HEDGE PLANTING FOR COCONUTS ?

By D. V. LIYANAGE

Botanist, Coconut Research Institute

Summary

As the available planting matrial in coconuts is so mixed, a system of hedge planting is suggested whereby more seedlings than necessary are transplanted and selectively thinned to a required density so that the ultimate stand is composed of high-yielding palms. Theoretical considerations are adduced in favour of this system of planting but no definite recommendations are made owing to the lack of supporting experimental evidence. The Institute is initiating a field trial to compare hedge planting with the conventional method of planting.

Introduction

Since coconut palms were planted on a plantation scale in Ceylon, the common practice has been to transplant seedlings at the corners of a geometrical figure—a square, a rectangle or a triangle—so that the plants within rows and columns are in straight lines. It is difficult to conceive how this practice originated ; presumably the European settlers who were conversant with similar systems of planting in orchard crops introduced it to the island. Let us examine the genetic make-up of available planting material and consider whether maximum yield could be obtained from a unit area with the orthodox system of planting.

Variations between palms

The variety of coconut palms grown on a commercial scale in Ceylon is heterozygous due to cross-fertilisation and in the absence of any known methods of vegetative multiplication there is considerable variation between plants raised from seed-nuts. Each plant has its own specific gene dose different from another. Multiple genes determine the character yield of copra and their expression depends on the environment. Consequently, it is very unlikely that a uniform stand of good palms could be obtained however much coconut seedlings derived from *open-pollinated* seed-nuts are selected, at least during the first few generations of a selection programme, unless the stand is thinned.

A cursory glance at any coconut plantation would reveal the extent of variability between palms. These variations are illustrated in figure 1 and tables 1, 2 and 3. Figure 1 represents summarised data collected for a period of twenty years from a block of 300 palms about sixty years old now. Tables 1, 2 and 3 represent data collected during the eleventh to fourteenth years of a younger plantation, planted in 1939 with stringently selected seedlings.

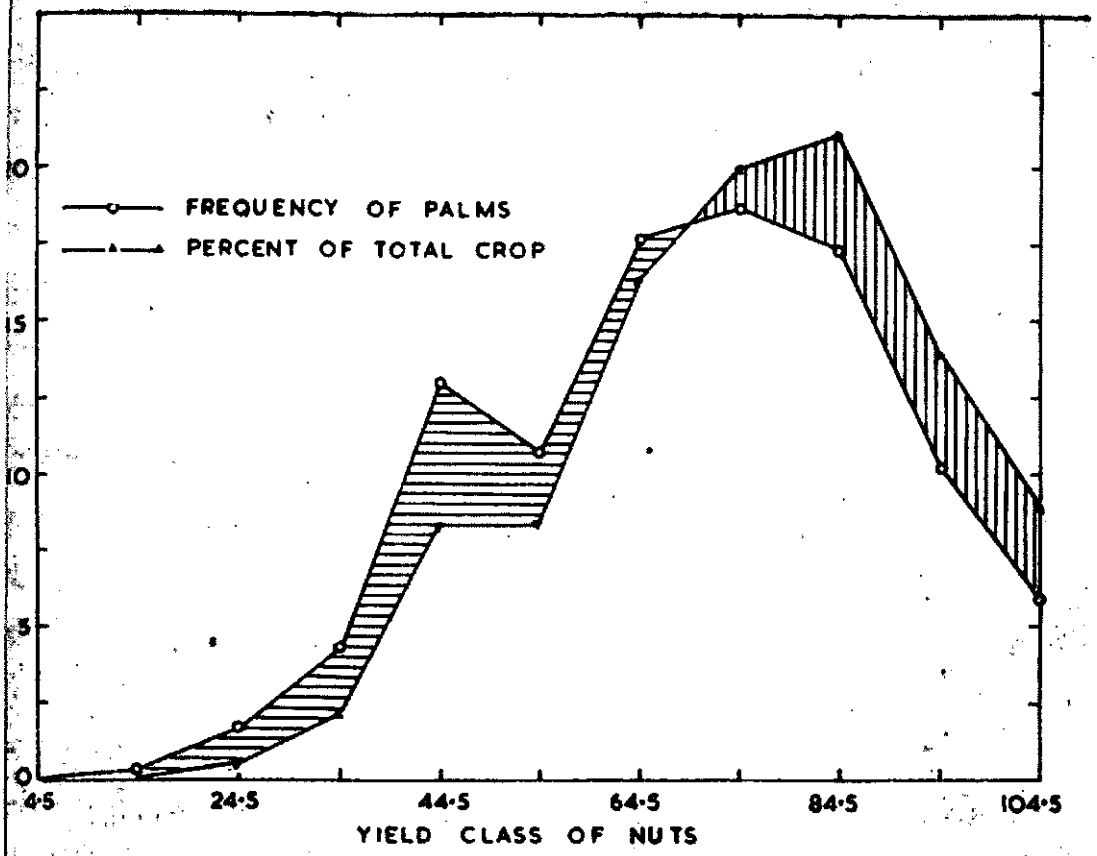

Fig. 1. The frequency of palms and the percentage of crop contributed by each yield-class of a high-yielding block.

In figure 1, vertical hatching covers segments of the curves where a smaller percentage of palms have given a larger percentage of crop and horizontal hatching where more palms have given a smaller crop. 30.0 *per cent of the palms* giving a yield less than 59 nuts a year ***have contributed only*** 19.7 *per cent of the total crop*, and 33.6 per cent of the palms giving more than 80 nuts a year have contributed 44.0 per cent of the crop. These statistics are for a high-yielding block with an average of 70 nuts per palm per year and if a low-yielding block is considered there is bound to be a higher frequency of palms giving poor returns. It is these palms that offset good averages that could be obtained from a plantation.

TABLE I

Frequency distribution of flowering-period of palms

Class (flowering-age in months)	*Frequency of palms*	*Percentage of total*
54-59	3	3.8
60-71	29	36.7
72-83	25	31.6
84 and over	22	27.8

Average flowering period : 78.3 months.

TABLE II

Frequency distribution of yield of nuts per palm per year

Class (yield of nuts)	*Frequency of palms*	*Percentage of total*
0-19	15	9.4
20-39	25	15.6
40-59	56	35.0
60-79	36	22.5
80-99	23	14.4
100-119	5	3.1

TABLE III

Frequency distribution of yield of copra per palm per year

Class (in lb.)	*Frequency of palms*	*Percentage of total*
0- 9	18	11.3
10-19	26	16.3
20-29	42	26.3
30-39	40	25.0
40-49	27	16.9
50-59	7	4.4

From the above tables it is clear that there is considerable variation between palms inspite of stringent selection of seedlings derived from open-pollinated seed-nuts. *Nearly 30 per cent of the palms are late flowering (more than seven years) and low-yielding (less than 40 nuts or 20 lb. of copra per palm per year).*

Besides the variations in yield and flowering-age between palms other significant differences occur with regard to habit of the palm, orientation of crown, length of bunch—and leaf-stalk, size and quantity of copra per nut, degree of tolerance to drought and water-logging, differential responses to manuring end, etc. Roughly it can be safely said that nearly 30 per cent of the palms show various undesirable characters inspite of a rigid selection of seedlings on the current methods. These characters could be eliminated to a large extent by hybridisation and selection, but that is a long range programme of research. How best then could the low-yielding palms and those that show poor agronomic characters be eliminated from the plantations that are being opened in the interim period ?

Hedge planting

One possible approach to the problem is by a change in the present conventional system of planting to *hedge planting* where more plants than necessary are transplanted and systematically thinned to the required density.

It is possible to space the rows as usual and plant about 30 per cent more seedlings within each row. During the first three years of transplantation all the palms that show poor growth should be removed ; in a field trial at Bandirippuwa in a low-lying area about 20 per cent

the stand could have been removed due to poor growth within the first three years. The remaining extra palms could be removed during the sixth and seventh years, out of those showing extreme undesirable characters and late flowering types. The remaining stand will be to the required density and the more important factor is that they will be composed of good desirable types of palms only.

For instance with a density of 74 palms to the acre, planting could be done in the following manner. Rows are lined out 28 feet apart and within the rows the planting holes are marked 5 feet apart, such that each hole alternates with the one on the next row. Thus, altogether holes will be marked per acre and a seedling planted on each site, i.e. approximately 30 per cent more seedlings will be planted. After transplantation, each plant should be examined periodically and those that fall below the required standards should be uprooted leaving 74 palms to the acre finally.

With the orthodox method of planting, spacings of 24 × 24 feet on the square, or 26 × 26 feet on the equilateral triangle give about 74 palms to the acre. The palms are uniformly spaced in rows, columns and even diagonally, whereas with hedge planting only rows are evenly spaced and palms within rows are unevenly distributed.

The intrinsic advantage of hedge planting is that by the tenth year of planting, a very uniform stand of good yielding palms could be obtained without affecting either the required density or the large uniformity between palms in a block. It may be said that thinning could be done even with the orthodox method of planting. Yes, but with a difference. Every plant removed has to be replaced; if a three year old young palm is uprooted, three years are lost as the supply would take the same period if not longer to show the same growth as the replaced palm. In the process of thinning, the palms that show poor growth, or are late flowering, or those that do not respond to manuring, etc., are removed so that the ultimate stand conforms to a set of desirable agronomic characters.

The spacing of palms within rows is irregular with hedge planting and it may be that three to four adjacent palms may turn out to be good yielders and consequently not removed and *vice versa*. It is very unlikely that such close juxtaposition of palms would adversely affect their growth and yield and in support of this hypothesis there is the observation of Preuss (1911)* that ' A common observation that appears to me to be worthy of note here is the presence of small groups of 3 to 6 palms, not more than 10 to 16 feet apart from one another, which are very heavy yielding and, in this respect scarcely inferior to single palms normally spaced '. Even in our village gardens groups of five to six very productive palms spaced not more than 12 feet apart are common.

With hedge planting land could be cultivated conveniently between rows. The direction of the hedge-rows has to be in relation to the slope of the land so that ploughing could be done on the contours.

Expenditure would be about 30 per cent more during the first two years on holing and filling, cost of seedlings and upkeep of the plants and thereafter less in proportion to thinning. After the eighth year, when the required stand is established, expenditure would be same as with conventional planting. The increased cost during the early stages is likely to be more than compensated with increased yields from the plantation.

*Preuss (1911). *Die Kokospalmae and ihre Kulture* (extract from a translation by Mr. W. V. D. Peiris.)

Hedge planting has been successfully adopted in other perennial crops, e.g. *Hevea* rubber, forest and fruit trees. At one time mixed plantings of rubber and *Robusta* coffee were done in Indonesia ; the rubber was usually grown in hedge-rows, the distance between rows being 9 feet and the coffee in the wide spaces in between the rubber rows. According to Dijkman (1951)* ' Both commercial and experimental data from such plantings have shown that the rubber trees in these avenues, selectively thinned on a basis of yield up to 30 per cent of the original stand, produced anywhere from 30 up to 50 per cent more than conventional rubber plantings of the same clones or seedlings initially planted on 6 × 6, 6 × 7, or 7 × 7 meter spacings and selectively thinned from 20 up to 40 per cent. Considering that in these crops more homogeneous clonal planting material is available and yet more plants than necessary are transplanted and selectively thinned to the required density, the case for hedge planting manifests itself more in the case of coconut palms as the available planting material is so heterogeneous.

*Dijkman M.J. (1951) *Hevea—Nearly 30 years of Research in the Far East.* University of Miami Press.

P. L. KAPITZA (VOKS BULLETIN, NO. 9-10 (1943)) BELIEVES THAT THE DIRECTOR OF A LABORATORY CANNOT BE EFFECTIVE UNLESS HE WORKS WITH HIS OWN HANDS. HE SAYS: ' ONLY WHEN ONE WORKS IN THE LABORATORY ONESELF, WITH ONE'S OWN HANDS, CONDUCTING EXPERIMENTS, EVEN THE MOST ROUTINE PARTS OF THEM,—ONLY UNDER THESE CONDITIONS CAN REAL RESULTS BE ACHIEVED IN SCIENCE. GOOD WORK CANNOT BE DONE WITH OTHER PEOPLE'S HANDS. A PERSON WHO DEVOTES TEN OR TWENTY MINUTES A DAY IN DIRECTING SCIENTIFIC WORK CAN NEVER BE A GREAT SCIENTIST. AT LEAST, I NEVER SAW OR HEARD OF A GREAT SCIENTIST WHO WORKED IN THAT MANNER, AND I DO NOT THINK IT CAN BE DONE. I AM CERTAIN, THAT THE VERY MOMENT EVEN THE GREATEST SCIENTIST STOPS WORKING IN THE LABORATORY HIMSELF, HE NOT ONLY CEASES TO DEVELOP *BUT*, IN GENERAL, CEASES TO BE SCIENTIST '. KAPITZA, HOWEVER, IS SPEAKING OF AN INSTITUTE EMPLOYING ONLY A VERY FEW SCIENTISTS, AND HE ACKNOWLEDGES THAT WHEN THE WORK EXPANDS AND DEVELOPMENT WORK IS INVOLVED, THE TIME OF THE DIRECTOR WILL BE TAKEN UP WITH OTHER MATTERS THAN WORK IN THE LABORATORY.

G. E. K. Mees, *The Path of Science*, John Wiley & Sons, Inc.