METHODS OF UNDERPLANTING IN SENILE COCONUT PLANTATIONS*

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A number of coconut plantations in Ceylon have reached a condition of total senility and show a progressive decline in yield. The age at which a coconut palm reaches this condition cannot be defined precisely as a number of environmental factors are involved. A reliable index is the yield: if production decreases gradually in spite of regular cultivation, balanced manuring and good management and in the absence of any adverse effects due to pests and diseases, then it could be presumed that the decline is due to the age of palms.

A field experiment was carried out at Bandirippuwa Estate on a block of land with senile palms, to test three methods of underplanting as follows:—

A. Late thinning:—Underplanting with the old stand of palms remaining and removing the latter 8 years later.

B. Gradual thinning:—Underplanting and removing the old stand of palms gradually, during the first 8 years. In this instance 12 percent of the old palms that were very close to the new planting sites, were removed before transplanting seedlings. Thereafter, the old palms were removed yearly and percentage of old palms remaining at the end of each year was as follows: 1st year—82, 2nd year—72, 3rd year—60, 4th year—42, 5th year—32, 6th year—20, 7th year—8, 8th year—none. During the first two years all the old palms within 8 feet from the new planting sites were removed, and thereafter removal was largely based on yield of nuts per palm.

C. New clearing:—Planting after removal of the old stand of palms completely.

The pattern of yearly leaf production during the first six years of growth of the young palms was related to the treatment type. In the first year after planting, leaf production was practically the same for all treatments. The plants in the new clearing treatment have produced significantly more leaves than those in either of the other two treatments,

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from the second to the sixth year. Leaf production between gradual thinning and late thinning treatments has been in favour of the former from the fourth year; the differences between the two treatments during the second and third years, being not significant. As far as leaf production of a young palm during the first six years are concerned, the three systems of underplanting could be placed in the following order of merit: (i) new clearing (ii) gradual thinning and (iii) late thinning.

Flowering-period

The percentage of palms in flower, cumulative for each year is given in Table I.

TABLE I

Percentage of palms in flower

	Year after planting					
	5th	*6th*	*7th*	*8th*	*9th*	*10th*
New clearing	11.4	39.4	60.6	83.4	89.7	94.3
Gradual thinning	2.9	21.1	43.4	65.1	74.3	78.3
Late thinning	1.1	11.4	24.0	44.0	54.9	67.4

From the 7th to the 10th years, significant differences exist only between new clearing and late thinning treatments, differences between other combinations of treatments being not significant. The presence of the old stand of palms has retarded the growth of the second plantation considerably that only 55 per cent of the palms were in flower during the 9th year, whereas over 74 per cent have flowered in the other two treatments.

Yield of nuts and copra

The palms started bearing in the 7th year after planting and the yield per acre has progressively increased from the 7th to the 12th year (Table II). There was a heavy incidence of yellowing of leaves due to magnesium deficiency in the 9th and 10th years in three of the blocks, and consequently the progressive increase in crop during the 10th year has been low relative to the increase in crop recorded in the 9th year.

TABLE II

Yield per palm in full bearing and yield per acre

	Per palm in full-bearing		*Per acre*	
	Nuts	*Copra (lb.)*	*Nuts*	*Copra (cwt.)*
7th year after planting				
New clearing	..	..	337	1.91
Gradual thinning	..	..	146	0.64
Late thinning	..	..	42	0.24

TABLE II—(*Contd.*)

Yield per palm in full bearing and yield per acre

	Per palm in full-bearing		*Per acre*	
	Nuts	*Copra (lb.)*	*Nuts*	*Copra (cwt.)*
8th year after planting				
New clearing	44	26.2	1064	5.69
Gradual thinning	49	27.6	537	2.71
Late thinning	32	19.2	225	1.21
9th year after planting				
New clearing	46	25.6	1720	8.42
Gradual thinning	47	24.3	1244	5.76
Late thinning	43	23.9	594	2.96
10th year after planting				
New clearing	36	20.0	1766	8.71
Gradual thinning	34	18.2	1263	6.03
Late thinning	34	16.4	790	4.04
11th year after planting				
New clearing	45	27.3	2389	12.94
Gradual thinning	45	26.9	2014	10.57
Late thinning	48	30.3	1584	8.65
12th year after planting				
New clearing	—	—	2906	15.31
Gradual thinning	—	—	2715	13.75
Late thinning	—	—	2007	11.21

The yield per acre in the above table represent yield per acre of land and is not based on the yield per bearing palm multiplied by the appropriate number of palms per acre.

When the critical differences were evaluated, the only significant factor was that palms in the new clearing treatment have given higher yield of nuts and copra than those in the late thinning treatment during the 8th, 9th and 10th years, except yield of copra in the 8th year. The differences in yield between new clearing and gradual thinning treatments, and the latter and late thinning treatments have not reached the required significant level.

Comparison between the three methods of underplanting

In the evaluation of a suitable system of underplanting senile coconut plantations, one has to take into consideration the economic aspect wherein a reasonable income could be derived from the old palms

without unduly retarding the growth of the young palms. From the results presented above, it is clear that the treatments could be placed in the following order of merit with respect to growth, bearing age and yield of the young palms: (*a*) new clearing, (*b*) gradual thinning, (*c*) late thinning.

The presence of the old stand of palms in the late thinning treatment has retarded the growth of the underplantation by over 50 per cent at the end of the 8th year, so much so, that only 44 per cent of the palms were in flower and 83 per cent were non-bearing, whereas in the new clearing treatments the comparative figures were 83 and 50 per cent respectively; even at the end of the 10th year, 58 per cent of the palms were non-bearing. Therefore the late thinning system is not a satisfactory method of underplanting.

If new clearing method is adopted, there is a total loss of crop from the old palms during the first seven years—14,000 nuts (approx.)—per acre in this instance. The yield of palms during the first few years of bearing has not been extraordinarily high to compensate for the loss in crop from the old palms (Table III). Thus, the new clearing system of underplanting will not be suitable from an economic point of view.

The growth of palms in the gradual thinning treatment has been depressed relative to palms in the new clearing treatment, but the magnitude of the differences in yield of nuts (Table II) is not so high during the 8th to 10th years, and thereafter the differences are fast evening out. Further, if the yield of the young palms and the remaining old palms are estimated, the gradual thinning method is at a distinct advantage over the new clearing (Table III), having given nearly 6,000 nuts per acre more than the latter during the first 12 years.

TABLE III

Total yield of nuts per acre that may be gathered during the first 12 years under the three different systems of underplanting

	From underplantation	*From old plantation (estimated)*	*Total (approx.)*
New clearing	10182	Nil	10000
Gradual thinning	7919	8000	16000
Late thinning	5332	14000	19000

The results of this experiment indicate that a system of gradual thinning of old coconut palms is a feasible method of underplanting senile plantations. In this instance 18 per cent of the old palms were removed during the first year and immediately before planting, and thereafter 10 per cent (approx.) each year, and the final lot being removed during the 8th year.