AAR-NEWS

EDITORIAL

Leaf eating pests, particularly the bagworms and nettle caterpillars are a major problem in mature oil palms. They are voracious feeders capable of defoliating the palms and causing severe yield loss. It is essential that the pests be controlled in the early stage to prevent losses. This calls for early detection and timely implementation of the correct control measures. Our Dr. Ang, who had to deal with several bagworm outbreaks recently, wrote a comprehensive manual on the control of the pest. An abridged version is reproduced here. I hope you will find it useful.

In the pre-weevil (*Elaeidobius kamerunicus* Faust) days, it was a standard practice to remove young inflorescences (disbudding) in newly matured palms. The main reason for this was poor pollination. Since the introduction of the weevils in 1982, this problem has largely disappeared. However, the disbudding practice still persisted for a variety of other reasons. We would like to share with you our Shahrakbah Yacob's paper on **The review of the effects of prolonged disbudding on the early yield of oil palm**. Please let us know your views on the subject.

Happy reading !

OOI, L.H.

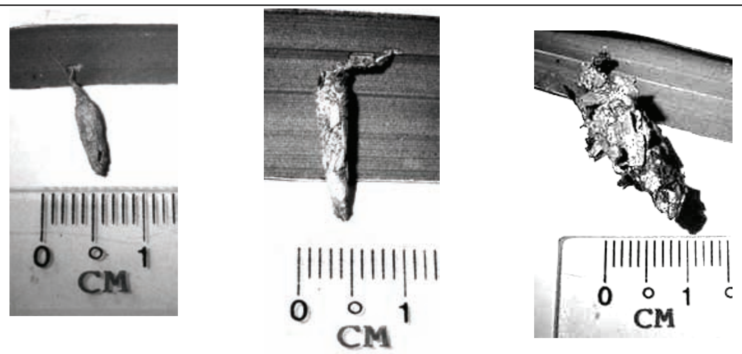
CAUSES OF OUTBREAK AND FAILURE TO CONTROL BAGWORMS IN OIL PALM

BY ANG BAN NA

1.0 Introduction

Loss of leaf in oil palm will reduce yield. Wood *et al.* (1973) conducted simulated defoliation and found that 50% defoliation could result in a yield loss of 10 t/ha of FFB. Mohd Basri (1993) found that 10%-13% insect defoliation when fronds number 2-6 were the most affected can cause 44% reduction in yield. With the current scenario of shrinking profit margins for palm oil production, all efforts must be made to prevent if possible, or else to minimize loss of leaf area to pests, in order to ensure that profit margins are not further eroded by reduction in yields. This article will highlight some of the causes for outbreaks and failure of control operations for bagworms in order to heighten the awareness of the Estate Managers towards this pest. Please refer to AAR Advisory Circular No. 1/01/ABN for details.

FIGURE 1. CHARACTERISTICS OF PUPAE OF THREE COMMON SPECIES OF BAGWORM IN OIL PALM



Pteroma pendula, cocoon hangs suspended to leaf by a thin thread.

Metisa plana, cocoon hangs on a crooked attachment to leaf.

Mahasena corbetti, cocoon is larger than *P.pendula* and *M. Plana*

2.0 Causes for outbreaks and failure to control outbreaks

2.1 Failure to detect bagworm population at threshold levels

Failure to detect a pest population at threshold level (5 larvae/ frond) in estates which have not had the problem before is usually due to the failure of the field personnel to recognize the pest. Pictures of the three common bagworm species in oil palm are given in Figure 1.

In areas which have a history of the pest outbreak, failure to detect the threshold is normally due to the lack of a standing instruction/reminder for field personnel to constantly monitor the pest status, or due to the absence or poor census program once the pest has been detected. Delays in detecting the pest population when they have reached threshold levels can result in an increase in the density of the pest as well as an increase in the area infested, which will lead to an increase in cost of control.

2.2 Treating the pest with insecticides at non-susceptible stages

Trunk injected insecticides are only effective on the larval stages of the bagworms that are actively feeding on foliage containing the insecticide. Early instar larvae, which are smaller will need relatively smaller amount of feeding to aquire a lethal dosage of the insecticide, are therefore easier to kill than larger late instar larvae. Sprayed insecticides are only effective on the male moths and actively feeding larvae stages.

2.3 Faulty trunk injection technique and equipment

2.3.1 Trunk injection on short palms.

Trunk injection with 10 ml/palm of 50% a.i monocrotophos or 48.9% a.i. methamidophos is only suitable for palms older than 5 years or with trunks of at least 2 m tall. Palms with 2-3 m tall trunks should be treated by using 2 holes placed directly opposite each other. Palms with trunks taller than 3 m can be treated with only one hole. Generally, when trunk injection is used on palms with trunks shorter than 2 m or if only one hole is used for palms with trunks shorter than 3m, the injected insecticides might not spread throughout the canopy. Thus pests which are located on the leaflets without insecticides will escape and cause re-infestation.

2.3.2 Site of trunk injection holes on the frond butts.

The correct site of trunk injection hole is in between frond butts (Figure 2a & 2b).

Figure 2a. Correct site of trunk injection hole in between frond butts.

Figure 2b. Incorrect sites of trunk injection holes on frond butt.

The recommended depth of the hole is 15 cm. When holes are drilled on the frond butts, 5-10 cm of the depth of the holes could be located on the frond butts. Because the spouts of the guns used for delivering the insecticides are inserted into the holes to a depth of 4-5 cm only, holes sited on the frond butts can result in non-delivery of the chemical into the trunk.

2.3.3 Shallow holes and holes drilled horizontally instead of at 30-45^{o} angle to the trunk.

Trunk injection holes should be 15 cm deep and 1.5 cm wide drilled downwards at a 30-45^{o} angle to the trunk to ensure that there is sufficient space to hold the recommended 10 ml of insecticide applied. Holes shallower than recommended or drilled at less than the recommended angles may not be able to accommodate the 10 ml of insecticide and thus can result in spillage and hence the delivery of sub-lethal dosages.

2.3.4 Failure to remove drill spoils from the hole

Un-removed drill spoils will occupy space in the hole and may be back-siphoned into the drench gun causing clogging and wear and tear. It is recommended that the drill operators clear the holes by inserting and withdrawing the drills from the hole four to five times after drilling to remove as much of the drill spoils as possible.

2.3.5 Poorly calibrated or faulty insecticide delivery equipment for trunk injection.

For accuracy and safety reasons, the drench gun is the recommended tool for injecting insecticides into trunk injection holes (Figure 3).

The funnel and scoop system is sometimes practised because it is cheaper, but it is inaccurate and hazardous to the operators and should be avoided (Figure 4).

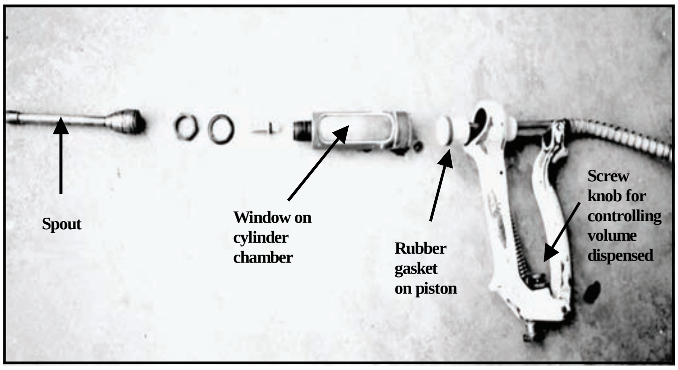
Figure 3. Injecting insecticides into trunk injection hole using a drench gun.

The common drench gun used to inject the insecticide needs to be calibrated before use. The piston is locked into position to deliver 10 ml via a screw knob that can be knocked out of position after repeated usage (Figure 5). It is therefore recommended that the worker check on the correct position of the piston at the beginning of the operation and as and when malfunction is suspected.

Figure 4. Delivering insecticides into trunk injection hole using a funnel.

Worn out piston gaskets or presence of foreign material between the piston gasket and the cylinder wall will result in the suction of air into the cylinder during filling of the compartment with insecticide, and thus causes the delivery of less than 10 ml of insecticides/palm. It is therefore necessary for the worker to periodically check for air bubbles and foreign materials in the cylinder chamber via the transparent window on the cylinder. Often, the transparent windows on the cylinder becomes opaque after prolonged use thus obscuring inspection. It is therefore recommended that a 10 ml measuring cylinder be used to check the accuracy of the drench gun when the window becomes opaque.

Figure 5. Parts of a typical drench gun referred to in the text



2.3.6 Back-siphoning of insecticides and drill spoils from the hole into the drench guns.

After injecting the insecticide into the hole, the worker should not release the trigger of the gun until the spout of the gun has been withdrawn from the hole. If the trigger is released while the spout is still in the hole, back-siphoning of insecticide and drill spoils into the gun can occur. This will result in the delivery of insufficient insecticide and the contamination of the cylinder chamber by the drill spoils, thus resulting in poor pest control and speeding up the wear and tear of the gun.

2.4 Applying insecticides by spraying with faulty technique/ equipment or wrong choice of insecticide

2.4.1 Faulty technique/equipment
When insecticides are to be sprayed, motorized mistblowers, either backpack versions (Figure 6)

Figure 6. Backpack mistblower used for applying insecticides on short palms.

or larger tractor mounted and driven versions are to be used (Figure 7).

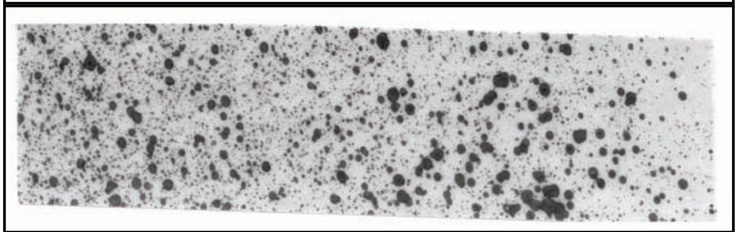
Figure 7. Tractor drawn and driven mistblower for applying insecticide on tall palms.

When canopies are small, eg. palms less than 12 months after field planting, the conventional knapsack sprayer may still be used. With all spraying equipment, poor coverage is a common cause of failure to control bagworm infestation. If one is doubtful of achieving good coverage with an equipment, it is recommended that water sensitive paper be used to check the coverage of the spray equipment before embarking on area wide-spraying. Water sensitive paper can be obtained from **Norvatis Corporation (M) Sdn Bhd, Lot 9 Jalan 26/1, Seksyen 26, Kawasan Perindustrian Hicom, 40400 Shah Alam, Tel: 03-511-6500**. One frond each from the lower, middle and upper canopy that is located in the harvesters path, interrow and within the row should be selected for this purpose. A 2.5 cm wide by 10 cm long strip of the water sensitive paper should be stapled on the underside of a leaflet at the proximal, middle and distal end of each selected frond. Figure 8 illustrates the desired spray pattern on the water sensitive paper which will turn blue when it comes into contact with water. Ensure that the fronds in the canopy are dry before embarking on this test to avoid contamination of the water sensitive paper.

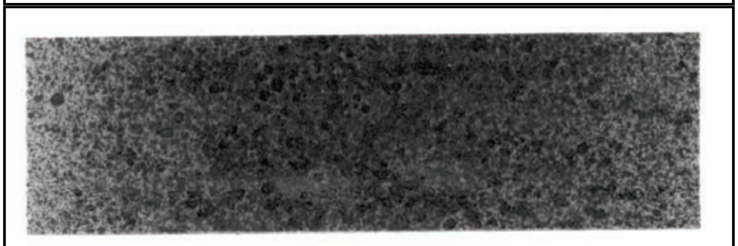
Figure 8. Spray pattern on water sensitive paper

Untreated water sensitive paper.

Desired spray pattern.



Spray droplets too coarse, which can cause chemical wastage.



Over sprayed, which can caused chemical wastage.

2.4.2 Wrong choice of insecticide
When applying insecticides by spraying, the objectives are:

a. to apply an effective insecticide when the pest is susceptible to result in a quick kill.
b. to have minimal residue of the insecticide in the oil palm environment thereafter. Residues of insecticides which persist in the oil palm environment after the pest had been killed will harm non-target organisms including the natural enemies of the bagworms, thus disrupting the pest-natural enemies balance in the environment.
c. to use an insecticide with low mammalian toxicity to minimize hazards to workers, as worker safety and comfort will affect quality of control operations.

The recommended chemicals to be applied via spraying are the synthetic pyrethroids (eg. cypermethrin and cyhalothrin) and trichlorphon (Dipterex) at 0.01% a.i. and 0.1% a.i., respectively. Monocrotophos and methamidophos are highly toxic and therefore should not be applied as a spray (Table 1).

Table 1. LD_{50} of common insecticides used for bagworm control

Chemical	Oral LD_{50} for rats (mg/kg)
Pyrethroid	166
Trichlorfon	250
Monocrotophos	18-20
Methamidophos	20

Bacillus thuringiensis (B.t.) is currently not recommended because of variable success with its use (Mohd Basri *et al.* 1999, 1996, 1994).

2.5 Consequences of bare ground conditions resulting from indiscriminate herbicide spraying.

Indiscriminate weed control program resulting in bare ground conditions have often been associated with leaf eating caterpillar outbreaks. Maintaining a natural ground cover (Tiong, 1980, Hoong & Hoh 1992) or establishing nectar bearing ground vegetation (Ho 1993, Ho & Teh 1999, Mohd Basri et al. 1999) will significantly reduce pest levels and outbreaks. The presence of ground vegetation enhances natural enemy population in the field. Adults of many natural enemies thrive on the nectar of these vegetation or seek refuge in it during periods of low pest population. Estates in chronic pest areas should attempt to establish the beneficial plants *Cassia cobanensis* or *Euphorbia heterophylla* along the perimeter of the blocks and in open spaces. Ho and Teh (1999) and Basri *et al.* (1999) described the methods for the establishment of *E. heterophylla* and *C. cobanensis*, respectively (Figure 9).

Figure 9. Beneficial plants

Euphorbia heterophylla

Cassia cobanensis

3.0 Conclusions

Bagworms can only be controlled effectively if there is a good and reliable census program that will detect infestations early and accurately. Successful control will also require a well planned treatment program using the correct technique and equipment. Failure of control programs are costly because they will increase the cost of control directly and indirectly they could cause loss of yields and diversion of workers from other important estate work.

In the long term, other practices such as choice of insecticide and management method of ground covers will also influence incidence of pest. Therefore these practices should be planned in a manner that will avert pest outbreaks.

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THE EFFECT OF PROLONGED DISBUDDING ON EARLY YIELD OF OIL PALM

BY SHAHRAKBAH YACOB

Summary

A comparative study was made on the effect of prolonged disbudding on cumulative early yields in young oil palms. Three out of 4 blocks with prolonged period disbudding gave marginal differences in cumulative fresh fruit bunches (FFB) yield when compared with normal/nil disbudding. Generally, prolonged disbudded palms showed extreme fluctuations in yield pattern, with high yields for the first 6 months, followed by a markedly low yielding period to be followed again by another sharp high yielding phase. From trial data, the yield gap between disbudded and non-disbudded palms narrowed after 4 to 6 years. Thereafter there were no differences in yield pattern. Based on the study and also review of past research findings, prolonged disbudding of immature palms is neither advantageous nor practical and should not be implemented. There is no economic justification for prolonged disbudding as it incurs additional cost and labour much needed elsewhere.

1. Introduction

Disbudding or ablation is the practice where inflorescences are removed from a plant. In the oil palm, disbudding is done for immature oil palm before harvesting commences. Disbudding commences at 16-18 months after field planting. Two types of disbudding based on their duration have been practised. Short period disbudding is the removal of inflorescences for 6 months prior to bringing the palms to maturity at 26-30 months. Extension of disbudding beyond this period resulting in harvesting commencement at 36-40 months is considered as prolonged disbudding.

Disbudding was widely implemented during the early days of the oil palm industry mainly due to problems of poor pollination in young bunches, delay in mill construction and diseases and pests associated with rotten fruits e.g. *Marasmius* and *Tirathaba* (Chew and Khoo, 1973; Chan and Mok, 1973; Turner and Gillbanks, 1974; Rajaratnam *et al*., 1978). Disbudding was reported to result in better and more uniform growth of immature oil palms, and good early flush of fresh fruit bunches at the onset of harvesting (Mok, 1971). The rationale was to eliminate competition for energy from reproductive sink from the growth of the palm. Although an initial higher growth rate (leaf area and girth) was detected for disbudded palms, the differences narrowed down after the treatment discontinued. With the introduction of the pollinating weevil, the problems associated with bunch rot due to poor pollination were greatly reduced (Chee and Chiu, 1999). This in turn produced better fruit formation, thus reducing incidence of parthenocarpy.

In terms of cumulative FFB yield for the first 4-6 years of harvesting, it has been shown repeatedly that there were no significant differences between disbudded and non-disbudded palms (Tailliez and Olivin, 1971; Hew and Tam, 1972; Chew and Khoo, 1973; Chan and Mok, 1973; Corley and Teo, 1975). In fact, higher cumulative FFB yield was recorded for non-disbudded than disbudded palms. More pronounced yield fluctuations in the early years were experienced with the disbudding practice. Although the initial flush of FFB at the onset of harvesting was higher for disbudded than non-disbudded palms, it was short-lived (for only 6 months) with a subsequent sharp decline in FFB yield before another peak appeared. The early yield was the consequence of higher sex ratio and bigger bunches while high abortion rate during the peak yield period was responsible for the subsequent drop in FFB yield (Chew and Khoo, 1973). This was in line with Chan and Mok's (1973) finding that during the high yielding period, palms were under stress due to high nutrient demand. Owing to the severe yield fluctuations, the cumulative yield remained lower than non-disbudded palms for at least 4-6 years before it caught up with the latter (Tailliez and Olivin, 1971; Chan and Mok, 1973). Uneven yield pattern induced by prolonged disbudding also led to reduction in estate harvesting efficiency.

Table 1 : Detailed descriptions of the selected estates

Rainfall Region	Estate/ ha	Soil series	Parent Material	Planting	Disbudding Period (mth)
Kelantan (High rainfall and monsoonal)	A/174.5	Kuah/Musang	Shale	92	24
	B/40	Tawar	Riverine (T2)		39
	A/165	Tebok	Riverine (T2)	93	22
	B/47	Tawar	Riverine (T2)		32
Kedah (High rainfall and bimodal)	C/45	Harimau	Riverine (T3)	91	24
	D/37	Holyrood	Riverine (T2)		30
Northern Johor (Moderate rainfall and bimodal)	E/152.1	Rengam/Pelepah / Rengam-Beserah	Granitic	92	22
	F/155	Rengam/Pelepah /Tai Tak	Granitic		29

Although much evidence obtained in the 1970's suggests little yield advantage with prolonged disbudding, many planters still practise prolonged disbudding hoping to achieve the objective(s) mentioned earlier. The current study attempts to verify and also update previous findings on the subject.

2. Materials and method

Six estates in three different regions with young oil palm plantings were chosen. FFB yields for the first 4 to 7 years of two disbudding regimes were compared between similar-aged plantings in estates from similar rainfall regions (Table 1).

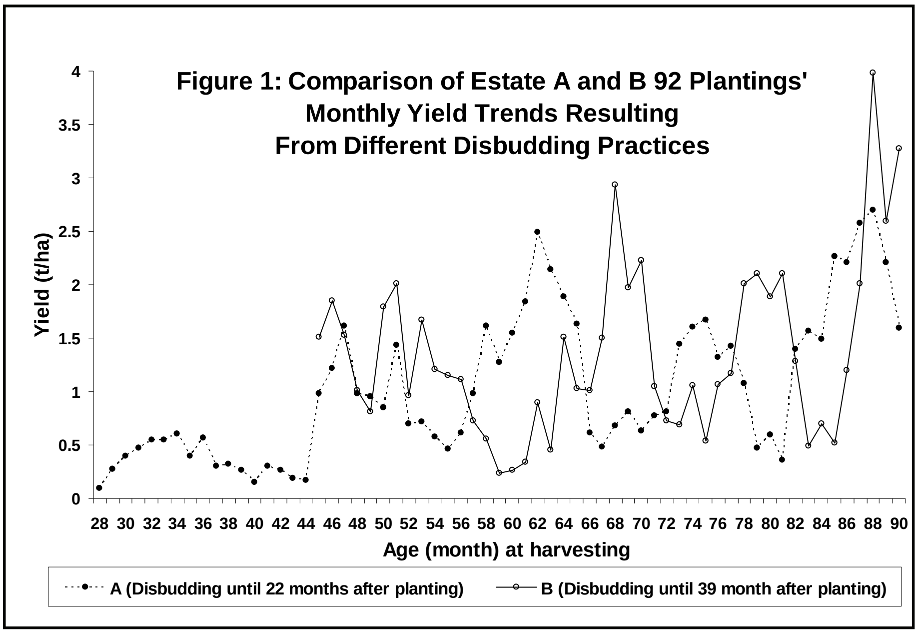


Figure 1: Comparison of Estate A and B 92 Plantings' Monthly Yield Trends Resulting From Different Disbudding Practices

3. Results and discussion

Yield Trends

In Kelantan region, high initial yields of FFB from prolonged disbudded palms were observed in both planting blocks for Estate B (Figure 1 & Figure 2). However, the prolonged disbudded plantings failed to maintain the initial flush as shown by the sharp decline in yield, 4 to 10 months later. Over the same 4 year period, cumulative yields of Estate A's short disbudded blocks were only between 1.8% to 5.2% lower than Estate B's prolonged disbudded blocks (Table 2). Fluctuations in early yields were more pronounced in the prolonged disbudded blocks.

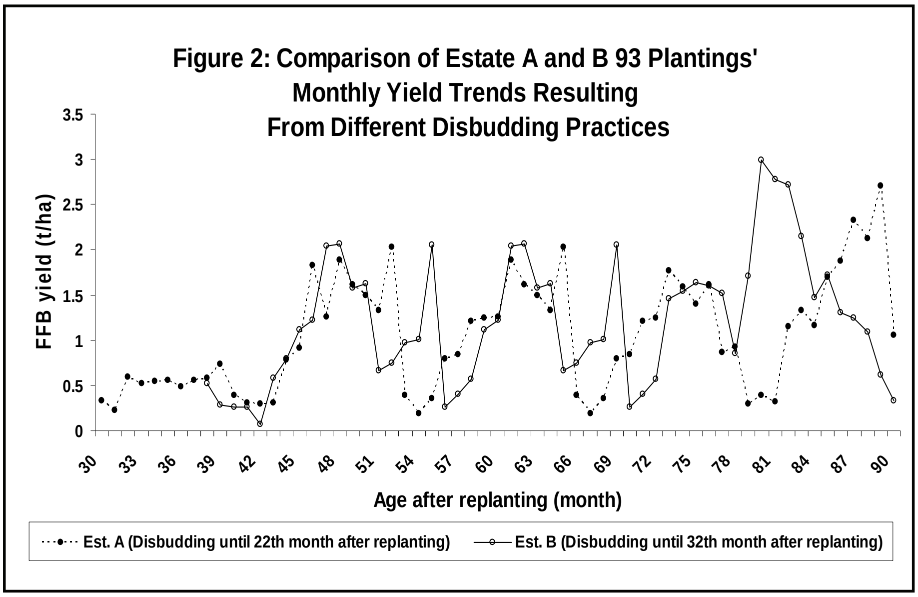


Figure 2: Comparison of Estate A and B 93 Plantings' Monthly Yield Trends Resulting From Different Disbudding Practices

Table 2: Cumulative Yield Comparison From Different Disbudding Practices

Estate	Disbudding Period (mth)	Region	Total Yield from First Harvesting (t/ha)	Yield diff. %	Cumulative Yield From the Same Period of Harvesting (t/ha)	Yield diff. %
A/92	24	Kelantan	65.09	3.64	59.60	-5.23
B/92	39		62.72		62.72	
A/93	22	Kelantan	67.59	3.21	64.26	-1.81
B/93	32		65.42		65.42	
C/91	24	Kedah	145.74	-0.26	139.50	-4.75
D/91	30		146.12		146.12	
E/92	22	North Johor	64.95	-5.56	64.95	-5.56
F/92	29		68.56		68.56	

Table 3: Economic Analysis of Different Disbudding Practices from Field Planting until 1999

Estate	Region	Disbudding Practices	Total profit per ha*(RM)	Profit Diff. (RM)
A/92	Kelantan	Short	9,674	452
B/92		Prolonged	9,222	
A/93	Kelantan	Short	10,077	388
B/93		Prolonged	9,689	
C/91	Kedah	Short	21,799	5
D/91		Prolonged	21,794	
E/92	North Johor	Short	9,681	-33
F/92		Prolonged	9,713	

**Assumptions:*
- ***a)*** *FFB cost RM130 per tonne from mean value of FFB cost from 1994-1999 for 3 studied regions.*
- ***b)*** *Ablation cost RM62 per ha from mean value of disbudding cost from 1994-1999 for 3 studied regions.*
- ***c)*** *FFB revenue at RM280 per tonne from mean value of FFB revenue from 1994-1999 for 3 studied regions.*

The FFB yield comparison for the Kedah region (Figure 3) also demonstrated the same pattern as observed for Kelantan. Prolonged disbudded for the '91 planting in Estate D resulted in very high initial yields at the start of harvesting. Again, the high yielding pattern was not sustained and yields dropped sharply 6-8 months later. This was followed by alternating sharp yield increases (at 50th and 60th month) and falls. After 6 years of planting, both prolonged disbudded palms produced slightly higher FFB yield but more pronounced yield fluctuations than the short disbudded palms. Cumulative yield for Estate C was 4.8% poorer than similar planting in Estate D (Table 2).

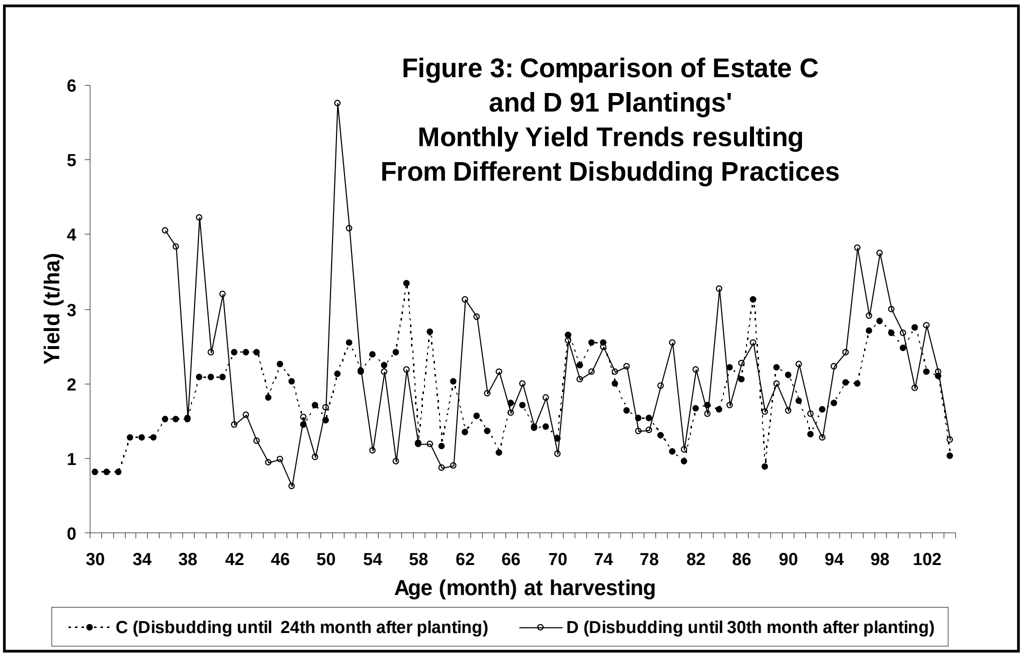
In Northern Johor similar comparisons were made using quarterly yield data as monthly records were not available. Significantly higher initial yield was noted in the prolonged disbudding planting in Estate F (Figure 4), but these high yields lasted only for 6 months. Cumulative yield of Estate E planting was lower than that of Estate F planting by 5.6% (Table 2).

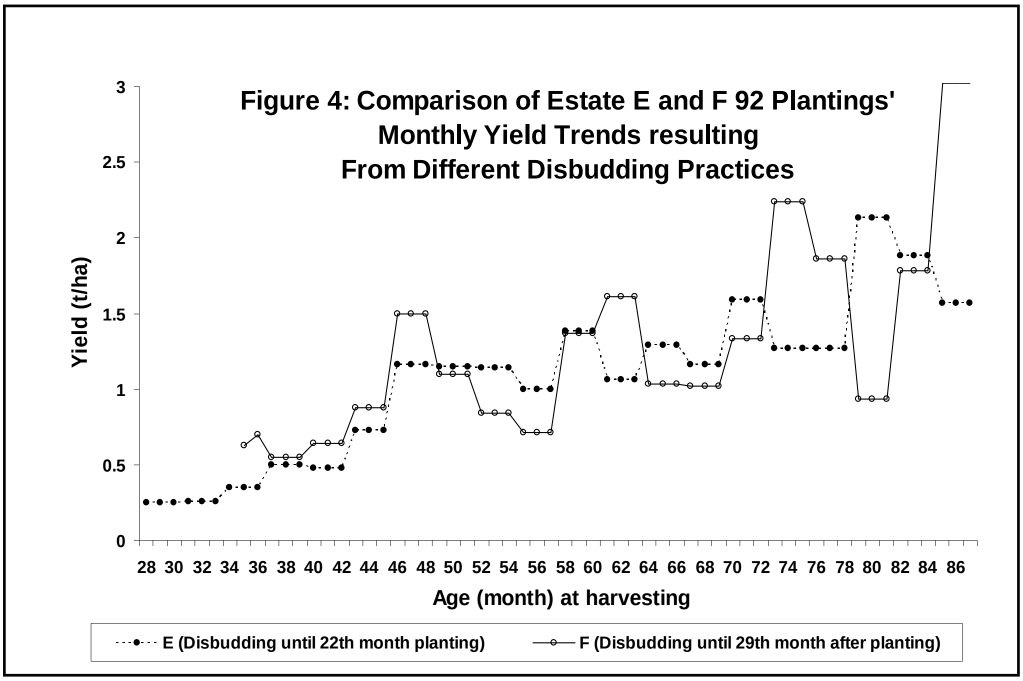
Economic Analysis

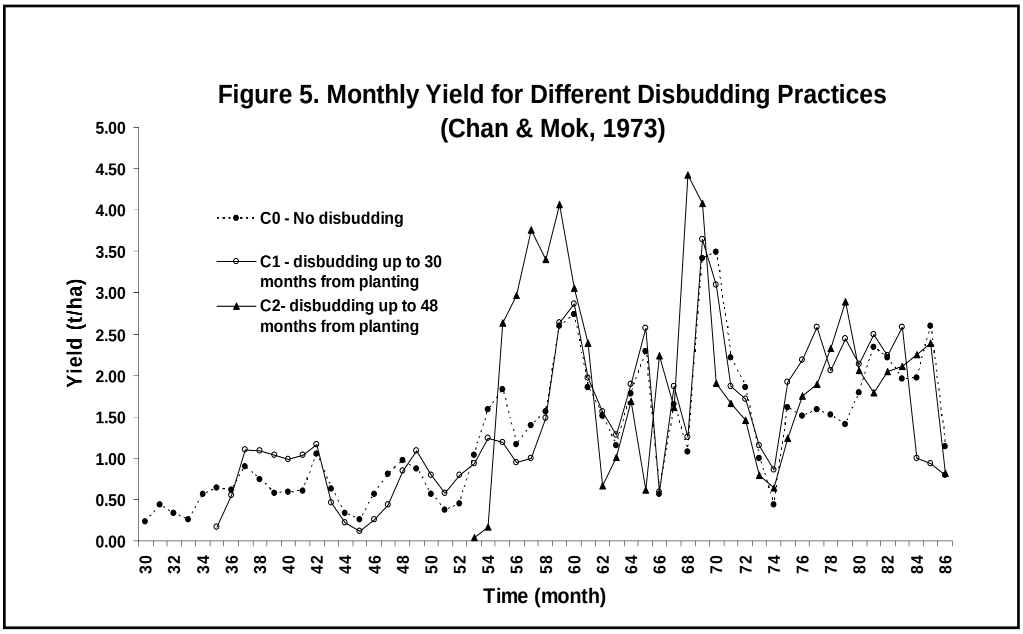
For the Kelantan region, short period disbudding gave a higher profit of RM388 to RM451 per ha than prolonged disbudding (Table 3). For Kedah and Johor areas, there were only small yield differences between short and prolonged disbudding (Table 3). The larger difference in profitability in the Kelantan region is mainly due to the wider difference in the length of disbudding between short and prolonged disbudding. From the economic analysis, it can therefore be concluded that the longer the period of disbudding, the greater will be the reduction in profitability.

In general, the yield trend of prolonged disbudding examined in all 4 selected regions was similar to results reported earlier by Mok and Chan (1971, Figure 5). Although prolonged disbudding substantially increased the FFB yield over the first few months of harvesting, a marked yield decline ensued subsequently. Without disbudding, the yield was fairly uniform during the first year of harvesting but increased rapidly in the second year, after which a fluctuating pattern set in. The prolonged disbudding practice also showed a similar yield trend except that the peaks and troughs were more pronounced especially during the initial period of harvesting. In terms of, cumulative yield over the first 4-6 years, prolonged disbudded palms mainly gave marginally higher FFB yields than short period disbudded palms.

The results however indicate that there is no economic justification in prolonged disbudding despite the marginally higher yield as overall profitability was higher for short disbudding. However, a short period of disbudding is recommended during the immature stage of growth to encourage more uniform palms and also synchronize bunch development; reduce pest and disease incidence and to maximize the utilization of assimilate for vegetative growth of oil palm. This would apply mainly for areas with marginal soils and/or low rainfall. A short period of disbudding would also assist the estate in detecting abnormal palms or runts early.







4. Conclusion

Prolonged disbudding will disrupt the physiological yield cycle of the palm, manifested in marked yield fluctuation during the early years. Much valuable labour (and also higher costs) is also tied up in the process. Loss of revenue is also incurred when compared with short period disbudding. In view of the above factors, prolonged disbudding is no longer advisable for immature oil palms.

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SOCIAL AND PERSONAL

Names	Date	Designation
Recruitment		
Mohd Kamal B. Othman	2/5/2000	Lab. Tech. Gr. IV
Promotion		
Dr. Soh Aik Chin	1/3/2000	Head of Agricultural Research
Ms. Girlie Wong	1/1/2000	Principal Research Officer
Dr. Kee Khan Kiang	1/1/2000	Principal Research Officer
Mr. Goh Kah Joo	1/1/2000	Principal Research Officer
Cik Lolaina Bt. Tinie	1/3/2000	TC Lab. Tech. Gr. IV
Retirement		
Mr. Chew Poh Soon	1/3/2000	Head of Agricultural Research

We regret the resignation of our **Chemist, Miss Kok Ting Fung.** We wish her all the best and happiness on her marriage to Mr. Johnny Fellhauer.

♥ **Congratulations To :** En. Rosazaman B. Mohd Nor and Cik Nik Hasni Bt. Hassan who tied the knot on 14/4/2000.

WELCOME TO :

Mr. Eugene Yee Wei Chiun, who joined us on 02/05/2000 as Assistant Research Officer to work as oil palm agronomist in the Sabah Research Sub-station. He was born a city boy in 1977 in Kuala Lumpur, and graduated in March 2000 with Bachelor of Science (Hon) in Geology (UKM). He is currently a member of the Geological Society of Malaysia.

OBITUARY

We extend our condolences to the family of **Mr. K. Krishnan,** a long serving staff on his sudden demise on 19/5/00 due to a motor accident.

SEE, C.M. & SULIMAH OSMAN