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Supplying the New York Market with High-Quality Puerto Rican Mangos¹

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INTRODUCTION

Mangos have been grown in Puerto Rico since about 1750. Established varieties however, such as Mayaguezano and Pasote, are small in size, have a turpentine flavor, a fibrous pulp, and a very seasonal production. These characteristics, together with their relative abundance, reduce the value of common mango varieties to about 2 cents each or even less when retailed along roadsides. In addition to local sales, some fruits are destined for distribution in the United States mainland, principally New York City, where they generally wholesale for about 7 cents a pound.

Efforts to introduce large, attractively-colored mango varieties of excellent quality fruit were begun in 1948 by the Agricultural Experiment Station of the University of Puerto Rico. More than 150 varieties since have been imported from other areas, planted in different micro-climates of the Island, and observed. Varieties considered to have the best commercial possibilities were carefully selected and propagated at the Fortuna Substation in sufficient numbers to permit marketing studies.

A market survey was conducted in 1969 in Puerto Rican supermarkets to determine the varietal preferences of local consumers and to assess the market potential in these outlets.³ In 1970, fruits were shipped to New York City to evaluate market acceptability, to acquire experience with export procedures, and to determine the extent of sales and fluctuation of

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³ Mattern, F. and Pennock, W., The Potential Market for Improved Varieties of Mangos in Puerto Rican Supermarkets, *J. Agr. Univ. P.R.* 55 (2): 153-60, 1971.

prices as affected by season and size preferences. The data presented and analyzed in this report is based on the experience obtained from shipments of fruit to the New York market.

It is the intent of this report to help mango producers in Puerto Rico select varieties for export, to acquaint them with necessary shipping procedures, and to indicate the returns that may be expected from shipping to the New York market.

PACKING AND SHIPPING PROCEDURES

Shipping maturity in mangos is accompanied in most varieties by a "color break" on the skin surface. Fruits at the Fortuna Substation were picked at this stage, transported to San Juan, and placed in refrigerated storage at 50° F. Following washing, fruits were carefully packed in ventilated cardboard flats measuring 14 by 16 inches and varying in depth from 3¾ to 4¼ inches. Small amounts of shredded newspaper were used for packing. Regulations of the Puerto Rico Department of Agriculture⁴ governing export licenses, grade standards, condition of fruit, containers, packing material, labeling, and inspection were followed closely throughout packing. The number of mangos per container varied from 6 to 30 depending on size. The boxes contained about 12 pounds of fruit on the average but tended to weigh less when packed with small fruit.

On day of shipment, the fruit was submitted to treatment at the fumigation plant for possible infestation with larvae or eggs of the West Indian fruit fly. This process consists of holding the fruit in a sealed chamber containing ethylene dibromide for a period of 2 hours.⁵ The treatment must be performed under the supervision of plant quarantine inspectors. Transfer of the fruit from the fumigation plant to the shipping terminal was by tarpaulin-covered transport to prevent possible fly reinfestation during transit. Loading at the terminal was again subject to supervision by plant quarantine inspectors.

Shipments by ocean transport were in refrigerated reefer vans. The vans were sealed and coupled to electrical installation for lowering the temperature to 50° to 55° F. Shipping rates were \$1.09 per cubic foot or \$2.50 per hundredweight, whichever rate favored the carrier.

The following schedule was observed throughout most of the test:

Monday: Fruit picked at Fortuna, transported to San Juan, and placed in refrigerated storage.

⁴ Commonwealth Department of Agriculture. To Regulate Shipments of Farm Products from the Commonwealth of Puerto Rico, Market Regulation Number 7, San Juan, P.R., December 1970.

⁵ ARS, USDA, Plant Quarantine Division, Territorial Quarantine Notice, Part No. 318; 58-3d, December 29, 1959.

Tuesday: Fruit washed, packed in cardboard flats, and returned to refrigerated storage.

Wednesday: Fruit fumigated, transferred to the shipping terminal, and loaded in reefer vans.

Thursday: Reefer vans loaded on ocean vessels and embarked for mainland.

Friday, Saturday, Sunday, and Monday: En route.

Tuesday: Fruit arrived at Elizabeth, New Jersey.

Wednesday: Mangos sold at Hunt's Point Market.

Three shipments were made by airfreight without temperature control. Airshipment permitted the fruit to be sold at the Hunt's Point Market 3 or 4 days after picking. The airfreight rate was \$0.15 per pound.

The fruit was inspected upon arrival at the Hunt's Point Market by the Consumer Marketing Service of USDA.

Following the above procedure, 20 weekly shipments of high-quality mangos were consigned to a wholesaler in the New York City Terminal Market at Hunt's Point. No deterioration of quality, or spoilage, was reported during the trial.

MARKETING COSTS AND MARGINS

Marketing costs and margins per flat are presented in the following tabulation:

Item	Dollars
Wholesale price	4.14
Selling costs:	
Wholesale commission charges	0.41
Transportation to New York	.76
Cartage in New York	.23
Loading charges	.06
Terminal charges	.02
Total selling costs	1.48
Net proceeds	2.66

Estimates represent the average of 20 consecutive weekly shipments of quality mangos to New York, beginning in May and carried through to October. A total of 1,926 flats were shipped during the trial. Total marketing costs to New York City were estimated at \$1.48 per flat of mangos shipped. Transportation charges were \$0.76 per flat for all shipments, but averaged \$0.62 per flat shipped by ocean carrier and \$1.58 per flat sent

by air freight. Commission charges were 10 percent of the gross returns based on the wholesale price received by the wholesaler. These charges amounted to \$0.41 per flat. Cartage charges from the point of entry to the Hunt's Point Market, plus loading and terminal charges, amounted to \$0.31 per flat.

The average wholesale price received for the 20 shipments was \$4.14 per flat. Net proceeds, or the amount left to pay for all growing and selling expenses to time of shipment, were \$2.66 per flat.

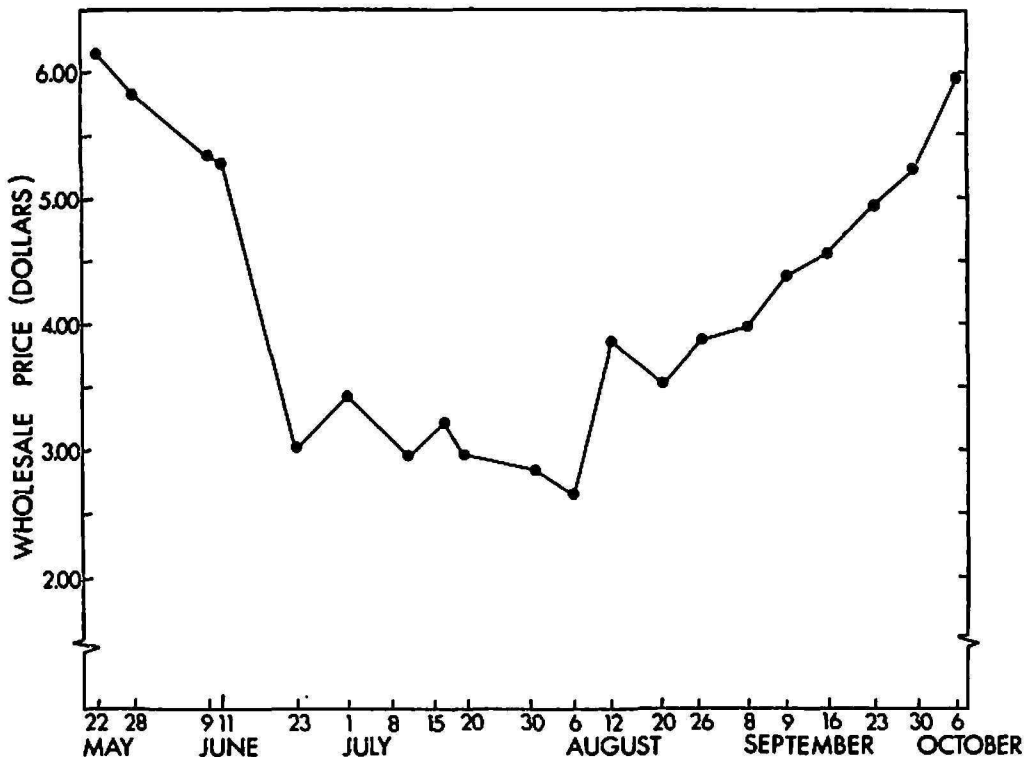


FIG. 1.—Average Wholesale Prices Per Flat of Quality Mangos Shipped to the New York City Terminal Market, 1970.

PRICE SEASONALITY

The movement of wholesale prices for mangos included in these shipments during the 1970 season is illustrated in figure 1. From a high of \$6.08 on May 22, the price fell to \$2.67 per flat on August 6, with the most severe decline occurring from June 11 to 23. After remaining at low levels for several months, prices improved steadily for the remainder of the season. It should be noted that the relatively low prices between June 20 and August 20 coincided with heavy marketings of Florida mangos in the New York market. Puerto Rican mangos were, however, price competitive throughout the test.

**THE EFFECT OF FRUIT SIZE UPON WHOLESALE
PRICES IN NEW YORK**

The size, color, and complexion of individual fruits and the attractiveness of packaging are important considerations with mangos. Not only do flats of large mangos sell for higher prices, but harvesting, washing, and packaging operations are more rapidly accomplished with large than with small fruit.

The following tabulation presents the weighted average wholesale prices received per flat by size of fruit:

Fruit size	Fruit per flat	Average wholesale price
	<i>Number</i>	<i>Dollars</i>
Large	6-9	4.11
Medium	10-16	4.05
Small	18-24	3.17

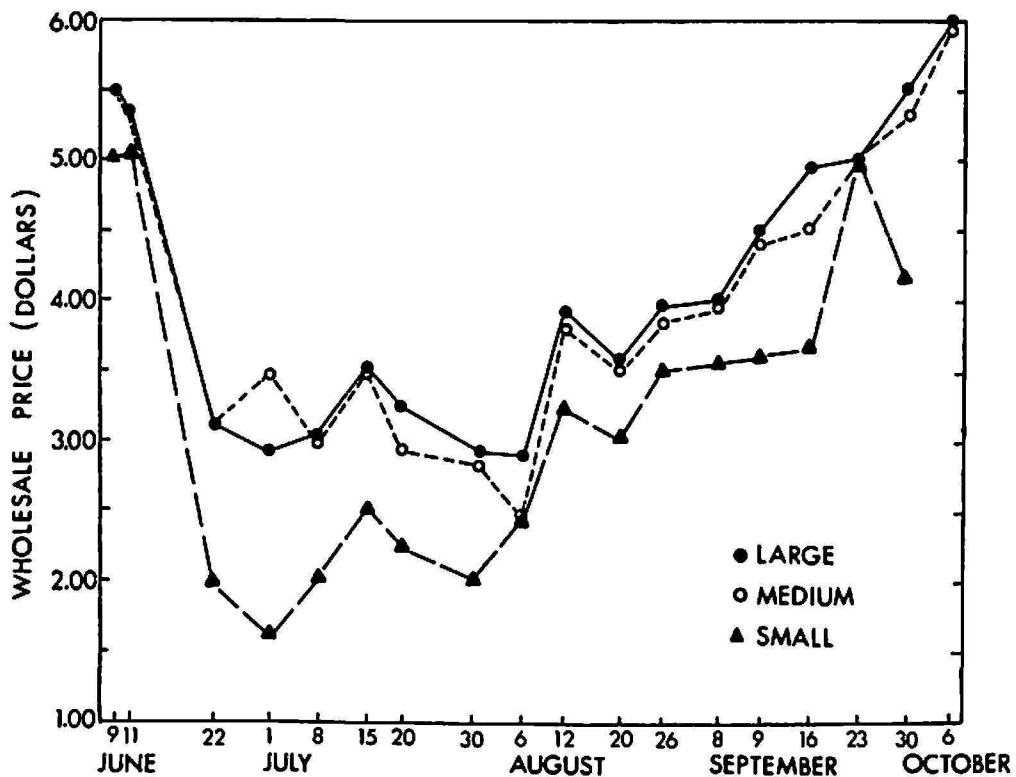


FIG. 2.—Average Wholesale Prices per Flat of Quality Mangos Shipped to the New York City Terminal Market, by Size of Fruit, 1970.

It may be noted that price differences between flats of large and medium fruit are not great, but that a sharp break in price occurs with small mangos. This also is clearly evident in figure 2 which shows seasonal movement of

wholesale prices for fruit of different sizes. Wholesale prices per flat of large, medium, and small fruits tended to converge early and late in the season during fruit scarcity.

EQUIVALENT WHOLESALE PRICES IN THE NEW YORK AND PUERTO RICO MARKETS

Wholesale prices of mangos drop severely in New York when large supplies of Florida mangos become available during the season. Because of wide price fluctuations and the expense of shipping from Puerto Rico, it is useful to estimate the minimum wholesale price that would make it advantageous to sell in the New York market.

An indication of equivalent returns in New York and Puerto Rico markets may be established by estimating all costs of producing and marketing fruits in both areas. For this purpose, costs of production and selling in Puerto Rico are assumed equal to their opportunity returns; that is, wholesale prices obtainable in local markets. Thus, when prices in New York are below opportunity returns in Puerto Rico plus all costs of marketing fruit to New York, shipment to New York would be discouraged.

The following tabulation shows total costs per flat of packaging, transporting, and wholesaling mangos in New York:

	Dollars per flat
Opportunity returns, Puerto Rico	1.20
Container costs	.30
Labor costs in packaging, fumigation, and transporting fruits to terminal	.50
Marketing costs to New York	1.48
	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/>
	3.48

Opportunity returns in Puerto Rico are estimated to be \$1.20 per flat wholesale, a price readily obtainable in a previous market test.⁶ Other costs of exporting mangos include container costs, labor used to package, fumigate, and transport fruit in Puerto Rico, and marketing costs incurred in shipping to New York. Results suggest that income gains could be achieved by allocating mango production to the New York market when wholesale prices there are above \$3.48 per flat. Figure 2 shows that prices per flat of large and medium mangos fell below \$3.48 during only six shipments. Net returns for small mangos were below opportunity returns during a substantial part of the test. Shipment by ocean transport would lower the equivalent price in New York to \$3.33 per flat, wholesale.

⁶ Mattern, F. and Pennock, W., loc. cit.

Withholding shipments of lower-valued packs of fruit through diversion to the local market, when the New York price does not cover selling and packing expenses plus wholesale prices obtainable in Puerto Rico, would contribute to net earnings.

CONSIDERATIONS CONCERNING MANGO VARIETIES

A good commercial variety of mango for the export market must possess the capacity of permitting harvest of the fruit before ripening on the tree, with a fairly long interval between picking and ripening. It also must be of large or medium size, and bear fairly early or late in the season, to capture prices that would exceed returns available in local markets. Fruit also should be from productive varieties. Some of the attributes of mangos shipped to New York with respect to size, bearing season, and productive capacity are presented in this section.

The following provides a classification of the mango varieties in these shipments according to size, although variation in fruit size occurs within a given variety and some overlap of varieties occurs among size groups.

Large	Medium	Small
Springfels	Parvin	Ruby
Davis Haden	Early Gold	Pillsbury
Keitt	Haden	Adams
Kent	Zill	
Jacquelin	Irwin	
Palmer	Lippens	
Eldon	Sensation	
Edward		

Subject to similar overlapping, the above varieties are classified below as to bearing season as indicated by the dates they became available for shipment.

Early (May-June 11)	Midseason (June 23-September 9)	Late season (September 16-October 6)
Early Gold	Jacquelin	Davis Haden
Edward	Eldon	Kent
Zill	Parvin	Palmer
Haden	Irwin	Ruby
Adams	Lippens	Keitt
	Pillsbury	
	Sensation	

It thus is apparent that large-size mangos are primarily supplied by mid- and late-season varieties. It therefore is difficult to find a completely satisfactory variety from the standpoint of both large fruit size and early bearing season, both factors being important varietal attributes governing marketing desirability.

Varietal selection is even further complicated when productive capacity is taken into account. The following groupings indicate varieties which are highly productive, least productive, and those which fall somewhere in between:

Highly productive	Fairly high to moderately productive	Low or erratic in production
Irwin Sensation Eldon Lippens Davis Haden	Springfels Early Gold Ruby Zill Parvin Kent Keitt Adams Pillsbury Haden	Palmer Jacquelin Edward

Obviously, the additional criterion of productive capacity makes the choice of varieties more difficult. A logical procedure is to select an assortment of varieties so that the crop may benefit from the outstanding qualities of several varieties while some of the major faults of each can be reduced in part by culling. The assortment should, however, be based on those varieties which offer the most promise of high returns and should also include both early and late varieties. Under conditions attendant to the south coast of Puerto Rico, earliness and lateness in bearing can change considerably in most varieties from year to year. It is possible to get some early fruit from midseason or late varieties and this could cancel out some of the relative disadvantages of midseason varieties.

Springfels undoubtedly rates first choice as a commercial variety, based on criteria of size, early bearing and productivity. Its production is quite high and its sales appeal is higher than any other variety.⁷ Despite mid-seasonal bearing, it can produce some early fruit in some years. Its eating quality is inferior to many varieties but apparently is good enough to escape future curtailment of demand as a possible consequence of repeat

⁷ The variety Tommy Atkins possibly has equally high sales appeal in the wholesale market but was not available in sufficient quantity to send more than a small sample.

sales. This is thought to be particularly true in the New York market where a mild flavor is not a handicap and where Springfels has enjoyed high demand for more than 8 years.

Irwin is a close second choice as a commercial variety. It is by far the most productive variety in the test and has excellent color but is a little smaller than desired. It is a midseasonal variety but will frequently produce early fruit.

Haden probably is the best third choice because it is fairly large and has excellent color and high market acceptability. It is not as early as Edward or Early Gold, however, and is moderately productive to somewhat erratic in bearing.

A selection of varieties for producing early fruit therefore would include a combination of these three: Haden, Edward, and Early Gold of which the latter two can be sold in a mixed pack. Edward is a low producer but because of its exceptionally high quality and good appearance would help "high grade" the lot. Early Gold is similar although less attractive, poorer in quality, and more productive.

Both Kent and Keitt have high-sales appeal, good quality, and are a late fruit. Keitt in particular has the latest season and holds some fruit as late as December. Reasons for ignoring or discarding some of the varieties which thus far have not been discussed are:

Davis-Haden—Has a reputation for uneven ripening and anthracnose injury; some wholesalers refuse to buy it.

Jacquelin—Large and very handsome but markedly low in production.

Palmer—Large and handsome but production is low and erratic.

Eldon—A good and fairly large commercial variety but bears at midseason and must compete with Springfels and Irwin.

Zill—Somewhat too small.

Adams—Much too small.

Parvin—A good commercial variety but bears in midseason.

Lippens—Somewhat small, has poor color, and bears in midseason.

Pillsbury—Too small, poor color.

Sensation—Excellent color and high production but is a little small and bears in the latter part of the midseason.

Ruby—Too small.

SUMMARY

Improved varieties of mangos have been introduced to Puerto Rico for evaluation in several micro-climates and for market testing. During 1970, 20 consecutive weekly shipments of these mangos consisting of 1,926 flats were made to New York to acquire experience with export procedures, and

to determine the extent of sales and fluctuation of prices as affected by season and size preferences.

The fruit was shipped by ocean or air freight in ventilated cardboard flats containing approximately 12 pounds of mangos each. Marketing costs to New York City were estimated at \$1.48 per flat. Wholesale prices varied from a high of \$6.08 per flat in May to \$2.67 during the flush of the season when heavy shipments of Florida mangos arrive on the market. Price differences between flats of large and medium fruit were minimal, but a sharp break in price occurred with small mangos. The average wholesale price received for the 20 shipments was \$4.14 per flat. The results suggest that it would be advantageous to ship fruit to the New York market when prevailing wholesale prices are above \$3.48 per flat. No deterioration of quality or spoilage were reported during the trial.

Based on criteria of size, bearing season and productivity, Springfels may be rated first choice as a commercial variety, followed by Irwin, Haden, and Kent.

RESUMEN

En Puerto Rico se han introducido variedades selectas de mangó con el propósito de determinar su adaptación a diversas condiciones de clima y suelo y también para valorarlas mediante pruebas de mercadeo. Durante el 1970, se despacharon a Nueva York 20 embarques semanales consecutivos que totalizaron 1,926 cajas, para adquirir la experiencia necesaria en el procedimiento de exportación y determinar el volumen potencial de las ventas y la fluctuación de los precios según la temporada y los tamaños preferidos por los consumidores.

Los envíos se hicieron por barco o carga aérea y la fruta se empacó en cajas de cartón ventiladas con un peso aproximado de 12 libras netas cada una. Los gastos de mercadeo a Nueva York se calcularon en \$1.48 por caja. El precio de venta al por mayor varió de un máximo de \$6.08 por caja en el mes de mayo a \$2.67 durante la temporada de abundante cosecha, cuando el mango de Florida llega al mercado. Las diferencias en los precios entre las cajas de fruta de tamaño grande y mediano fueron mínimas, pero el mangó pequeño bajó de precio marcadamente. El precio promedio al por mayor para los 20 embarques fue \$4.14 por caja. Los resultados sugieren que sería lucrativo embarcar fruta al mercado de Nueva York cuando los precios al por mayor exceden \$3.48 por caja. No se registró deterioro alguno durante las pruebas, en cuanto a la calidad o por pudrición de la fruta.

Basándose en criterios tales como el tamaño, época de fructificar y producción, desde el punto de vista comercial la variedad Springfels puede considerarse la mejor, seguida de las variedades Irwin, Haden y Kent.