

Effect of Season of the Year on Yields of 13 Varieties of Rice Growing in the Humid Region of Puerto Rico^{1,2}

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INTRODUCTION

More than 300 million pounds of rice are imported each year to Puerto Rico at a cost of over \$40 million. There are now no commercial rice plantings here but about 10,000 acres of upland rice were planted in Puerto Rico during World War II. Yields were low, however, averaging only about 600 pounds per acre.

Despite the importance of rice in the Puerto Rican diet, little research has been conducted on its production in Puerto Rico. Theis and his associates⁴ at the Federal Experiment Station of the U.S. Department of Agriculture at Mayagüez, working in cooperation with personnel of the Lajas Substation of the Agricultural Experiment Station of the University of Puerto Rico, conducted tests under flooded "paddy" conditions in the Lajas Valley in 1959 using several of the varieties of rice then available. Despite problems related to poor land preparation and weed and water control, they obtained yields of about 2,500 pounds per acre in two 8-acre plantings.

Prospects are good for commercial production of rice in Puerto Rico if high yields can be obtained in completely mechanized operations, especially if two crops can be produced yearly. There are over 40,000 acres of poorly drained soils in the humid coastal region with heavy rainfall which in many cases can be supplemented with irrigation.

In the present study, yields produced by 13 varieties of rice were determined in monthly plantings over a 1-year period with irrigation applied as required.

MATERIALS AND METHODS

The experiments were conducted at the Gurabo Substation of the Agricultural Experiment Station, University of Puerto Rico. This Sub-

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⁴ Unpublished report, Federal Experiment Station, Mayagüez, P.R.

station is located about 250 feet above sea level with a mean annual temperature of about 80° F. Annual rainfall is about 60 inches with a marked dry season from November through March.

The following varieties were tested: Long grain; Sunbonnet, Starbonnet, Bluebelle, Juma 8, Juma 13, and Juma 18; Medium-long grain; Sinaloa A-68-19C, Sinaloa A-68-1C, Sinaloa A-68-8C, and IR-8, Medium-short grain; Vista, Chontalpa 16, and Chontalpa 437. Some characteristics of these varieties are shown in table 1.

Plantings were made each month for a year, with all varieties replicated 4 times in 12 feet × 12 feet plots using a randomized block design.

TABLE 1.—Some characteristics of the 13 rice varieties studied

Variety	Grain type	Height	Tillering	Maturity	Seed obtained from—
Sunbonnet	Long	Tall	Medium	Medium	Louisiana
Starbonnet	do	do	do	do	Do.
Bluebelle	do	Medium	Little	Early	Do.
Juma 8	do	Dwarf	High	Late	Dominican Republic
Juma 13	do	do	do	do	Do.
Juma 18	do	do	do	do	Do.
Sinaloa A-68-1C	Medium-long	do	do	do	Mexico
Sinaloa A-68-8C	do	do	do	do	Do.
Sinaloa A-68-19C	do	do	do	do	Do.
IR-8	do	do	do	do	Philippines
Vista	Medium-short	Medium	Little	Early	Louisiana
Chontalpa 16	do	do	Medium-high	Medium	Mexico
Chontalpa 437	do	do	Medium-high	do	Do.

The rice was drilled in rows 8 inches apart at the rate of 75 pounds of seed per acre and irrigated by flooding when required to supply 1½ inches of water weekly. One-hundred pounds per acre each of nitrogen, phosphoric acid (P₂O₅) and potash (K₂O) were applied to all plots, half at planting and half 45 days later.

The plots were sprayed periodically with Diazinon, Malathion and Dithane M-45 to control insects and diseases and rats were controlled with poison bait. Weeds were controlled by applying 2 gallons per acre of Propa-nil diluted in 50 gallons of water when the weeds developed their second pair of leaves. The rice in the plots was harvested when there was less than 5 percent of green grains. The grain was threshed and dried to 15-percent moisture.

TABLE 2.—Yields of rough rice (hundred pounds/acre) produced by 18 varieties of rice planted monthly over a 1-year period at Gurabo, P.R.

Variety	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Average for variety	Average number of days in field
Sunbonnet	51.0*	47.7*	46.9*	38.7	43.0	41.4	46.2	33.5	36.5	41.4	38.8	60.8*	44.0	145
Vista	28.6	31.2	41.2	29.4	27.6	30.5	33.8	33.1	27.0	19.3	27.2	35.2	30.4	126
Starbonnet	50.0*	52.3*	28.9	32.4	46.6*	37.1	47.3	36.0	27.5	—	—	39.2	39.3	141
Bluebelle	27.4	21.4	30.5	18.0	19.2	33.3	33.2	34.9	24.5	—	19.4	21.8	26.1	113
Chontalpa 437	32.2	51.1*	36.0	46.9	36.5	38.7	41.8	37.1	32.6	38.4	41.7	48.5	40.1	145
Sinaloa A-68-19C	44.5*	37.0	53.5*	54.5*	45.3*	37.6	57.8	39.4*	40.7	54.6*	55.2*	66.5*	49.1*	152
Chontalpa 16	45.7*	43.4*	39.6	50.1*	55.0*	42.5	43.5	34.9	31.2	31.2	40.6	43.2	41.7	140
Sinaloa A-68-1C	45.1*	46.1*	52.7*	55.6*	50.7*	36.5	63.7*	43.8*	41.3	54.2*	40.6	55.2	48.7*	152
Sinaloa A-68-8C	40.5	34.9	54.8*	61.1*	48.0*	35.7	57.2	43.6*	47.4*	52.7*	44.3	65.7*	49.4*	150
IR-8	34.7	48.5*	42.5	55.9*	53.4*	40.0	55.1	33.3	35.5	41.7	33.8	54.8	43.8	153
Juma 18	22.3	48.0*	39.5	47.9*	54.2*	34.4	48.0	40.4*	40.1	62.1*	43.1	52.9	44.1	160
Juma 13	41.4	43.6*	42.8	42.1	39.2	39.2	47.6	32.3	34.6	29.4	—	43.6	39.7	160
Juma 8	34.9	43.3*	38.1	48.0*	47.7*	36.5	52.1	38.1*	54.2*	48.3	35.3	53.0	45.1	158
Average/month	38.3	42.5	42.1	44.7	43.6	37.2	48.3	37.0	36.4	43.0	38.2	49.3	41.7	
Average/month for highest yielding variety	51.0	52.3	54.8	61.1	55.0	42.5	63.7	43.8	54.2	62.1	55.2	66.5	55.2	

* Asterisks denote highest yielding varieties which do not differ significantly among themselves.

RESULTS AND DISCUSSION

Significant yield differences occur among varieties as shown in table 2. The semidwarf, late maturing varieties generally were the best producers and the tall and early maturing ones lowest.

The three medium-long grain varieties Sinaloa A-68-1C, A-68-8C, and A-68-19C (fig. 1), which produced similar yields, were the highest overall



FIG. 1.—One of the monthly experimental plantings of 13 rice varieties.

yielders averaging 4,910 pounds of rough rice per acre per crop over the 1-year period (table 2).

Among the long-grain varieties of high quality, highest yields and best distribution of yield throughout the year were produced by Sunbonnet, which produced an average yield of 4,400 pounds per acre per crop.

Highest yields of the medium-short grain varieties were produced by the varieties Chontalpa 16 and 437 which averaged 4,090 pounds per acre per crop.

Tall varieties such as Starbonnet and Sunbonnet were susceptible to lodging especially during the cloudy period of high rainfall. The semi-

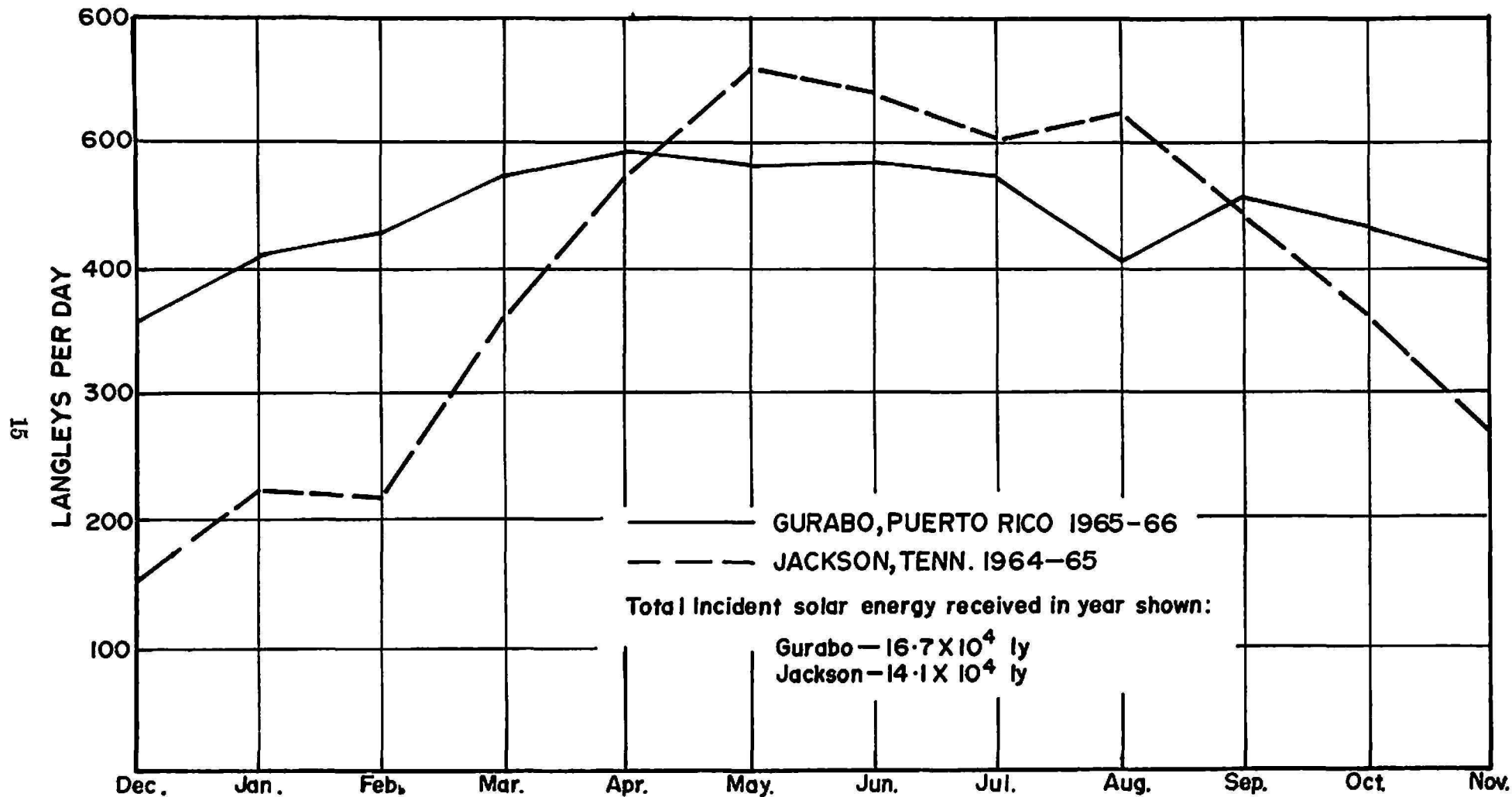


FIG. 2.—Comparison of monthly incident solar energy at one location in Puerto Rico and in mid-Southern United States.

dwarf types did not lodge during the course of the experiments and the medium-tall Chontalpas were resistant to lodging.

Yields of the different varieties were not markedly or consistently affected by season of the year (table 2).

Solar radiation available for the growth of rice tends to be similar throughout the year in the humid region of Puerto Rico (fig. 2) because cloudiness reduces radiation during the longer days of the rainy season while clear weather compensates for the lower radiation during the shorter days of winter. This rather uniform distribution of solar energy throughout

TABLE 3.—*Effect of planting date on number of days required to produce a crop with 13 varieties of rice*

	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Average for variety
Sunbonnet	150	143	144	126	140	137	123	150	152	174	160	152	146
Vista	112	133	106	112	110	110	108	120	138	161	160	133	125
Starbonnet	144	131	144	118	140	131	123	152	152	159	160	146	142
Bluebelle	104	95	106	96	138	95	94	99	111	152	139	117	112
Chontalpa 437	152	138	134	126	140	131	133	145	138	173	176	155	145
Sinaloa A-68-19C	162	154	162	128	142	141	124	154	157	173	173	162	153
Chontalpa 16	145	143	136	118	140	128	125	130	138	159	161	142	138
Sinaloa A-68-1C	158	153	157	126	142	141	123	156	157	176	173	162	152
Sinaloa A-68-8C	160	134	157	126	145	141	124	156	157	176	173	162	151
IR-8	153	156	158	128	146	145	128	156	157	180	175	162	154
Juma 18	175	173	160	140	148	146	129	158	158	176	175	174	159
Juma 13	160	154	157	136	146	145	128	158	158	176	175	163	155
Juma 8	175	161	160	140	148	146	129	158	158	176	175	174	158
Average	150	144	145	125	140	134	132	145	149	170	167	156	

the year and the fact that the rice varieties tested were not sensitive to the relatively small variations in day length occurring in Puerto Rico explains why yields of rice were rather uniform throughout the year in these experiments.

Table 3 shows that plantings made in November, December and January took longer to mature generally than plantings made in May, June, July and August, probably as a result of shorter days and cooler weather. This table also shows that Bluebelle, the earliest but also the lowest yielding variety, produced a crop in about 100 days or less during most of the year.

The data presented herein show that two or three crops of rice can be produced yearly in Puerto Rico where irrigation is available, depending on varieties planted. The data also show that yields of 5 tons of rough rice can be obtained per acre yearly without permanent flooding or paddy con-

ditions. With yields such as these, Puerto Rico could produce all the rice it now imports and consumes, at a cost of over \$40 million yearly, on only about 40,000 acres of poorly drained soils with irrigation.

At current prices, 5 tons of rough rice sell for about \$850 at the farm. Assuming production costs of \$225 per acre per crop (vs. \$150 for large, efficient farms in Louisiana), rice could yield a net income of about \$400 per acre yearly in Puerto Rico.

SUMMARY

The effect of season of the year on the productivity of 13 varieties of rice was determined in monthly plantings at Gurabo over a 1-year period with irrigation applied only as required.

The semidwarf, late maturing, medium-long grain, Sinaloa varieties produced the highest yields, averaging 4,910 pounds of rough rice per acre per crop.

Yields of the 13 varieties tested were not markedly or consistently affected by season of the year.

The data from these experiments show that two crops of rice with a total production of about 5 tons of rough rice per acre yearly can be grown in areas of the humid region of Puerto Rico where conditions exist similar to those prevailing at Gurabo.

RESUMEN

Se determinó el efecto de la época del año en la productividad de 13 variedades de arroz mediante siembras mensuales realizadas durante un año en la Subestación de Gurabo.

Las variedades Sinaloa que son semi-enanas y tardías, y producen granos de tamaño largo mediano produjeron los más altos rendimientos con un promedio de 4,910 libras de arroz en cáscara por acre por cosecha.

La producción de las 13 variedades de arroz no fue afectada apreciablemente por la época del año.

Los datos obtenidos demuestran que en la región húmeda de Puerto Rico pueden producirse dos cosechas de arroz, lográndose una producción total de unas 5 toneladas de arroz en cáscara por acre al año bajo condiciones similares a los de estos experimentos.