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Fodder Grass Cultivation Under Coconut †

A clump of Guinea grass growing under Coconut.

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SUMMARY

Satisfactory growth of Guinea grass could be obtained beneath mature stands of coconut in the wet zone of Ceylon with no loss of coconut yields, provided both crops are adequately manured. The locally available strain of Guinea grass is considered satisfactory for the present, though the Australian commercial strain now under test may prove to be somewhat superior. Planting should be done on prepared land with vegetative material (tillers) spaced 2½ feet apart in squares.

The plants should be manured with a mixture of 2 cwt. sulphate of ammonia, 1 cwt. muriate of potash and 1 cwt. saphos phosphate per acre per season, broadcast. Part of this fertilizer may be replaced with farm yard manure and irrigation with urine and dairy wash.

The plants should be cut down to six inches when they are in mid-bloom.

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† Preliminary popular article based on unpublished data.

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INTRODUCTION

It has been shown that within the wet zone of Ceylon inter-cropping coconut lands will not cause any reduction in the yield of coconut provided both crops are adequately manured (Santhirasegaram 1966). This was based on observations with perennial pasture grasses such as *Brachiaria miliiformis* (cori grass) and *B. brizantha* (signal grass) and fodder grasses such as *Pennisetum purpureum* (Napier grass) and *Panicum maximum* (Guinea grass). In more recent work Santhirasegaram and Ferdinandez (1967) have shown that under the shade of coconut *B. miliiformis* would be superior to *B. brizantha*. Based on these studies, Advisory leaflet No. 45 of the CRI was issued for the establishment and utilization of cori grass pasture under coconut.

From a survey of literature and performance of dairy cattle in the tropics, Santhirasegaram (1967) has recommended that a half-bred Sinhala-Jersey cow would be the most suitable dairy animal for the low country wet zone of Ceylon, under grazing conditions. Appadurai (1966) however suggests that European bred dairy cattle such as the Friesian and Ayrshire could be maintained under stall fed conditions. This needs to be tested. However, in view of the urgent need for increasing the production of whole milk around the city of Colombo, it is hoped that enterprising planters who take up the suggestion will meet with success.

Whatever the circumstances, the need for growing high yielding fodder grasses to provide feed for the dairy animals is imperative. This paper briefly describes the work in progress at the Coconut Research Institute on the establishment and management of fodder grasses, particularly Guinea grass.

Guinea grass, a native of Africa, thrives best in the humid tropics. It is adapted to a wide range of Soil types, but thrives best in relatively fertile, well drained heavy soils.

EXPERIMENTAL

Unless otherwise stated, all experiments were carried out under mature stands of coconut planted at least 25 feet apart in either direction. All plots of Guinea grass received a basal application of 1 cwt. muriate of potash and 1 cwt. saphos phosphate, per acre, broadcast at the time of planting and at the commencement of each season thereafter.

Experiment 1, Selection of suitable strains

For this purpose a large number of strains of Guinea grass were collected from overseas and were subjected to preliminary selection in pots and then in small field plots. From these, three promising strains were selected and a field trial was planted including the locally available material as control at Bandirippuwa estate.

There were thus four strains tested at four levels of nitrogen application (0, 1, 2 and 4 cwt/ac/season of sulphate of ammonia) in randomised blocks with 20'x10' plots. The planting material was about five rooted tillers at each point spaced two feet square. The experiment was sampled

for total dry matter yield when the local strain was in midbloom. Immediately following sampling, a herd of Sinhala-Sindhi cows was let in to graze the plots within three days. Grazing was done only during day time to minimise contamination of the nitrogen treatments from dung and urine. A sample was taken after grazing to determine the amount of material left behind. From these samples (before and after grazing) leaf/stem ratios were determined. Due to lack of analytical facilities, it was not possible to make other comparisons. *Table* 1 gives the mean dry matter yield produced from three grazing occasions during the first six months of the experiment.

The data show that the Australian commercial strain is somewhat superior in dry matter production, particularly at the moderate level of nitrogen application. It was also observed that the Australian blue and the Jamaican tall strains flowered earlier than the others, and were relatively more stemmy. Two or more season's growth is necessary to decide between the Australian and Ceylon commercial strains.

TABLE 1

Mean Dry Matter Yield (lb/ac) of three cuts from Four Strains of Guinea Grass grown at four levels of Nitrogen Application

	N_0	N_1	N_2	N_4	Mean
Ceylon Comm.	2996	3553	3769	3596	3478
Australian Comm.	2911	3641	4420	3971	3756
Australian Blue	637	1415	1560	1576	1297
Jamaican Tall	1875	2081	2185	2547	2172

Experiment 2—Planting Distance

In this experiment Guinea grass tillers (Cey. comm. strain) were planted at spacings of 1, 3, 5, 7 and 9 ft. apart in both directions, thus giving 25 distance of planting combinations. The experiment was planted in November, 1964, and after satisfactory establishment it was sampled on three occasions between June and November, 1965 for dry matter yield determination. The data is presented in *Table* 2.

TABLE 2

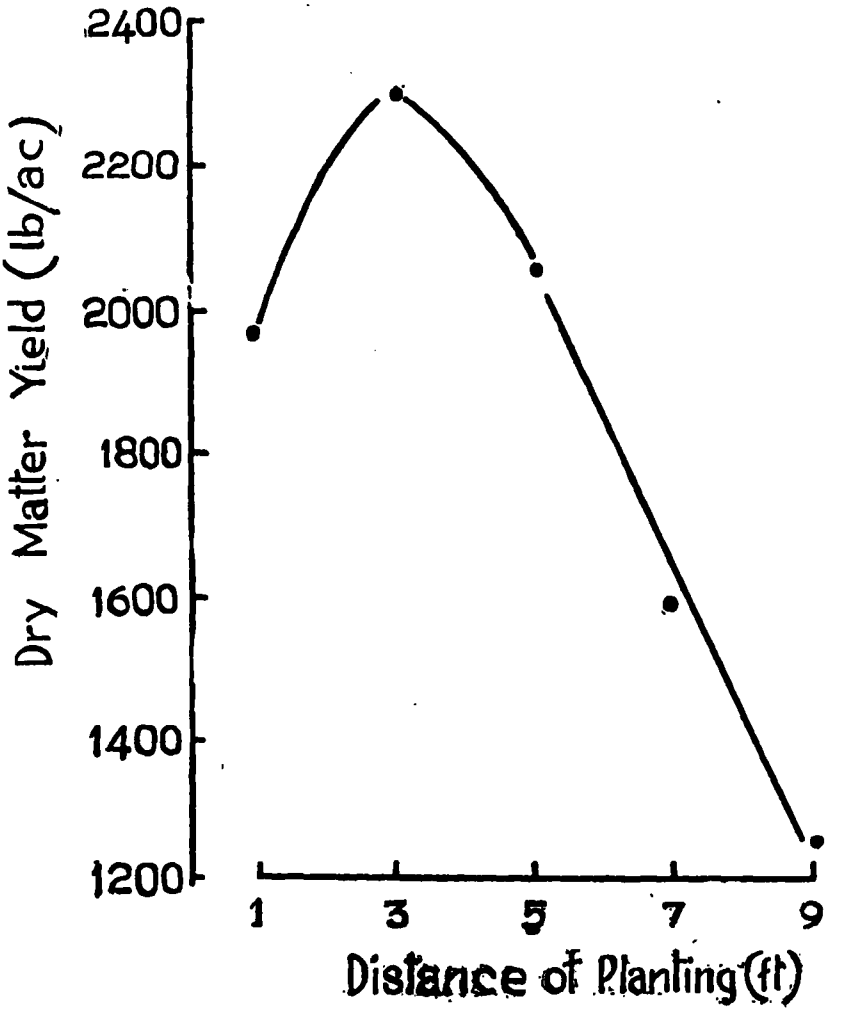
Mean Dry Matter Yield (lb/ac) per cut of Guinea Grass Planted at varying distances

Spacing (ft.)	1	3	5	7	9
1	1964	2294	2056	1596	1258
3	2124	2263	1854	1289	913
5	2124	2033	1548	975	657
7	1700	1602	1138	652	490
9	1020	972	624	498	411

In the first row of figures in *Table* 2 the plants may be considered to be a foot apart in one direction, while in the other direction they were also a foot apart in the first treatment (1 x 1). In the next treatment, while being a foot apart in one direction, they were 3 feet apart in the other (1 x 3),

and so on in the other treatments. Under these circumstances it will be seen that as the distance between plants increased, the dry matter yield rose and then dropped rather steeply (*Figure* 1). Using various mathematical equations it was found that the best planting distance for practical purposes was 2.5 feet in both directions i.e. in 2.5 feet square planting.

FIGURE 1



An interesting feature of this experiment was the low yield in the closest spacing treatment (I×I) compared to the next (I x 3). This is contrary to the generally accepted belief that as the space between plants decreases, or as the density increases the dry matter yield of herbage increases and then remains constant. This is called "ceiling yield".

To test this phenomenon further, another spacing experiment was carried out at Bandirippuwa in the open, where there was no shade from coconut palms.

In this experiment tillers of Guinea grass were planted in squares varying from (1 x 1) to (4 x 4), giving seven treatments of planting distances. The various planting distances, the corresponding densities and the dry matter yield (mean of four cuts) are presented in *Table* 3.

In this experiment too, the dry matter yield increased with density, reached a maximum and then declined. In *Figure* 2 the relationship between density and yield is shown as observed in the experiment, and that expected according to the concept of ceiling dry matter yield (Donald 1963).

FIGURE 2

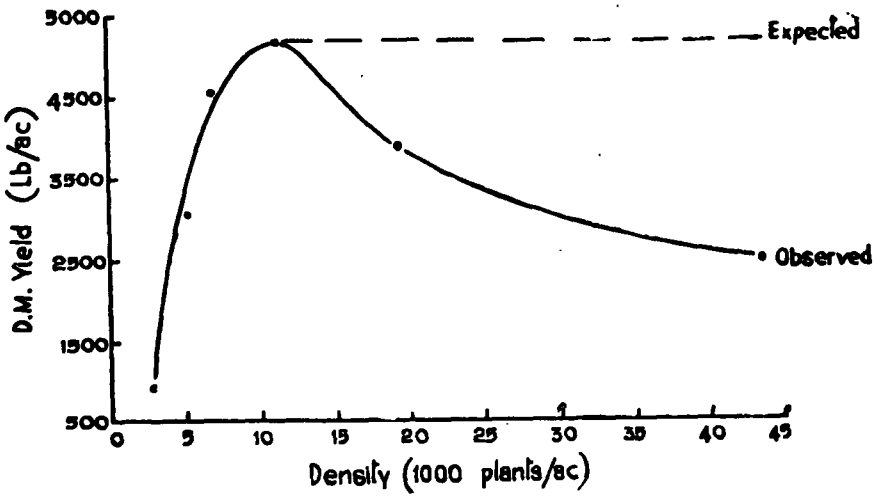


TABLE 3

Planting Distance, Plant Density (plants/ac) and Mean Dry Matter Yield (lb/ac) of Guinea grass grown in the open

Planting Distance	Density (Plants/ac)	Dry matter (lb/ac)
1.0×1.0	43560	2562
1.5×1.5	19360	3953
2.0×2.0	10890	5179
2.5×2.5	6969	4556
3.0×3.0	4850	3053
3.5×3.5	3556	2331
3.0×4.0	2723	929

Experiment 3—Height of Cutting Guinea Grass

This is part of a bigger experiment studying the effect of row spacing, nitrogen application and height of cutting, details of which were presented in the *Annual Report of the Agrostologist* 1964, 1965 and 1966. It was observed that in presence of applied nitrogen and spacing of 1'×2', cutting at 6

inches height gave a mean dry matter yield of 3993 lb/ac compared to 2502 lb/ac when the plants were cut to ground level. The low yields obtained when cut at ground level, may have been due to insufficient carbohydrate reserves for regrowth under such management.

Further it must be pointed out that cutting down to ground level is rather difficult and time consuming.

Experiment 4—Forms and frequency of nitrogen application and frequency of cutting on the dry matter yield of Guinea grass

In this experiment carried out at Ratmalagara, the effect of four sources of nitrogen (sulphate of ammonia, nitrate of ammonia, urea and farmyard manure) with equivalent amounts of nitrogen with a control of no nitrogen application, on the dry matter yield of Guinea grass was studied. The nitrogen was applied either as a single dose at the commencement of each season, or in two half doses, one at the commencement of the season and the other six weeks later. Further, each of these plots was divided into halves where one was cut every six weeks and the other every three weeks.

The results are shown in *Table* 4. It is obvious that cutting once in six weeks is far superior to cutting twice in the same period. Thus considering only the six weeks cutting treatments, application of nitrogen in one dose at the beginning of the season appears to be superior in the case of sulphate of ammonia, while split application appears to be superior with the other forms. Among the forms of nitrogen, sulphate of ammonia appears to be superior to the others. The experiment however needs to be continued for some length of time before it can be fully assessed for the performance of the forms and frequency of nitrogen application.

TABLE 4

The effect of forms and frequency of nitrogen application and frequency of cutting on the dry matter yield (lb/ac) of Guinea grass

Application/Season	Form of N	Cut 6 Weekly	Cut 3 Weekly
1	$(NH_4)_2SO_4$	5142	1255
	NH_4NO_3	4262	1648
	$CO(NH_2)_2$	3840	1867
	F.Y.M.	2977	1242
2 (Split)	$(NH_4)_2SO_4$	4719	1527
	NH_4NO_3	4436	1728
	$CO(NH_2)_2$	4349	1559
	F.Y.M.	3204	1231
No Nitrogen		2083	679

CONCLUSIONS

Guinea grass could be successfully grown under coconut in the wet zone without any loss of coconut yields, provided both crops are adequately

manured. The locally available strain of this grass is quite satisfactory, but the Australian commercial strain, now under test, may prove to be superior. In the evaluation of these strains, (as with pasture grasses), we have been limited, owing to lack of facilities to a comparison of dry matter yield produced and consumed. It is actually necessary to assess the nutritive value and digestibility of the herbage produced as well.

Both these strains of Guinea grass are similar in their growth habit, and the distance of planting studies with the local strain, may be reckoned from the practical point of view, to apply to the Australian strain as well. The optimum planting distance for practical purposes would be two and a half feet in squares; under coconut the manure circles may be kept free of the grass. Maximum yield in the experiment carried out in the open was obtained at 2' square planting. This was probably due to the absence of shade and other competitive factors from coconut.

Though some viable seeds are produced by both strains, for quick establishment and smothering of weeds that may come up, vegetative propagation would be more suitable. After the land is ploughed and harrowed, three to five tillers may be planted at each point. After ploughing and before planting it would be advisable to apply, broadcast, 1 cwt. saphos phosphate per acre. A fortnight after planting a mixture of 2 cwt. sulphate of ammonia and 1 cwt. muriate of potash may be applied per acre, again broadcast. These fertilizers need to be applied at the commencement of each season.

The grass may be cut down to six inches, each time the majority of the tillers are in midbloom. Such cutting should be possible once in six weeks during the monsoons and once in nine weeks during the off-season.

This continuous removal of feed from the fields, unlike grazing a pasture, would lend to heavy depletion of plant nutrients and hence deterioration of the land, with possible reduction in the yield of coconut. This could be overcome in two ways. The plant nutrients may be supplied wholly through fertilizers, in which case the fertilizer mixture for the fodder grass should be double that for cori grass pasture. Alternatively, the situation could be met partly by fertilizers and partly by putting back to the field the animal returns.

The latter method would actually be very profitable. The animal droppings and refused feed may be made into farmyard manure and whenever ready may be spread on the cut grass in the field. If the dairy buildings are situated on the elevated portions of the land and the fodder planted on the gentle slopes below, then the urine and dairy wash could be collected in tanks and used for irrigating the grass by gravitation. Such irrigation, particularly during the dry periods would benefit both the grass and the coconut.

It must be stressed that the manuring of coconut according to the recommendations of the C.R.I. must continue regardless of the method of manuring the fodder grass.

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