PINEAPPLE STUDIES IN THE U. S. VIRGIN ISLANDS

By A. Krochmal, R. M. Bond, A. L. Frederiksen[1]

Substantial quantities of fresh pineapples are consumed in the U. S. Virgin Islands, particularly from December to June, when more than 300,000 tourists visit the Islands. To meet this demand, pineapples are imported from Puerto Rico, but many of them arrive too green, too ripe, or demaged in transit. Present Virgin Islands pineapple production is centered in St. Croix, though amounts are also produced on Inner Brass Island, off the coast of St. Thomas. Production methods are usually haphazard and weeding is rarely done. 'Sugar Loaf' is the principal variety grown. It has small fruits of exceptional flavor, but is a poor shipper and keeper, and has low production. At the time of this writing, it wholesales from 10 cents to 18 cents per pound in St. Croix.

The investigations reported here were undertaken to try to raise yields, lower costs of production (especially by reducing labor input), and thus increase returns to the growers.

Experimental Design.

Pinneapple slips of the local 'Sugarloaf' variety, were planted on November 15, 16, and 17, 1961, in randomized, replicated blocks, with two replicates per treatment. The slips were set out in double rows (Fig 1) in beds 36 inches wide, with each row of plants set 6 to 8 inches from the side of the bed, and individual plants staggered in the row, at 12-inch intervals. The beds were separated by 30-inch walk-ways. Each plot had 4 rows 25 feet long, with 200 plants in each plot or replicate. The site on Estate Canaan is on Descalobrado Clay soil.

Treatments were: (1) Hand weeding, without mulch or fertilizer; (2) mulch of cut guinea grass, no fertilizer; (3) mulch of glass-kraft paper, no fertilizer; (4) mulch of black asphalt paper, no fertilizer; (5) mulch of black polyethylene, no fertilizer; (6-10) the same five treatments but with fertilizer. Fertilizer used was 400 lbs./acre of 10-4-20 applied to the soil surface just before planting, and a side-dressing of another 400 lbs./acre of the same, applied in June, 1962, about seven months after planting.

Pest and Disease Control.

No unusual problems arose during the course of these experiments. Malathion was used for mealy-bug control. Rat damage was minimized by frequent harvesting and by elimination of weeds in and *around* the plantation, and the use of Warfarin from time to time.

1.- Virgin Islands Agricultural Program, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Kingshill, St. Croix.

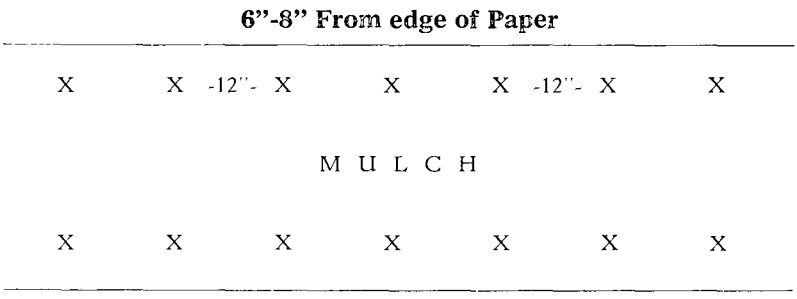

Fig. 1 Sketch showing distances used for planting pineapple slips in artificial mulch, as well as bed specing.

Soil type.

The area used has a moderately heavy clay top-soil and a heavier subsoil. The soil is rocky, increasingly so with depth, and was formed *in situ* on Cretaceous andestic parent material. It has a pH of about 6.8. The site was on an east slope of about 15% on land previously in Guinea grass and light brush; it has not been cultivated for several years. The entire area was in a small, protected valley which lies in the 50"-55" rainfall belt, as do other areas in the Virgin Islands where pineapples have been grown in the past.

Rainfall.

During the period after planting, in the middle of Nov. of 1961, to harvest in June of 1963, a total of 83.23 inches of rain fell (Table 1) with 58.38 inches in the first 11 months. Part of the test area may have suffered from inadequate internal drainage during November and December of 1961.

Mulch costs.

The costs of the various mulches, shown in Table 2, were calculated from the squiare foot cost of material for artificial mulch and for guinea grass from hours of labor required to cut and spread it. About 60% of the area of each mulched plott was actually covered.

Labor input.

Careful records were kept of the labor time needed for weeding the plots. For calculating costs we have used 75 c. per hour, the median agricultural wage on St. Croix. Weeding was required on all plots about once a month during the course of the experiment. The most common weed was guinea grass. The per acre labor input for weed control is given in Table 3.

Figura 2.—Canaan pineapple planting at height of harvest

TABLA 1.—Railfall at Canaan, St. Croix, during period of pineapple trial

Month	*Inches of Rain*
1961	
October	9.22
November	11.47
December	6.45
1962	
January	3.80
February	2.91
March	3.11
April	3.09
May	5.45
June	6.33
July	2.31
August	3.31
September	4.65
October	5.50
November	1.35
December	1.94
1963	
January	8.15
February	1.69
March	0.69
April	6.52
May	4.51
June	3.54

TABLA 2.—Costs per square foot and per acre (only 23,760 ft.^{2} of each acre covered) of mulch materials.

	Black polyethylene	Asphalt paper	Glasskraft	Guinea Grass
per sq. ft.	$ .004	$ .0135	$ .014	$ .0175
per acre	95.040	319.8100	332.640	414.6100*

* Two applications were made of which the second required only about 1/3 as much grass as the first.

TABLA 3.—Man-hours requiered for weed control with different treatments.

Treatment	Man-hours, weeding acre
Mulch, glass Kraft	449.1
Mulch, polyethylene	529.7
Mulch, Black asphalt + fertilizer	547.1
Mulch, Black Asphalt	571.9
Mulch, polyethylene + fertilizer	588.9
Mulch, Guinea grass	728.0
Check plot	728.8
No mulch + fertilizer	741.8
Mulch, glass Kraft + fertilizer	744.9
Mulch, Guinea grass + fertilizer	763.2

Fruit size.

The distribution of fruit sizes under different test conditions is shown in Table 4. With mulch alone, the percentage of the total crop in the less than 2.0 pound class was 5.2% more than in the mulch + fertilizer plots. In those the heavier fruits 2.0-2.9 pounds occurred more frequently — 4.3% more than in mulch plots lacking fertilizer. Of the fruits harvested from 4,000 plants, 1.5% weighed over 3 pounds; 70.9% weighed less than 2 pounds; and 29.5% weighed between 2 and 2.9 pounds. Ten fruits in each of 3 size classes were peeled, and the edible flesh and peeling weighed (Table 5). At present prices, considering food value only, the large fruits are worth only about one cent per pound more than the small ones. However, market preference may require a slightly larger price differential.

Fertilizer.

An analysis of yield data (Fig. 6) showed a significant increase at the .05% level when 10-4-20 fertilizer was applied at the rate of 800 pounds per acre. Five of the six highest yielding treatments received such application.

The greatest gross return was recorded for the fertilized plot without mulch, a result not anticipated (Table 7). Perhaps the relatively high amount of rainfall during the testing period reduced the value of the mulches for moisture conservation. The rainfall also may have made the fertilizer more readily available to the plants on the unmulched, fertilized plot.

The Guinea grass mulch gave the smallest return and was the second most costly treatment. The decaying of this mulch material undoubtedly tied up soil nitrates and decreased the yield. When fertilizer was used with guinea grass mulch, the yield increase was marked.

Although there seems to be a difference in mulch vs. non-mulched plants, no statistical analysis was possible with the design of the experiment. The glasskraft paper began to disintegrate after 6 months, but was not replaced.

Discusion.

The harvest of these experimental plots started in June, and continued till the end of August. Usually there is a ratoon crop in early winter that is about one-fourth to one-third the size of the main crop. This particular year the ratoon crop was negligible, so that the net returns shown in Table 7 are for a period of about 18 months, and net returns per year must be reduced accordingly.

Although only the small, ratoon crop is available for the tourists, the winter price is high enough to make it approach the value of the main, summer crop. It is estimated that the yield from 70-100 well managed acres could be marketed profitably in the Virgin Islands. Processing part of the main crop for the tourist trade might make it possible to put even a larger area into pineapples.

Summary

Of ten different treatments tried the highest return came from use of 800 pounds of 10-4-20 fertilizer with no mulch. The lowest return was from a mulch of guinea grass without fertilizer.

Table 4.—Size of 'Sugar Loaf' pineapple as associated with different cultural treatments.

Treatment	Av. Wt. lbs.	Percentage of total crop		
		Less than 2 lbs.	2.0-2.9 lbs.	3 lbs. +
Fertilizer, no mulch	2.03	44.0	54.5	1.5
Mulch, glass Kraft + fert.	1.96	50.5	48.0	1.5
Mulch, glass Kraft	1.84	62.0	37.5	0.5
Mulch, black asphalt + fert.	1.79	65.0	35.0	0.0
Mulch, polythylene	1.71	75.0	25.0	0.0
Mulch, polyethylene + fert.	1.65	75.5	22.0	2.5
Mulch, black asphalt	1.63	65.0	35.0	0.0
Mulch, Guinea grass + fert.	1.60	76.5	23.5	0.0
Mulch, Guinea grass	1.57	86.5	13.5	0.0
Check Plot	1.52	89.0	11.0	0.0

TABLE 5.—Edible percentage of different size 'Sugar Loaf' fruits.

	Average lbs./*fruit	% edible flesh
Large	(2.12-2.35)	53.6
Medium	(1.72-1.90)	49.2
Small	(0.80-1.50)	48.8

TABLE 6.—Calculated yields per acre of 'Sugar Loaf' pineapple with different treatments.

Treatment	Pounds/acre
Fertilizer only	21,488
Mulch Polyethylene-fertilizer	15,821
Mulch, polyethylene	15,468
Mulch, black asphalt fertilizer	15,456
Mulch, glass Kraft-fertilizer	12,937
Mulch, Guinea grass-fertilizer	11,134
Mulch, black asphalt paper	10,990
Mulch, glass Kraft	9,278
Check	5,628
Mulch, Guinea grass	1,638

TABLE 7.—Some costs and returns per acre under different systems of cultural treatment, Canaan pineapple trials.

	PER ACRE					
	Costs				Returns	
	Weeding man-hours	Weeding, Cost 1	Materials 2	Materials & Labor	Gross 3 Return	Net 3 Return
Fertilizer	741.8	$556.35	$ 32.00	$ 588.35	$2148.80	$1560.45
Mulch, polyethylene	529.7	397.28	95.04	492.32	1546.80	1054.48
Mulch, polyethylene + fertilizer	588.9	441.68	127.01	568.69	1582.10	1013.41
Mulch, black asphalt + fertilizer	547.7	410.33	351.81	762.14	1345.60	583.46
Mulch, glass Kraft + fertilizer	744.9	558.68	364.64	923.32	1293.70	370.38
Mulch, black asphalt	571.9	428.93	319.81	748.74	1099.00	350.26
Mulch, glass Kraft	449.1	336.83	332.64	669.47	927.80	258.33
Mulch, guinea grass + fertilizer	763.2	572.40	446.61	1019.01	1113.40	94.39
Check Plot	728.8	546.00	0.00	546.00	562.80	16.80
Mulch, Guinea grass	728.0	546.00	414.61	960.61	163.80	796.81 (Loss)

1) 75 cents per hour.

2) Fertilizer and mulch.

3) 10 cents per pound.