TEA PRUNING-CYCLE PATTERNS

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The length of a pruning-cycle is commonly determined by rough and ready methods. It is generally recognised that there are a goodly number of factors involved, of which jat and elevation are the chief. Sometimes it is asserted that manuring has a marked influence. Apart from any or all of these, there are factors of convenience. A bush on a long pruning-cycle may become unmanageable in plucking, and the increased cost of pruning, coupled with the longer interval after pruning during which the bush is out of plucking, may decrease the apparent advantage to be gained by an extended cycle. Surveying the past decade, it is probably correct to say that there was, until the war brought about symptoms of labour shortage, a tendency to increase the length of pruning-cycles. There is satisfactory evidence that the quality of tea improves for a time after recovery from pruning, gradually approaching a maximum which remains reasonably constant under specific circumstances. Recent work on Shot-hole borer suggests that lengthened pruning-cycles may be a practicable method of combating the damage due to this pest.

For some years, as opportunities have occurred, we have collected data from estates about the behaviour of tea with pruning-cycles of varying lengths, particularly of cycles of four and five years. Out of a considerable number examined most have had to be discarded because of some vitiating irregularity in the records. Estates with a ten to fifteen years' uninterrupted sequence are scarce, but a number of interesting observations have been made. The time is not ripe for any simple generalisation: the purpose of this article is to put on record a sample of the observations made, and to solicit help in extending them by obtaining access to suitable data at present unknown to us.

The first indication of the type of difference with which this article is concerned came from one of our own experimental areas. The experiment is in six identical blocks distributed over a forty-two acre field. Whilst five blocks behaved similarly, the sixth was anomalous. Early in the cycle the yield of this block was noticeably below (15 per cent) that of the average of the rest. After three years it was substantially above (25 per cent). The improvement was regular enough to be represented by a simple mathematical relationship.

Percentage increase over other blocks $= 1.9 \times$ Time interval $-$ 14.7.

The time intervals chosen were periods of 45 days. In that period the equation tells us the average improvement of the anomalous block, when compared with the rest, was just under two per cent.

When the yields are plotted for each year of the cycle the result is as in Figure 1. Both areas show a low yield in the first year, a maximum in the second and a diminution in the third. What we shall call the pruning-cycle pattern is similar in both, but the change in relative yield during the three years is clearly noticeable. This behaviour has been repeated in three subsequent cycles and suggests that "pruning-cycle pattern" is a definite and stable characteristic of an area or field.

Further instances of the stability of pruning-cycle patterns are afforded by yields graphed in Figure 2 (a) and (b)

from an up-country estate. A, B and C represent the patterns of three out of a total of nine fields of hybrid jat in each of two concurrent pruning-cycles. They show that the maximum yield occurs in the second year, after which there is a more or less steady decline. To have displayed all nine fields on this estate would have confused the diagram, so three rather different patterns have been chosen from among them The decisive portion of the diagram is the decline from the second year. A has a slightly concave shape; B is convex and C is a straight line. The interesting characteristic of these graphs is that the same shapes are repeated with considerable consistency in the second cycle, both in regard to the relative yield levels and to the shapes of the graph. The features of concavity and convexity are not quite so prominent in the second cycle, but they are nevertheless distinguishable. In both these diagrams a third (dotted) line M is shown. This represents the average decline for *all nine* fields. The slope of this curve is almost identical in both pruning-cycles. The average rate of decline from the peak is 128 lb. per annum in the first cycle and 128.5 lb. in the second. These results show a very marked correlation between the behaviour of the individual fields of this estate in successive cycles. The yields in the first year are affected by various considerations, such as time taken to recover from pruning, and they do not maintain the same order of ranking from cycle to cycle. But when the bush has developed to a self-supporting stage with a mature and defined plucking-table, the similarities stand out as follows :—

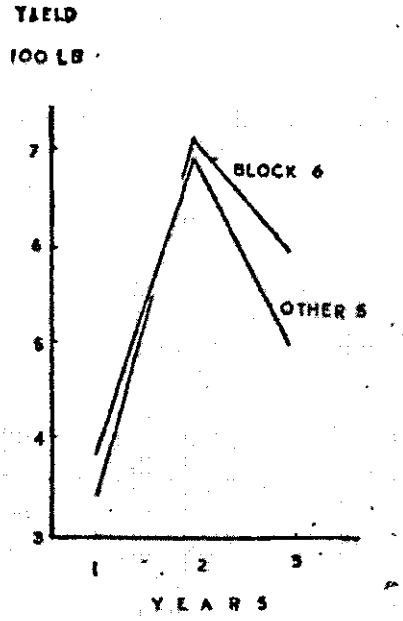

Fig. 1.

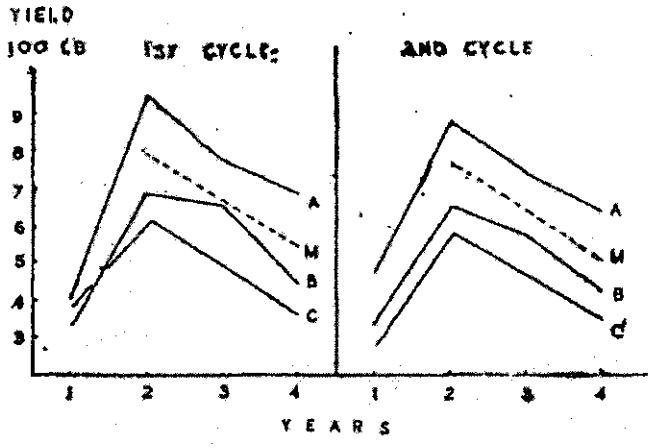

Fig. 2

(1) The fields maintain the same general pruning-cycle pattern with a peak in the second year.

(2) The more detailed characteristics of the pattern are maintained from one cycle to the next.

(3) The average rate of yield decline is identical in the two cycles.

It is highly improbable that such similarity is due to chance. The fact that difference in seasonal weather has not completely deleted the idiosyncracies of these pruning-cycle patterns, confirms the belief

that such patterns are a stable and enduring feature of individual fields, and to some extent of individual estates.

The observations were extended to the adjoining estate where there was a division similar in elevation and aspect. Six of the eight fields were old plantings of hybrid jat of similar age to the former estate. The remaining two were much younger, and were planted with what would be ordinarily regarded as a better jat, the normal dark-leaved Manipuri that is now commonly raised in Ceylon seed-bearer gardens.

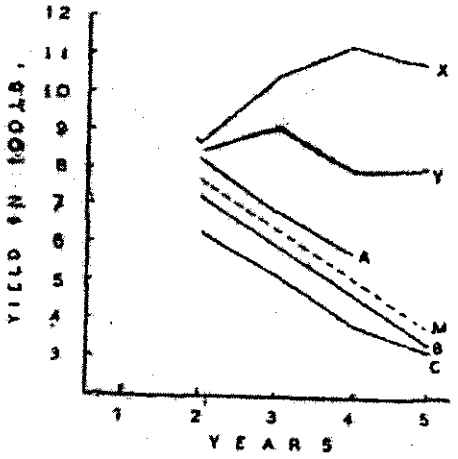

Fig. 3

A selection of the yields of this estate is given in Figure 3. A, B and C show representative fields from the hybrid jat. M as before gives the average of all six fields in this group. X and Y are the graphs of the later plantings with better jat. The yields are plotted from the second year, because, as was remarked in the previous examples, this is the critical period, and because the first portion of the graph is so intricate that the reproduction of the fine interlacing lines would have been very confused.

It is immediately obvious that the fields fall into two groups, of which the one A.B.C. resembles the previous examples, whilst the other X. Y. is of a recognisably different type. It is of special interest that the slope of the average M for group A.B.C. is, as near as makes no matter, the same as those of the previous averages. It represents a decline of 131 lb. per annum. The fact that these rates of decline do differ by so little as two per cent. from each other is probably a coincidence. Their similarity establishes an identity in type amongst the pruning patterns of these two estates for tea of similar situation and constitution.

In the course of examining such records as have been procurable, examples of both these types of pruning-cycle patterns have been encountered. They will be referred to as the 'early maximum' and the 'late maximum' patterns. There are also what appear to be intermediate stages, as for example fields which attain a maximum in the third year from pruning but drop severely in the fourth. So far, there is one distinguishing feature of these records; the early maximum pattern is found on old tea of mixed jat, and the late maximum on more recent clearings of better jat. Is either of these characteristics, age or jat, the determining factor for pruning-cycle pattern? At present it is impossible to say. To confirm the hypothesis that young tea starts with the late maximum pattern, and in the course of time deteriorates to the early maximum type, would require a long series of unequivocal records that are not available at present. For the present we shall have to accept the fact without generalizing on the cause.

There is a further point of interest in these pruning-cycle patterns and that is their relation to manurial response. Two of our manurial experiments at St. Coombs are laid down, one on old tea fifty or more years old, and one on younger clearings now in their twenty-fifth year. The patterns of yield are true to the two types described. The experiments have plots with incremental manurial doses, and from

each the response to 40 lb. of nitrogen is obtainable. Figure 4 shows the efficiency of this nitrogen in the various years of the cycle, expressed on an acreage basis as pounds increment of crop per pound of nitrogen. The early maximum type of pattern shows a corresponding early efficiency in nitrogen response, levelling off severely after the maximum cropping year. The other pattern gives a steady increase with no signs of stabilization in the fourth and final year. Since this type of data is

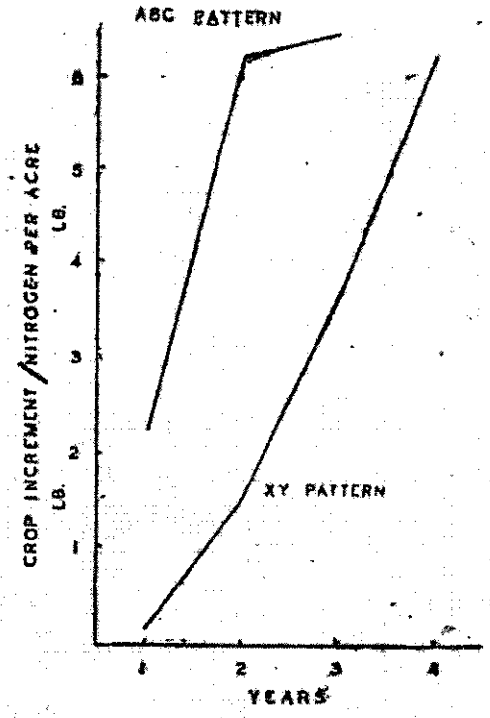

Fig. 4

only obtainable from formal experiments, and cannot be procured from estate records, we cannot obtain the same kind of confirmation for the stability of these types as for the yield patterns; but the probability that the pruning-cycle patterns and the nitrogen efficiency patterns are thus generally associated is an interesting one. In practical terms it suggests the use of different scales of incremental fertilizer dosage within the period of the cycle, for different patterns.

One additional feature of these pruning-cycle patterns is that they show clearly when a field can be profitably run on a long pruning-cycle. Obviously the late maximum pattern is suitable because not only does it not fall away in yield, but in the later periods it responds more efficiently to manuring. The status of the early maximum pattern is not so evident. First-year yields are always low because of recovery from pruning. The fall-off in yield after the maximum may be much less severe than the probable loss occasioned by pruning. But the loss is cumulative and the extension of a cycle by an extra year can only be regarded as satisfactory if the yield in that extended year exceeds the average of the previous years. This is a matter for trial. The fact that pruning-cycle patterns are stable characteristics makes it possible with reasonable accuracy to take a decision on the basis of a one-cycle trial.

In conclusion, we should be glad to hear from estates who are able and willing to supply data on which to extend the type of observation here described. The war has unfortunately interfered with both pruning-cycles and regular manuring, but any information on these lines will be welcome.