

Effects of Yields, Shade, and Varieties on Size of Coffee Beans¹

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INTRODUCTION

Although coffee-bean size is not an important quality factor in the United States or local market, bean size is of major importance in Europe, where up to 20 percent of the Puerto Rican crop is sold at premium prices. As a result, Island coffee producers have recently become concerned over the apparent reduction in bean size; this has followed the introduction of new, high-yielding varieties and the use of intensive-management practices, including growing coffee in full sunlight.

This paper presents the results of studies on the effects of yields, varieties, and use of shade trees on size of coffee beans under typical conditions in the Coffee Region of Puerto Rico.

MATERIALS AND METHODS

EFFECT OF YIELDS

Four-year-old coffee trees of the Red Bourbon variety growing in full sunlight with intensive management at an elevation of 2,500 feet near Jayuya were used in this study. Forty trees were divided into 10 groups of 4 trees each similar in size and growth habit. To obtain a wide range of yields, one tree in each group was allowed to bear a full crop. Approximately 25, 50, and 75 percent, respectively, of the berries were removed from the other three trees soon after fruit set. Yields produced by each tree were determined, and representative samples of berries from each were carefully processed.

EFFECT OF SHADE AND VARIETIES

Berries were obtained from seven varieties of coffee growing under intensive management in full sunlight and in about 30-percent shade provided by trees at Jayuya. The varieties were replicated four times both in full sunlight and under shade. Individual plots consisted of eight trees in a row.

¹ This paper reports the results of field trials carried out cooperatively by the Soil and Water Conservation Research Division, Agricultural Research Service, USDA, the Agricultural Experiment Station of the University of Puerto Rico, and the Soil Conservation Service, USDA.

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A sample of berries was taken from each plot of the 6-year-old, heavily bearing trees at the height of the picking season.

The berries obtained in both studies, conducted in 1963-64, were weighed, depulped, and demucilaged. The beans were dried in the sun to a moisture

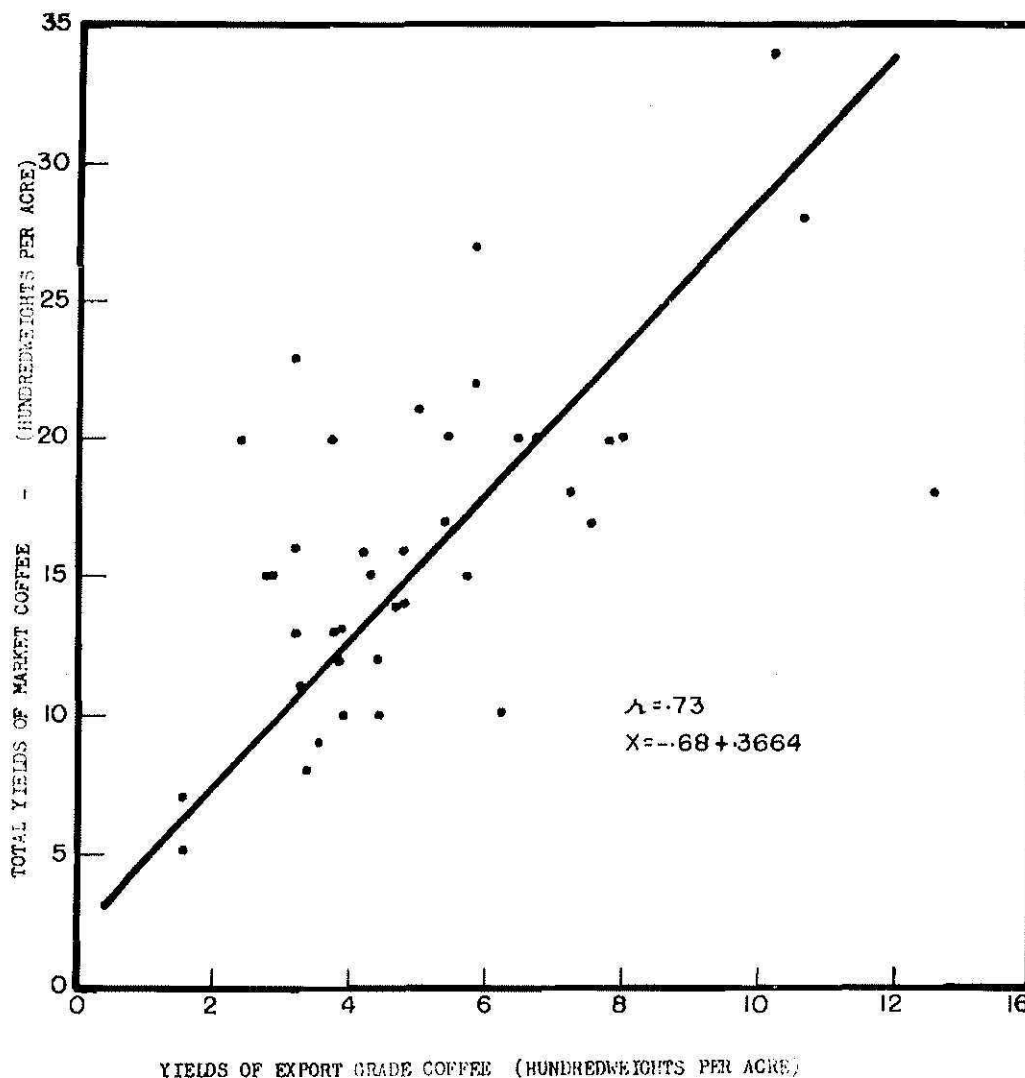


FIG. 1. The relationship between total yields produced by Bourbon variety coffee and yields of export-grade beans.

content of 12 to 14 percent, and the parchment was removed. The beans were passed through sieves used to grade coffee commercially, and the proportion of beans in each size group was determined.

RESULTS AND DISCUSSION

Yields of export-grade beans (>17.64 inch in thickness) increased as total yields increased (fig. 1). For example, about 300 pounds of export-

grade coffee were produced at the 10-hundredweight yield level, compared with 680 pounds at the 20-hundredweight yield level. However, the proportion of export-grade beans was slightly higher at yield levels below 10 hundredweights per acre, but was not affected as yields increased beyond this level. The proportion of commercial-grade beans ($>15/64$ inch in

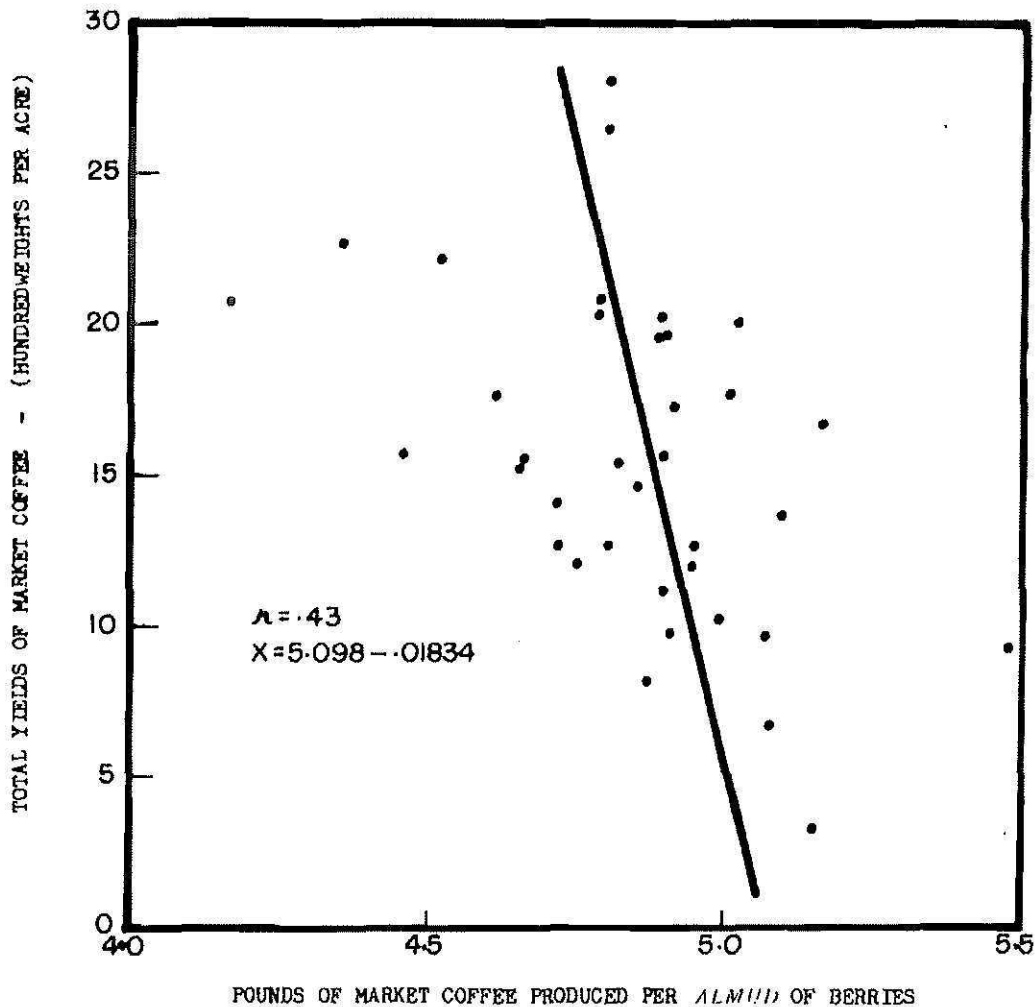


FIG. 2. The relationship between total yields and pounds of market coffee produced per *almud* of coffee berries.

(thickness) was not appreciably affected by yields, averaging about 80 percent.

Pounds of processed coffee produced per *almud*³ of berries tended to decrease slightly with increasing yields (fig. 2). For example, at the 5-hundredweight yield level each *almud* yielded an average of about 5 pounds of coffee

³ Unit used for measuring coffee in Puerto Rico; it equals 20 liters, or 28 pounds, of berries.

compared to only 4.7 pounds at the 20-hundredweight yield level. Since pickers are paid and coffee berries are purchased on this basis, this trend is important to farmers and buyers of unprocessed berries.

Table 1 shows that, with the exception of the Caturra and Yellow Bourbon varieties, yields of export-grade beans were higher in full sunlight because of the higher total yields produced. Conversely, with the exception of Red Bourbon, a higher proportion of export-grade beans was produced by all varieties under shade, an average of 57.5 percent, rather than in full

TABLE 1.—The effect of shade and varieties on size of beans¹ produced by intensively managed coffee at Jayuya, P. R.

Variety	Proportion of export grade beans grown in — ²		Proportion of commercial-grade beans grown in — ³		Yields of export grade beans grown in —	
	Sun	Shade	Sun	Shade	Sun	Shade
	Percent	Percent	Percent	Percent	wt./acre	wt./acre
Mundo Nuevo	63.8 a ⁴	65.8 b	89.3	88.2	19.6 a ⁴	13.7
Puerto Rico 401	59.8 ab	73.9 a	90.1	89.8	16.5 a	13.3
Red Bourbon	41.8 c	39.9 d	86.9	83.7	11.4 b	10.2
Yellow Bourbon	38.7 c	59.0 bc	84.5	88.0	10.3 b	13.4
Kent	55.6 b	60.3 bc	89.2	89.7	17.0 a	10.0
Caturra	43.0 c	57.9 c	85.4	88.6	9.3 b	12.0
Pacas	37.7 c	45.9 d	83.1	87.7	8.9 b	7.1
Average	48.6	57.5	87.0	88.0	13.3	11.4
LSD ⁰⁵	7.6	7.4	n.s.	n.s.	4.9	n.s.

¹ Air-dry (12- to 14-percent moisture) market coffee (parchment removed).

² Retained on sieves with perforations of 17_{64} inch.

³ Retained on sieves with perforations of 15_{64} inch.

⁴ Varieties having one or more letters in common do not differ significantly.

sunlight, 48.6 percent. Shade had no appreciable effect on the proportion of commercial-grade beans.

In full sunlight the Mundo Nuevo, Kent, and Puerto Rico 401 varieties produced the highest proportion and yields of export-grade beans. Under shade, these varieties and the Yellow Bourbon produced the highest proportion of export-grade beans. There was no significant varietal difference in yields of export-grade coffee produced under shade trees. There were no significant varietal differences in the proportion of commercial-grade beans produced either in shade or in full sunlight.

Since sizes can be separated by sieving, yields of top-grade beans are more significant than their proportion in the total yield. As shown above, yields of export-grade beans increase sharply with total yields, are slightly

higher in full sunlight than under shade, and vary considerably with varieties. The Mundo Nuevo and Puerto Rico 401 varieties, which produce the highest total yields, also generally produce the highest yields of export grade coffee.

Overall, total yields rather than size should be stressed in both coffee research and production programs in Puerto Rico. Even under conditions most conducive to the production of small beans, sufficient export-grade coffee to cover the limited shipments to Europe (rarely more than 20 percent of the crop) can be obtained by sieving.

SUMMARY

The effects of yields, shade provided by trees, and varieties, on size of coffee beans was determined under typical conditions in the Coffee Region of Puerto Rico.

Yields of export-grade beans ($> 17/64$ inch) increased rapidly with total yields; however, the proportion of these beans was highest when yields of market coffee dropped below 10 hundredweights per acre, remaining constant as yields increased beyond this point.

Although yields of export-grade beans were higher in full sunlight, a somewhat higher proportion of these beans was produced under shade trees.

The Mundo Nuevo, Puerto Rico 401, and Kent varieties produced the highest proportion and yields of export-grade beans.

RESUMEN

Se estudió el efecto de las variedades, la sombra y el rendimiento sobre el tamaño del grano de café bajo condiciones típicas de la región cafetalera de Puerto Rico.

La producción de granos para la exportación ($> 17/64$ de pulgada) aumentó rápidamente, a medida que aumentó la producción total, siendo mayor la proporción antes de alcanzar 10 quintales por acre. Sin embargo, la proporción de granos de dicho tamaño se mantuvo constante una vez el rendimiento pasó de 10 quintales por acre.

Aunque las parcelas a pleno sol produjeron una cantidad mayor de granos propios para la exportación, las que se cultivaron bajo sombra mostraron una proporción algo mayor de este tamaño de grano al compararse con la producción total.

Las variedades Mundo Nuevo, Puerto Rico 401 y Kent produjeron la mayor cantidad y proporción de granos propios para la exportación.