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DISBUDDING OF MATURE OIL PALMS AS A METHOD OF CONTROLLING YIELD FLUCTUATION

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RINGKASAN

Kesan akibat pembuangan putik yang dilakukan selama empat bulan, keatas pokok kelapa sawit yang matang telah dikaji. Ianya membuktikan bahawa kaedah ini boleh digunakan demi mengurangkan hasil yang naikturun dalam sesuatu musim tertentu, sekurang-kurangnya di Malaysia. Ini akan menjimatkan perbelanjaan menuai dan keupayaan kilang.

INTRODUCTION

Oil palm yields vary considerably from month to month, generally showing a marked seasonal periodicity, with one or two peaks per year. In order to cope with the peak months, the capacity of a processing factory must be considerably larger than if the total annual yield was equally distributed through the year. In Malaysia, the capacity of a factory is usually planned to be sufficient to take, in the peak month, 12½ percent of the expected total annual crop, but in some countries as much as 18 or 19 percent of the total may be harvested in one month (HARTLEY 1967). With no yield fluctuation only 8½ percent of the total would be harvested every month. Since the capital cost of a factory depends largely on its capacity, it is obvious that even in Malaysia an appreciable saving in investment would arise if yield fluctuations could be reduced. In addition, the organisation of harvesting would be simplified.

In a strongly seasonal climate, such as that of West Africa, the fluctuation is largely attributable to the effects of the dry season on inflorescence abortion rate and sex differentiation, and hence on bunch number, but in less seasonal climates, such as the south of Peninsular Malaysia, regular yield cycles also occur. It appears that to some extent yield fluctuation in the oil palm is self perpetuating; during a period of high yield, inflorescence abortion rate will be high (de BERCHOUX and GASCON 1965), and so a period of low yield will follow. Abortion rate will then also be low, resulting in a further yield peak, and so on. Thus it is possible that, for example, a single dry period might induce a fluctuation which could continue for several years.

After a period of disbudding (removal of inflorescences) in young oil palms, a "flush" of bunch production usually follows, during which yield is considerably higher than that of undisbudded palms; this may in turn be followed by a "recession" (TAILLIEZ and OLIVIN 1971), in which yield is below that of untreated palms. If the initial period of disbudding was prolonged, a second flush and recession may follow (CHAN and MOK 1973). Here the same system apparently operates: during disbudding abortion rate is very low (CORLEY and HEW in press), so that a flush follows, and this in turn induces a high abortion rate and subsequent recession. Sex differentiation and mean bunch weight are also affected by disbudding, but so far as the fluctuation in yield is concerned, these are less important.

TAILLIEZ and OLIVIN (1971) pointed out that in the Ivory Coast, by timing the end of disbudding correctly in relation to the dry season, yield fluctuation in the early years of production could be reduced. It has also been suggested that a short period of disbudding might be used to control yield fluctuation in mature palms in a similar fashion (see discussion following CHAN and MOK 1973, pp 164-165), and this possibility is considered below.

MATERIALS AND METHODS

The trial was done in a field of 10 year old tenera palms in South Johore. Four treatments were included, no disbudding, complete disbudding for four months, and two continuous partial disbudding treatments; the last two were intended for studying changes in bunch composition during disbudding. Yield was lower with these treatments, and they are not considered further in this paper. There were 32 replications of single tree plots. Disbudding was done by cutting out the inflorescences before anthesis with a "chisel", throughout February to May 1973. The previous yield pattern of the field was known, and it was intended that the period of zero yield which followed disbudding should coincide with the normal yield peak.

RESULTS AND DISCUSSION

Monthly yields for both treated and control palms are shown in *Fig. 1.* It is immediately apparent that the yield peak has been shifted by disbudding. During July to October 1973 the disbudded palms produced no fruit, as a result of the disbudding 5 months earlier. There followed a sustained period of high yield for nine months, during most of which yield of the control palms was fairly low; then as the latter reached their peak, yield of the disbudded palms fell. For a short period yield was very low in both treatments, but the next peak again came earlier in the disbudded palms.

Cumulative yields for two years are given in *Table 1.* Yield of fruit from the disbudded palms was only some six percent lower than that of controls, although one might expect that disbudding for four months out of twenty four would reduce yield by a sixth (16.7 percent). Presumably carbohydrate produced during disbudding can be stored by the palm and used later for bunch production; CORLEY (unpublished) has found a considerable accumulation of carbohydrates in both trunk and leaves during disbudding.

Despite the small difference in yield, bunch number was nearly 20 percent lower, and mean bunch weight 18 percent higher, with disbudding. Oil to bunch ratio was significantly higher in the disbudded palms, and total oil yield was little different. However, we must note that oil/bunch was higher in the disbudded palms even in the first three months of recording, before the treatment was likely to have had any effect. CORLEY and HEW (in press) in a review of other trials, concluded that disbudding had no effect on oil/ bunch, so it will be safer to assume that some oil loss does occur here, corresponding to the fruit loss shown in *Table 1.*

Disbudding has little effect on the variability of monthly yields; peak yield comes at a different time, but is just as high. The simplest procedure for using disbudding to reduce yield fluctuation would probably be to apply the treatment to half the palms in an area, to shift the yield cycle out of phase with the remainder. Results of such a treatment can be estimated from the present trial by examining the combined total yield of control and disbudded palms for each month. *Table 2* shows that such a treatment would reduce the overall average monthly yield by about 3 percent. Yield in the peak month would be some fifteen percent lower, however, and represents an appreciably

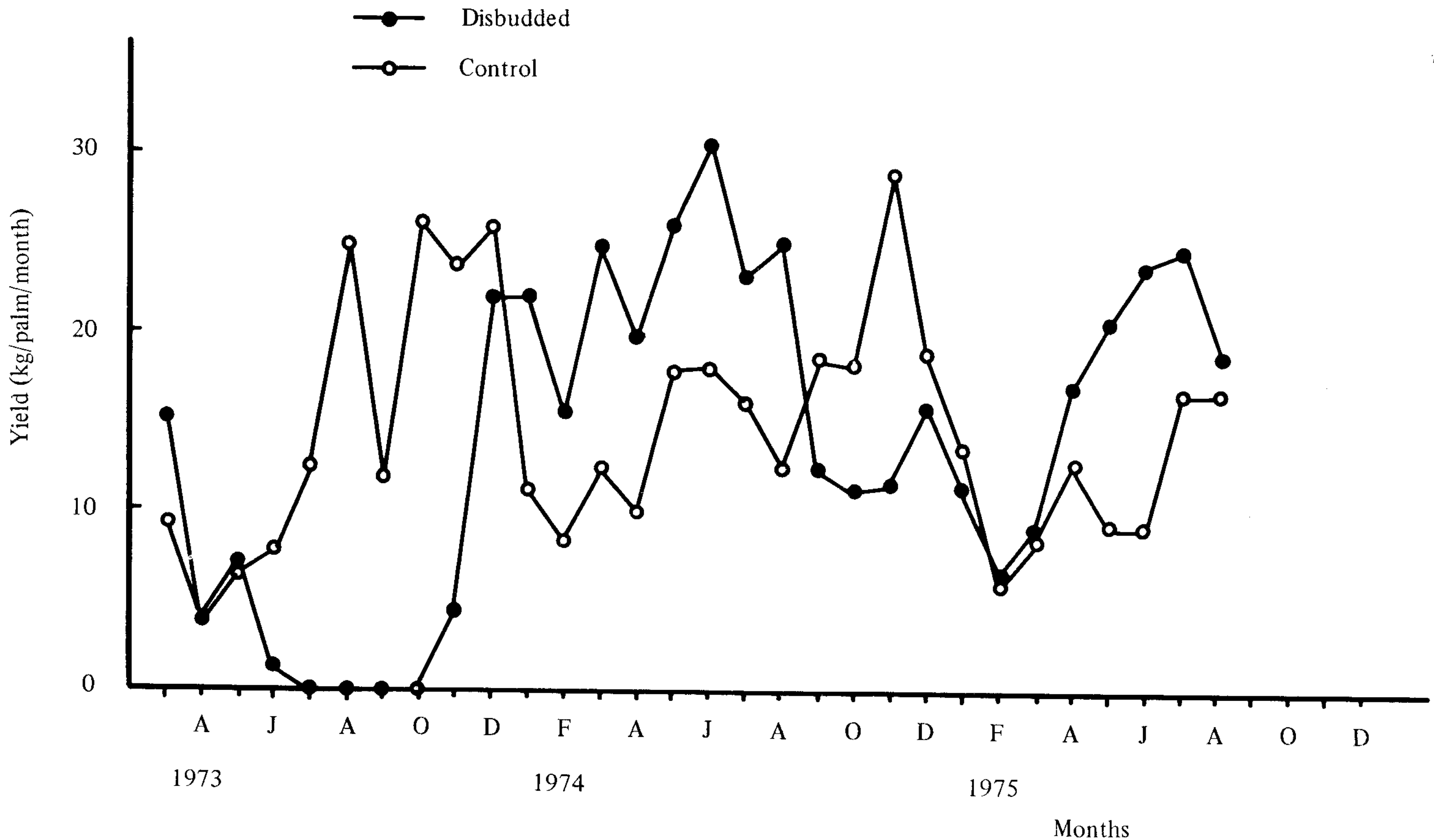

Figure 1. Monthly yields of fruit from disbudded and control palms.

TABLE 1. CUMULATIVE YIELD OF DISBUDDED AND CONTROL PALMS (JULY 1973 TO JUNE 1975 INCLUSIVE)

	Disbudded	Control	s.e.
Total yield of fruit (kg/palm)	352	373	16.2
Total bunch number per palm	15.2	18.9	0.77
Mean bunch weight (kg)	24.4	20.6	1.10
Oil/bunch (%)+	21.7	20.6	0.26
Total yield of oil (kg/palm)	76.3	76.7	

+ The difference in oil/bunch may not be an effect of the treatment – see text.

TABLE 2. EFFECT OF DISBUDDING ON YIELD FLUCTUATION (JULY 1973 TO JUNE 1975)

	Control	Disbudded	Control and disbudded combined
Average monthly yield (kg/palm)	15.6	14.7	15.1
Yield in peak month (kg/palm)	28.7	30.4	24.2
Peak month as % of annual mean	15.4	17.3	13.4
Coefficient of variation of monthly yields (%)	42	64	34
CV of monthly yield Nov. 1973 to June 1975 only	42	41	28

smaller proportion of the annual total yield. The coefficient of variation expresses this in more general terms: the variability of monthly yields is considerably reduced, especially when the four months with no yield from the disbudded palms are excluded.

The timing of the treatment, in relation to the yield peak of the control palms, was not perfect *(Fig. 1)*, and we might expect a greater reduction in variability if the treatment had exactly coincided with the peak. However, the peak month tends to vary slightly from year to year, and better timing might be difficult to achieve. A longer period of disbudding should ensure that the required result was obtained, but would also cause a greater yield loss. An alternative might be to disbud, say, one third of the palms for three months, and another third for the next three months, with the treatments centered around the expected peak. Another possibility would be to utilise counts of anthesising female inflorescences, such as are sometimes made for the purpose of yield forecasting. A variable amount of disbudding would then be used to restrict expected monthly bunch numbers to a predetermined maximum level (the inflorescences being removed at or just after anthesis if necessary).

The possible advantages to be gained from the treatment are several. First, factory capacity could be reduced by, as a first estimate, fifteen percent, because of the lower peak yield expected. Second, organisation of harvesting might be simplified. Third, the higher mean bunch weight and lower bunch number should result in a lower harvesting cost.

Against these savings must be set the value of the yield lost (estimated here at 20 kg fruit per disbudded palm or 10 kg per palm over all palms) and the cost of disbudding. The importance of the yield loss depends on the number of years over which it has to be spread. Only just over two years' results are available at the time of writing, but from the trend in *Fig. 1* it appears that the effect of disbudding on the yield pattern may last through a third year. We noted in the introduction that yield cycles in the oil palm are probably to some extent self perpetuating, and we might expect, therefore, that the effect will continue until some other factor (such as a severe drought) "resets" the cycle. The duration of the effect would thus be unpredictable in the Malaysian climate, but in an environment with a regular dry season it might well last only for one year. In the latter case the treatment would almost certainly not be worthwhile.

The cost of disbudding mature palms by present methods would be high, as would the possibility of damage to the palms, because of the inaccessibility of the inflorescences. The best approach here would be to use a chemical spray to stop inflorescence growth. So far as we know, no work has been done on this in oil palm, but there is a wide range of plant growth inhibitors available, and probably a suitable compound could be found.

CONCLUSION

Disbudding half of an area of palms for four months would reduce yield fluctuation in the area as a whole, for a loss of perhaps 10 kg fruit per palm. In Malaysia the effect may last for several years, but in a more strongly seasonal climate it might only last one year. Further work is need to devise a system to make best use of these results, while some thought should also be given to new methods of disbudding.

ACKNOWLEDGEMENTS

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SUMMARY

The effects of a short period of disbudding on mature palms are examined, and it is shown that such a treatment could be used to reduce seasonal yield fluctuation, at least in Malaysia. As a result factory capacity and harvesting costs could be reduced.

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