



INFORMATION CIRCULAR

Date

February 1971

Classification

Tropical Crops

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COMMISSION

Serial No.

31

* THE EFFECT OF CULTURAL METHOD AND SIZE OF PLANTING
MATERIAL ON THE YIELD OF COLOCASIA ESCULENTA

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The Agriculture Development program by the Department of Agriculture of American Samoa calls for the production of tiapula (taro cuttings) for sale to new farms under the program. In 1968 - 1969, tiapula were sold to farmers who paid according to size, in the order from large to small, 3¢, 2¢, 1¢, .5¢ per tiapula. Farmers in American Samoa who purchased large tiapula (3¢ and 2¢) did so with the belief that they had higher yields. Other Samoan farmers, however showed no preference, saying that they found no difference in yield according to tiapula size, and have often asked to pay a lower price for large tiapula. Until this writing, no satisfactory answer based on experimental results has been obtained as to whether tiapula size affects yield and therefore would substantiate a price differentiation.

To reduce costs in the planting of taro, the Department of Agriculture of American Samoa, has advocated the reduction of labor through planting in a furrow in contrast to the older and slower method with a digging stick, the Samoan Oso. Acceptance of the furrow method of planting has been slow due to the belief that the corms produced are smaller than those planted by the Oso method, even though it is known that the furrow method is more efficient in requiring less time to plant a row of taro.

* Acknowledgment is made to the Government of American Samoa which sponsored the studies on which Mr. Ching's article is based.

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The experiment reported here, which was sponsored by the Department of Agriculture of American Samoa, was designed to compare the effects of the size of the planting material and the cultural method of planting on the yield of taro, and to observe any other possible combination effects.

METHODS AND MATERIALS

A six month experiment was conducted from September, 1969 to March, 1970, on the Department of Agriculture's production farm in Taputimu, Tutuila. The field design was a randomized complete block. The main effects were the method of culture at two levels, furrow and Oso, and the planting material size at three levels, 1 ϕ , 2 ϕ , and 3 ϕ .

Six replications or blocks were laid out at random with the six subplots again randomly arranged in each block. Each block was bordered by a guard row to account for any border effects. Each subplot had 15 plants of the cultivar Niue.

The tiapula categories of 1 ϕ , 2 ϕ , and 3 ϕ were chosen for this experiment as they are the more common sizes being sold. The tiapula sizes were standardized by sampling from piles of the three sizes being prepared for the market. Sampling revealed that when the number of leaf petioles were restricted to four per tiapula, they were selected by the people according to the diameter of the base of the pseudostem formed by the leaf petioles. The 1 ϕ tiapula were found to range from 33mm to 47mm in diameter, the 2 ϕ tiapula ranged from 48mm to 66mm and the 3 ϕ tiapula ranged from 67mm and greater in diameter at the base of the pseudostem.

Furrows were cut 254mm deep before planting. A 38.1mm pipe was used as an Oso. Each tiapula planted with the Oso was placed 254mm deep.

Fertilizer of a 10-20-20 rating was applied at 561 kg/ha immediately after planting, 30 days and 60 days after planting.

At the end of the 6 month crop period, 10 samples from each treatment were selected at random. Plant height, leaf number and the number of suckers produced were recorded. Yield from each treatment was recorded after tiapula was made from each corm by removing the pseudostem by cutting 3-5mm below the petiole base.

All data were subjected to analysis of variance and the Duncan's multiple range test (1) when it was necessary to locate further treatment effects.

RESULTS AND DISCUSSION

YIELD

The results of the experiment revealed that when the cultivar Niue was planted under the two different cultural methods, the furrow and the Oso, and with tiapula of three different sizes, yield was affected only by the size of the tiapula used. Higher yields were obtained as the tiapula size increased. Under the conditions of the experiment, the yield of Niue showed no significant difference between the furrow and the Oso method of planting.

In Table I, the mean yield for each treatment combination is presented. Mean yields increased from F-1 to F-3 and from O-1 to O-3. There were no significant difference between the planting methods when their yields were compared. Size of the tiapula, however, had an effect on yield as the mean differences between the three sizes proved to be significant. Significantly larger mean values were obtained with succeeding larger tiapula (Table II). The two factors did not interact to significantly increase or decrease yield.

Although further investigations of this nature must be repeated in several locations, it may be concluded that it would be valid to sell tiapula at different price levels commensurable to its productivity. Furthermore, since the two cultural methods do not affect corm yield, American Samoa's taro farmers should base their selection of one of the two methods on job efficiency.

PLANT HEIGHT

Plant height did not vary significantly with either of the two factors. In Table I, O-2 and F-3 have high averages of 92.52 cm and 95.09 cm respectively, but were not high enough to be significantly different from the other factor combinations.

LEAF NUMBER

The number of leaves per plant (Table I) was not affected by the cultural method nor the size of the planting material. All of the factor combinations had no significant differences in leaf number at the end of the experiment.

NUMBER OF SUCKERS

The number of suckers from the corm per plant was significantly affected by the treatment combinations. The number of suckers per plant increased (Fig. I) from 1¢ to the 2¢ size of tiapula under both the furrow and the Oso method of culture. Within the Oso method, the mean number of suckers per plant increased from 1¢ to the 2¢ tiapula, but was not large enough to be significant. The mean increase of suckers per plant was 1.2 between the 1¢ and 2¢ tiapula within the furrow method, but it too was not a significant increase (Fig. I). Between the Oso and the furrow methods of culture, the number of suckers produced by the 1¢ and 2¢ tiapula were also insignificantly different. However, although the mean number of suckers per plant were the same for F-2 and O-2, the number of suckers produced by a 2¢ tiapula under the furrow method was significantly larger than a 1¢ tiapula grown under the Oso method of culture.

A change in rate interaction was recorded between a 3¢ tiapula grown under the two cultural methods. The mean number of suckers per plant decreased insignificantly from 4.7 to 3.6 under the Oso. Conversely, the sucker production of a 3¢ tiapula under the furrow culture increased to be significantly higher than any of the other treatments (Fig. I).

The Oso method of culture involves punching a hole through the loose top soil and the undisturbed subsoil. The tip of the Oso in the hole is moved from side to side to loosen the subsoil and to open the hole. This may result in further compaction depending upon soil type. Therefore, the immediate soil condition around the hole in comparison, does not have the loose tilth of the furrow. This may be a factor in sucker production, in combination with the size of the planting material.

SUMMARY

The effects of the cultural method, planting in a furrow or by the Samoan Oso, and three sizes of planting material on the yield of a single cultivar of taro was investigated.

The three planting material sizes were determined by the diameter of the base of the pseudostem formed by the leaves of the taro. The three sizes were 33mm to 47mm, 48mm to 66mm and 67mm and larger in diameter at the base of the pseudostem. Yield was found to be affected by the size of the planting material and not by the cultural method. Yield became significantly higher as the planting material increased over the three sizes.

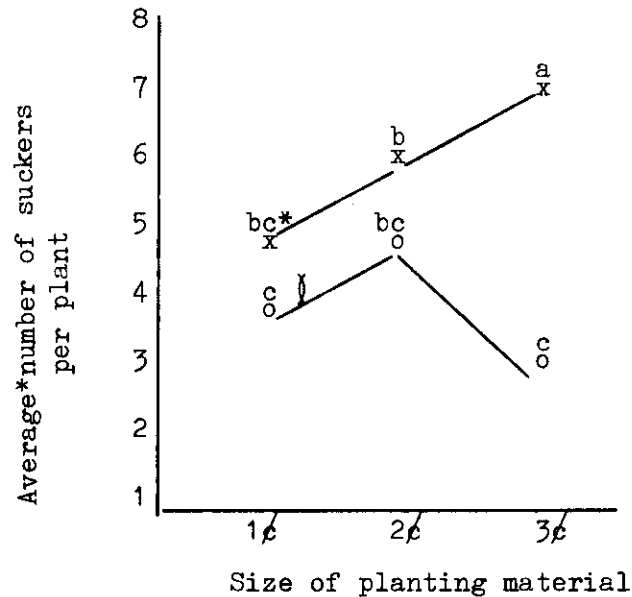
Plant height and leaf number after 6 months of growth were found not to be affected by any of the treatments.

The number of suckers produced per plant was also investigated. The experiment revealed that the mean number of suckers per plant after 6 months of growth was a product of the two factors, cultural method and size of planting material. A change in rate interaction was observed. The mean number of suckers per plant did not vary significantly by the size of the planting material while under the Oso method of culture. However, the mean number of suckers per plant was found to increase significantly over the other treatments when the diameter at the base of the pseudostem of a taro cutting (tiapula) was 67mm or greater, and when planted under the furrow method of culture.

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Fig. I. Mean number of suckers per plant.



* values from Table I

1 values with same superscript are not significantly different

Table I. Summary of cultural method and planting material size on taro.

Variables	TREATMENTS						
	F-1	F-2	F-3	O-1	O-2	O-3	S
Yield (kg)	27.24	31.90	56.50	27.40	38.30	46.60	3.47
\bar{x} height (cm)	82.56	85.61	95.09	83.54	92.52	87.20	1.81
\bar{x} leaf/plant	2.7	2.6	2.8	2.8	2.7	2.6	0.31
\bar{x} sucker/plant	4.7bc*	5.9b	7.2a	3.7c	4.7bc	3.6c	1.89

* values with same subscript are not significantly different.
 Furrow (F), Oso (O); 1, 2, 3, (1c, 2c, & 3c tiapula)
 Standard deviation of the mean (S)

Table II. Yield (kg) of 10 samples of
Niue by size of planting material

BASE DIAMETER OF TIAPULA

	33-47mm	48-66mm	67 / mm
\bar{x} (kg)	22.08c*	28.58b	37.55a

*values with same subscript are not
significantly different.

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