MORE PALMS, MORE NUTS, MORE COPRA

M. R. T. Wickramaratne

Introduction

It is common knowledge that a given area of land cannot support an unlimited number of plants. Each tree must have adequate room for its growth and development. There is a simple relation between a plant population or number of trees on a block and yield or the crop harvested. The yield is naturally a function of the number of trees harvested and the yield per acre is the product of the yield per tree and the number of trees per acre.

The maximum yield per tree is determined by the genetic capability of a tree to exploit fully the surrounding area. If all the requirements of the tree are supplied by the environment, maximum yield results. If the plants requirements are limited by some shortcoming of the environment, the yield is reduced. Thus, if there are too many palms on the land overcrowding may result in interference of each plant with its neighbours and competition for nutrients, moisture, light and air bringing about a lowered yield. If the stand falls short of the optimum, full advantage is not taken of the available area and maximum yields are not achieved. Hence spacing is an important factor influencing crop yields. The number of palms per acre which gives maximum productivity from any given piece of land is the optimum density and this is dependent on several factors much as variety, agroclimatic region, soil type, presence of other crops etc.

The local scene

There has been no uniformity in planting system in the cultivation of coconut. Consequently, there is wide variation in the stand of palms per acre. In 1945 Mr. W. V. D. Peries reported that spacings have ranged from 9 ft. (2.75 m) which amounts to 538 palms per ac. to 46 ft. (14 m) or 20 palms per ac, the commonest being 26 to 28 ft. (8 to 8.7 m), or 64 to 55 palms per ac. The spacing used varies from country to country and within a country from region to region. In small holdings, palms are planted haphazardly without any proper spacing or system. There is often a tendency to overcrowd and even to mix with other trees. Overcrowding is attributed to the ease of moving from tree to tree for tapping toddy and due to the valuation of land based on the number of trees rather than yield and is commonest in the Southern regions of Sri Lanka. In contrast, on larger holdings it has been customary to plant on the corners of a square, triangle or rectangle. Past experiences and traditions seem to have determined the spacings and systems of planting.

The accepted density of planting for Coconuts in Sri Lanka has been 64 palms/ac. (158 palm/ha) which may be obtained by several different planting systems, for instance:

26×26 ft square	(7.9m×7.9m)
28×24 ft rectangular	(8.5m×7.3m)
28 ft equilateral triangular	(8.5m)

Although this has been a long standing recommendation of the Coconut Research Institute, it was only provisional in the absence of experimental data. In other countries much wider planting distances of about 30–33 ft. square (or 40 palms/ac) and going up to as much as 49 ft for the San Ramon variety in the Phillipines are used. In the light of present knowledge it appears that all these accepted densities have been suboptimal.

Experimental evidence

It is not surprising that there are few successful spacing experiments for coconuts, considering the large extents of land required and the length of time over which such a trial would

have to be carried out to obtain meaningful results.

As far back as the early nineteen-sixties, the need for experimental evidence for spacing of coconuts under local conditions was realised and a planting distance trial was laid out in 1964 at the Pothukulama Research Station in the Chilaw district, over an extent of 10 acres. This trial was initiated by Dr. D. V. Liyanage while he was Botanist, the experimental design being provided by Mr. V. Abeyawardana and the results analysed and published by Dr. M. A. P. P. Manthriratne who succeeded Dr. Liyanage, in collaboration with Mr. Abeyawardena. The trial tested four different between row spacing and four within-row spacings and about seven different densities, ranging from 45 to 116 palms per acre.

The results (shown in Table 1) indicate significant differences in the mean yield per palm for the different spacings with an increase in yield with increase in distance between palms. A regrouping of the information displayed in Table 1 so that similar densities are considered together, as in Table 2, shows that it is the density rather than the rectangularity that affects the yield per palm. Thus it was possible to get the same range of yield with several different planting systems, all giving the same density.

The coconut cultivator is more concerned about the total yield from his entire plot rather than the yield of each individual palm. Our data as well as that from other trials suggest that more coconut palms per unit area means more coconuts per unit area and this increases progressively even upto a density of about 96 palms per acre (239 per ha). The addition of more palms per unit area may reduce, by competition, the number of nuts per palm but this is more than compensated for by the increase in the number of palms.

Since the land available for coconut cultivation is limited, it is important to make the fullest possible use of the available land by increasing the number of palms per unit area and consequently the number of coconuts collected from the land.

The important point that emerges from this study is that there is a range of spacings and systems of planting over which the yield per unit area does not change very much. There is a range of densities over which the addition of extra individuals to the population may reduce by competition the value of the yield per palm but this reduction is compensated for by the increased number of trees.

A study of vegetative characters was also carried out in the trial planted at Pothukulama Research Station. It was found that spacing did not significantly influence either the total leaf production or the period taken for initial flowering. However, it did have a significant effect on the length of leaves and girth of trunk. The general trend was for the leaves to get shorter and girth to reduce as the distance between palms increased. The changes in weight of nuts with spacing were also investigated recently. Here too the general trend was for an increase in weight of husked nut with spacing so that nuts of increased weights were obtained at wider spacings .

Recommendations

We are now in a position to offer the grower a choice of systems and densities of planting. Our present recommendation is a density ranging from 70 to 90 palms per acre (170–220 palms per ha) depending on the agroclimatic zone. Details are given in Table 3. The narrowest spacing (or densest planting) is recommended for the less favourable regions, for example the dry zone or where the soil is infertile or of hard texture while the widest spacing is recommended for the zone, rich soils and more favourable areas.

The system of planting is less important than the density. A certain density may be obtained by a variety of systems and spacings, examples of which are listed in Table 4. A rectangular system is to be preferred for intercropping as there would be more light penetration and more space. Although a triangular planting was not tested in this trial from theoretical considerations it is best for monoculture for the following reasons:

(i) more palms can be accommodated on a given extent of land without interference of fronds of neighbouring palms.

(ii) the ground is more effectively shaded so that soil remains cool and moist and weed growth is checked.

Conclusion

Clearly more palms per acre results in more and heavier nuts per acre and therefore more copra. However, it is important that the plantation is well-maintained and also that there is uniformity of the plantation with any casulties supplied in time.

TABLE 1 **BETWEEN-ROW AND WITHIN-ROW SPACINGS, NUMBER OF PALMS/ACRE AND NUMBER OF NUTS/PALM/YEAR**

Between-row

Within-row Ft.	*m.*	25 / 7.62	30 / 9.15	35 / 10.68	40 / 12.20
15	4.58	116 **48.64**	96 **48.82**	82 **51.22**	72 **70.88**
18	5.49	96 **55.98**	80 **70.12**	69 **79.79**	60 **75.88**
21	6.41	82 **57.22**	69 **67.09**	59 **73.00**	51 **86.21**
24	7.32	72 **71.36**	60 **71.62**	51 **75.47**	45 **91.89**

TABLE 2 **YIELD PER PALM AS INFLUENCED BY DENSITY AND RECTANGULARITY**

Group	*Inter-row Spacing* ft	m	*Intra-row Spacing* ft	m	*Rectangularity Inter-row/ Intra-row*	*Density* palms/acre	palms/ha	*Mean yield*	*Yield per unit area* nuts/acre	nuts/ha
A	30	9.15	15	4.58	2.00	96	239	54.46		
	25	7.62	18	5.49	1.39	96	239	53.89	5242	12948
B	35	10.68	15	4.58	2.33	82	205	61.88		
	30	9.15	18	5.49	1.67	80	199	61.31	5039	12447
	25	7.62	21	6.41	1.19	87	205	60.75		
C	40	12.19	15	4.58	2.67	72	179	69.30	4850	11979
	35	10.68	18	5.49	1.94	69	171	68.73		
	30	9.15	21	6.41	1.43	69	171	68.17		
	25	7.62	24	7.32	1.04	72	179	67.60		
D	40	12.19	18	5.49	2.22	60	150	76.15		
	35	10.68	21	6.41	1.67	59	146	75.59	4549	11237
	30	9.15	24	7.32	1.25	60	150	75.02		
E	40	12.19	21	6.41	1.90	51	128	83.01		
	25	7.62	24	7.32	1.04	51	128	82.44	4287	10589

Note: The CRI reccommendations on planting densities are given in the Advisory Circular No. A1 – Editor.

TABLE 3 RECOMMENDED PLANTING DENSITIES

Agroclimatic Zones	*Rainfall (mm)*	*Planting Density (approx.)* *(per–ac)*	*(per–ha)*
1. Wet	1875–2500	70 to 80	173 to 198
2. Intermediate			
2.1 Semi wet	1500–1875	74 to 80	183 to 198
2.2 Semi dry	1000–1500	80 to 85	198 to 210
3. Dry	1000	85 to 90	210 to 222

TABLE 4 PLANTING SYSTEMS

1. Rectangular System

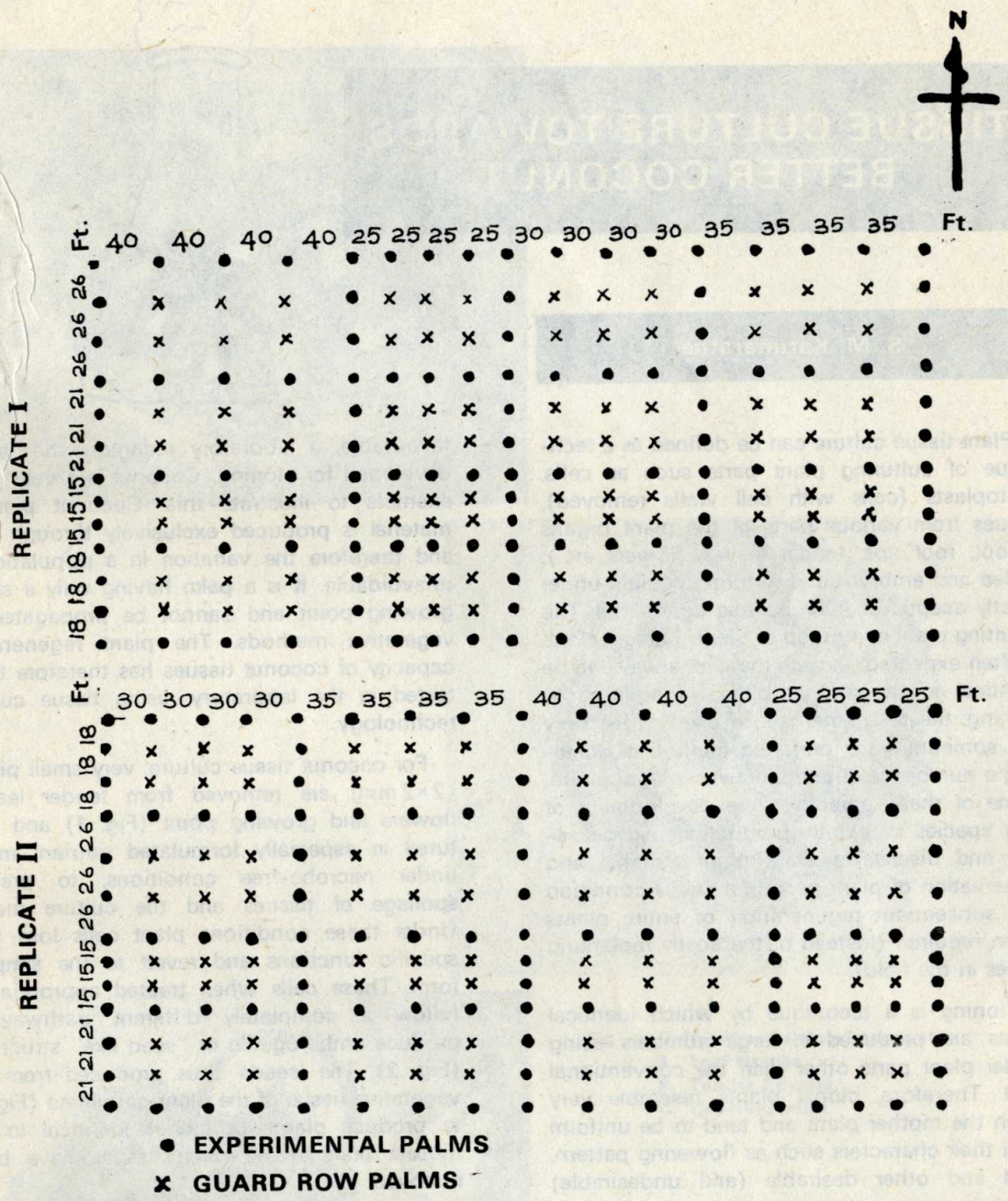
Distance		*Palms per*	
Feet	*Metres*	*Acre*	*Hectare*
18×35	5.5×10.7	69	170
21×30	6.4× 9.2	69	170
22×28	6.7× 8.5	71	175
24×25	7.3× 7.6	73	180
18×30	5.5× 9.2	81	200
21×25	6.4× 7.6	83	205
18×27	5.5× 8.2	90	222
20×24	6.1× 7.3	90	222

2. Equilateral Triangular System

Distance		*Palms per*	
Feet	*Metres*	*Acre*	*Hectare*
27×27×27	8.2×8.2×8.2	69	170
26×26×26	8.0×8.0×8.0	74	183
25×25×25	7.6×7.6×7.6	80	198
24×24×24	7.3×7.3×7.3	87	215

3. Square System

Distance		*Palms per*	
Feet	*Metres*	*Acre*	*Hectare*
25×25	7.6×7.6	70	173
24×24	7.3×7.3	76	188
23×23	7.0×7.0	82	203
22×22	6.7×6.7	90	222


N
REPLICATE I
Ft. 40 40 40 40 25 25 25 25 30 30 30 30 35 35 35 35 Ft.
26 26 26 21 21 15 15 18 18 18
REPLICATE II
Ft. 30 30 30 30 35 35 35 35 40 40 40 40 25 25 25 25 Ft.
18 18 26 26 26 15 15 21 21 21
● EXPERIMENTAL PALMS
× GUARD ROW PALMS