

# Tillage and Yields of Horn-Type Maricongo Plantain on an Ultisol<sup>1, 2</sup>

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## ABSTRACT

Plowing and harrowing, as compared to no tillage, of a Corozal clay (Aquic Tropudults) with 6.2% pores drained at 1/3 bar and a bulk density of 1.3 g/cm<sup>3</sup>, increased plantain yields from 26 to 41 t/ha.

## INTRODUCTION

In Puerto Rico, most plantains (*Musa acuminata* × *M. balbisiana*, AAB) are grown on Ultisols in the humid mountain region. Ultisols range from very well aggregated, porous soils such as Humatas (Typic Tropohumults) to denser Corozal heavy clay (Aquic Tropudults). Annual rainfall in the mountain region ranges from about 1,600 to 2,400 mm.

Usually, adequate rainfall, combined with proper fertilization and liming, effective pest and weed control, and use of high yielding cultivars, result in high plantain yields. However, because of land steepness, plowing is difficult and conducive to soil erosion.

The possibility of growing plantains on some of these soils, typical of vast areas in the tropics, with minimum tillage has been studied by Vicente-Chandler et al.<sup>4</sup> They found that complete land preparation did not increase yields over those with no tillage on three soils typical of the humid region of Puerto Rico.

This paper presents results of a study comparing the effect of complete land preparation with that of no tillage on plantains grown on a Corozal clay (Aquic Tropudults), another soil of the mountain region of Puerto Rico.

## MATERIALS AND METHODS

The experiment was carried out at the Corozal Substation, located about 200 m above sea level. Annual rainfall is about 1,650 mm, with

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<sup>4</sup> Vicente-Chandler, J., Caro-Costas, R., and Boneta, E. G., 1966. High crop yields produced with and without tillage on 3 typical soils of the Humid Mountain Region of Puerto Rico, *J. Agri. Univ. P.R.* 50 (2): 146-50.

heavy rains from July through December, followed by a rather dry season from February to May. Average minimum and maximum temperatures are 19° and 30 ° C, with an average yearly temperature of 25° C.

The Corozal clay (Aquic Tropudults) is a red or mottled reddish-brown soil, fairly deep, compact and plastic when wet but medium to hard when dry, with restricted internal drainage in the subsoil. At the 0- to 20-cm depth this soil had a pH of 5.3, exchangeable bases were 11 meq/100 g of soil, bulk density of 1.3 g/cm<sup>3</sup> and 6.2% of the pores drained at 1/3 bar.

The experimental site, on a 25% slope, had been in stargrass pastures for many years. The grass was mowed close to the ground and killed with Dalapon 85W (2, 2-dichloropropionic acid)<sup>5</sup> at the rate of 12 kg/ha.

Tillage consisted of plowing and harrowing twice to a depth of about 20 cm. Untilled plots were left undisturbed except for digging the holes to plant the plantain suckers. Weeds in all plots were controlled with paraquat, (1,1-dimethyl-4,4-bipyridinium dichloride) applied at the rate of 2.3 liters/ha.

The treatments were compared in a paired plot design with six replications. Plots were 8.5 × 8.5 m with 25 plants spaced at 1.7 × 1.7 m. A double row of plantains was planted around the experimental field.

Maricongo suckers from high yielding plants weighing about 1.6 kg, were planted in holes 30 × 30 × 20 cm deep. The suckers were dipped for 10 minutes in an aqueous solution of ethoprop (O-ethyl S,S-dipropyl phosphorodithioate) at a concentration of 2,000 p/m. At planting, and every 6 mo thereafter, 10% granular carbofuran (2-3-dihydro-2,2-dimethyl-7-benzofuranyl-methylcarbamate) was applied at the rate of 56 g/plant to control nematodes and soil insects. The experiment was planted June 1977. Six mo after planting, and every 2 weeks thereafter, the plants were sprayed with orchard mineral oil at the rate of 9.4 liters/ha to control Sigatoka leaf spot caused by *Mycosphaerella musicola* (*Cercospora musae*.)

All plots were fertilized with 3t/ha of 10-5-20 containing 75 kg MgO/t, divided in four equal amounts and applied 2, 5, 8 and 11 mo after planting. In addition, 40 kg of ZnO and 35 kg of B<sub>2</sub>O<sub>3</sub> were applied per hectare 5 mo after planting. Sprinkler irrigation maintained at least 30% of available moisture in the soil.

The plantains were harvested at the mature-green stage. The bunches were weighed, and number of hands and fruits per bunch were counted. After the last picking, the plots were surveyed for insect and nematode damage.

<sup>5</sup> This paper reports the results of research only. Mention of a pesticide does not constitute a recommendation by the USDA or by the Agricultural Experiment Station of the University of Puerto Rico, nor does it imply registration under FIFRA.

## RESULTS AND DISCUSSIONS

Bunch emergence began in May and lasted through August 1978 (fig. 1). About 89% of the plants in the tilled plots produced a bunch 11 to 12 months after planting; only 53%, in the untilled plots.

Harvesting began about 3.5 months after bunch emergence and lasted through November 1978. In the tilled plots, 98% of the plants produced a marketable bunch; in the untilled plots, 81%.

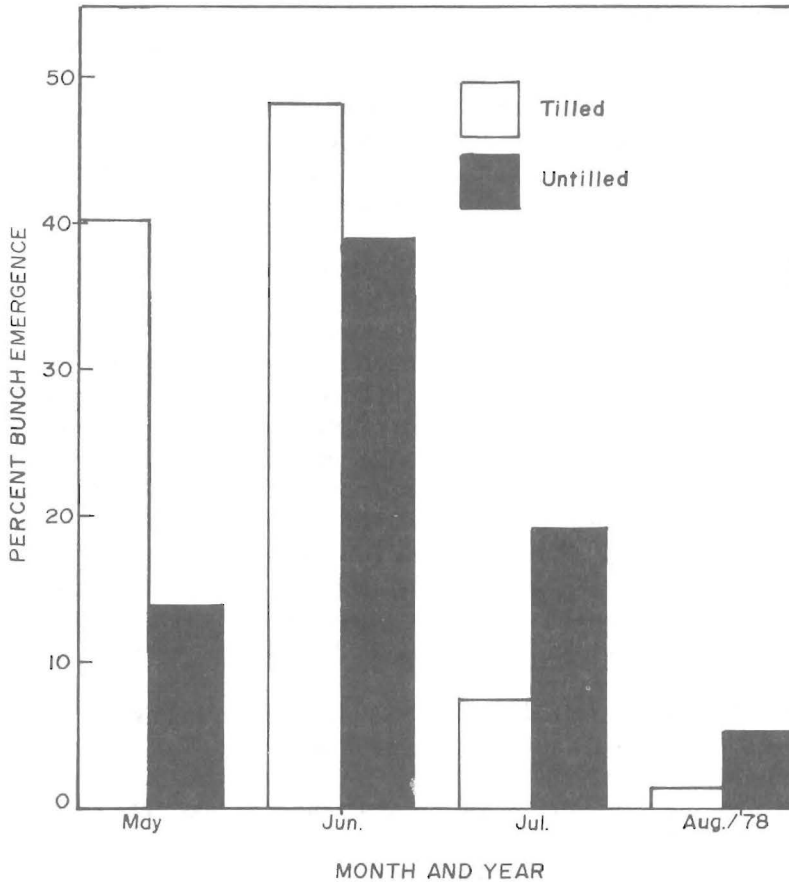


FIG. 1.—Bunch emergence distribution from plants grown on tilled and untilled soil.

Both number of marketable fruits and weight per bunch were lower for bunches harvested from the untilled plots (tables 1 and 2). The untilled plots produced an average of 101,960 fruits or 26 t/ha compared to 143,260 fruits or 41 t/ha for the tilled plots.

Number of hands per bunch and mean fruit weight were not significantly affected by tillage.

Plant height, pseudostem diameter, number of functional leaves and suckers per plant were not affected by land preparation.

Complete land preparation did not increase yields of plantains growing on Humatas clay (Typic Tropohumults), Daguey clay (Orthoxic Tropohumults) and Quebrada clay (Typic Eutropepts) (formly Catalina, Cialitos and Múcara) as shown by Vicente-Chandler et al.<sup>4</sup> This fact is explained by the more desirable physical characteristics of these soils

TABLE 1.—Effect of tillage on various yield components of the Maricongo plantain grown on a Corozal clay

Treatment	Hands/bunch	Fruits/bunch	Bunch weight	Mean weight of fruit
	No	No	Kg	G
Complete land preparation	7.4 <sup>a1</sup>	50.4 <sup>a</sup>	14.7 <sup>a</sup>	290.4 <sup>a</sup>
No tillage	7.1 <sup>a</sup>	45.7 <sup>b</sup>	11.4 <sup>b</sup>	246.4 <sup>a</sup>

<sup>1</sup> Means in columns followed by the same letter do not differ significantly at P = 0.05.

TABLE 2.—Effect of tillage on yields of the Maricongo plantain grown on a Corozal clay

Treatment	Yields	
	Marketable fruits	Weight
	No/ha	T/ha
Complete land preparation	143,260 <sup>a1</sup>	41.0 <sup>a</sup>
No tillage	101,930 <sup>b</sup>	26.0 <sup>b</sup>

<sup>1</sup> Means in columns followed by the same letter do not differ significantly at P = 0.05.

TABLE 3.—Effect of tillage on percentage of uprooted and nonbearing Maricongo plants grown on a Corozal clay

Treatment	Uprooted plants	Non-bearing plants
	%	%
Complete land preparation	5.0 <sup>a1</sup>	2.0 <sup>a</sup>
No tillage	23.0 <sup>a</sup>	19.0 <sup>a</sup>

<sup>1</sup> Means in columns followed by the same letter do not differ significantly at P = 0.05.

with 15.5% of the pores drained at 1/3 bar and a bulk density of 1.0 g/cm<sup>3</sup>, compared to 6.2% and 1.3 g/cm<sup>3</sup>, respectively, for the Corozal clay.

Although not significantly different, more plants were uprooted and fewer produced a bunch in the untilled than in the tilled plots. (table 3)

#### RESUMEN

Para evaluar el efecto que la preparación del terreno puede tener sobre el rendimiento del platanero (*Musa acuminata* × *M. balbisiana* AAB), se usaron dos sistemas en un suelo Corozal arcilloso. En un tratamiento el suelo se aró y rastrilló; en el otro no se aró, sino que solo

se hicieron los hoyos para sembrar. Se sembró la cultivar Maricongo. En ambos casos, los yerbajos se controlaron con herbicidas.

Un mayor porcentaje de plantas floreció más temprano cuando el terreno se preparó completamente que cuando éste no se aró.

Los racimos cosechados en las parcelas aradas tuvieron un número significativamente mayor de frutas comerciales y pesaron más que los de las parcelas sin arar. Como resultado, las parcelas aradas produjeron 41,330 frutas o 15 toneladas métricas más por hectárea, que las parcelas sin arar.

En las parcelas sin arar hubo más plantas desarraigadas y más plantas que nunca llegaron a florecer.