CROP FLUCTUATIONS IN COCONUT

V. Abeywardene

Introduction

Efficient estate management rests basically on the extent to which the management understands its crop variations in relation to known factors.

In this respect the management of a coconut estate can be very disconcerting indeed. Unlike other plantation crops, coconut is known to exhibit phenomenal crop fluctuations, quite apart from variations arising as the result of some agronomic innovation or other. These seasonal fluctuations may not be quite within one's control; yet they are invariably large enough to mask the crop variations due to other factors, in which the management is deeply concerned. Therefore some understanding of these seasonal crop fluctuations is well-nigh essential for efficient estate management.

The development of a bunch of coconuts

Before one attempts to understand crop variations, it may be useful to get some idea of the various phases of development of a bunch of coconuts. The coconut palm delivers one mature bunch or crop more or less regularly each month. Each such crop goes through a cycle of development lasting about $3\frac{1}{2}$ years before it is ready for harvesting. The primordium of the inflorresence (or bunch) is formed about 32 months before the flower opens out; that of the spikes about 15 months before; and of female flowers about 12 months before. Within about 4 weeks of the opening of the flower, some of these female flowers get successfully pollinated to form nuts, and the unpollinated flowers fall off. This phenomenon is termed "setting". Some of these nuts fall off within the early months of nut development. This is termed "immature nutfall". After a lapse of about 12 months from the opening of the flower, the bunch is ripe and ready for harvest. Among the harvested nuts too one may find some which are either without kernal or with imperfectly developed kernal. These are termed empties or barren nuts.

Crop fluctuations within the year and the contributory fluctuations of the individual crop components

The magnitude of a particular crop will thus depend on a series of growth factors or crop components inherent in this development cycle. These are (1) the number of bunches produced (2) number of female flowers per bunch (3) percentage setting (4) immature nutfall (5) incidence of barren nuts and (6) copra out-turn.

What are the relative magnitudes of the six bi-monthly crops within the year and what crop components are primarily responsible for making each crop what it is ?

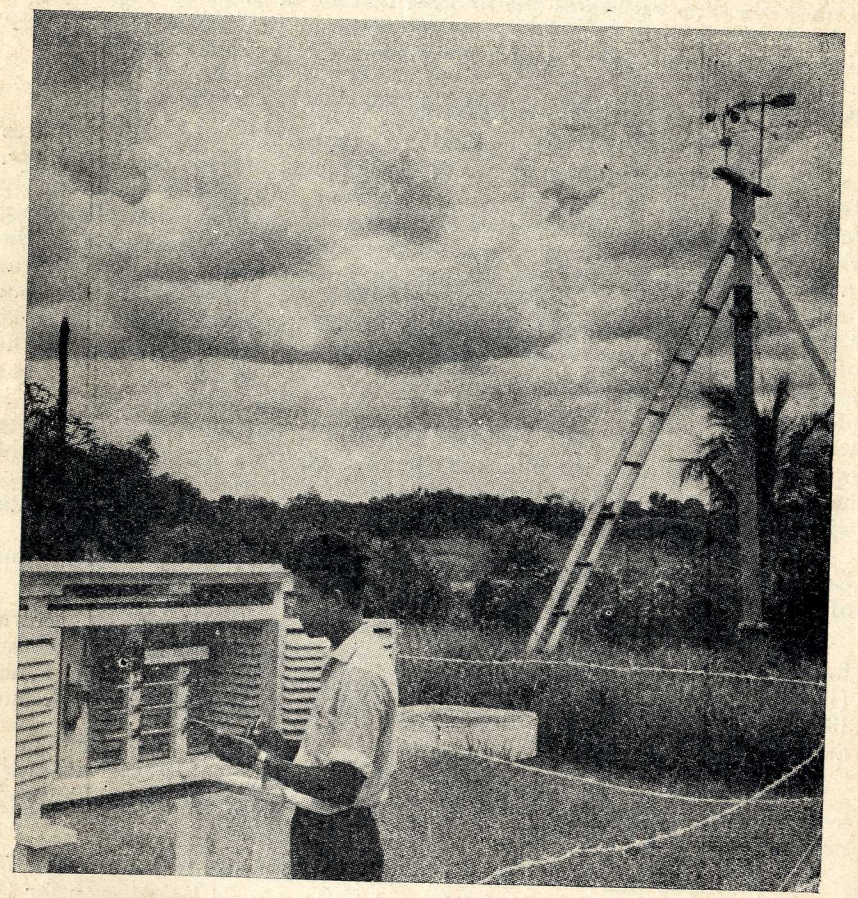
The first crop (harvested during January to February) is normally 27% below the average for the six picks and is the second lowest crop for the year. It has the lowest percentage setting, the lowest number of bunches,

and the heaviest immature nutfall. These adverse conditions are offset to a certain extent by the fact that it has the best copra out-turn.

The second crop (i.e. March to April) is 14% above the average for the six picks. It is conditioned by slightly above average values in all the crop components. It records the second best copra out-turn.

The third crop (i.e. May to June) has the highest crop within the year, being 42% above the average. This is brought about primarily by very heavy setting. The number of bunches harvested is also the highest. It records the lowest immature nutfall. The copra out-turn is slightly above average and third best. The incidence of barren nuts is very high.

The fourth crop (i.e. July to August) constitutes the second best crop being 21% above average. Its percentage setting and the number of bunches is appreciably lower than the best crop. The out-turn is very poor. The immature nutfall is relatively low while the incidence of barren nuts is appreciable. A compensatory feature in this crop is that it records the highest number of female flowers per bunch.



Weather Recording at the Isolated Seed Garden of the Coconut Research Institute

The fifth crop (i.e. September to October) is a pretty low crop being 20% below the average. The percentage setting is slightly below normal, the number of female flowers per bunch is very low and the copra out-turn the worst. However it is very favourable from the point of view of the number of bunches.

The sixth crop (i.e. November to December) records a drop of 31% below average and is the poorest crop. All the crop components operate unfavourably towards this crop. It is the worst from the point of view of the number of female flowers per bunch.

Crop fluctuations between years

(*a*) *Rainfall the controlling factor*

This pattern of the within year crop variations is pretty regular and therefore would be a satisfactory guide for most purposes. The fluctuations of crops between years, on the other hand, do not exhibit any regularity what-so-ever. These fluctuations are controlled chiefly by rainfall, although it may not be so obvious as one would expect it to be. The reason is that every plant species, in its bid for optimum growth, lays down certain specific maxima and minima in respect of the period, the quantity, and the distribution of rainfall. It is not the mere rainfall that matters but the plant specific effective rainfall. The coconut palm in its unique position as a perennial both in respect of growth and cropping, is in fact more exacting in this respect. As such if at all one is to explain away annual crop variations by means of the rainfall, one must first examine what constitutes the effective rainfall from the point of view of a year's coconut crop.

(*b*) *Effective period of rainfall*

Let us first consider the effective period of rainfall. The intricate nature of the floral biology of coconut makes it difficult to make a definitive statement about the effective period of rainfall. At any rate it is beyond the scope of this talk. However it is known that the emergence of inflorescences, the setting of female flowers and to some extent the immature nutfall, in respect of all bunches that mature in a particular year, are conditioned during the period of 12 months immediately preceding the crop year. And in most coconut growing areas, these factors together can account for nearly 90% of the total fluctuations of the final crop. Accordingly there is ample justification to accept the preceding year's rainfall as the effective period of rainfall for a particular year's crop.

(*c*) *Effective quantity of rainfall*

The second aspect of rainfall to be considered is the effective quantity. All the rain that falls is not available to plants. During a particular spell of rainfall, a fraction is lost as surface run-off, a fraction percolates through the soil to join the subterranean water and a fraction is held in the soil as soil moisture. The plants get their water requirements chiefly from that fraction of rainfall held as soil moisture. Once the soil has taken in the maximum it could hold as soil moisture, any further rain will be totally non-effective from the plant's view point. In fact it may even be harmful. Therefore for any particular period—depending on the intensity of rain, soil type and the atmosphoric environment—there is a certain maximum rainfall beyond which any further rain will be of no use to the palm. Investigations have shown that for most coconut growing areas, coconut crops do not

respond to any rain over 14 inches in a month on an average. This maximum value will however depend on the condition of the soil at commencement of the rainy spell. It will be high if the preceding month has been dry, because more rain is required to recondition the already depleted soil moisture status of the soil; and it will be low if the preceding month has been wet. Giving due weight to these considerations one could determine the effective quantity of rainfall for a given year.

(*d*) *Rainfall distribution*

The third and in fact the most important aspect of rainfall for a perennial bearer like coconut is its distribution over the year. The palm needs water throughout the year. Two different years which are identical from the point of view of their effective quantity of rainfall, might differ in their rainfall distribution and hence record widely different crops. Rainfall, if it is to give of its best, should be evenly spaced. The spacing should not be too narrow as to cause a waste of water and not too wide as to cause an undue depletion of soil moisture.

It will be beyond the scope of this talk to explain how to derive a numerical index to indicate the distribution. I would refer the listeners to an article in the Ceylon Coconut Planters' Review entitled "Thè rainguage and Estate Management" for guidance on this point.

Coconut Crop vis. a vis. effective rainfall

Accordingly there are two criteria for judging the annual coconut crop—namely the effective quantity of rainfall in the previous year and its distribution index. Given the same distribution, the crop will increase as the effective rainfall increases, with the reservation that as one gets up to higher rainfalls, the law of diminishing returns would operate. Given the same total effective rainfall the crop increases as the distribution index increases. For a high effective rainfall and low distribution index and vice versa or medium rainfall and medium distribution, the crop should be average. For a high effective rainfall and high distribution index the crop should be extremely good. For a low effective rainfall and low distribution index the crop should be very poor. Crop prospects for intermediate situations will obviously be intermediate.