countries	10.7	2.1	6.4	5.6
	100.0	100.0	100.0	100.0

*Future of United States Foreign Trade Policy. Brief of the International Apple Association, Inc., before the Trade Information Committee, Washington, D.C., March 31, 1968, p. 2.

†Annual average.

‡Crop year except Southern Hemisphere.

$4.36 and $4.45 for the same period.[10] The average C.I.F. price of U. S. apples is higher than the Argentina average price apparently for two reasons: (1) U. S. apples are sold in the Brazilian market when the supply of apples is low (i.e., mostly in the U. S. autumn and winter); and (2) apples exported from the United States to Brazil are exclusively of high quality.

Theoretical Framework

Assuming that apples exported from Ohio to Brazil were similar to those which are regularly exported from Argentina to Brazil (i.e., apples either from Ohio or Argentina would provide the same set of utilities), and assuming further that Brazilian apple prices would not vary in response to imports from Ohio, the feasibility of exporting apples from Ohio to Brazil could be evaluated through satisfying the following inequality:

$$P_{aj} > a + P_{oj} \text{ or the equality } P_{aj} = a + P_{oj} + X_1$$

where: P_{aj} = Price per bushel of quality j apples in Argentina

P_{oj} = Price per bushel of quality j apples in Ohio

a = Cost differential corresponding to freight, insurance, and tariffs per bushel of transporting apples from Ohio and from Argentina to Brazil

X_1 = Slack variable representing extra profit margin

However, neither assumption, product similarity or price fixity, is realistic. This is because: (1) U. S. apples are usually exported to Brazil when the supply on Brazilian markets is low and therefore they provide different time utility, at least; (2) to assume price fixity in response to variations in supply would imply that the demand elasticity for apples in Brazil would be equal to infinity, which is not the case.[11] These two assumptions can be eliminated by making the parameter:

$$a = a' - b + c$$

where: a' = Cost corresponding to freight, insurance, and tariffs of exporting apples from Ohio to Brazil

b = Premium which Brazilian consumers are willing to pay for Ohio apples

c = Decrease in price of apples in Brazil in response to an increase in supply

and by making $P_{aj} = P_{bj}$, price of apples in Brazil.

Ohio apple producers can engage in activities directed toward influencing three variables: (1) the price of apples in Ohio, (2) the premium which Brazilian consumers are willing to pay for Ohio apples, and (3) the cost of transportation from Ohio to Brazil. Prices of apples in Ohio at the farm level can be reduced in the long run through improving methods of production and marketing. The 2-year average prices of apples at the farm level in 1963-64 were 5.09 cents per pound in Ohio, 4.80 cents in Indiana, 4.80 cents in Illinois, and 3.67 cents in Michigan.[12] Among the central states, only Minnesota, Iowa, Kentucky, and Tennessee produced apples for a higher average price than Ohio.

METHODOLOGY AND DATA ANALYSES

Methodology

Two major Ohio apple packers were visited in 1968 and a third one in 1969. Their operational records were tabulated and analyzed to identify the costs associated with the performance of the various functions required to pack apples. Data were also collected relative to volume of pack and percentage pack-out by grades. Multiple regression techniques were utilized in an attempt to characterize significant variables which influence the unit cost of packaging apples. The analyses were made to estimate if exporting activities can lead to circumstances under which the cost of packaging apples could be reduced.

[10]Galveias, ibid.

[11]Apples in Brazil can be classified as luxury delicacies. The Fundacao Getulio Vargas estimated in 1963 that the elasticity of demand for apples, pears, and other imported fruits was greater than one. Elasticidade Preco Da Demanda De Selecionados Produtos Agricolas. Fundacao Getulio Vargas, Rio de Janeiro, Conjuntura Economica, 1963, p. 53.

[12]Two Year Average Apple Prices for Major Producing States, 1963-64. U. S. Dept. of Agriculture, Fruit Situation, August 1964. The above figures converted into prices per bushel are as follows: $2.24 per bushel in Ohio, $2.11 in Indiana, $2.11 in Illinois, and $1.61 in Michigan.

A production area shipping point was selected and transportation freight rates corresponding to hauling apples from such shipping point to alternative exportation ports were found. The selection of the shipping point was based on its location with respect to apple production in Ohio and the existence of transportation and communication facilities and services.

Cleveland Port Authority officials were interviewed with the objective of evaluating the possibility of using that port to export apples to Brazil. The same was done in Baltimore. Exporters and steamship company agents in New York were interviewed and all costs related to exporting apples to Brazil were identified.

The prices of Ohio apples and their seasonal fluctuation, quantities of Brazilian imports of apples in previous years, prices of apples at Brazilian ports, and prices of apples on the Rio de Janeiro wholesale market were obtained from reports of the U. S. Dept. of Agriculture Market News Service, Carteira de Comercio Exterior do Banco do Brasil, Servico de Informacao de Mercado Agricola, and Anuarios de Estatistica do Instituto Brasileiro de Geografia Estatistica.

Costs of Packaging Apples

Ohio apple producers can influence the price of their product by several means. Reducing the cost of production by adopting new technology and cultural practices is one alternative but this is beyond the scope of this study. The use of more efficient grading and packing practices is another, and this one was studied during 1967 and 1968.

The cost records of three Ohio packing plants were analyzed in detail, two for the 1967 packing season and one for 1968. The three firms had grading and packaging capacities of between 100,000 and 150,000 bushels per year. One firm was a cooperative, one a corporation, and the third a sole proprietorship. Data relative to fixed and variable costs, volume of apples dumped and packaged, and percent pack-out (i.e., usable grades other than culls) were calculated for each firm.

The cost data are shown for the plants and compared with similar data from a 1961 study in Table 5. Note from the data that the biggest variability in cost components per bushel of apples packed is that relating to fixed cost. This is influenced by two factors: (1) high utilization of the firm's grading and packing equipment in relation to its capacity, and (2) percent pack-out in relation to total quantity of apples delivered for grading and packaging.

Labor and materials costs, designated as variable costs in this study, were stable over the period and were very similar for all plants. The one exception was materials cost per bushel for plant 3 in 1968, which seemed to be high for some unknown reason. The typical total cost for grading and packaging a bushel of apples in Ohio is probably in the 80 to 85 cent range today. Cost differences due to variations in the type of package used must be considered, although these differences are small. The standard used in this study was the common 3 lb. polyethylene bag packed in 40 lb. cartons.[13]

TABLE 5.—Costs of Packaging Ohio Apples, Selected Firms, 1961, 1967, and 1968.

Cost Component	1961*	Plant 1 1967	Plant 2 1967	Plant 3 1968
	Cents per Bushel			
Labor	21.3	21.3	24.0	22.0
Materials	38.9	38.6	40.0	59.3
Total Variable Costs	60.2	59.9	64.0	81.3
Fixed Costs	5.4	22.0†	10.0	17.0†
Total Costs	65.6	81.9	74.0	98.3

*Cravens, M. E., Jr. and R. L. Bere 1961. Grading, Packaging, and Selling of Apples Under Ohio Conditions. Ohio Agri. Exp. Sta., Res. Bull. 881.

†Actual fixed costs prorated to the grading and packing activities, but assuming operations at 80 percent of total capacity.

A detailed analysis of the variable cost data was made at one plant to determine if economies of scale were possible in the operation. The dependent variable Y, average variable cost of packaging, was found to be highly correlated with the independent variables X_1, quantity of apples packaged, and X_2, per centage pack-out of the quantity of apples delivered and handled.[14] When percentage pack-out was held constant at 80 percent, the average variable cost per bushel reached a minimum at 371 bushels (Fig. 3). The minimum average variable cost was 47.4 cents per bushel at this quantity.

The smaller the quantity delivered for grading and packaging, the higher the average variable cost (Fig. 3). In fact, deliveries in lots of less than 100 bushels raise the average variable cost per bushel 50 percent or more. It is to the advantage of both producers and packers to receive apples in economic-size lots for cost savings and corresponding efficiency, especially in labor utilization.

The variations in average total costs associated with the two variables mentioned previously regarding fixed costs are also very important. These relate to the percent pack-out per lot of apples delivered

[13]Cartons of 24 1-kilogram bags (1 kilogram = approximately 2.2 lb.) are probably the most desirable unit for export to South American countries.

[14]The correlation coefficient, R, was .87.

and to the percentage use of the grading and packing facility based on its total capacity. The data shown in Figures 4 and 5 for plant 3 clearly demonstrate these cost relationships.

The series of average total grading and packing cost curves in each figure are estimates based on a sample of actual pack-out percentages and costs for the plant.[15] They show that the lowest average total cost curve for the plant is reached when 90 percent of the apples in the lots delivered and dumped grade U. S. No. 1 or higher. This is a reflection of the added costs incurred at the plant in sorting and handling significant amounts of cull apples in the mixed lots delivered.

Note that all curves in Figure 5 represent lower cost positions at each level of pack-out for the firm than those in Figure 4. This is a reflection of the economies of scale realized when a plant's fixed costs are spread over a larger volume of activity. The estimates in Figure 5 assume that the plant was running at or near full capacity, while those in Figure 4 were estimated for the plant's actual volume during the year, slightly less than 50 percent of full capacity.[16]

The shift downward in total costs per bushel of apples packed ranged from 11.6 cents at 90 percent pack-out to 23.1 cents at the 50 percent pack-out. These differences would be quite important in a competitive market and, although only estimates for one plant at one point in time, demonstrate how efficient use of a marketing facility influences one aspect of marketing costs.

Costs of Transporting Apples from Ohio to Seaports

Cleveland was chosen as the central point from which Ohio apples can be hauled to alternative ports. It is located in the northeastern part of Ohio, where approximately 1.2 million bushels of apples are produced annually, i.e., about 40 percent of the total state production. Cleveland also has the needed tertiary facilities and services associated with a large terminal market for fruits and vegetables.

Two railroad companies and three trucking firms were asked to furnish freight rates for hauling

[15]The coefficient of correlation for the function used in Figure 4 was .99, while that in Figure 5 was .98.

[16]Full capacity was defined as the total packing volume possible based on the speed of the slowest machine in the line times two 10-hour shifts per day times the number of days in the extended packing season.

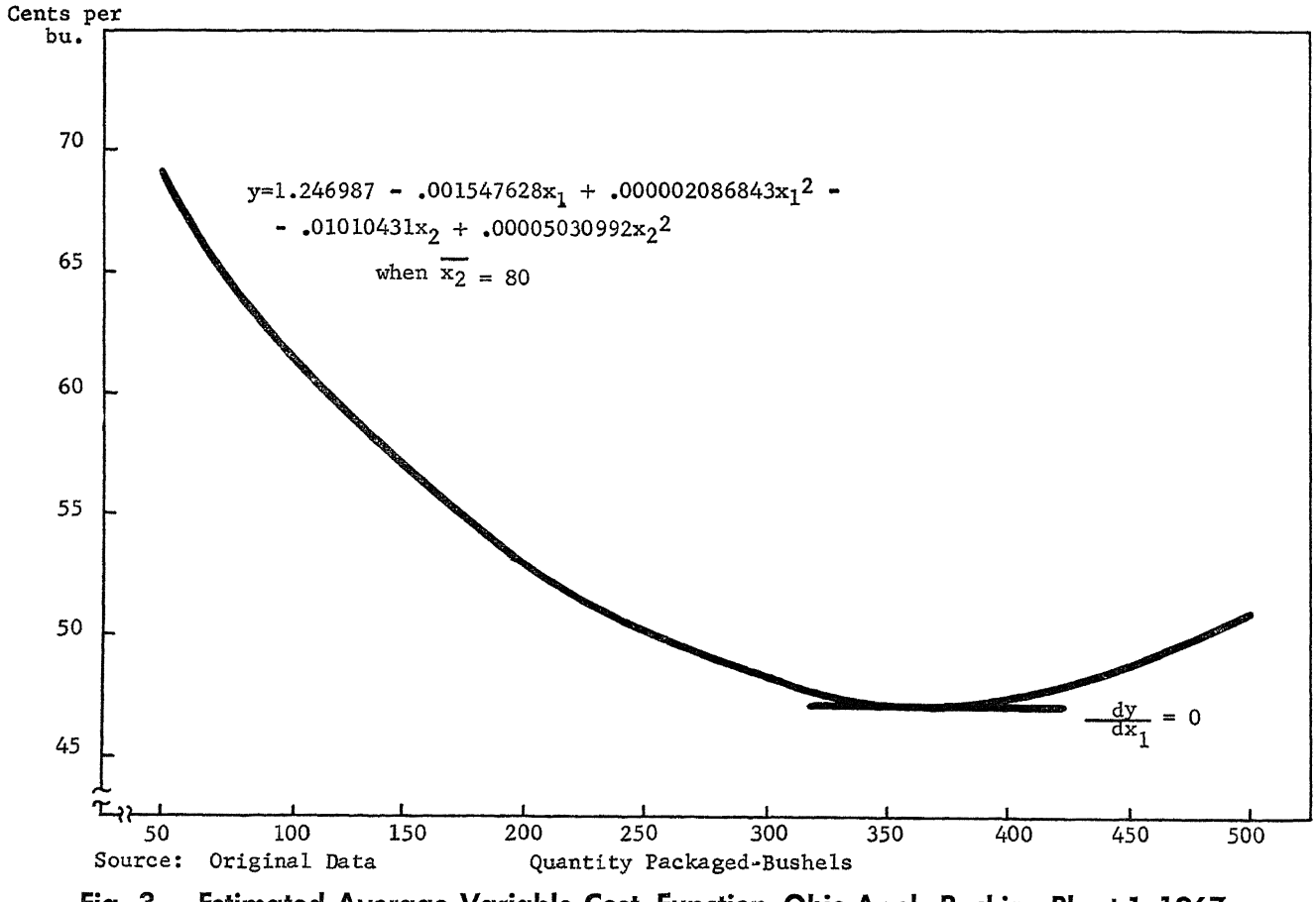


Fig. 3.—Estimated Average Variable Cost Function, Ohio Apple Packing Plant 1, 1967.

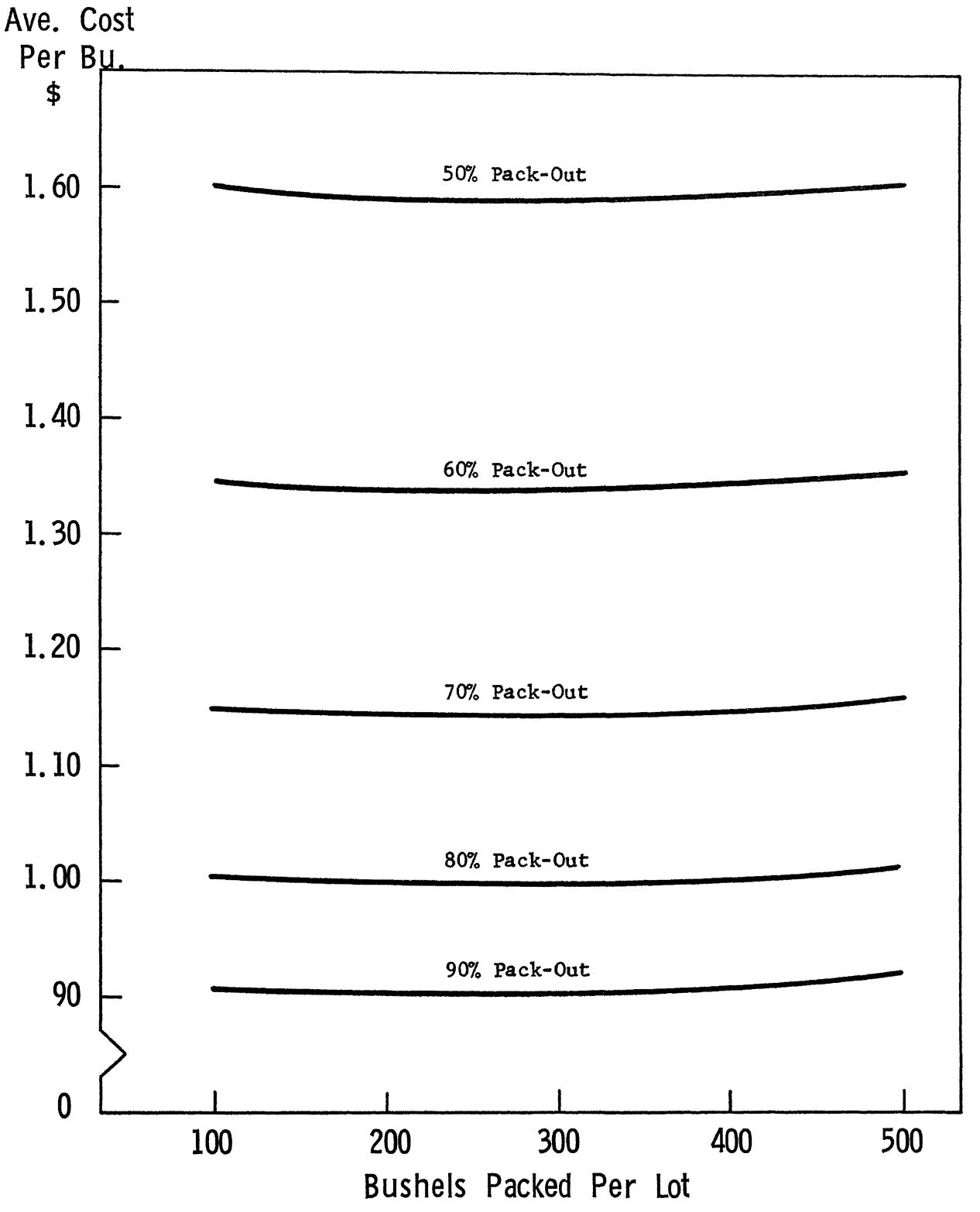


Fig. 4.—Apple Packaging Cost Schedule, Ohio Plant 3, 1968, with Plant Operating at 47 Percent of Capacity.

apples from Cleveland to Baltimore and from Cleveland to New York. The choice of these two points was made because: (1) Ohio apples have been exported through New York and most of the eastern apple exporters have offices located there; and (2) Baltimore is the nearest major seaport to Cleveland.[17]

There is no published rate for hauling non-processed agricultural commodities by truck.[18] There-

[17]The distance from Cleveland to New York is 562 miles by train and 491 miles by truck. It is 490 miles by train from Cleveland to Philadelphia and 417 miles by truck, while from Cleveland to Baltimore it is 444 miles by train and 348 miles by truck.

[18]The Motor Carrier Act of 1935. The agricultural exemption consists of Section 203 (b) (6), Part II, Interstate Commerce Act.

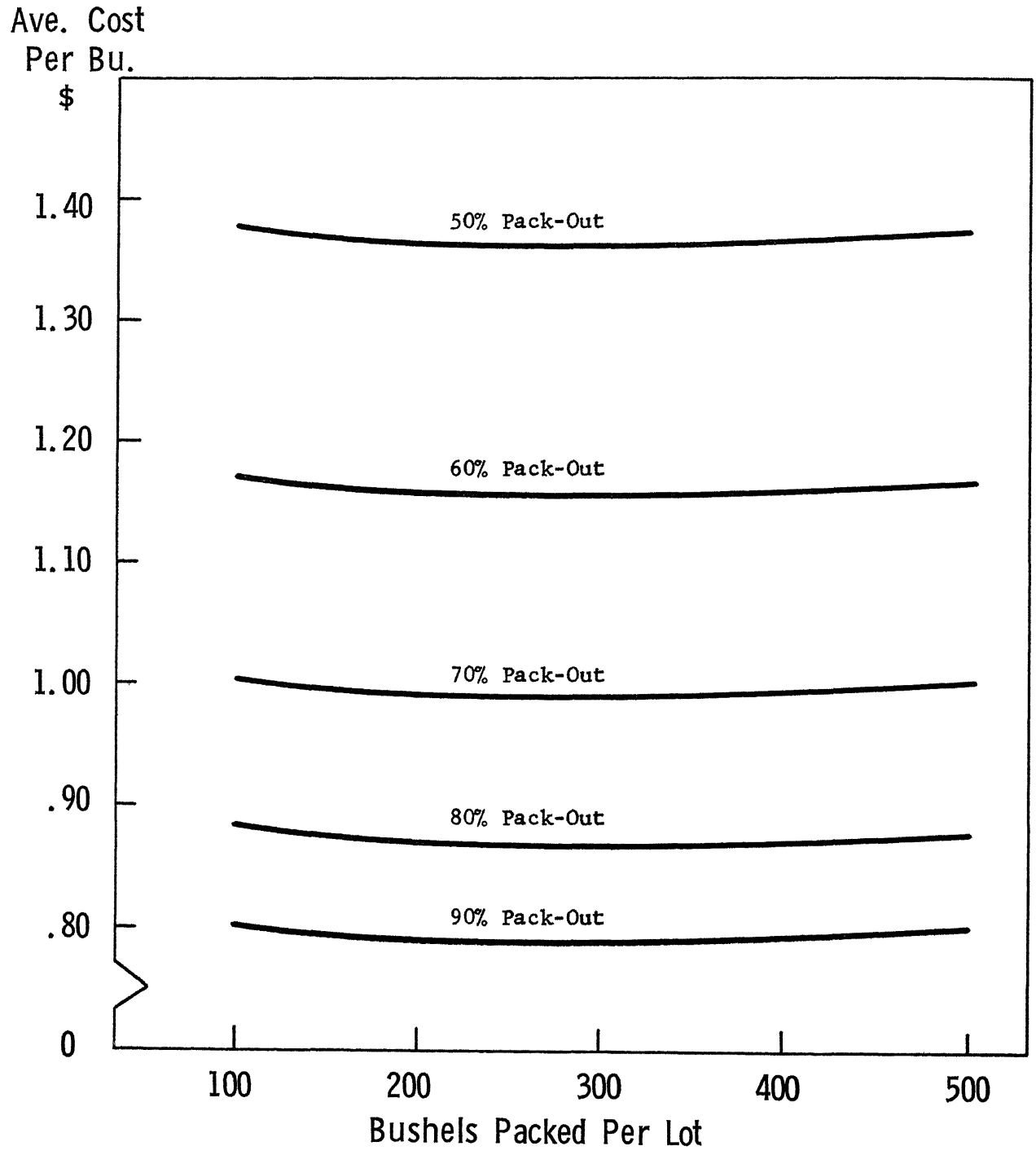


Fig. 5.—Apple Packaging Cost Schedule, Ohio Plant 3, 1968, with Plant Operating at Full Capacity.

fore, the truck rates gathered and presented in Table 6 are estimates based on data furnished by trucking firms.

Truck rates vary in response to several economic and non-economic variables. Consequently, the price estimates obtained by the authors for hauling apples by truck are indicative of the real trucking rates. However, individual rates may vary from these estimates due to special conditions related to individual bargaining positions.

A cost analysis which established a logical lower limit for truck hauling rates is presented in the study, Motortruck Operating Costs of Farmer Cooperatives.[19] Direct costs were 25.6 cents per mile. These are the costs directly chargeable to individual vehicles which vary directly with vehicle miles traveled and tonnage hauled. The overhead costs amounted to 6.7 cents per mile, i.e., costs directly chargeable to individual vehicles which do not vary with vehicle miles traveled and tonnage hauled. Indirect costs, i.e., expenses not directly chargeable to individual vehicles, amounted to 3.7 cents per mile. Therefore, the average total cost per mile was 36 cents. Based upon this information, the cost from Cleveland to New York is $1.05 per hundredweight and 75 cents per hundredweight from Cleveland to Baltimore.

It seems realistic to consider the mid-points of the hauling rate data and the trucking cost data as estimates of the actual hauling costs. Therefore, the cost estimate for hauling apples by truck from Cleveland to New York is 45.6 cents per bushel and from Cleveland to Baltimore is 36.8 cents per bushel.

The cost of hauling apples by train from Cleveland to Baltimore or New York is $1.23 per hundredweight plus an additional $76.05 per railroad car or approximately 5 cents per bushel for refrigeration, a total cost of 63 cents per bushel. The minimum quantity which can be hauled is 24,000 pounds. Furthermore, following interviews with wholesalers of fruit and vegetables, it was found that not only economic variables but also non-economic variables, such as certainty of arrivals and versatility, lead to the conclusion that the transportation of apples by truck is the most convenient method at present.

The alternative was also considered of shipping apples through the Ohio River to New Orleans from where they could be exported. The lack of refrigerated ships operating in the inland river system and the non-availability of containerized service to Brazil makes the alternative of using the Ohio River unviable. However, it is likely that this system will be used in the future with the adoption and use of refrigerated containers for exporting perishable commodities.

[19]Motortruck Operating Costs of Farmer Cooperatives. Farmer Cooperative Service, U. S. Dept. of Agriculture, Gen. Report 121, June 1964.

TABLE 6.—Price Estimates for Hauling Apples by Truck.

From	To	Dollars per Hundredweight	Minimum Load Lb.
Cleveland	Baltimore	1.09	23,000
Cleveland	New York	1.23	23,000

Source: Primary data collected from trucking firms.

At the office of the Port of Cleveland, the following information was obtained:

a. Only one steamship company which operates to South America serves the Great Lakes area. Ships of this company normally do not stop at Cleveland.

b. From Cleveland to Brazil, a ship takes approximately 10 days longer than from New York to Brazil.

c. Although there would not be any difficulty in exporting fruits from Cleveland since physical facilities are available, it was impossible to obtain a shipping cost estimate because of lack of experience.

Costs of Insurance and Freight

The following information was obtained during interviews with two exporters and one traffic manager of a steamship company:

a. The handling costs associated with transferring boxes of apples from trucks to ships are approximately 25 cents per hundredweight.

b. The total cost for hauling apples from Cleveland to New York and placing them on ship would be 55 cents per bushel.

c. Refrigerated containers have been utilized for transporting apples. However, when using refrigerated containers, the total cost of getting apples from the packer to the importer country is estimated to be 5 percent less than the cost of using refrigerated trucks and ships. The following companies currently operate with refrigerated containers: Sea-Land Company, Atlantic Container Line Ltd., and W. R. Grace Line.

d. It is not feasible to operate through the St. Lawrence Seaway since only small ships have access to the Great Lakes, a small number of refrigerated ships operate on the Great Lakes and it takes about 2 weeks to go from the Great Lakes area to New York by ship. Therefore, 2 weeks are added to the shipping time from the East Coast to South America. Furthermore, it was said that the possibility of using the Great Lakes for exporting apples had been studied at the request of an Ohio producer and it was found that it would be much more expensive to export

TABLE 7.—Apples for Fresh Use, 2-Year Average Prices Received by Farmers in Ohio, September 1966 through January 1967.

	Dollars per Bushel		Dollars per Bushel
September	3.09	December	2.89
October	2.82	January	2.86
November	2.81		

*Report of the Ohio Apple Industry Task Force Committee, Wooster, Ohio, May 14, 1968.

TABLE 8.—Brazilian Imports of Apples from 1961 to 1967.

Year	Bushels	Index Number
1961	1,981,467	100
1962	2,298,725	116
1963	2,946,625	149
1964	1,765,179	89
1965	2,735,488	138
1966	2,593,570	131
1967	4,048,633	204

Sources: Anuarios Estatisticos Do Brazil. IBGE/Conselho Brasileiro De Estatistica, 1965 and 1967, pp. 195-237; and Carteira De Comercio Exterior.

through the Seaway than through New York. Finally, the Seaway is closed to shipping during the winter months.

e. The Brazilian market demands high quality American apples exclusively. Extra Fancy and Fancy Red Delicious apples are those predominantly imported.

f. Apples sent to Brazil should be packaged in 24 1-kilo bags per box.

g. The use of refrigerated containers to South America will be delayed because the majority of the steamship companies serving South America have new refrigerated ships.

h. The cost of exporting apples from New York to Brazil in packages not exceeding 2.2 cubic feet per box is at the rate of $2.35 per box. In addition, there is an unloading charge of 21 cents per 100 pounds. The cost of insurance is approximately 1 percent of the total value of the commodity.

i. The Brazilian government import duty amounts to 32 percent of the C.I.F. price of apples.

j. The port of Baltimore is not used for exporting apples. The steamship companies encourage exporters to ship from New York, where they load quantities of perishable commodities, to avoid re-opening the refrigerated compartments of their ships at other ports.

Prices of Ohio Apples and Their Seasonal Fluctuations

In the United States, the apple marketing year begins in July. This season can be divided into three periods.[20] During the first period, i.e., the harvest period, apples move to the fresh market, to storage, and to processing. The interaction of these three alternative marketing methods determines price. The second period, which lasts from December to April, is characterized by most of the apples moving out of storage to meet the fresh apple demand. During the third period, apples move out of storage to meet the fresh market demand, but in this case most of the apples sold are controlled atmosphere (CA) storage apples.[21]

In general, prices of apples in the United States reach their lowest level during the harvest season and the increase after the harvesting season is mostly due to the expenses related to storage. In Ohio, this general pattern was observed by Cravens and Bere in 1955, even though they indicated that the increase in storage capacity relative to the Ohio crop had caused a reduction in the intensity of seasonal apple price fluctuations.[22]

However, in recent years the seasonal price pattern has been changing in Ohio. This is shown in Table 7 by the average prices received by farmers during the 1966-67 marketing years.

It is not the purpose of this study to make a complete analysis of Ohio apple prices. However, it should be mentioned that decreases in average prices of Ohio and Michigan apples on the Cleveland market following the end of the harvesting season have been attributed to the variety of grades supplied to that market.[23] Conversely, western apples which are supplied during the third period of the marketing season are controlled atmosphere apples of the highest quality produced in western states, are harvested during their proper level of maturity, and are supplied to eastern markets only after local highest quality apples are sold. Furthermore, western apples are merchandised and advertised intensively.

Brazilian Imports of Apples

The Brazilian imports of apples from 1961 to 1967 are shown in Table 8.

Brazil has imported apples mainly from Argentina. Other countries which have exported apples

[20]Pasour, E. C., Jr. Jan. 1965. An Analysis of Interseasonal Apple Price Movements. U. S. Dept. of Agriculture, Agri. Econ Research, XVII (1): 28.

[21]Apples are kept under a special atmosphere maintained in a sealed storage room.

[22]Cravens, M. E., Jr. and R. L. Bere. Feb. 1955. Trends in the Ohio Apple Industry—1889 to 1953. Ohio Agri. Exp. Sta., Bull. 756, pp. 27-29.

[23]This explanation was given to the authors by county agricultural extension agents and industry members.

TABLE 9.—Brazilian Imports of Apples by Country of Origin, 1965-1967.

	1965		1966		1967	
	Bushels	Percent	Bushels	Percent	Bushels	Percent
Argentina	2,730,712	99.82	2,503,843	96.54	3,923,647	96.91
Canada, Nova Scotia	—	—	36,619	1.41	27,431	0.68
France	—	—	—	—	1,742	0.04
Greece	206	0.01	2,017	0.08	1,002	0.03
Uruguay	4,570	0.17	8,067	0.31	10,827	0.27
U. S. A.	—	—	43,024	1.66	83,984	2.07
Total	2,735,488	100.00	2,593,510	100.00	4,048,633	100.00

Source: Letter from Dr. Ernane Galveias, Director, Banco Do Brasil, South America, Carteira De Comercio Exterior, Brazil, Jan. 23, 1968.

to Brazil are the United States, Canada (Nova Scotia), Uruguay, France, and Greece. The quantities exported by these countries to Brazil and their shares of the total Brazilian apple imports from 1965 to 1967 are presented in Table 9.

Prices of Apples at Brazilian Ports

The average prices of all apples imported at Brazilian ports, i.e., C.I.F. prices, were $3.78 per bushel in 1965, $4.44 per bushel in 1966, and $4.50 per bushel in 1967. These averages represent the total value of imports of apples from all countries divided by the total quantity imported. The average C.I.F. prices per bushel of apples by countries of origin are presented in Table 10.

The freight and insurance costs from each country which exported apples to Brazil from 1965 to 1967 can be estimated from the differences between C.I.F. and F.O.B. prices furnished by the Carteira de Comercio Exterior do Banco do Brazil as presented in Table 11.

Prices of Apples on Brazilian Wholesale Markets

The monthly average prices of Red Delicious apples or equivalent presented in Figure 6 represent the arithmetic average of the daily average of wholesale prices collected by the Brazilian Market News Service. The daily average prices are the sum of the minimum and the maximum prices observed on the market divided by two. Therefore, these daily averages do not necessarily represent the most frequent prices at which transactions took place.

The Rio de Janeiro wholesale market was chosen because it represents a terminal market highly representative of the Brazilian agricultural products market situation and because of the availability of monthly average prices covering the period July 1966 to December 1967. The average apple prices reported on the Rio de Janeiro terminal market for those months are shown in Figure 6.

Data Analyses

In Brazil, an average mark-up of 10 percent is taken by the wholesaler of fruits and vegetables in terminal port cities like Rio de Janeiro. Since the price paid by apple wholesalers in Brazil represents the C.I.F. price plus tariffs for imported apples, the variable P_{bj} of the theoretical model, i.e., price of apples of quality j at the Brazilian port, can be found from the price of apples collected on the Rio de Janeiro terminal market, P_{tj}. Thus P_{bj} for each month is the average price reported on the Rio de Janeiro terminal market (Fig. 6) divided by 1.10 (Table 12).

TABLE 10.—Annual Average Cost, Insurance, and Freight Prices at Brazilian Ports for Apples by Countries, 1965-1967.

	1965	1966	1967
	Dollars per Bushel		
Argentina	3.78	4.36	4.45
Canada, Nova Scotia	—	6.74	6.67
France	—	—	6.54
Greece	4.98	3.32	3.32
Uruguay	2.96	4.46	2.91
U.S.A.	—	7.31	6.35

Source: Carteira De Comercio Exterior Do Banco Do Brasil, S.A.
Exchange Rate: 2.7 Brazilian cruzeiros = 1 U.S. dollar.

TABLE 11.—Estimates of the Cost of Insurance and Freight Corresponding to Each Country Which Exported Apples to Brazil, 1966-1967.

Country	Freight and Insurance
	Dollars per Bushel
Argentina	1.04
Canada, Nova Scotia	2.60
France	1.50
Greece	1.74
Uruguay	.54
U.S.A.	2.66

Source: Carteira De Comercio Exterior Do Banco Do Brasil, S.A.
Exchange Rate: 2.7 Brazilian cruzeiros = 1 U.S. dollar.

TABLE 12.—Average Apple Prices on the Rio de Janeiro Terminal Market (P_{tj}) and Estimated Apple Prices at the Brazilian Port (P_{bj}), July 1966 to December 1967.

Date	P_{tj}*	P_{bj}†
	Dollars per Bushel	
1966		
July	6.38	5.80
August	6.81	6.19
September	7.04	6.40
October	7.04	6.40
November	7.20	6.55
December	8.18	7.44
1967		
January	9.11	8.28
February	10.18	9.25
March	9.78	8.89
April	6.48	5.89
May	6.32	5.75
June	6.11	5.55
July	6.11	5.55
August	6.18	5.62
September	6.20	5.64
October	6.67	6.06
November	6.47	5.88
December	7.22	6.56

*Fancy Red Delicious apples or equivalent.

†P_{tj} divided by 1.10.

Source: Brazilian Market News Service reports. Exchange Rate: 2.7 Brazilian cruzeiros = 1 U.S. dollar.

TABLE 13.—3-Year Monthly Price Averages for Midwestern Fancy Red Delicious Apples, Cleveland, Ohio, 1964-1967.

Month	Dollars per Bushel	Month	Dollars per Bushel
1964-66*		1965-67†	
September	3.75	January	3.18
October	3.36	February	3.04
November	3.25	March	2.94
December	3.23	September‡	3.81
		October	3.48
		November	3.40
		December	3.36

*Monthly average for the years 1964, 1965, and 1966.

†Monthly average for the years 1965, 1966, and 1967.

‡Southern Hemisphere apples are readily available in Brazil between the months of April and September and therefore those months were excluded from the anaylsis.

Source: Keller, R. E. Marketing Michigan Apples, Market News Service on Fruits and Vegetables. U.S. Dept. of Agriculture and Michigan Dept. of Agriculture, Benton Harbor, Mich. Season Summaries, 1964, 1965, and 1966; and Fresh Fruit and Vegetable Market News, Cleveland Daily Report, Consumer and Marketing Service, U.S. Dept. of Agriculture, Sept.-Dec. 1967.

To compute the feasibility price estimates in Ohio, 3-year monthly price averages for midwestern Fancy Red Delicious Apples on the Cleveland, Ohio, market were used. These are presented in Table 13.

Considering the theoretical assumption that:

$$P_{bj} = a + P_{oj} + X_1$$

where: P_{bj} = Price per bushel of quality j apples in Brazil

P_{oj} = Price per bushel of quality j apples in Ohio, and

X_1 = Slack variable representing extra profit margin.

(In both cases, quality j apples represent Fancy Red Delicious.)

$$a = a^1 - b + c$$

where: a^1 = Cost per bushel corresponding to freight, insurance, and import duties for exporting apples from Ohio to Brazil

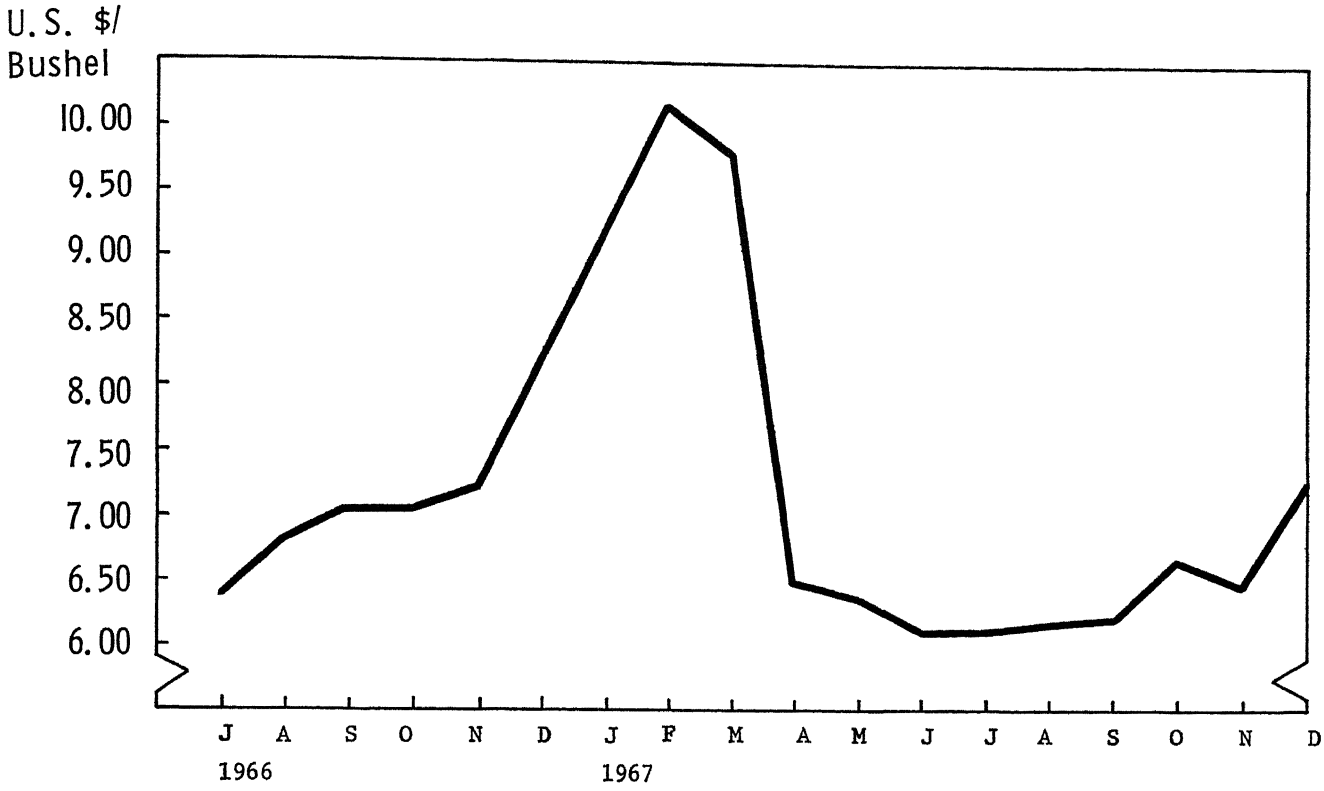
b = Premium which Brazilian consumers are willing to pay for Ohio apples

c = Decrease in the price of apples in Brazil in response to an increase in supply

It is now possible to substitute the appropriate values in the equation and to identify the following: a^1 is equal to $3.05 per bushel plus 32 percent of the C.I.F. price; and b is implicitly included in the variable price per bushel of Fancy Red Delicious apples in Brazil because these prices correspond to American apples of the same grade. In regard to c, i.e., decrease in price of American apples in Brazil in response to an increase in supply, this variable was not taken into consideration.

The data for the 11 months analyzed are presented in Table 14. Unfortunately, apple prices from the Rio de Janeiro terminal market for the months of January, February, and March 1968 were not available at the time this study was completed. Consequently, the results do not reflect two complete trading seasons for Northern Hemisphere apples.

The price maps shown in Figures 7, 8, and 9 correspond to each of the months studied from September 1966 through December 1967. The boundary line $P_{bj} = a + P_{oj}$ indicates the combination of points where prices of apples in Brazil are equal to prices in Ohio plus all transfer costs and import duties. The points indicated on each of the price maps show the observed combination of prices based on the data collected. Therefore, the vertical distance from $P_{bj} = a + P_{oj}$ to the points indicated shows the amount of profit or loss per bushel that an Ohio producer would have incurred if sales transactions had taken place during the respective months. These are the values for the variable X_1 in the model for the months studied. Note in Figure 9 that January,



Source: Brazilian Market News Service Bulletins.

Fig. 6.—Average Prices of Fancy Red Delicious or Equivalent Apples on the Rio de Janeiro Terminal Market, July 1966 to December 1967.

TABLE 14.—Evaluation of the Feasibility of Exporting Apples from Ohio to Brazil, September 1966 through December 1967.

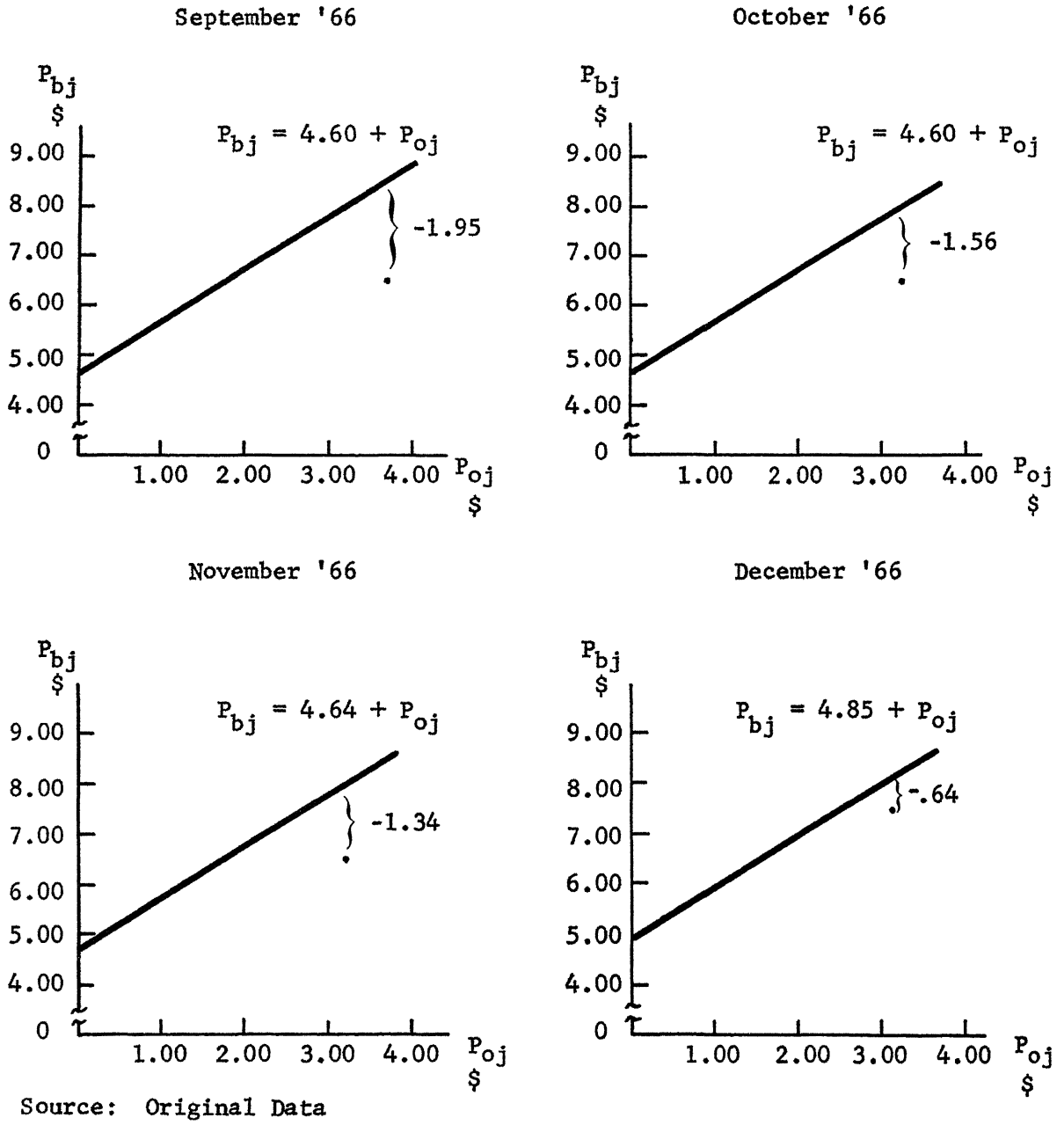
Date	1. P_{hj}	2. Brazilian Import Tariff*	3. Transportation, Insurance, and Export-Import Costs	4. a (2. + 3.)	5. P_{oj}	6. Total Cost (4.+5.)	7. Net Returns If Ohio Apples Were Shipped to Brazil x_i (1.—6.)
	Dollars per Bushel						
1966							
September	6.40	1.55	3.05	4.60	3.75	8.35	—1.95
October	6.40	1.55	3.05	4.60	3.36	7.96	—1.56
November	6.55	1.59	3.05	4.64	3.25	7.89	—1.34
December	7.44	1.80	3.05	4.85	3.23	8.08	— .64
1967							
January	8.28	2.01	3.05	5.06	3.18	8.24	.04
February	9.25	2.25	3.05	5.30	3.04	8.34	.91
March	8.89	2.16	3.05	5.21	2.94	8.15	.74
September	5.64	1.37	3.05	4.42	3.81	8.23	—2.59
October	6.06	1.47	3.05	4.52	3.48	8.00	—1.94
November	5.88	1.43	3.05	4.48	3.40	7.88	—2.00
December	6.56	1.59	3.05	4.64	3.36	8.00	—1.44

$$*P_{hj} — \left[\frac{P_{hj}}{1.32}\right]$$

February, and March 1967 were the only months when it was profitable and economically feasible to export Ohio apples to Brazil.

The price maps in Figures 7, 8, and 9 should be compared with Figure 10, where the 32 percent ad valorem import duty imposed by the Brazilian Government has been deducted. It is clearly evident that if free trade were permitted between the United States and Brazil, it would also have been profitable for Ohio apple producers to export their products to Brazil during the months of November and December 1966 and December 1967. Furthermore, the level of profitability, X_1, increased significantly during the months of January, February, and March 1967.

A cyclical seasonal pattern in Brazilian apple prices was evident for the 2 years studied. The cyclical pattern in the data in Table 14 and Figures 6 and 10 indicates that apple prices in Rio de Janeiro probably reached the high side of the 1967-68 cycle in January, February, or March 1968, as was the case in the 1966-67 cycle. Although the general level of prices appears somewhat lower in 1967-68 than in 1966-67, January, February, and March were



Source: Original Data

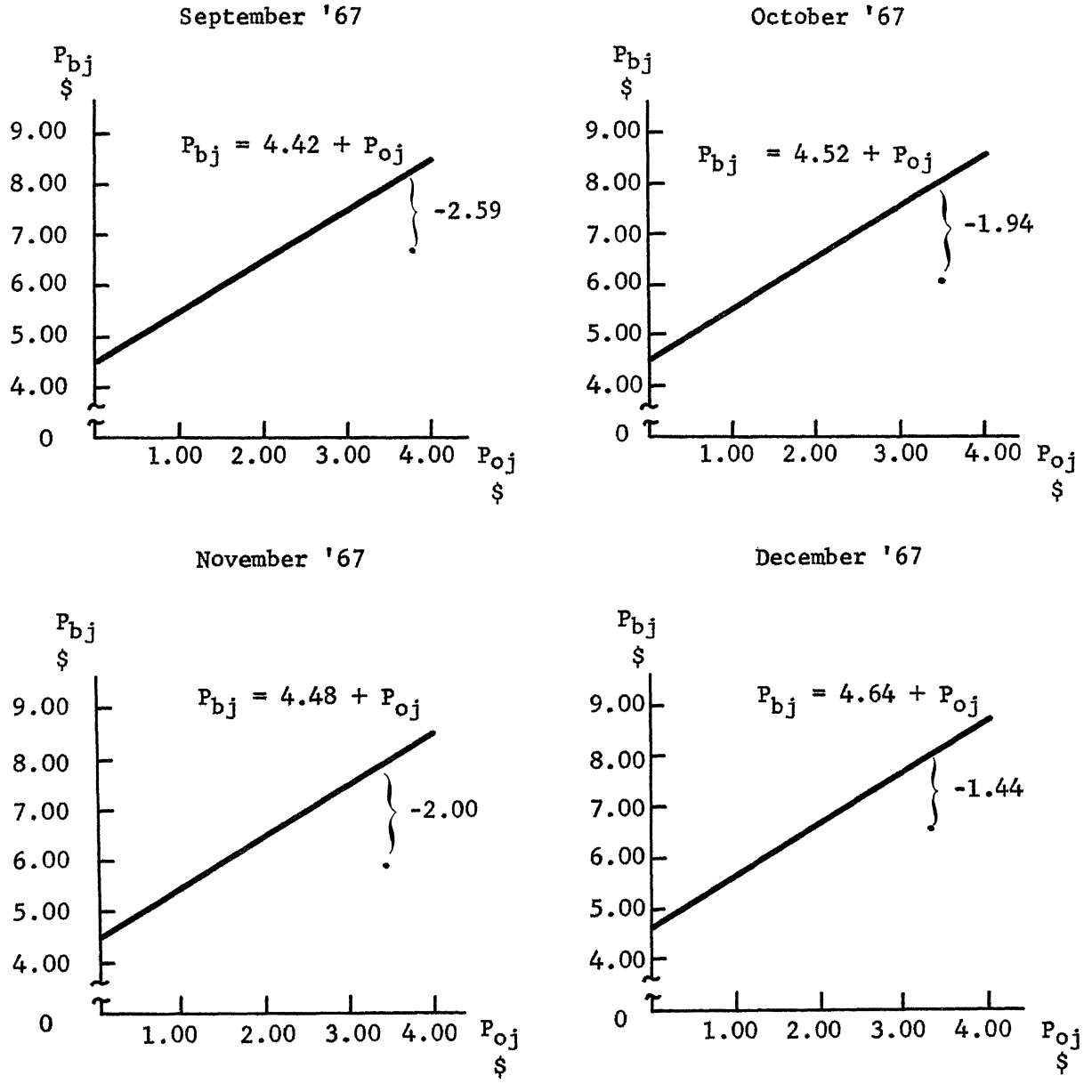
Fig. 7.—Price Maps Indicating Profitability of Exporting Ohio Apples to Brazil, September to December, 1966.

probably the most profitable months for Ohio exports. The month of December 1967 would have yielded profits if there had not been a Brazilian import tariff (Fig. 10).

Other Factors Influencing Trade Possibilities

The interviews completed, especially with exporting enterpreneurs, led to the identification of other variables which are very important with regard to international trade of fruits as a whole, and particularly with respect to apple exports. The non-economic variables of market information, reliability of supply and grade, packaging adequacy, and brand image have particular importance.

Market information is related to the concept of awareness of the current market situation in importing countries like Brazil. Similarly, awareness of product supply availability is an important part of the market. Most of the information related to current market situations abroad is normally obtained by importing and exporting firms through their own communication facilities, mostly teletype systems. The exporting firms normally check on supply availability



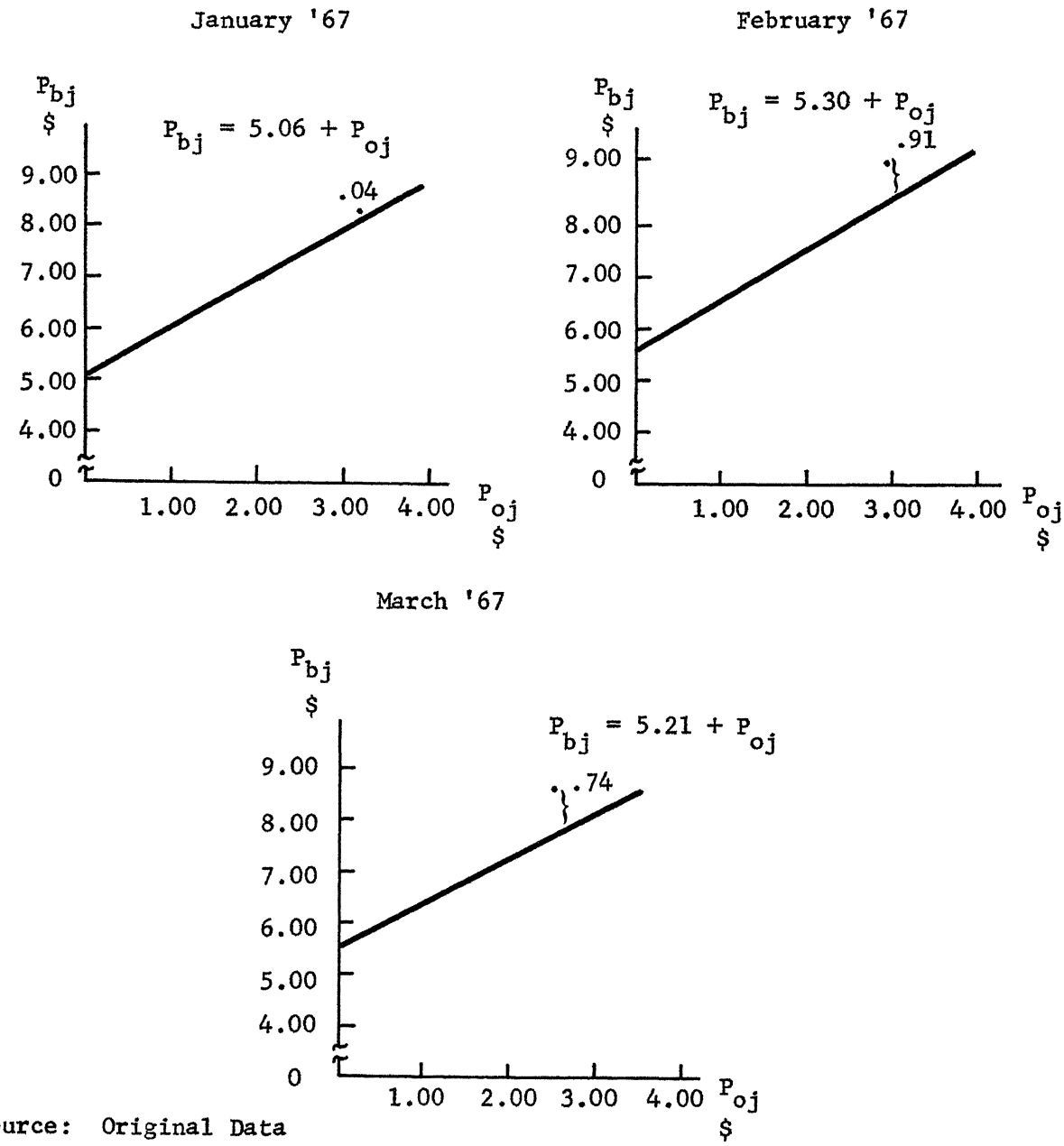
Source: Original Data

Fig. 8.—Price Maps Indicating Profitability of Exporting Ohio Apples to Brazil, September to December, 1967.

through their clientele of producers or sellers who have already an established image as suppliers of the needed commodity. Therefore, in order to become eligible for international trade transactions, a non-traditional supplier of export apples should keep exporting companies informed of its capabilities of supplying apples with respect to volume, quality, and price. This need for constant information is reduced after a supplier becomes well known and when exporters begin to consult it whenever a potential trade transaction is likely to occur.

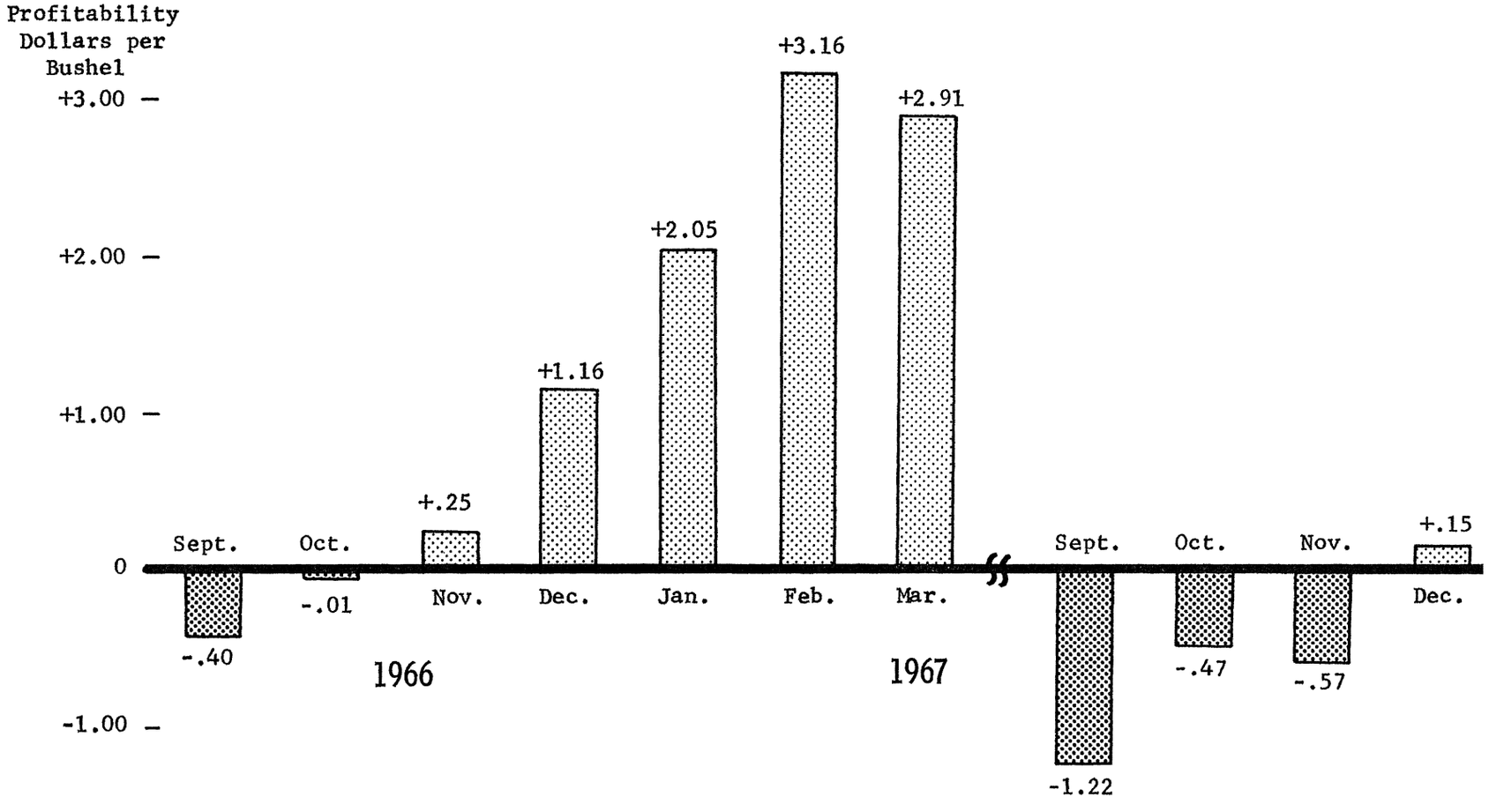
Reliability of supply and grade relates to the capability of a certain marketing organization to meet, on time, an increasing demand for its product, to keep a high level of homogeneity in the final grade and pack of the product, and to be able to respond to changing market requirements.

It was pointed out by the interviewees that, as a rule, importers who successfully imported and sold apples asked for the same product for repeat orders. The repetition of these requests means that importers are looking for a homogeneous supply of branded



Source: Original Data

Fig. 9.—Price Maps Indicating Profitability of Exporting Ohio Apples to Brazil, January to March, 1967.



Source: Original Data

Fig. 10.—Monthly Profitability of Exporting Ohio Apples to Brazil Without Brazilian Import Duty, 1966-1967.

apples which leads to the establishment of a product image easy to merchandise and to an increasing demand for these apples. Consequently, before attempting to export apples from a given production area, it is necessary to make sure that supplies from that area have the potential of satisfying estimated demand increases. When an importer is not able to obtain the same product with which he has been successful, he becomes discouraged in his attempts to merchandise that product and consequently loses his enthusiasm for building up a demand requirement which he may later be unable to meet.

Packaging adequacy is another non-economic variable which was indicated as being very important. The package has to be adequate to meet demands of the marketing system of the importing country. In Brazil, for example, apples are imported in boxes holding 24 1-kilo bags. Thus, the necessity to perform extra handling of the apples in the importing country is eliminated and damages which could hurt the image of the product are avoided. In other words, packaging apples properly prior to exporting increases the certainty that they will be sold at the highest quality level.

Brand image or product differentation is a variable closely related to all other factors previously mentioned. To reach a satisfactory level of brand image, the producer of apples must not only provide for intrinsic qualities but also should attempt, through merchandising and advertising procedures, to project a favorable image about his product. This can be accomplished through the choice of an adequate label, advertisements, etc.

CONCLUSIONS AND IMPLICATIONS

International trade is one of the alternative outlets for selling agricultural commodities, including apples produced in Ohio. However, the profitability of engaging in such activity is contingent on several economic and quasi-economic variables. The economic variables include the cost of producing, packing, and transporting the product to the importing country in relation to market prices received in the importing country.

The quasi-economic variables include trade barriers, such as the 32 percent ad valorem import tariff on American apples in Brazil, type or variety of product desired in the importing country (Fancy Red Delicious apples are the variety in demand in Brazil), package and unit of sale, reliability of supply, and demand creation or merchandising activities.

The cost of producing apples in Ohio was not analyzed in this study. However, it was found that total grading and packing costs can be reduced as much as 23 cents per bushel by more efficient use of labor, equipment, and facilities. Similarly, grading costs may be reduced significantly if field-run cull apples are not transported to the packing plant.

It costs about 55 cents per bushel to transport apples from the Cleveland area to the port of New York in refrigerated trucks and another $2.50 per bushel to complete the trip from New York to Rio de Janeiro, including commissions, freight, and insurance. The Brazilian import tariffs add from $1.37 to $2.25 per bushel to the cost, depending on the C.I.F. price at the Port of Rio de Janeiro.

Ohio apple producers could have realized additional profits above Cleveland prices of from 4 to 91 cents per bushel in three of the months studied by shipping to Brazil despite the high import tariff. Without the tariff, additional profits ranged from 15 cents to $3.16 per bushel and expanded from 3 months to 6 months duration.

Brazil imposes the 32 percent ad valorem tax as a member of the Latin America Free Trade Association, supposedly to protect Argentine apple producers from competition outside of LAFTA. In fact, Argentine apples and other Southern Hemisphere apples are not available in Brazil from September to April, the spring-summer growth period there. Northern Hemisphere apples are in high demand during this period, the normal period of Northern Hemisphere supply, and are not competitive with Southern Hemisphere apples which are in very short supply. A strong case can probably be built for Northern Hemisphere apples being complementary in demand to Southern Hemisphere apples because of the differences in production seasons, the high coefficients of elasticity of demand with respect to income in Brazil for apples, and a rising per capita income there coupled with increasing total demand for apples.

The study suggests that the relationships mentioned above should be studied in more detail and that appropriate foreign trade policy decisions based on the studies should be developed and implemented.

SUMMARY

International trade represents one of the alternative outlets for selling agricultural commodities. Ohio produces more than 3 million bushels of apples per year but is a net importer of the commodity. At certain times of the year, Ohio apple producers face serious competition from other states when recent harvest supplies arrive on local markets. Some large Ohio apple producers have chosen to export to other countries in order to maximize revenue at these times.

The basic objective of this study was to analyze the costs, returns, and profitability of exporting Ohio apples to Brazil during the period September 1966 through December 1967. Apple price and volume data were obtained from the Rio de Janeiro port and terminal markets and from the Cleveland market. Exporters and freight handlers were interviewed relative to transfer costs and facilities available in Cleveland, New York City, and Baltimore. Additional data relative to apple grading and packing and hauling costs were obtained from three Ohio packing firms.

Apple prices reach a seasonal high on the Rio wholesale market in December, January, February, or March when Southern Hemisphere apples, principally from Argentina, are not available. The high was the equivalent of $10.18 per bushel in February 1967 in this study. Deducting the normal Brazilian dockside wholesale mark-up of 10 percent, all freight and transfer costs, including a 32 percent ad valorem Brazilian import tariff, would have resulted in a net price to Ohio producers 91 cents per bushel above the Cleveland market price that month if sales had taken place. Similar computations for January and March yielded net prices 4 and 74 cents above Cleveland average prices. Net prices for the remaining 8 months analyzed were less than Cleveland average wholesale prices.

If the 32 percent Brazilian import tariff had not been in force, the net price advantage over Cleveland, as a result of exporting to Brazil, would have increased to $3.16 per bushel in February and $2.05 and $2.91 in January and March. Further, November and December 1966 and December 1967 would have been additional months of profitable exports, yielding net price advantages of 25 cents, $1.16, and 15 cents, respectively.

Brazil imported only 84,000 bushels of apples from the United States in 1967 but this was double the quantity imported in 1966. Consumption of the fruit, still a luxury in Brazil, is increasing. Several factors point to an expanding U. S. market in Brazil if certain problems are resolved.

The biggest problem is the artificial trade barrier—the 32 percent ad valorem import tariff. This is enforced because of Brazil's participation in the Latin America Free Trade Association. Argentina is a member and the tariff supposedly protects Argentine apples from competition. A strong case can be made of the fact that U. S. apples arrive in Brazil when Argentine apples are not on the market (because of opposite growing seasons). Therefore, U. S. apples are not competitive but are probably complementary in demand.

The packing plant analyses showed that Ohio firms could significantly reduce present average packing costs by handling volumes approaching plant equipment capacities and by restricting the inefficient practice of receiving small lots of orchard-run fruit. By adoption of these practices, average grading and packing costs could be reduced to below 80 cents per bushel.

Interviews with exporters also pointed to the need for improved and coordinated sales and merchandising efforts in potential countries of import, better market news gathering and dissemination, and more reliable sources of supply of standardized fruit for repeat business.

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Southern Branch, Ripley, Brown County: 275 acres

Western Branch, South Charleston, Clark County: 428 acres