September 2002
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AAR NEWS

EDITORIAL

We have devoted this issue of our AANews to cover the topics that would be discussed at the forthcoming AAR Field Day cum official opening of AAR Paloh Office scheduled for the 10th October 2002 at Paloh Estate. The main objectives of the Field Day are: i) to update AAR Principals and Estate Managers on AAR research programmes on Paloh Estate and ii) to obtain feedbacks from AAR Principals and Estate Managers and to facilitate exchange of ideas. Our Chairman, Dato' Lee Oi Hian has kindly consented to officiate the opening of our new office on Paloh Estate and we take this opportunity to thank him.

The following subjects would be covered at the Field Day:

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Due to some constraints, we have limited the participation to the following groups of personnel only:

1) TPSB/AARSB Crop Committee members
2) BEASB/AARSB Crop Committee members
3) AARSB Board of Directors
4) Estate and Palm Oil Mill Managers/Assistants from nearby estates

For those who are not attending the Field Day, we hope this newsletter would be able to provide you with some useful information. If you are interested to find out more, please do not hesitate to write to us. We also welcome your comments and suggestions. In addition to the Field Day papers, we have also included an advisory note on **Identification of illegitimate commercial DxP seedlings and palms on page 24.** Happy reading!

Ooi LH

BRIEFING BY HEAD OF AGRICULTURAL RESEARCH (SOH AIK CHIN)

Honorable Members of AAR Board, honored guests and colleagues, we bid you a very good morning and a very warm welcome to AAR Paloh Substation in conjunction with the official opening of the new station complex cum field day.

When AAR was first formed in 1986 the national economy was still in recession. For reasons of minimal work disruption and quick establishment of the Company and its activities, we decided to site the Main Office and Labs at Bujong, Sg. Buloh and the field trials at the nearby Balau,

Sedgeley, Tuan Mee and Coalfields estates. As the country rose quickly out of recession we soon realize that our field trials, particularly the oil palm breeding and seed garden trials, would be under threat of urban development. Sure enough the estates surrounding Balau were acquired for housing development, and even Balau Estate itself has been chosen for a college campus and township. Our trials at Coalfields are under similar threat, while our maximum yield agronomy trial at Sedgeley has become the Prime Minister's Office in Putrajaya!

So in 1990 we started to scout around for an alternative more secure area to house our strategically important plant breeding germplasm and seed garden materials and long term agronomy trials. We decided on Ladang Paloh for a number of reasons:

Large good areas scheduled for replanting in the estate as well as in the nearby jungle complex estates to site our trials and seed gardens; a central place in an area of active plantation activities for good interaction between agronomists and plantation managers; and reasonably well developed infrastructure in terms of housing, water and electricity supply, quick road access to train, bus and air terminals and ease of communications.

Since 1991 we have planted in Ladang Paloh and its vicinity 21 breeding and clonal trials and 6 agronomy trials covering 343 ha. to date. We are pleased to report that we have virtually completed planting all our important new seed garden and accompanying progeny testing trials. By 2007 we expect to be able to start producing new improved AA DxP from these seed gardens.

We started operating in Ladang Paloh in 1991 out of a renovated old worker's house with 2 research assistants and lent labour from the estate and research officers from Bujong visiting periodically. We now have a plant breeder and 2 agronomists stationed here assisted by 7 research assistants/clerks and 54 recorders and workers.

As you can see, we also have a new office complex. This building of about 5000 sq.ft. siting on 1 ha. land cost about RM480,000. It mainly houses our plant breeding and agronomy labs besides the office and officers' rooms and a multipurpose meeting room. By 2005 or so we will have added on our new seed production lab at the back of the present building and will gradually close down the lab at Bujong. We have also made some provision for extensions to the office and the labs if needed.

Finally, we would like to express our sincere thanks and appreciation to the Management of Ladang Paloh past and present particularly Encik Thomas and his staff and Taiko Management for being so supportive and allowing us their best areas to site our new office complex and our trials. As a veteran French agronomist once said the quality of field trials depends on a good choice of trial site. It also varies with increasing distance from the researcher's office. Our agronomists will have no excuses this time as both conditions have been met!

We now invite Dato' Lee Oi Hian, Chairman of AAR Board and Taiko Plantations to say a few words and officially declare open AAR Paloh New Office Complex.

Ad-hoc investigations into the effects of pulverizing double-row stacked palm trunk chips with Howard Mulcher at one year after chipping on the breeding of *Oryctes rhinoceros* beetles, and the resultant vegetation with and without replanting of LCC.

Ang Ban Na , Thomas Thomas (Ldg. Paloh) and Ooi Ling Hoak

Introduction

Chung *et. al.* (1999) found that damage by rhinoceros beetles to young palms can delay maturity of the palms and reduce early yields. They reported that severe damage by rhinoceros beetle to 21 months old palms delayed maturity by 7 months and resulted in a crop loss of 3.5t/ha in the first 12 months of harvesting. Liau & Ahmad (1991) found that method of land clearing which affects the ability of the beetles to breed in situ will also affect early yields . They reported that clean clearing (burning) increased the first 18 months yield by 5t/ha, as compared with felling, windrowing and single burning of the palm. Their data also showed that fresh beetle damage peaked at about 23-25 months after felling. During this period fresh damage was at about 12% in the clean clearing method, while in the felling, windrowing and single burning method, damage was at 57%. It is important to note here that their trial was conducted with plots that were only 10 ha each and yield and fresh damage recording was conducted in the central 20 x 20 palms. This proves that beetle bred in situ in a replant is the major cause of subsequent beetle damage on the palms.

Beetle breeding in situ could be prevented/reduced by removing the old palm residues at replanting. Alternatively the residues can be left within the replant in a physical form that would speed up decomposition thus reducing period during which the residues are available for breeding of the beetles. We are now exploring the options for pulverization of the palm chippings into smaller aggregates to speed up decomposition. Pulverization should preferably be done at land clearing before replanting of palms.

This ad-hoc investigation was set up to determine whether pulverization of 12 months old double-row stacked chippings could reduce breeding of the beetles in the residues and the resultant vegetation after pulverization with and without replanting of LCC. The cost involved was also determined.

Treatment	Ha	Remark
1. Chippings pulverized with Howard Mulcher with replanting of LCC.	**35.7**	1st run of Howard Mulcher followed by tinning and second run of Howard Mulcher. In about 10 ha, a 3rd run of the Howard Mulcher was conducted as the chippings were stacked in unusually thick layers.
2. Chippings pulverized with Howard Mulcher with no replanting of LCC.	**1.3**	1st run of Howard Mulcher followed by tinning and second run of Howard Mulcher.
3. Control - chippings not pulverized with Howard Mulcher.	**2.0**	Chippings in windrow were left undisturbed.

Materials and method

This ad-hoc investigation was conducted in the plant breeding trial area of the 2001 replant in Ldg. Paloh. Details of treatments are as follows:

Pulverization was done with a 104 hp John Deere 6400 tractor and HM60 Howard Mulcher (Figure 1).

Figure 1. John Deere 6400 and HM60 Howard Mulcher.

Figure 2. Tractor drawn tines.

After the first run of the Howard Mulcher a tractor drawn tine (Figure 2) was used to rake up unpulverized chippings or partially pulverized chippings before a second run of the Howard Mulcher.

A third run of the Howard Mulcher was required for about 10 ha in the Howard Mulched + replanting of LCC area as the chippings there were stacked in unusually thick piles.

Immediately after completion of Howard Mulching, replanting of LCC was done (2 kg *Pueraria javanica*, 2 kg *Calapogomium mucunoides* and 0.75 kg *Calapogonium caeruleum*, 4.75 kg Floranid Permanent and 9.5 kg RP per ha). The legume seeds were sown in four drills along the middle section of the pulverized palm residues. At 3 months after Howard Mulching one round of spot spraying in the replanted LCC row was done with Starane (0.5 L/ha). Predominant species of weeds were Mikania, wild bitter gourd, Asystasia and siam weed.

Census for rhinoceros beetle population in the residues was conducted at 3-monthly intervals after Howard Mulching. At each sampling point, all the residues within a 2 x 2 palm area were checked for larvae, pupae and adults of the beetle. Sampling points for the census were located as follows:

Treatment	Ha	Location of sampling points*	Total no. of sampling points
1. Chippings pulverized with Howard Mulcher with replanting of LCC.	**35.7**	20 x 20 palms grid	17
2. Chippings pulverized with Howard Mulcher with no replanting of LCC.	**1.3**	6 x 6 palms grid	8
3. Control, chippings not pulverized with Howard Mulcher.	**2.0**	4 x 5 palms grid	15

**Sampling points may be shifted by a few palms if a designated sampling point falls on drains or roads.*

Presence of fresh beetle damage on the 4 palms surrounding the sampling points were also recorded. Vegetation within a 1-m^2 area beside each sampling point was collected and separated into grasses, broad-leaves and LCC for dry weight determination.

Results

Beetle population in the residues

At 3 months after Howard Mulching: Beetle population in the Howard Mulched residues increased slightly from that at pre-treatment (Table 1a). This proves that the residue continued to attract beetle breeding activity after pulverization of the double-row stacked chippings. In the none Howard Mulched residues, the population of beetles in the residues declined from that at pre-treatment. Pulverization of the residue could have triggered an increased release of chemicals associated with decomposition such as ammonia which will attract the beetles (Bedford 1980). Also the resultant smaller aggregates after pulverization would result in a more compact arrangement of the residues that would allow for better retention of moisture thus making it more conducive for beetle breeding. Norman *et al.* (2001) found that high moisture content (over 77% w/w) in the residue is essential for successful development of beetle larvae.

The average duration from the beetle eggs to pupa is about 165 days (Table 1b). Thus the presence of pupa and adult beetles in the residues at 3 months after Howard Mulching also indicated

Table 1a. Population of beetles in the residue.						
Treatment	Mean ± SD number of rhinoceros beetles per 2 x 2 palm area					
	Pre-treatment		3 months after Howard Mulching		6 months after Howard Mulching	
	Larvae	Pupae + adults	Larvae	Pupae + adults	Larvae	Pupae + adults
Howard Mulcher + replanting of LCC	30 ± 59	4 ± 8	40 ± 51	13 ± 24	33 ± 46	7 ± 12
Howard Mulcher + No replanting of LCC	11 ± 22	1 ± 1	17 ± 24	5 ± 9	19 ± 31	1 ± 3
Control no Howard Mulching	66 ± 63	22 ± 22	19 ± 32	24 ± 37	27 ± 26	2 ± 4

Table 1b. Life cycle of rhinoceros beetles (Norman *et. al* 2001 & Bedford 1980).							
Stage	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Pre-pupa	Pupa	Total
Average duration of each stage in days	10	15	24	116	11	14	190
Average cumulative days to end of each stage	10	25	49	165	176	190	

that some beetle larvae that were in the residue at pre-treatment were unharmed by the pulverization exercise.

At 6 months after Howard Mulching: Beetle population continued to be present in the Howard Mulched residue but slightly less than at 3 months after pulverization. It was noted that the beetles were confined to areas in the residue where the chippings were only partially pulverized and thus had accumulated into thick piles. In the none Howard Mulched area, beetle population showed an increase from that at 3 months after Howard Mulching. Residues in the non Howard Mulched area consisted of mostly intact trunk chippings and most of the beetles were found on the chippings that were moist and in contact with the soil.

We shall continue to conduct 3 monthly census on beetle population in the palm residue. The expected increase in decomposition rate of the residues in the Howard Mulched area should result in earlier termination of beetle breeding than in the none Howard Mulched area. To note here is that if the chippings were left unpulverized in the windrows, breeding activity is expected to continue up to 30 months after felling (Table 1c).

Table 1c. Historical data of population of beetles in palm residues in other replants in Ladang Paloh.			
Block	Method of stacking	Months after felling	Population of beetles per 2 x 2 palm area
PM95	2 rows to 1 windrow	12	37
PM94	2 rows to 1 windrow	24	55
PM94	1 rows to 1 windrow	28	13
PM94	1 rows to 1 windrow	30	3

Fresh damage on the palms

It should be noted here that this is an ad-hoc investigation, thus the size of the areas representing the treatments, Howard Mulching without replanting of LCC (1.3 ha) and none Howard Mulching (2 ha) were very small. Therefore fresh damage observed in these treatments are more affected by the movements of beetles into and out of the area than the Howard Mulched with LCC replanting area (35.7 ha).

At 3 months after Howard Mulching: Level of fresh beetle damage on the palms increased from that at pre-treatment in the Howard Mulched area, concurrent with the increase in beetle population in the residues (Table 1d). In the none Howard Mulched area, the level of fresh beetle damage on the palms declined from that of pre-treatment concurrent with the decline in beetle population in the residues.

At 6 months after Howard Mulching: Level of fresh damage in the Howard Mulched area continued to increase where LCC was replanted but declined in the treatment where LCC was not replanted. In the none Howard Mulched area the level of fresh damage stayed at about the same level as at 3 months after pulverization.

Vegetation at 3 and 6 months after Howard Mulching, with and without replanting of LCC.

At 3 months after Howard Mulching, none LCC vegetation accounted for 63% and 99% (on dry weight basis) of the above ground vegetation in the area with replanting and no replanting of LCC respectively (Table 2). Even with the replanting of LCC after Howard Mulching, the vegetation was dominated by the resident plant species consisting of mostly Asystasia, Mikania, wild bitter gourd, siam weed and grasses. Initial establishment of the LCC were probably also slower because they were planted during the dry weather in March (rainfall in February =56mm, March = 42mm, April=182mm). Selective weeding was done at 3 months after Howard Mulching. At 6 months after Howard Mulching LCC increased to 44% and 5% with and without LCC replanting, respectively.

In general it was found that the establishment of the resident population of plants was very vigorous and the legumes did not compete well with them (Figure 2 & 3). This is probably due to the rapid build up of seeds of the resident population of plants in the soil during the 12 months period after felling. Thus the replanted LCC in this trial faced a more intense competition from the resident vegetation in comparison with the LCC that are planted immediately after conventional land clearing. There was also very little regeneration of the original stand of LCC after pulverization of the palm residues.

Size of residue after Howard Mulching (Figure 4a)

After 2 runs of the Howard Mulcher and one run of the tines, 88% of the residues passed through 15 x 20 cm mesh. Only 12 % of the residues were considered large, i.e., they did not pass through 15 x 20 cm mesh. These consisted of chippings that were cut along the grain of the trunk into unusually thick and large chippings (Figure 4b).

Cost and productivity of machines (Table 3)

The total cost excluding depreciation for two runs of the Howard Mulcher and one round of tinning was RM90.63/ha, where a 3rd run of the Howard Mulcher was required, the additional cost per ha was RM 30.39. Productivity of the Howard Mulcher was 5.26ha/manday, 6.67 ha/manday and 4.35 ha/manday for the 1st, 2nd and 3rd run respectively. Productivity of the tractor drawn tine was 14.28ha/manday.

Table 1d. Level of fresh beetle damage on the palms (% of palms).			
Treatment/ha	**Pre-treatment**	**3 months after Howard Mulching**	**6 months after Howard Mulching**
Howard Mulcher + replanting of LCC/35.7 ha	7.3%	11.8%	29.4%
Howard Mulcher + No replanting of LCC/1.3 ha	3.1%	18.0%	4.2%
Control, no Howard Mulching/2 ha	33.0%	28.0%	25.0%

Table 2. Composition of ground vegetation with and without replanting of LCC at 3 months after Howard Mulching.				
Treatment	**% dry weight**			
	Grass	**Broad leaves**	**Total none LCC (Grass + Broad leaves)**	**LCC**
With replanting of LCC	39%	24%	63%	37%
Without replanting of LCC	22%	77%	99%	1%
	% dry weight at 6 months after Howard Mulching			
With replanting of LCC	26%	30%	56%	44%
Without replanting of LCC	39%	60%	93%	5%

Table 3. Cost and productivity of Howard Mulching and tinning operations (does not include depreciation cost).					
Operation	**Ha**	**Cost (RM)/ha**		**Man-day/ha***	**Ha/ manday**
1st run of Howard Mulcher	37	Operation	16.10	0.19	5.26
		Parts**	22.57		
		Total	**38.67**		
Tinning	37	7.47		0.07	14.28
2nd run of Howard Mulcher	37	Operation	17.05	0.15	6.67
		Parts**	27.44		
		Total	**44.49**		
Total	**37**	**90.63**		**0.41**	
3rd run of Howard Mulcher	10	30.39		0.23	4.35
**Assuming 7 hrs/manday. ** Blades and bolts*					

Figure 2. View of vegetation in treatment with Howard Mulching and replanting of LCC(3 months after Howard Mulching).

Most areas consisted of mixed establishment of LCC, grasses and broad leaves (mostly Asystasia, wild bitter gourd, siam weed and Mikania).

Some pockets of pure LCC also established.

Figure 3. View of vegetation in treatment with Howard Mulching and no replanting of LCC. (3 months after Howard Mulching).

Mixed establishment of grasses and broad leaves (mostly Asystasia, wild bitter gourd, siam weed and Mikania).

Figure 4a. Size of residue after 2 runs of the Howard Mulcher with one run of the tines in between.

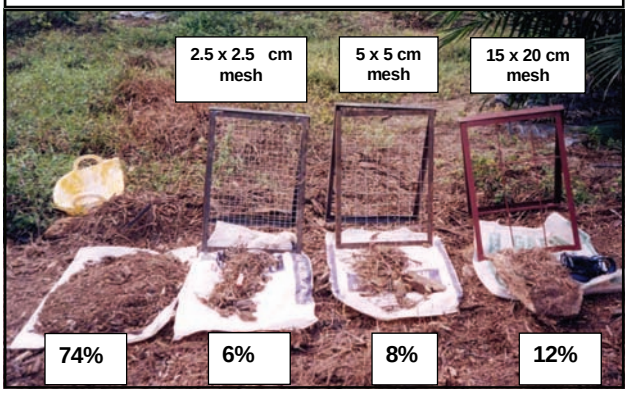

Figure 4b. Chippings that were cut along the grains of the trunk into unusually thick and large chunks were left intact after 2 runs of the Howard Mulcher and one run of the tines.

Conclusions

The Howard mulched residues continued to attract beetle breeding activity at 3 and 6 months after pulverization of the double-row stacked chippings. However it was noted that at 6 months after pulverization, the beetle populations were confined to areas in the residue where the chippings were only partially pulverized and thus had accumulated into thicker piles. In both the 3 and 6 months after Howard Mulching census, the residues in the none Howard Mulched area consisted of mostly intact trunk chippings and most of the beetle population were found on the chippings that were moist and in contact with the soil.

Pulverization of the residue is expected to increase decomposi-

tion rate of the residue and result in earlier termination of beetle breeding activity than in the none pulverized residue. We shall continue to conduct 3 monthly census to determine when this will occur.

Replanting of the LCC increased the stand of LCC greatly as compared to none replanting of the LCC. At 6 months after Howard Mulching LCC increased to 44% and 5% with and without LCC replanting, respectively.However vegetation was still dominated by the resident plant species. The 12-months period between stacking and Howard Mulching of the chippings had allowed a buildup of seeds of the resident plant population and the replanted LCC is expected to face a more intense competition from these resident plants than in conventional land clearing where the period between felling and planting of the LCC is shorter, say 2-3 months.

Pulverization of 12 months old double-row stacked chippings using a HM60 Howard Mulcher and a 104 hp John Deere 6400 tractor with 2 runs of the mulcher and one round of tinning in between was done at a cost of circa RM91/ha (excluding depreciation cost) requiring 0.4 mandays/ha.

Available data indicated that with double row stacking of the old palm chips, beetle breeding can persist to 30 months after felling. The current 2-weekly preventive cypermethrin spraying for 30 months with mechanised sprayer would cost approx. RM 514-640/ha @ say RM8-10.00/ha/rd. The annual cost for this preventive spraying would be RMRM208-260. Thus the cost of pulverizing the chippings at 12 months after felling is only about half the annual cost of preventive cypermethrin spraying.

If rhinoceros beetle breeding activity could be halted at earlier than 30 months after felling the following advantages could be realized:

1. Once in situ beetle breeding activity has been terminated, control will only be necessary for emigrant beetles. Thus any delays, misapplications and wash out by rain of the 2-weekly preventive cypermethrin applications should result in less beetle damage to the palms as the beetle population pressure would be smaller.
2. It might be possible to terminate preventive cypermethrin application completely if there are no replants nearby to contribute to beetle breeding activity. This should result in reduced cost of preventive cypermethrin applications to maturity.
3. Palms which suffered less damage from the beetles would mature earlier and give better early yields.

Data (Table 4) collected from commercial areas cleared by pulverization of the chippings with the Howard Mulcher before planting of the palms indicated that breeding activity at 9-18 months after felling was very low compared to the conventional double-row stacking of chippings and those observed in this investigation.

Table 4. Population of beetles in the residue with pulverization of the palm chippings with the Howard Mulcher at land clearing.

Block	Mean ± SD number of rhinoceros beetles per 2 x 2 palm area					
	9-12 months after felling/4-8 months after pulverization		12-15 months after felling/7-11 months after pulverization		15-18 months after felling/10-14 months after pulverization	
	Larvae	Pupae + adults	Larvae	Pupae + adults	Larvae	Pupae + adults
PR01/75ha	3.4 ± 6.7	0.5 ± 1.8	10.0 ± 32.4	0.6 ± 2.5	9.8 ± 16.3	1.0 ± 2.0
PR01/54ha	6.7 ± 13.1	1.0 ± 2.9	7.2 ± 10.8	0.3 ± 0.7	0.3 ± 1.1	0.4 ± 0.8

These observations give early indications that pulverization of the chippings at land clearing before planting of palms would be more effective at reducing beetle breeding activity. We have a trial that this currently in progress to confirm the data from these commercial clearings.

Some of the other advantages of pulverizing the chippings with the Howard Mulcher at land clearing vs stacking in double-row stacks followed by Howard Mulching at a later date:

1. Over 80% of a replant land area can be used to spread the palm chippings if Howard Mulching is done at land clearing before planting of the palms. When the chippings are stacked in double-rows, even if successfully pulverized by the Howard Mulcher would result in the residues being heaped in only 30% of the available land area. This inevitably will result in thicker layers of residues, which will be more conducive and available for longer period for beetle breeding.
2. If the double-row stacks of chippings are less than 12 months old there is a possibility that the chippings would have to be spread out with a excavator before the Howard Mulcher can be used to pulverize the chipping, this would result in an extra cost of about RM100.
3. The pulverization of the chippings at land clearing would result in better access in the re-

Figure 5. View of area where pulverization of chippings with the Howard Mulcher was done at land clearing vs double-row stacking of chippings at land clearing and planting of palms

Chippings Howard Mulched at land clearing.

Double-row stacking of chippings at land clearing and planting of palms.

plant (Figure 5).

Acknowledgements

The technical support of all the workshop staffs and Assistant Managers of Ladang Paloh is gratefully acknowledged.

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MAXIMUM YIELD TRIAL MF3/92 By Kee Khan Kiang

1. GENETIC YIELD POTENTIAL AND SITE YIELD POTENTIAL (SYP)

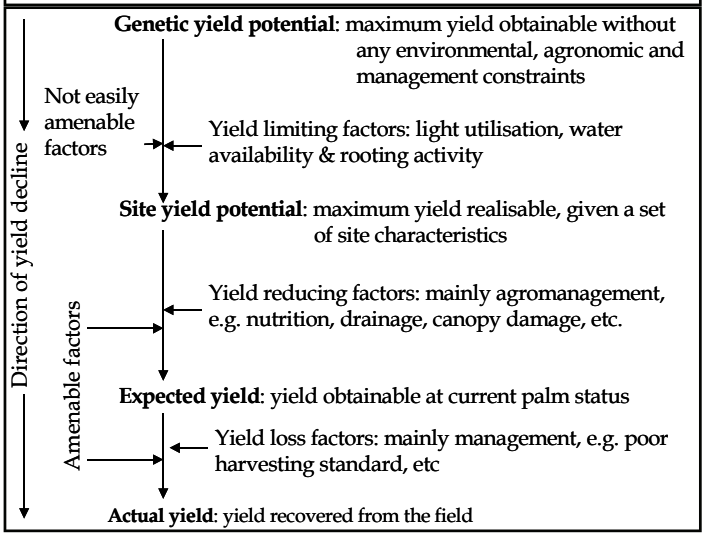
The genetic potential of a crop is the largest yield obtainable if all the environmental conditions and agronomic decisions were perfect (Tinker, 1984).

The theoretical potential fresh fruit bunch (ffb) yield of oil palm had been estimated at 45 t ha-1y-1 (Corley, 1982, 1985). Very high ffb yields of 35-42 t ha-1y-1 had already been reported in Malaysia (Yong and Chan, 1992; Lee and Toh 1992). However actual yield achieved for a given site is usually lower than the genetic potential due to yield limiting site factors, which limit the full expression of the genetic potential (Fig. 1). These factors (which restrict light utilisation, water availability or rooting activity) will act to reduce the potential yield that can be achieved from the genetic yield potential to the Site Yield Potential (SYP). This SYP therefore is the maximum realisable yield for any given set of site characteristics.

In the estates, there will be other yield reducing factors, which operate to further reduce the achievable yield. Yield reducing factors are mainly agromanagement factors such as poor nutrition, loss of leaf area by pests and herbicides, poor drainage etc. These factors reduce the achievable yield from the SYP to the Expected Yield i.e. the yield obtainable at the present or current palm status.

If estate management is poor yield loss factors could be significant. Examples of yield loss factors are poor crop recovery or harvesting standards. These factors will widen the gap between Actual Yield and the SYP.

Figure 1: Relationship between genetic potential, site potential and actual yield of a crop (adapted from Tinker, 1984)



Yield limiting site factors are difficult or not easily amenable factors. At best they are costly to correct (e.g. irrigation for drought prone areas). Yield reducing and yield loss factors in contrast are both controllable or more amenable. If appropriate corrective inputs are implemented to eliminate or reduce these factors, then the actual yields can be improved to the SYP.

A reliable technique to estimate with confidence the SYP of oil palms for any given site would be very useful for both agronomists and managers. The estimated SYP can be used to set realistic yield targets. It also provides an objective basis for assessment of current yield in relation to SYP. A large yield gap between current yield and SYP will help focus attention on identification of yield constraints that are present. Specific steps to correct or minimized these yield constraints can then be taken. The concept of site yield potential therefore allows for a multidisciplinary approach to yield maximization and focus on site-specific inputs to avoid wastage and inefficiencies.

2. THE ASYP 2.6 MODEL for SYP prediction.

ASYP 2.6 is an empirical model developed for estimation of oil palm SYP for any given site. The SYP is expressed as a function of various plant, soil and environmental factors that influence yields as follows:

SYP = f (F1 x F2 x F3x…..Fi) x genetic potential where F1 - Fi are site-specific factors that influence yields.

The main factors taken into account are:

1) type of planting materials (e.g. HRU, AAR, Chemara etc)
2) light interception (as determined by planting pattern and density)
3) soil factors (affecting rooting activity e.g. soil depth, consistence, structure, drainage, terrain etc)
4) climate (indicated by magnitude and duration of estimated annual soil moisture deficits)
5) palm age (based on years from field planting)

These data are collected and rated according to severity of impact on the genetic yield potential. The score for each of these factors is then used to compute the site yield potential.

MF3/92 is one of several factorial trials set up to test the SYP of oil palm on contrasting soils as predicted by the ASYP 2.6 model. The experiment sited on Rengam soils (Typic Paleudult) was set up in 1992 immediately after planting in Paloh Estate, Johor. Detailed soil check of the trial site was conducted and all parameters and data required for the ASYP 2.6 model were measured or collected.

2.1 Experimental details:
The experiment is a 2(NK)x2(P)x2(M) factorial + 2 controls (as observations) in RCB (randomize complete block) design with 5 replicates. Treatment details are given in Appendix 1..

Legumes were sown immediately after palms were planted. The previous planting was chipped and all residues were left in the field. The NK treatment at rate 1 was calculated using INFERS, an integrated site-specific fertilizer recommendation system, which takes into account the palm demand for N and K and the inherent soil fertility of the site. Rate 2 was 2x rate 1. Rock phosphate for legume establishment was applied in 2 split applications after legume planting. EFB treatment was made annually. Basal applications of P, Mg, and B for the palms were given annually. Both NK and basal fertilizer rates were increased progressively with palm age to match palm requirements.

Upkeep and maintenance of the trial were in accordance with estate practice. Statistical analysis of the data was made using standard analysis of variance (ANOVA) for factorial design and by contrast for group comparisons (Gomez and Gomez, 1976).

3. RESULTS

3.1 FFB yields
Cumulative yields from 1994-2001 (Table 1) indicated a significant response only to P (at rate 2 for legume establishment). The yield response to P was mainly from bunch weight rather than from bunch number. Control (021) with higher P and EFB mulch gave heavier bunches compared to control 010.

3.2 Site yield potentials and actual yields
The site-yield potential profile for the trial estimated from the model is given in Table 2. Actual yields obtained are given as trial mean, best treatment, best plot (yearly) and the control treatment. The site yield potential is the best yield possible when all identifiable agronomic and management constraints are removed or minimized. In MF3/92, where there was a sig. response to P, the best treatment yield would be the best indicator of site yield potential.

The model projected a very rapid increse in SYP of 17.0, 22.9, 27.7, and 31.6 over the first 4 years of production (Table 3) and 34.4 t ha^{-1} y^{-1} thereafter. Best treatment for the first 3 years of production was relatively poor averaging at about 74% of SYP. Yields improve after 1998 and were generally >85% of the SYP. The 3 year mean from year 7-9 was 30.6 t/ha or 89% of SYP which was satisfactory.

Table 1 : FFB Yield (kg/palm),

Trt	FFB Yields (kg/palms)							
	1995	1996	1997	1998	1999	2000	2001	94-01
R1	83.5	119.6	131.5	176.6	223.0	197.4	178.2	1117
R2	79.2	119.4	125.4	166.2	237.2	197.1	187.5	1118
	ns	ns	ns	*	*	ns	ns	ns
P1	82.7	117.1	126.2	168.0	228.1	190.1	175.1	1094
P2	80.1	121.9	130.8	174.7	232.1	204.4	190.6	1141
	ns	ns	ns	ns	ns	*	ns	*
M0	82.1	119.6	125.4	169.3	229.8	195.0	188.7	1118
M1	80.7	119.4	131.6	173.4	230.4	198.9	177.0	1117
	ns	ns	ns	ns	ns	ns	ns	ns
C'trol 010	66.6	113.1	87.6	131.8	219.6	163.6	174.1	958
C'trol 021	76.9	113.9	111.9	154.9	217.7	181.3	190.1	1051
				*	ns	ns	ns	*
R vs C'trol				**	ns	**	ns	**
Trial mean	81.4	119.5	128.5	171.3	230.1	197.5	182.9	1117

Trt	Bunch no							
	1995	1996	1997	1998	1999	2000	2001	94-01
R1	15.8	14.4	10.90	11.1	13.29	11.78	9.43	87.85
R2	15.1	13.9	10.32	10.5	13.88	11.72	9.82	86.35
	ns	ns	ns	ns	ns	ns	ns	ns
P1	15.6	14.1	10.61	10.8	13.77	11.77	9.34	86.99
P2	15.3	14.2	10.61	10.9	13.40	11.72	9.90	87.20
	ns	ns	ns	ns	ns	ns	ns	ns
M0	15.5	14.0	10.15	10.3	13.28	11.62	9.79	85.92
M1	15.3	14.3	11.07	11.3	13.89	11.87	9.45	88.28
	ns	ns	ns	*	ns	ns	ns	ns
C'trol 010	13.7	14.8	8.3	9.07	13.90	10.65	10.36	81.09
C'trol 021	15.3	14.3	10.5	10.22	14.17	11.11	10.99	87.53
				ns	ns	ns	ns	*
R vs C'trol				*	ns	ns	ns	ns
Trial mean	15.4	14.1	10.6	10.8	13.6	11.6	9.6	87.1

cont. Table 1

Trt	Bunch Wt. (kg)							
	1995	1996	1997	1998	1999	2000	2001	94-01
R1	5.31	8.36	11.99	15.98	16.94	17.01	19.01	12.77
R2	5.25	8.64	11.67	16.01	17.26	16.96	19.30	13.02
	ns	ns	ns	ns	ns	ns	ns	ns
P1	5.30	8.40	11.62	15.85	16.72	16.34	18.97	12.64
P2	5.26	8.60	12.04	16.15	17.48	17.62	19.34	13.15
	ns	ns	ns	ns	ns	*	ns	*
M0	5.29	8.58	11.89	16.54	17.50	17.13	19.41	13.08
M1	5.28	8.42	11.77	15.45	16.70	16.84	18.90	12.72
	ns	ns	ns	*	ns	ns	ns	ns
C'trol 010	4.87	7.66	9.96	14.5	15.93	15.65	17.08	11.85
C'trol 021	5.02	7.92	10.82	15.1	15.52	16.45	17.70	12.04
				ns	ns	ns	ns	ns
R vs C'trol				*	*	ns	**	**
Trial mean	5.28	8.50	11.83	16.0	17.10	17.10	19.16	12.90

Table 3 : Census of no. of palms/replicate with fresh (spear and frond 1) rhinoceros beetle damage

Rep	A	B	C	D	E	Total	% palms
Oct 96	14	14	9	20	10	67	10.5
Apr 97	14	7	8	15	15	49	7.6
Jun 97	3	30	23	34	18	134	21.7
Aug 97	2	5	3	2	3	14	2.2
Sep 97	6	6	2	6	3	23	3.6
Oct 97	16	18	11	15	4	64	10.1
Nov 97	5	2	3	0	2	12	1.9
Dec 97	6	8	3	10	4	31	4.9
Jan 98	1	7	2	1	2	13	2.0
Feb 98	2	4	2	6	0	14	2.2
Mar 98	4	0	1	1	3	9	1.4
Apr 98	4	2	5	10	3	24	3.8
May 98	11	8	7	13	9	48	7.5
Jul 98	4	7	2	10	7	30	4.7
Sep 98	14	14	9	9	3	49	7.7
Oct 98	15	15	8	4	4	46	7.2
Nov 98	6	9	8	6	3	32	5.0

Table 2 : FFB yield profiles of SYP, trial mean,

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002***	**Mean**
Age (years)	3	4	5	6	7	8	9	10	(7-9)
SYP	17.0	22.9	27.7	31.6	34.4	34.4	34.4	17.2	34.4
Trial mean	11.2	16.5	17.8	23.6	31.8	27.2	25.3	13.2	28.1
% SYP	66%	72%	64%	75%	92%	79%	74%		82%
Best treat-	12.2	17.7	20.4	25.2	33.7	29.1	29.0	14.7	30.6
(code)	(111)	(111)	(111)	(121)	(220)	(221)	(220)	(211)	
% SYP	72%	77%	74%	80%	98%	85%	84%		89%
Best plot	15.7	21.2	24.2	29.1	36.2	33.9	38.5	20.7	36.2
(code)	(221)	(220)	(211)	(121)	(220)	(221)	(220)	(211)	
% SYP	83%	83%	79%	92%	105%	98%	112%		105%
Control 000	9.2	15.6	12.1	18.2	30.2	22.6	23.9	9.9	25.6

** For 6 months (Jan-June) only*

Best plot yields however have equaled or exceeded the SYP from 1999 to 2001, indicating that the estimated SYP is an attainable figure although it is based on a small plot (of 30 palms).

4. Discussion

4.1 FFB Yields

A significant palm response in ffb yields to higher P rate (applied for legume establishment) implied that P was still limiting in the system. This was despite the application of 0.5 kg RP palm^{-1} in the planting hole and 2-3 kg RP palm^{-1}y^{-1} subsequently. The beneficial effects of higher P at 1200 kg RP ha^{-1} instead of the usual 600 kg RP ha^{-1} were probably due to better legume growth and recycling of nutrients from the cover crop to the palms (Han and Chew, 1982; Tan and Ng, 1982; Yeow et. al., 1982). Pretreatment soil analysis had indicated low total and available P and a response to applied P in the legumes can therefore be expected.

4.2 Site yield potentials

In the steady yield stage (1997-2001) best treatment yielded 89% of the SYP. The relatively poorer yields recorded especially in the first 4 years of production may be attributed to the persisting chronic frond and canopy damage from rhinoceros beetle (Oryctes rhinoceros) since planting. A summary of fresh spear and frond damage since 1996 is given in Table 3. Data from an earlier trial in Sedgeley Estate indicated yield depression of >40% of SYP in first year of harvesting after severe rhino beetle damage. Except for the first 4 years of harvesting, best treatment yields were generally within satisfactory agreement with projected SYP. Differnces between best treatment yields and SYP were just over 10% of SYP.

Best plot yields were consistently >80% of SYP in the first 4 years of harvesting and were close to or exceeded the SYP from 1999-2001. Mean best plot yield from 1999-2001 was 36.2 t ha^{-1} or 105% of SYP. These

results indicated that the SYP of 34.4 t ha-1 is realistic and achievable.

The estimated SYP is based on long-term rainfall data and therefore will not account for any immediate impact of short-term adverse climatic conditions. Neither does it account for any inherent physiological yield cycles. Thus the model is not designed for short term or annual yield prediction and thus should not be used in this way.

In 1999 and 2001, best plot yield exceeded the SYP by 5 and 12% respectively. These reflect the 'upper limits' of variation in the actual yields achievable for the given site. However these upper limits are usually not sustainable (the same plot did not maintain the high yield every year) and therefore cannot be taken as indicative of SYP.

5. Conclusion

Results from this trial indicated that the SYP projected by the model are realistic and achievable. At the steady yield phase (1999-2001), the best treatment achieved a mean yield of 30.6 t ha^{-1} or 89% of projected SYP of 34.4 t ha^{-1}. Persistent chronic rhino beetle damage during the immature and early mature phase has depressed early yields by as much as 25% of the SYP especially in the first 3-4 years of harvesting. It remains to be seen if yields will continue to recover with time and actual yield of >95 % of the SYP can be achieved.

Appendix 1

Details of Experiment

Soil series:Rengam	Subgroup: Paleudult
Order: Ultisol	Parent materials: granite
Planting materials: DxP AAR	Density: 138 palms ha^{-1} (30′ Δ)
Year planted: June 1992	Trial commenced: October 1992
Recording palms: 12	Plot boundary: 1 guard row

Trial design: 2(NK)x2Px2M factorial + 2 Controls in RCB, 5 replicates

Treatment details (since 1994/95):

a) Nitrogen and Potassium (NK) rates
- N1 @ 1.05 kg N $p^{-1}y^{-1}$
- N2 @ 2.10 kg N $p^{-1}y^{-1}$
- K1 @ 2.4 kg K_2O $p^{-1}y^{-1}$
- K2 @ 4.8 kg K_2O $p^{-1}y^{-1}$

b) RP rates for legumes at establishment
- P1 @ 600 kg P ha^{-1}
- P2 @ 1200 kg P ha^{-1}

c) -/+ EFB mulching
- M0 @ zero mulch
- M1 @ 38 t $ha^{-1}y^{-1}$

N was applied as ammonium sulphate (21% N) and K as muriate of potash (60% K_2O) in 4 split applications per year.

d) Basal fertilizers were
- JRP @ 3.0 kg p^{-1} y^{-1}
- Ks @ 1.75 kg p^{-1} y^{-1}
- HGFB @ 0.1 kg p^{-1} y^{-1}

e) Control treatments were
- Control (010) = (N0K0)P1M0
- Control (021) = (N0K0)P2M1

YIELD IMPROVEMENT PROJECT IN PALOH ESTATE

BY T. THOMAS (PALOH ESTATE) & C.C. TAN (AAR)

1. INTRODUCTION

A yield improvement project or YIP was initiated in 1997 for certain blocks in Paloh Estate where Plant Breeding and Clonal Evaluation trials were set up. These blocks were selected because of their poor growth and yields right from the onset.

As an example of the YIP in Paloh Estate for the AAR Paloh field day, PM92A1 will be used.

The protocol of the YIP is as follows:

- Firstly, to identify the constraints to the poor growth and yields.
- Secondly to put in the necessary agronomic and management inputs to alleviate the effects of the constraints.

If all major constraints to the palms' growth are removed right from replanting, the plantings are highly likely to grow well and produce good early and subsequent yields, which would be within the site yield potential or SYP. An example, which will be discussed, is PM98.

2. CONSTRAINTS IN PM92A1

- Detailed soil checks in 1997 gave variable soil types consisting mainly of coarse Rengam, Pelepah and Terap. However, the soils were previously mapped as uniformly Rengam and this gave a false impression that soil was not a limiting factor to palm growth.
- Rhinoceros beetles had been seriously damaging the palms and severely affecting their growth right from replanting. The beetles were breeding in the nearby EFB dumps and the mill's fibre dump as well as coming in from the 1995 and 1996 replants. Cypermethrin spraying control was not available then and control of beetle breed sites had yet to be implemented.
- Rat damage, especially by the more ferocious *R. argentiventer* was seriously affecting the yield through losses in bunch weight and loose fruits.
- Constant outbreak of bagworm infestation. A serious attack in

1997 led to the use of trunk injection of Tamaron but because the palms were still small due to age and growth setbacks. This led to some severe lower frond desiccation thus aggravating the already serious loss of leaf area due to rhinoceros beetle.

- Shortage of labour led to severe weed competition in the early years right up to 1997/8.

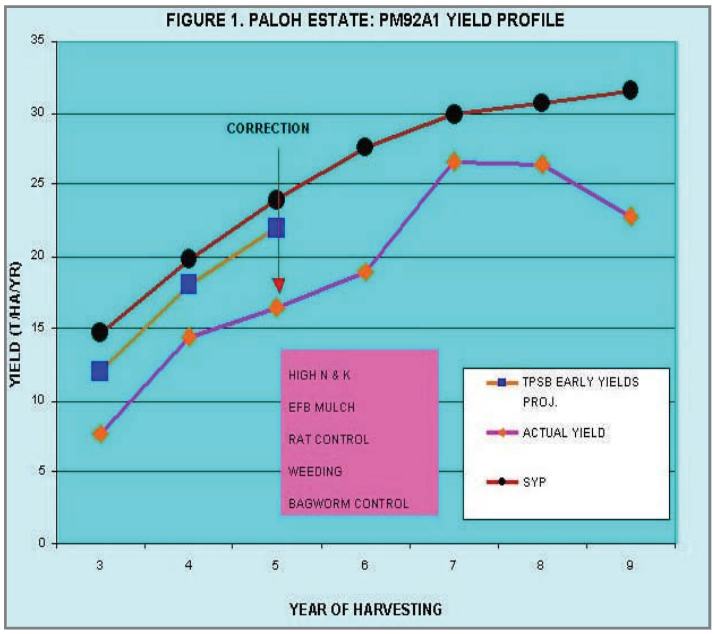
3. REMEDIAL ACTIONS

Remedial actions taken to alleviate the constraints to palm growth and yields started mainly from 1997. They were:

- EFB mulching at 60 t/ha, reduced to 40 t/ha from 2001 onwards, to improve the soil structure, conserve moisture and improve the palm nutrient status.
- High N and K fertilizer inputs to improve the palm nutrient status.
- Introduction of AAR's Saturation Baiting System in 1998 after an extensive study, to combat the previously chronic rat infestation.
- Increased weeding rounds.
- Bagworm control.

4. RESULTS

The yield profile of PM92A1 is illustrated in Figure 1.



Harvesting started at the 37th month after planting. The salient points from the yield profile are:

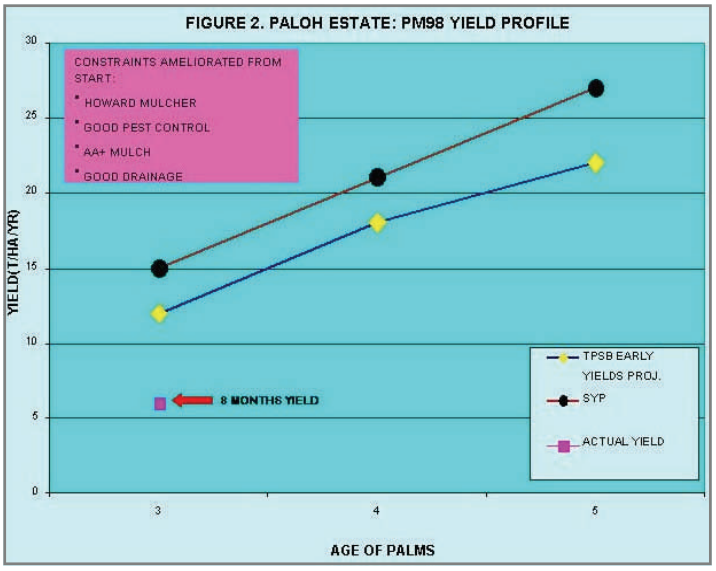
- Yields in year 3 and 4 although on an increasing trend were well below the SYP and TPSB's projections for the Jungle Complex.
- The yield increase slowed down in year 5 and the yield gap widened further.
- Corrections for palm growth were started from year 5 as per the remedies stated in item 2.
- Yield increase was still poor in year 6 as the impact of the corrections were just starting to take effect.
- In year 7 the yield increased by 41% over year 6 as the corrections begin to have greater impact on the palms' recovery.
- Yield in year 8 seemed to have plateaued.
- Yield decline in year 9 appeared to be a general trend affecting others in the region and due to the lower than usual rainfall.
- On a final note, the corrections appeared to have contributed favourably to improving palm growth and yields but due to serious growth setbacks previously, the yields would unlikely to be able to reach the SYP. Nevertheless the mean yield of years 7 to 9 at 25.3 t/ha has already achieved 81% of the mean SYP of 31.2 t/ha, which rated as satisfactory.

5. PM98

In this block, the constraints to early growth were initially identified and the necessary inputs need to ameliorate the effects of the constraints effected. These were:

- Total and effective pulverization of the old chippings with the Howard Mulcher. This led to very much reduced beetle damage through the destruction of their potential breeding sites as well as cypermethrin spray.
- AA+ mulch was used for the whole planting for weed control without chemical scorching of lower fronds through chemical weeding and reduction of manuring rounds.
- Drainage problems were sorted out early.
- Rat control was effectively implemented.

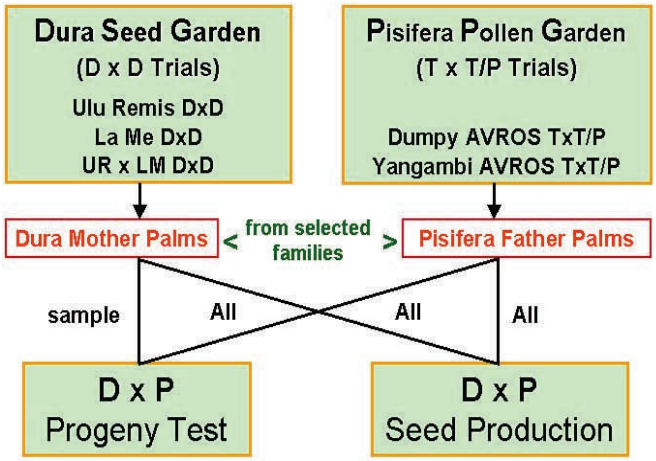
Figure 2 gives the yield profile of PM98 where the actual yield for the first 8 months of year 3 is given in comparison with TPSB's projection and AAR's SYP. Final yield for year three is expected to touch TPSB's targets but below the SYP due to the



dry weather for the previous as well as current year.

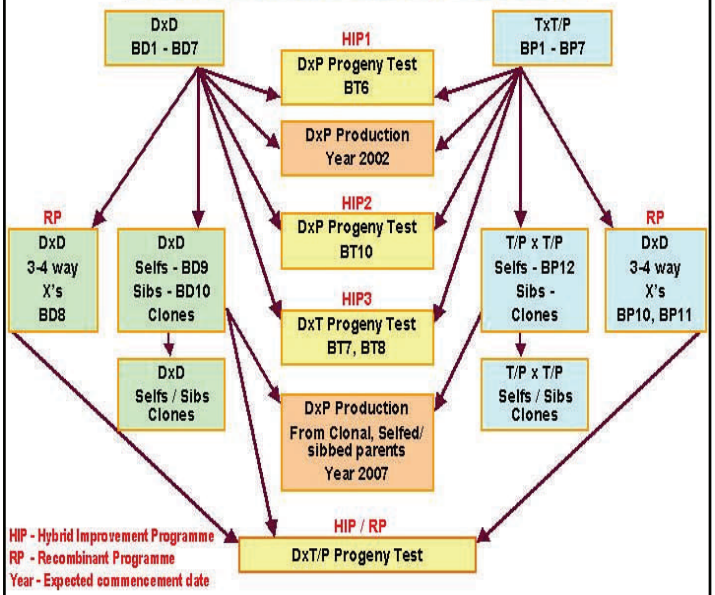
In conclusion, where good management and agronomic practices were effected right from the onset, the plantings are likely to produce the good early yields expected from them. With the maintenance of the good practices, their yields should stay close to the SYP.

Fig.1: Current AA DxP Seed Production



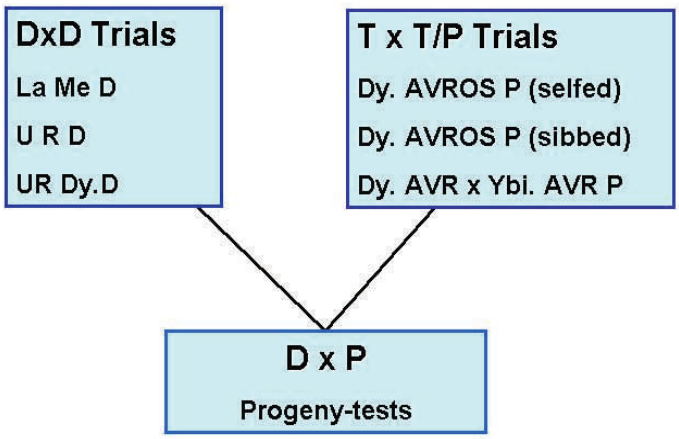
All selected D's and P's (from selected families) are used in commercial DxP Seed Production.
Only a small sample of D mother palms is progeny-tested.
All available P palms are progeny-tested.
Each P is crossed to 3 – 5 D's.
Improved AA DxP is obtained by selecting only superior P's based on DxP progeny-test results.
Based on such earlier progeny-tests, we have 'creamed off' the better P's and D's for improved DxP seed production.

Fig. 2: AAR's Main Breeding Programme And Prospective Improved AA DxP



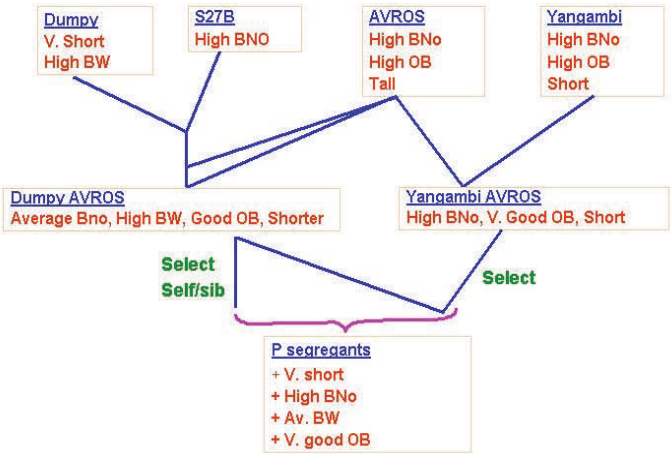
Objectives:
To produce 6-8 million seeds of improved AA DxP of:
Uniformly short (small) and high oil yielding palms
Using inbreds/clones of proven D and P parents.
All trials in program have been planted mainly in Ladang Paloh and vicinity.
Improved AA DxP from this program will be available by 2007.

Fig. 3: BT6-98 Field Demo Trial



All available P's in each family are being progeny-tested.
Each P has been crossed to 1-2 D's from each D family (LM/UR/ UR.Dy)
Objectives:
To obtain superior P's for improved AA DxP seed production.
To ascertain whether certain P's (Dy.AVR /(Dy. AVR x Ybi.AVR) combine better with certain D families (LM /UR / UR.Dy).

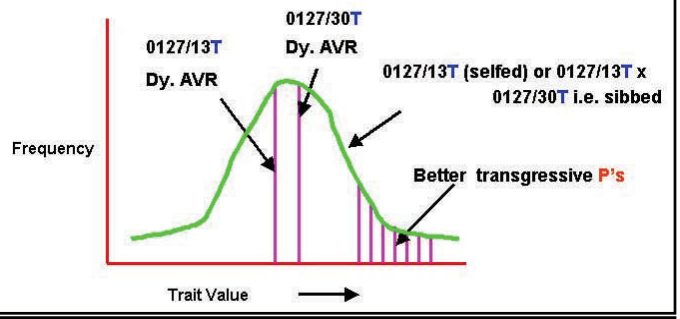
Fig. 4: Breeding Plans - Pisifera Improvement



To obtain superior P segregants with the best combinations of the desirable traits by inbreeding (selfing/sibbing) selected Dy. AVR parents and outcrossing to superior proven Ybi. AVROS parents which can complement the deficiencies in the Dy. AVR parents.

Fig. 5: Selection Plan (Inbreeding)

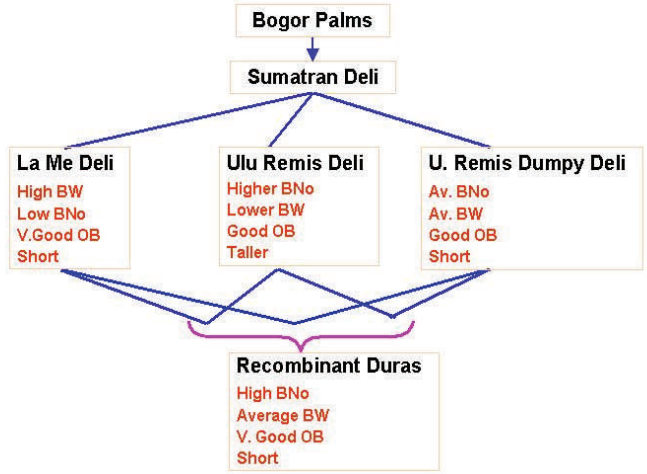
Dy. AVR Selfed/sibbed



Mean of Dy.AVR selfs/sib P's, similar to their parents (0127/13T, 0127/30T) in their DxP progeny-tests

Hope to select superior transgressive P's from the subsequent DxP progeny tests.

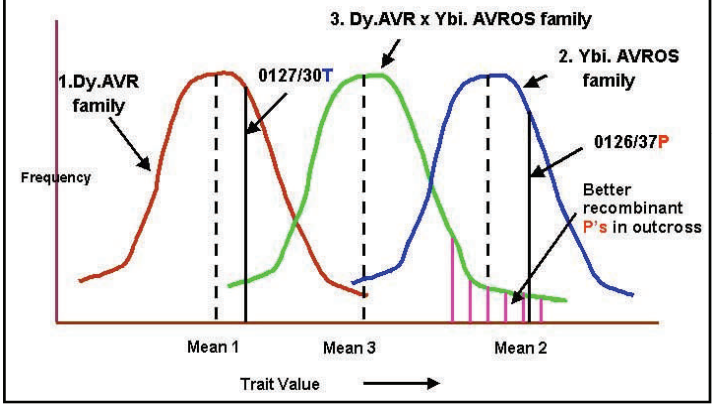
Fig. 7: Breeding Plans - Dura Improvement



The recombinant D's are progeny tested with different types of P's in BT10-02.
In this demo trial i.e. BT6, only the parental LM, UR and UR-Dy D's are sample tested with the Dy. AVR and (Dy. AVR x Ybi. AVR)P's to see how they combine: i.e.
Whether certain P's combine generally well with all D's. or certain P's combine well only with certain D's.

Fig. 6: Selection Plan (Outcrossing)

Dy. AVR x Ybi. AVR



Outcrossing i.e. Dy. AVR x Ybi.AVR likely to move family mean higher.

Further improvement in recombinant P's obtainable after DxP progeny-tests.

Fig. 8: BT6B-98: FFB Yields Results

Pisifera Group

Trial	Dura Group	Dy.AVR (sibbed)			Dy.AVR (selfed)	Dy.AVR x Ybi.AVR							
		053/20P	053/27P	053/33P	OBS20/30P	0138/1P	0138/4P	0158/1P	0158/4P	0158/8P	0158/15P	0158/16P	Mean (D)
FFB (t/ha)	UR D	12	16	12	13	11	14	15		14	17	13	14
	URDY D		12		15			14					14
	LM D	12	15			12			8				12
	Mean (P)	12	14	12	14	12	14	15	8	14	17	13	
	Comm. DxP Control = 12; Clone Control = 12												
BNo (No/P)	UR D	16	19	18	17	19	19	23		22	22	19	19
	URDY D		16		18			15					16
	LM D	12	16			14			10				13
	Mean (P)	14	17	18	18	17	19	19	10	22	22	19	
	Comm. DxP Control = 19; Clone Control = 18												
BW	UR D	5.7	6.4	4.7	5.5	4.4	5.5	4.7		4.6	5.6	5.1	5.2
	URDY D		5.5		6.3			6.7					6.2
	LM D	7.6	6.6			6.2			6.0				6.6
	Mean (P)	6.7	6.2	4.7	5.9	5.3	5.5	5.7	6.0	4.6	5.6	5.1	
	Comm. DxP Control = 4.6; Clone Control = 5.0												

(Dy AVR x Ybi. AVR) P's (esp. 0158) tend to confer high FFB yield through high BNo.

LM D tend to confer lower FFB because of lower BNo.

Fig. 9: BT6B-98: OB and HT Results

Pisifera Group

Trait	Dura Group	Dy.AVR (sibbed)			Dy.AVR (selfed)	Dy.AVR x Ybi.AVR							
		053/20P	053/27P	053/33P	OBS20/30P	0138/1P	0138/4P	0158/1P	0158/4P	0158/9P	0158/15P	0158/16P	Mean (D)
OB %	UR D	25.4	25.3	28.9	27.6	26.3	27.2	28.2		29.4	26.7	30.2	27.5
	URDy D		23.7		26.6			26.8					25.7
	LM D	27.8	25.4			28.9							27.3
	Mean (P)	26.6	24.8	28.9	27.1	29.6	27.2	27.5		29.4	26.7	30.2	
	Comm. DxP Control = 28.6 ; Clone Control = 30.7												
HT cm.	UR	23	29	18	24	36	26	36		35	52	22	30
	URDy		22		22			36					27
	LM	34	16			26			23				25
	Mean (P)	29	22	18	23	30	26	36	23	35	52	22	
	Comm. DxP Control = 30 ; Clone Control = 47												

(Dy AVR x Ybi. AVR) Ps, tend to confer higher OB than inbred Dy.AVR P.

UR D's and (Dy. AVR x Ybi.AVR) P's tend to produce taller progenies.

Conclusion – Preliminary indication that prospective improved AA DxP likely to derive from URD (high BNo) x (Dy.AVR x Ybi.AVR)P.

Shorter DxP can be assured by selecting only shorter D and P parents for AA DxP seed production.

PERFORMANCE OF AAR ORTET CLONES AND RECLONES IN TRIAL BCT14-97

BY TAN CHENG CHUA

1. INTRODUCTION

AAR"s oil palm tissue culture program originated in HRU (Highlands Research Unit) in 1981 with the main objective of propagating elite clonal oil palm planting materials. The sources of ortets for cloning were the progenies in HRU's plant breeding trials. By the time of AAR's formation in 1986, ramets from elite ortets were starting to come out of HRU's tissue culture laboratory but over at AAR it was back to square one.

AAR started a new laboratory from scratch operating from the former bungalows in the ex-KLK Complex, Sungei Buloh. However, with no breeding trials planted up yet, there were no sources of ortets for cloning. So, the initial materials used for cloning were seed embryos and seedlings from recreated crosses. The ramets from these materials were planted in trials and a semi-commercial planting in Kampar Estate with the possibility of going back to reclone them if the clonal tests were favourable. From cloning the recreated crosses we went on to reclone ramets from ortet clones which were planted in trials in Balau Estate and which were obtained from HRU as part of Boustead's share of HRU after the split from HRU.

The selection and cloning of elite ortets from AAR's own breeding trials, which were planted from 1987 onwards, commenced in 1992. BCT14-97 was the second trial on the evaluation of clonal materials from these ortets. The first trial was BCT13-97, which was planted in Kampar Estate at almost the same time as BCT14-97.

2. DETAILS OF TRIAL

Details of the trial are given below:

Objective: Evaluation of AAR ortet clones and some reclones from Class 1 clones.

Trial Design:

- Randomised blocks with 5 replicates.
- Plot size of 4x4 palms/plot.
- Planting Distance: 9.1 x 9.1 m Δ spacing.

Treatment Details:

Field code	Clone	Ortet	Parentage	No.of reps.	Remarks
0622	A92	5/14C	ZD`F' x OBS4/30	5	Class 1 reclone
0623	A98	C.6	3/7 x OBS4/30	5	Class 1 reclone
0624	A71	024/38	0251/8 x 0127/37	5	Evaluation clone
0625	A84	078/52	0254/62 x 0126/11	5	Evaluation clone
0626	A88	089/65	0106/10 x 0126/11	5	Production clone
0627	A101	082/70	0106/10 x 65/4	5	Production clone
0628	A81	082/51	0106/10 x 65/4	5	Evaluation clone
0629	A80	082/47	0106/10 x 65/4	5	Production clone
0630	A72	0159/22	0104/51 x 0127/4	5	Evaluation clone
0631	A105	0112/72	0251/8 x 0280/18	4	Production clone
0632	A65	089/36	0106/10 x 0126/11	2	Evaluation clone
0633	-	-	AA D x P Com.	5	

Note: Production clone – elite ortets are cloned as production clones for large scale plantings. The individual palms are selected on meeting all the following criteria:

- High FFB yield of >= 95% of Dumpy AVROS or >= 90% of AVROS
- High O/B of >= 28%
- Short palm of <= 95% of Dumpy AVROS or <= 80% of AVROS

Evaluation clone – where the ortet does not meet any

one of the above criteria, their clones are categorized as evaluation clones and are planted in limited numbers in clonal evaluation trials to evaluate their performances. These would be prospective clones for recloning if they are good performers.

Class 1 reclone – the best ortet clones from HRU were re-cloned at AAR to produce the Class 1 reclones.

Trial Area:	Location:	PR97A1, Paloh Estate
	Date planted:	April-May 1997
	Soil type:	Rengam/Beserah lateritic
	Previous crop:	Oil Palm
	Cover:	Legumes
	Hectarage:	6.6 ha

3. RESULTS AND DISCUSSIONS

Oil palm tissue cultured palms are plagued by a clonal abnormality affecting the fruits called mantling. This abnormality is caused by the vestigial stamens in the female flowers developing into fleshy carpels to form a mantle surrounding the fruit as shown in Figure 1. Such mantled fruits can be parthenocarpic or fertile. Severely affected bunches will abort causing the palm to be unproductive. On the other hand, palms with bunches having mild to moderate mantling may recover to produce normal bunches.

Figure 1. Mantling in Clonal Palms (Ramets)

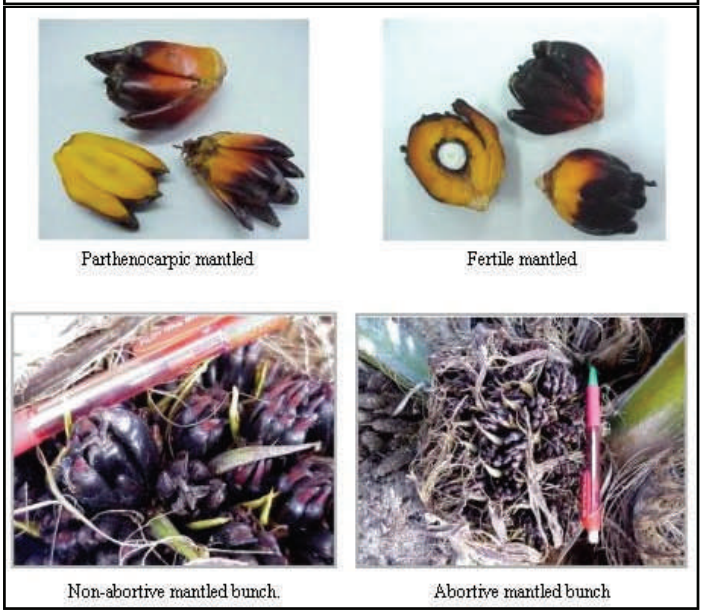


Table 1. Mantling Levels in BCT14-97

Trt. No.	Clones	No. of Reps.	No.of Palms	No. Mantled		% Mantled	
				N.Ab.	Ab.	N.Ab.	Ab.
622	A94/5/14c	5	80	0	0	0.0	0.0
623	A98/6	5	80	0	0	0.0	0.0
624	A71	5	80	0	0	0.0	0.0
625	A84	5	80	1	0	1.4	0.0
626	A88	5	80	0	0	0.0	0.0
627	A101	5	80	0	1	0.0	1.3
628	A81	5	80	0	0	0.0	0.0
629	A80	5	80	0	1	0.0	0.0
630	A72	5	80	0	0	0.0	0.0
631	A105	4	64	0	0	0.0	0.0
632	A65	2	32	0	0	0.0	0.0
633	AA D x P	5	80	0	0	0.0	0.0
TRIAL MEAN:			**896**	**1**	**1**	**0.1**	**0.1**

Abnormality levels in the form of mantled fruits were very low among the ortet clones of BCT14-97 (Table 1). Only two clones, namely A84 and A80 were mantled with 1 non-abortive mantled and 1 abortive mantled palm respectively.

The reclones A94 and A98 were all normal.

The low mantling levels in BCT14-97 are in line with the mantling levels for our ortet clones and latest reclones. Although 60 % of our clones have some level of mantling, they are mostly in the slight mantling category.

For ramets planted out earlier in our clonal programme i.e. from 1987 to 1995, the average mantling was >5 %. These ramets are mainly from the seedling-derived clones mentioned earlier. However, in the newer plantings from 1996 to 2000, the mantling level has dropped to a tolerable 2% or less.

The reduced mantling levels are attributed to improved protocol as well as more stringent culture selection and control in the laboratory and the conditioning nursery.

Formal FFB yield recording in BCT14-97 only started at year 4 of planting but harvesting started from year 3. The first 12 months of FFB yield recorded for the trial was 18.5 t/ha. This was 93% of the trial SYP for year 4, which was 20 t/ha. Yields of the clones were generally better than the AA DxP control; the FFB yield of the clones was 4.0% higher than the DxP control. The production clones were 7.4 % better than the DxP control followed by the evaluation clones at 5.9%. The reclones yielded lower than the DxP control by 7.8%.

In terms of oil yields, the superiority of the clones cannot be denied. This is due to the emphasis on high O/B during the selection of ortets for cloning or clones for recloning. The high O/B was well reflected in the resultant clones where the production clones have a mean O/B of 30.2% and the reclones have 30.4%. The evaluation clonal mean O/B was lower at 28.4% but the clonal mean at 29.4% was still higher than the AA DxP O/B of 26.8%.

From Table 2, the overall clonal mean oil yield was nearly 14% higher than the AA DxP control. In terms of types of clones, the production clonal mean oil yield was 21.0% up on the DxP control and the evaluation clonal mean oil yield was 12.1% more. The reclones which were lower in FFB yields compared to the DxP control were now 4.5% better in terms of oil yield by virtue of their higher O/B.

Table 3 compares the yield data of the clones with their respective ortets. The oil to bunch figures of the ortets correlates very well with their respective clones, which means that selection for O/B is efficient.

For FFB yields, there are wider differences between the ortets and their clones. As examples, A105 ortet had better FFB yields than its clone and for A65 the clone is better than its ortet. This is indicative of the fact that it is less reliable to select based on only FFB.

4. CONCLUSION

The very low abnormality levels in the form of mantled fruits in this trial concurred with the results of other clonal evaluation trials on AAR' latest ortet clones and reclones as well as semi-commercial plantings. It is a direct result of the measures that have been taken in AAR tissue culture laboratory as well as the conditioning nursery, to reduce the occurrence of such abnormalities in the field.

Table 2. BCT14-97: Todate FFB Yields									
Trt. No.	Clones	No. of Reps.	% O/B	FFB Yield (t/ha/yr.)			Oil Yield (t/ha/yr.)		
				49 to 60 mths.	% of AA DxP	Rank	49 to 60 mths	% of AA DxP	Rank
629	A80	5	29.1	20.6	115.1	4	6.0	125.0	4
626	A88	5	32.5	18.5	103.4	6	6.0	125.3	3
627	A101	5	29.9	22.5	125.7	1	6.7	140.2	2
631	A105	4	29.2	15.3	85.5	11	4.5	93.1	11
Production clones mean:			30.2	19.2	107.4		5.8	120.9	
632	A65	2	31.3	22.0	122.9	2	6.9	143.5	1
624	A71	5	26.7	21.5	120.1	3	5.7	119.7	5
630	A72	5	29.4	14.4	80.4	12	4.2	88.3	12
628	A81	5	25.6	20.4	114.0	5	5.2	108.9	6
625	A84	5	29.1	16.5	92.2	9	4.8	100.1	9
Evaluation clones mean:			28.4	20.0	105.9		5.4	112.1	
622	A94/5/14c	5	29.5	16.7	93.3	8	4.9	102.7	8
623	A98/6	5	31.3	16.3	91.1	10	5.1	106.4	7
Reclone mean:			30.4	16.5	92.2		5	104.5	
633	AA D x P	5	26.8	17.9	100.0	7	4.8	100.0	10
Trial mean:			29.2	18.5			5.4		
Clonal mean:			29.2	18.6	104.0		5.5	113.9	

Table 3. BCT14-97: Ortet and Clonal Yield Data										
Clone No.	% O/B		Ortet FFB		Clone FFB		Ortet O.Y.		Clone O.Y.	
	Ortet	Clone	% of Control	Rank	% of Control	Rank	% of Control	Rank	% of Control	Rank
A80	27.5	29.1	153.8	2	115.6	3	168.0	3	139.6	1
A88	31.6	32.5	147.1	3	113.0	5	184.5	2	126.5	4
A101	28.4	29.9	172.2	1	125.7	1	194.1	1	132.4	3
A105	29.1	29.2	111.1	5	89.5	8	134.6	4	102.6	7
Prodn.:	29.2	30.2	146.1		111.0		170.3		125.3	
A65	31.0	31.3	80.3	7	119.6	2	98.7	7	133.1	2
A81	24.7	25.6	113.0	4	114.6	4	110.9	5	118.4	5
A84	27.2	29.1	77.2	8	91.0	7	83.4	8	108.6	6
Evaln.:	27.6	28.4	90.2		108.4		97.7		120.0	
Control	24.6	26.8	100.0	6	100.0	6	100.0	6	100.0	8
Mean:	28.8	29.4	114.2		105.4		129.9		117.7	

The yield data of BCT14-97 although still in the early stages is nevertheless a good indication of the advantage that clones have over DxP materials if good breeding and clonal trials are in place to provide a source of ortets and reclones for recloning. FFB yields of clones maybe slightly better or on par with the DxP materials but the much higher O/B in the clones would push the oil yields of the clones significantly higher than the DxP seedling materials.

The selection of ortets based on oil yields is generally more reliable compared to selection based on FFB yields alone as seen from this trial. This is mainly due to the better reliability in O/B selection while FFB yields tend to differ more.

Another advantage in AAR clones that is still too early to detect in this trial is the lower height increment of AAR clones.

In conclusion, AAR has in place the necessary ortet and clonal evaluation trials to generate high yielding ortets and clones for cloning and recloning respectively. The previously high mantling levels in reclones has been solved paving the way for producing more ramets through recloning as the source of starting materials is larger for reclones. With the possibility of recloning also comes the capability to perpetuate the production of elite clones.

It is with this success, that AAR is at the threshold of commercial production of elite oil palm clones.

PALM PILOT FOR FRESH FRUIT BUNCHES (FFB) RECORDING IN PALOH ESTATE

By Tan Kiat Siang, Ooi Ling Hoak, Thomas Thomas, Heng Yong Choon and Gan Huang Huang

Introduction

The weight and number of bunches harvested are important records in oil palm estates, as they provide information on the estates' productivity, and are used to determine each harvester's pay.

The conventional method of recording harvested bunches involves pen-and-paper recording in the field by bunch counters, and summarising and further transferring of data in the office by field conductors. This involves many processes of recording, re-calculation and re-summarising of data and thus is prone to human errors. It is also time and labour consuming.

An improved method for recording and storing data on fresh fruit bunches (ffb) using a personal digital assistant (PDA) called the Palm Pilot has been introduced in Paloh Estate to alleviate these hassles. The PDA is a small hand-held computer that can be used for easy recording, storage and analysis of data. It acts as a portable data logger that can be integrated with a personal desktop computer to store and display reports in various electronic formats.

Objectives

1. To have a proper and accurate record of all relevant data involving the harvested fresh fruit bunches (ffb) on the estate.
2. To capture directly and store data in digital formats that can be transferred readily and thus reduce double-handling of data and minimise errors.
3. To reduce time and labour spent for recording/ summarising work in the office.
4. To have a reliable centralised data storage system that can be further developed to generate other forms of useful reports.

Materials and Methods

The Palm Pilot for bunch recording has been gradually introduced in Paloh Estate since January 2001. It has since gone through several adjustments to suit the estate's conditions through feedbacks gained from the personnel involved with the system.

i) The equipment and recording system

The system consists of two parts. The first component involves recording work in the field using the Palm Pilot. This is carried out by the bunch counters and supervised by the Conductors or Assistants.

The second part involves data downloading, processing and storage using the desktop computer in the office. This is done by the field Conductors and monitored by the Assistants or Manager.

For bunch recording, two models of PDA's are used – the Palm III (8Mb) and Palm m100 (2Mb). Both models are shown in **Figure 2 and 3**. They run on two rechargeable AAA batteries. Each Palm Pilot is connected with a Hot-sync cable for connection to the desktop computer **(Figure 1).** Data is keyed-in either using a pop-up screen keyboard **(Figure 2)** or the specialised 'graffiti' characters **(Figure 3)** using a special 'pen' called the stylus **(Figure 1).**

Seven palm pilots are available in the estate. The bunch counter of every harvesting gang is provided with one each for recording, while another three units are shared between the Conductors and Assistants for checking purposes, as well as to act as back-ups in case of breakdowns.

The computer for data processing and storage is an IBM NetVista running on Pentium IV with 1.70 GigaHertz clock speed, 256 Megabyte of Random Access Memory (RAM) and 40 Gigabyte of hardisk capacity. The printer installed is a Canon S1000SP Bubble Jet Printer with a speed of 5 monochrome pages per minute (ppm). A picture of the equipment setting is shown in **Figure 6.**

ii) The software

For recording using the Palm Pilot, a Palm application called JfilePro was installed in each Palm Pilot. This programme enables the user to devise a recording form that will be automatically converted into a Coma Delimited (csv) file that can be viewed in a Microsoft Excel format when transferred to a Windows-run desktop computer.

For data storage, a customised relational database devised on the 4th Dimension programme named Estate Database was installed in a desktop computer **(Figure 5)** operating on Windows XP**.** This programme converted the csv file downloaded from the Palm Pilot automatically for processing and storage into the Database.

Figure 1 : The Palm Pilot

Figure 2: The Palm m100 showing the pop-up keyboard

Figure 3: The Palm IIIe with the 'graffiti' characters shown underneath

Figure 5: The Estate Database

Figure 6: The Desktop computer, printer and Palm Pilot

iii) The estate's harvesting set-up

The estate has four harvesting gangs with a total of 67 harvesters covering 1761 ha, as detailed in **Table 1**. Three of the gangs are on the buffalo system, while one of them follows the MTG.

Table 1 : The harvesting system in Paloh Estate					
Assistant-in-charge	Ramachandran	Jairam			
Harvesting gang	P1	P2	P3	P5	
No. of harvesters	19	18	20	10	67
Harvesting system	Buffalo	MTG	Buffalo	Buffalo	
Bunch counter	Miskan	R/samy	Bahrom	Aidah	
Conductor-in-charge	-	Gunalan	T/Selvam	T/Selvam	
Total ha covered	433	752	357	219	1761

iv) The recording process

Field recording by bunch counters

- The bunch counter counts and inspects each pile of bunches/platform and records them into the Palm Pilot.
- The quality of bunches (black, rotten, ripe) are also noted as shown in **Figure 8**. A column for 'ganti' harvester is also provided to ensure the correct payment.
- It is important for the data to be keyed-in according to the preset formats e.g SD should not be entered as S Div or Sepuloh.

Figure 7: Bunch counting in the field with the Palm Pilot

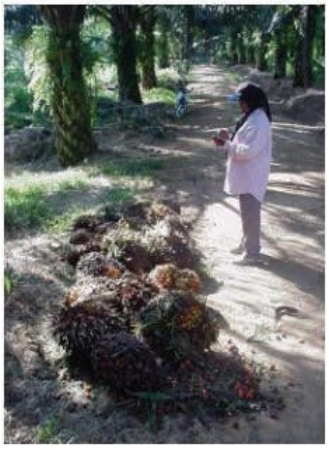


Figure 8: The electronic form for entering bunch counting records into the Palm Pilot

Division:	SD.....
Field:	1992A.....
Date:	26/7/2002.....
Recorder:	Aidah.....
Task No:	2.....
Platform:	.....
Gang Harvester:	B2.....
Ganti:	☐
Ripe:	23.....
Black:	1.....
Rotten:	.....
Long Stalk:	.....
Rat Damage:	.....
Remark:	.....

Random checks by conductors/ assistants

- The bunch counter 'beams' the recorded data to the assistant's/conductor's Palm Pilot, a process which involves the transfer of files from one Palm Pilot to the other by infra-red signals.
- The supervisor will proceed to randomly count the bunches and check the accuracy of data recorded.
- Any error noted should be corrected immediately in the field to avoid further correction work in the office.

Figure 9: 'Beaming' of Palm Pilots involving the bunch counter and assistant manager

Figure 10: 'Beaming' is when data is transferred from one Palm Pilot to another using built-in infra-red signals

Transferring data to the PC (Hotsync)

- Data collected in the morning is downloaded into the computer in the afternoon by field conductors.
- This involves connecting the Palm Pilot into the desktop computer in a process called 'Hot sync', where data from the Palm Pilot is automatically transferred and synchronised with data in the desktop computer.
- It is important that the estate is equipped with a computer with enough capabilities to ensure fast and smooth data transfer.

Figure 11: Downloading data from the Palm Pilot into the desktop computer

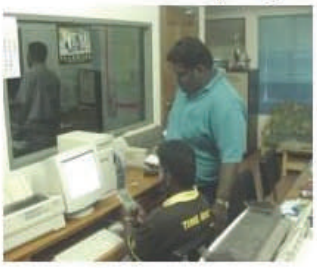


Figure 12: A close-up view of the downloading (Hot-sync) process

Checking for errors and processing data

- Once transferred the data is checked for errors.
- Any data that is not entered according to the preset format will result in a prompt (e.g.when field 1994B is keyed in as 94B/64), as shown in **Figure 13**. Error of this kind has to be corrected before the data can be processed.
- Data that involved mistakes in counting or entry into the wrong column will not however trigger a prompt and have to be identified manually. (e.g. when 100 ripe bunches is entered as 100 black bunches)
- Once the data is checked, it will be processed and stored into the database.

Keying-in Tonnage

- The weight of bunches recorded on weighbridge slips from the mill or estate's weighbridge are entered into the database when they are acquired.
- Bunches collected from different fields has to be divided according to their percentages from the whole load. The date of harvesting has to also be differentiated from the invoice date to ensure the correct weight of bunches for each tasks.
- The drivers' ID, invoice number and vehicle registration number are also entered for record purposes, as shown in **Figure 14**.
- Separate columns for estate tonnage and mill tonnage are also provided for checking purposes.

Generating reports

Daily reports are generated and printed out for filing.

- The management may choose to print the harvester daily bunch count or the harvester daily bunch count sheet (OPH1)
- Monthly reports such as the monthly bunch payment record (OPH 2), and monthly FFB Crop Summary (OPH3) are generated at month-end.
  The estate may also choose to print other tables which they may find useful for their own reference.

Figure 12: The 'Hot-sync' process in progress

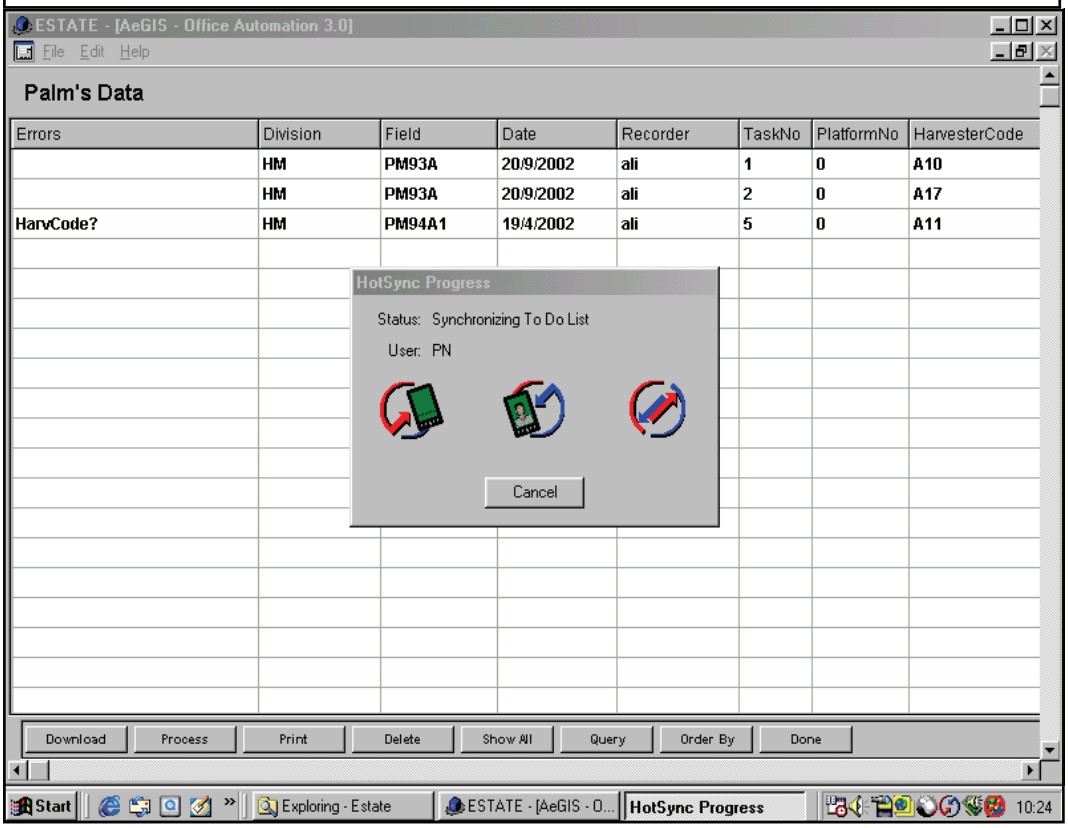
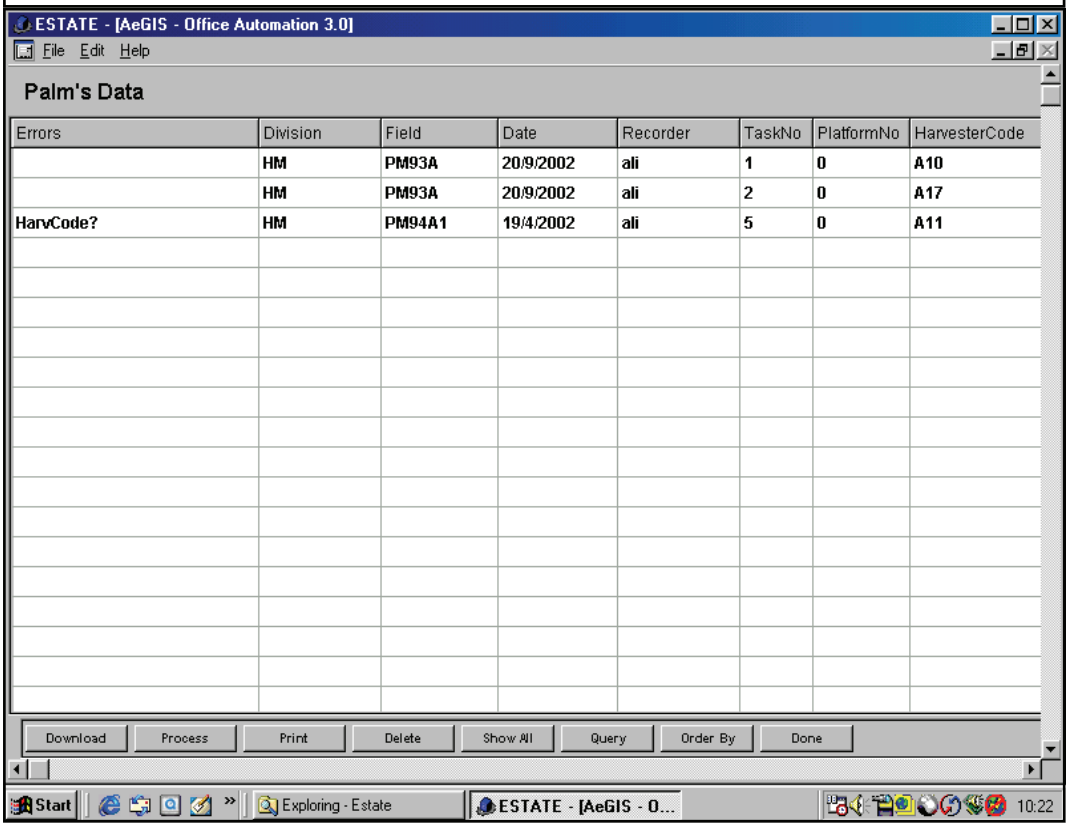


Figure 13: The PDA Download interface showing the error prompts



Data Back-up

- The Database has a built-in back-up programme that automatically performs back-up on data stored each day.
- The estate copies this back-up file (named Estate.dbb) and sends them to AAR every month.

Reporting

Information gathered by the Palm Pilot is integrated with data on crop tonnage in the Database, and this record can be used to generate numerous tables that will be very useful to the management. Up to 17 different tables can be produced automatically by a click of a button on the Database, as shown in **Figure 15**. Each of the table provides a different combination and presentation of data and is designed to help the management retrieve information about their crop in a quick and orderly manner.

For daily checking and filing purposes, however, the Manager may opt to print out only a number of useful reports. This will be discussed below.

1) Harvester Daily Bunch Count (*Table 2*)

The harvester daily bunch count sheet shows the number of bunches harvested by all harvesters for that day and their quality. The table may be displayed on the notice board each day to enable the harvesters to check on whether the recording has been done correctly. This table may be used to replace the Daily Bunch Count Sheet (OPH 1), which may also be printed out daily.

The sheet allows the management to quickly assess output and the quality of crop harvested and make necessary adjustments if necessary to control the harvesting standard or programme.

2) Daily Bunch Count Slips (*Figure 16*)

The management may opt to issue bunch counting slips to harvesters after each recording and transferring of data. The slips recorded each harvester's name and the number of payment bunches for the day. The name of the bunch counters are also included to ensure transparency and accountability of the recording process.

Figure 14: Entering the weigh-bridge record

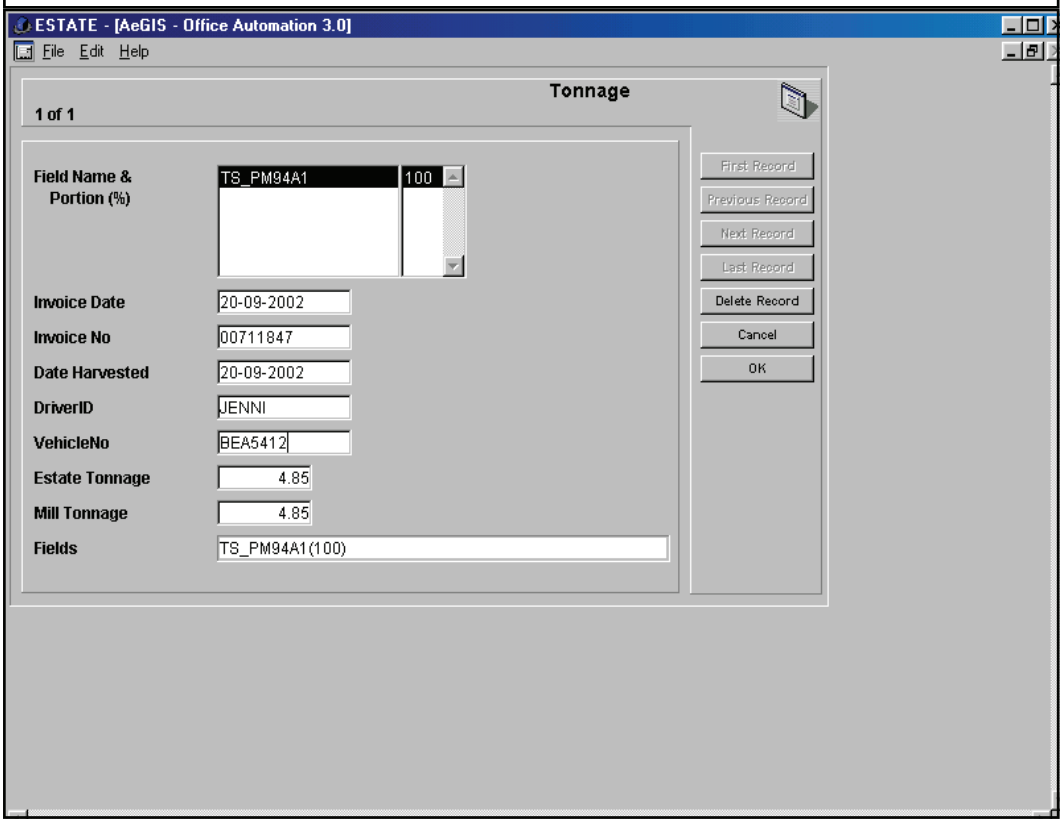
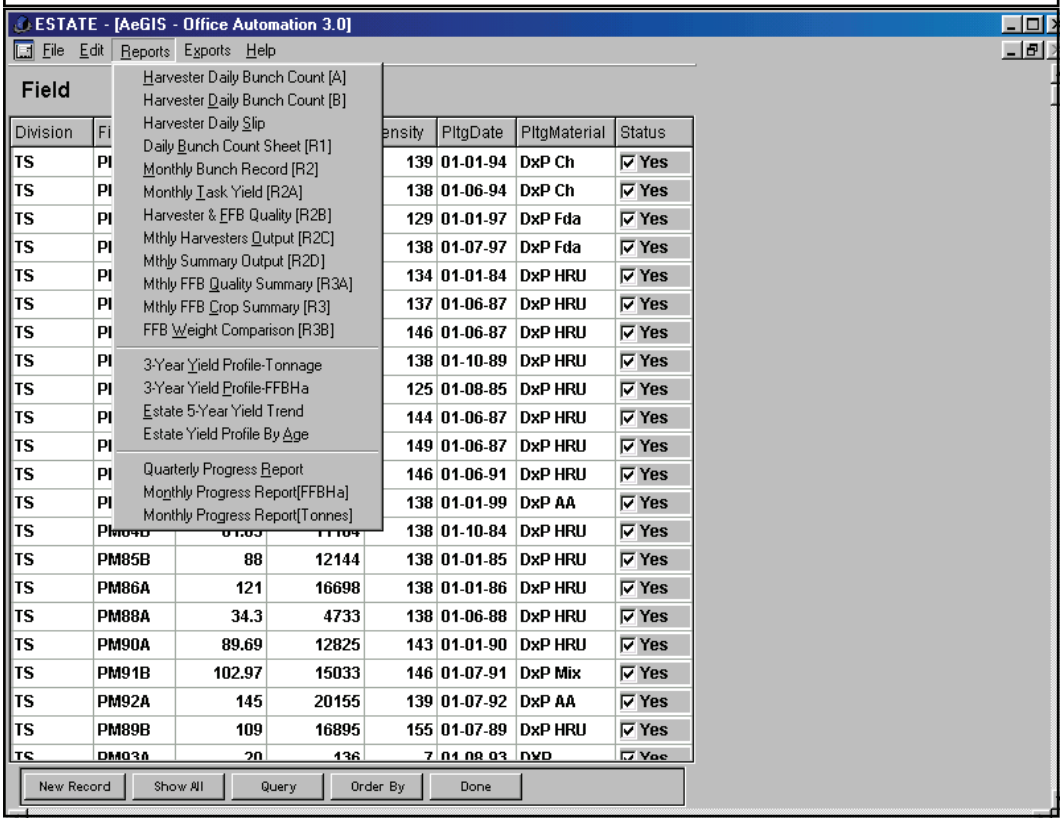


Figure 15: A list of other reports that can be printed out from the Database



3) Monthly Bunch Payment Record (OPH 2, *Table 3*)

The monthly bunch payment record summarises the number of payment bunches for each harvester for each field and month of harvesting. It totals up the number of bunches harvested for each harvester, task number and date of harvesting.

This table enables the management to assess the performance of each field and harvester at the end of every month. It is also used to determine the payment to be issued to each harvester for their effort.

4) Monthly FFB Crop Summary (OPH 3, Table 4)

The FFB Crop Summary displays the sums of crop harvested each day and integrates them with data on crop tonnage to provide key information such as average bunch weight and yield per harvester. It also compares the actual crop harvested with estimates to provide an assessment of crop performance. Besides providing useful information on yield potential, the tracking of average bunch weight is also essential to guard against erroneous counting of bunches.

Main Difficulties Encountered

As with many other computerised systems, the Palm Pilot and database pose some difficulties for those who have not familiarise themselves with it. This is further aggravated by the fact that the system is being practised mainly by estate field personnel, who have little knowledge in using the computer. Some of the main difficulties encountered when running the system are listed below:

1. Recording in the field

i) Error in recording

The recording of data has to follow the exact format and records in the database's templates and this sometimes results in data that cannot be processed and stored by the database.

e.g. when field 1994A is entered as 94A/77

Solution:

⇒ Bunch counters to be more alert and improve themselves through practise.

⇒ Regular checking by

Table 2 : The Harvester Daily Bunch Count Record

HARVESTER DAILY BUNCH COUNT

Estate LADANG PALOH Field …… Date 20/7/2002

Harvester			Bunches				Remarks
Gang/ No	Name	Fields	Ripe	Black	Rotten	Payment	
C1	MUSA BIN MOHAMMAD	1990A,	118	0	0	118	
C2	SUHAIMI BIN SAMAT	1989B,	132	0	0	132	
C3	KRISHNAN AL KUNJAN	1989B,	145	0	0	145	
C4	IDRIS BIN SADIN	1989B,	170	0	0	170	
C5	AYANARAPEN AL KANDAS	1989B,	100	0	0	100	
C6	ZAINAL BIN AHMAD	1990A,	70	0	0	70	
C7	ROSTAM BIN SAMAT	1990A,	162	0	0	162	
C8	MISMAN BIN MISKON	1989B,	111	0	0	111	
C9	GANESAN AL MUNUSAMY	1990A,	104	0	0	104	
C10	ISHAK BIN MOHD RASHI	1990A,	61	0	0	61	
C11	MOHD AZMY BIN BAJURI	1990A,	62	0	0	62	
C12	GHALIDIN BIN BASAR	1990A,	81	0	0	81	
C13	MOHD ZAN BIN MADON	1990A,	60	0	0	60	
C14	KAMAL BIN ISHAK	1990A,	80	0	0	80	
C15	RIZAL BIN MOHD ARIFF	1989B,	71	0	0	71	
C16	ATAN BIN IBRAHIM	1989B,	132	0	0	132	
C17	SAIF BIN WASMAN	1989B,	90	0	0	90	
C18	RAMLIE BIN ABAS	1990A,	40	0	0	40	
C22	HAWALUDDIN BIN MOHD	1989B,	71	0	0	71	
C		Subtotal	1860	0	0	1860	
E1	MAAROF BIN ABD RAHIM	1992B,	172	0	0	172	
E2	SELVAJAH AL NAGARI	1992B,	129	0	0	129	
E3	SHAJAHAN	1991A,	102	0	0	102	
E4	NADARAJAH	1992B,	120	0	0	120	
E5	SAMIKUN BIN ISMAIL	1992B,	140	0	0	140	
E6	SUBRAMANIAM AL KRISH	1992B,	100	0	0	100	
E7	ABD RAHIM BIN ABD RA	1992B,	99	0	0	99	
E9	AHMAD SHARIFF BIN TH	1992B,	106	0	0	106	
E11	ITHNIN BIN ABU	1992B,	265	0	0	265	
E13	BUHARI BIN DAUD	1991A,	119	0	0	119	
E		Subtotal	1352	0	0	1352	
		Grand Total	3212	0	0	3212	

CONDUCTOR-IN-CHARGE …… MANAGER/ASSISTANT …… ...

Signature-Date Signature-Date

Figure 16: Daily Bunch Count Slips

Harvester SELVARAJAH AL NAGARI Bunch Counter AIDAH
No E2 Tarikh 1/7/02
Jumlah Tandan Dibayar 61 Estate LADANG PALOH
Tandan Tidak Dibayar 0 Field (SD) 1992A

Catitan _____

Harvester SHAJAHAN Bunch Counter AIDAH
No E3 Tarikh 1/7/02
Jumlah Tandan Dibayar 118 Estate LADANG PALOH
Tandan Tidak Dibayar 0 Field (SD) 1992A

Catitan _____

Harvester NADARAJAH Bunch Counter AIDAH
No E4 Tarikh 1/7/02
Jumlah Tandan Dibayar 105 Estate LADANG PALOH
Tandan Tidak Dibayar 0 Field (SD) 1992A

Catitan _____

Conductors/ Assistants.

ii) Occasional mis-configuration of the Palm-Pilot

Sometimes the Palm-Pilot is accidentally mis-configured (due to the pressing of the wrong buttons), and unable to trouble shoot, the bunch counter may not be able to access the relevant recording file and therefore missed recording for days.

Solution:

⇒ Bunch counters to take time to familiarise themselves with basic set-up of the Palm Pilots.

⇒ To ensure that a spare unit of the Palm Pilot is always available should any other unit fail to function.

iii) Damage to the Palm Pilot

The Palm Pilot is liable to breakdowns if not handled with care. Carelessly placing the Palm Pilot while riding on rough estate roads, or exposing it to harsh weather may result in irreparable damage.

Solution:

⇒ To exercise care while using the Palm Pilot.

⇒ To provide safety devices e.g. padded pouch while carrying the Palm Pilot in the field, plastic cover to guard against rain.

2. Transferring/ processing of data and generating reports

i) *Lack of basic computer knowledge among Assistants/Conductors*

A certain degree of computer literacy is needed for a field Conductor or Assistant manager to run the database. This must involve knowledge on how to store and retrieve data, operating the printer and simple trouble-shooting.

Solution:

⇒ AAR to provide regular training to personnel involved.

⇒ Personnel involved need to spend time with the computer and equip themselves with the necessary knowledge through own initiative.

ii) Computer break-downs or mis-configuration

Improper use of the computer by untrained personnel may result in the computer being wrongly configured or corrupted, and this will cause breakdown. Data may get lost or corrupted, and will need a lot of effort and time to correct.

Solution:

⇒ AAR to provide regular training to

Table 3: Monthly Bunch Payment Record (OPH2)

Estate LADANG PALOH
Field No SD 1992A
Ha 77.00

KUALA LUMPUR KEPONG BERHAD
MONTHLY BUNCH PAYMENT RECORD

O.P.H./2
Total No of Tasks 28
Month of 7/2002

Harvester No & Name	Task No	Task Size	Date 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	Grand Total
E1 – MAAROF BIN ABD RAHIM	6	203											131											94										225	
	17	417														117									102									219	
	27	284															208									88								296	740
E2 – SELVARAJAH AL NAGARI	5	145														99										83								182	
	18	399		94													84																	178	360
E3 - SHAJAHAN	4	483														103																		103	
	7	223															*130																	130	
	8	322													103											104								207	440
E4 - NADARAJAH	12	416		105												118	50							72	70									415	
	20	410															76								26									102	
	25	395				*180																												180	697
E5 – SAMIKUN BIN ISMAIL	1	420															173																	173	
	3	381														133								50	122									305	
	23	482				168																												168	
	28	281		*147																														147	793
E6 – SUBRAMANIAM AL KRISH	15	418														224								96										320	
	19	489		120													114								111									345	665
E7 – ABD RAHIM BIN ABD RA	13	421		102													137																	239	
	26	301														90																		90	329
E8 – AHMAD SHARIFF BIN TH	11	404														248																		248	
	24	483		177													134																	311	559
E11 – ITHNIN BIN ABU	9	455													127									38	100									265	
	14	502														112	96																	208	
	18	436		124													59																	183	656
E13 – BUHARI BIN DAUD	2	403													140										132									272	
	10	462														172																		172	
	22	258		139													100																	239	683
Names			0	8	0	2	0	0	0	0	0	0	1	0	3	10	12	0	0	0	0	0	0	1	5	9	0	0	0	0	0	0	0		43993
Total Bunches			0	1008	0	348	0	0	0	0	0	0	131	0	370	1416	1361	0	0	0	0	0	0	94	358	836	0	0	0	0	0	0	0		

* denote Ganti Task

CONDUCTOR-IN-CHARGE _____
Signature – Date

MANAGER/ASSISTANT _____
Signature – Date

Table 4: Monthly FFB Crop Summary (OPH3)

Estate LADANG PALOH
Field No SD 1992A
Ha 77.00

KUALA LUMPUR KEPONG BERHAD
MONTHLY BUNCH PAYMENT RECORD

O.P.H./2
Actual Av. Bunch Wt (Previous mth) _____
Month of 7/2002

Date	TOTAL NO. OF BUNCHES						ESTIMATED CROP HARVESTED (TONNAGE)		ACTUAL DESPATCH (TONNAGE)		+/- (TONNAGE)		AVERAGE BUNCH WEIGHT (KGS)		HARVESTER NAMES		YIELD PER HARVESTER (KG)		Remarks
	Non-Payment		Payment		Total														
	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	To-day	To-date	
1/7			976	976	976	976	17.14	17.14	16.35	16.35	-0.79	-0.79	16.75	16.75	9	9	1,816	1,816	
2/7			1,008	1,984	1,008	1,984	17.98	35.12	15.67	32.02	-2.31	-3.10	15.55	16.14	8	17	1,958	1,883	
4/7			348	2,332	348	2,332	6.20	41.32	8.37	40.39	2.17	-0.93	24.05	17.32	2	19	4,185	2,125	
11/7			131	2,463	131	2,463	2.33	43.65	2.39	42.78	0.06	-0.87	18.24	17.37	1	20	2,390	2,139	
13/7			370	2,833	370	2,833	8.83	52.48	7.96	50.74	-0.87	-1.74	21.51	17.91	3	23	2,653	2,206	
14/7			1,416	4,249	1,416	4,249	25.26	77.74	21.23	71.97	-4.03	-5.77	14.99	16.94	10	33	2,123	2,180	
15/7			1,361	5,610	1,361	5,610	24.28	102.02	23.44	95.41	-0.84	-6.61	17.22	17.01	10	43	2,344	2,218	
22/7			94	5,704	94	5,704	1.67	103.69	2.02	97.43	0.35	-6.26	21.49	17.08	1	44	2,020	2,214	
23/7			358	6,062	358	6,062	6.38	110.07	6.49	103.92	0.11	-6.15	18.13	17.14	5	49	1,298	2,120	
24/7			836	6,898	836	6,898	14.91	124.98	13.89	117.81	-1.02	-7.17	16.61	17.08	8	57	1,736	2,066	

CONDUCTOR-IN-CHARGE _____
Signature – Date

MANAGER/ASSISTANT _____
Signature – Date

personnel involved.

⇒ Personnel involved need to spend time with the computer and equip themselves with the necessary knowledge through own initiative.

⇒ To give enough priority to the Palm Pilot Database in a computer and not cluttering it with other irrelevant files or programmes.

iii) Computers that are below the required capabilities

Computers that do not meet the minimum systems requirements will make the downloading and printing processes slow and unable to complete a task in a reasonable time frame.

Solution:

⇒ Estate to equip themselves with the necessary computer equipment

iv) Update in the estate data

Certain information that is encrypted in the database template such as the field names, task numbers, harvesters' codes, etc, is sometimes updated, and the necessary changes have to be replicated in the database. Failure to quickly update the template may result in data being mixed-up.

Solution:

⇒ Personnel involved have to be alert to any changes made in the field and update the data immediately.

⇒ Estate to avoid making unnecessary changes in the field

3) Other Difficulties

i) *Frequent transfer of estate personnel*

When personnel involved with the Palm Pilot project, e.g. the Assistant/ Conductor is transferred, the new employee has to be re-trained. This costs a lot of training time and disrupts the flow of the project.

Solution:

⇒ To avoid transferring the staff or executives involved with the Palm Pilot project as far as possible.

⇒ The Manager/ Assistant to equip themselves with the necessary knowledge to be able to train his new staff/ executives.

⇒ The estate to devise a system of working that ensures the continuity of the project.

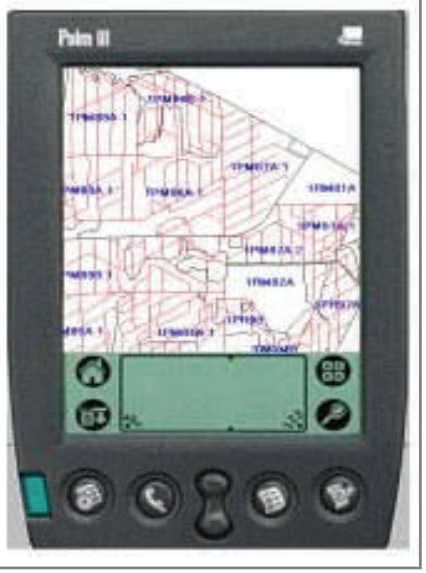
Other Potential Uses of the Palm Pilot for the estate

The small and handy Palm Pilot makes it a suitable gadget to be carried in the Manager's pocket, and its high capabilities for storing information and generating reports allows it to act as a very useful tool in the field.

1) As an electronic form

Besides bunch counting, other recording work, particularly those that use a lot of time and labour can be made simpler with an electronic recording system. The Palm Pilot can be programmed to devise a form for any recording work. The estate may use the Palm Pilot to record information such as census data, be it on rat damage, bagworm or rhino beetle attack. This information can be stored and retrieved quickly, as well as being transformed into useful information to assist the Manager to make more informed decisions. The Palm Pilot may also be programmed for other daily recording work such as the muster chit and work programme according to estate needs.

Figure 17: A Palm Pilot displaying the detailed road map of an estate



2) For storage and quick retrieval of information

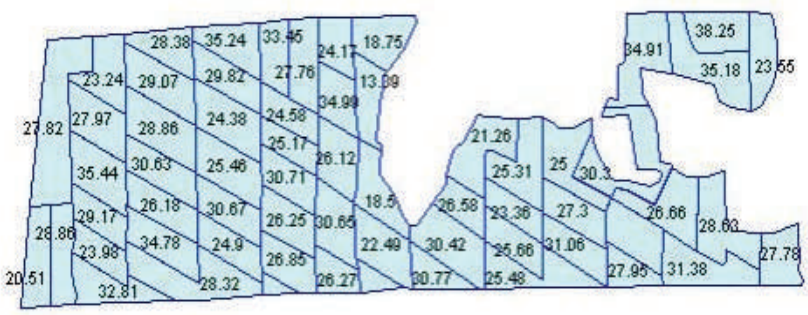
The Palm Pilot may be used as a portable data storage device to allow the managers to make quick reference in the field. This may involve the storing of estate's map in the Palm Pilot, along with the relevant information about each field such as yield trends and soil types, as shown in an example in **Figure 17**.

Other information such as worker's particulars, checkroll and work programme can also be stored and accessed easily at the touch of a button.

3) To generate yield recording map from FFB recording data

Data gathered using the Palm Pilot and stored in the Database can be manipulated to display information in various electronic formats. Incorporating the figures collected into the estate's (Global Positioning System) GPS map will allow a graphical view of the estate's yield patterns according to field or task, as sown in **Figure 18**. Colour-coding the tasks according to different yield classes, gives a clearer representation of the performances of each task. This can further be smoothened with geo-statistical methods developed by AAR to display the yield patterns in the block.

Figure 18: A graphical representation of yields for Each task in one estate's block



Detailed information such as this is vital for site-specific agricultural practice. The manager and agronomist will be able to identify exact poor yielding areas in the estate and zoom in for correction. This will lead to an efficient system for precision farming.

Conclusion

The recording of harvested ffb using the Palm Pilot provides a great opportunity for an efficient and labour saving system to be introduced and further developed in the estates. By having the field data simplified and organised in a digital form, a great deal of information can be extracted and computed to assist the Manager to manage the estate more efficiently. The initial difficulties encountered in introducing a new system such as this should not deter the estates from exploring new and useful tools.

References

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Special Advisory Note: Identification of Illegitimate Commercial D x P Seedlings and Palms

By Soh Aik Chin

The commercial D x P seed is obtained from controlled pollination of the female flowers (inflorerscence) of a selected dura (D, thick shelled fruit) mother palm with pollen from the male flowers (inflorescence) of the female sterile (abortive bunches) pisifera (P, shell-less fruit) parent (Figure 1). The inflorescences are isolated (bagged) prior to pollen collection for male inflorescence and pre and post pollination for female inflorescence to ensure legitimacy of the cross. Only such a cross can ensure production of 100% legitimate D x P hybrid or tenera (T, thin shelled fruit) seedlings (Figures 2, 3, 4).

D x D, D x T and T x T crosses are only done in breeding programmes or by illegal commercial seed producers. A D x D cross produces 100% D seedlings; a D x T cross produces 50% D and 50% T seedlings; and a T x T cross produces 25% D, 50% T and 25% P seedlings.

Please note that the resultant seed of a cross still bears the shell characteristic of the mother palm! For example, the seed from a D x P cross is still thick shelled (D). It is the embryo that is the T hybrid that grows up to produce T fruits. In a T x T cross the seed is still T (Figure 5, 6) but the embryo can grow up to become D or T or P palms.

The occurrence of illegitimate D x P palms in commercial oil palm plantings, manifested as sterile or abortive P palms (i.e non yielding) and thick shell fruited D palms (i.e. lower oil content) in sizeable proportions can result in significant reduction in the oil yield of a plantation.

Plantings during the period 1982-1990 in Malaysia suffered high D contamination, averaging 15% with some as high as 70%. This arose from the breakdown in the existing controlled pollination procedures with the introduction of the pollinating weevil (*Elaedobius kamerunicus*) which are very efficient pollinators. Illegitimate pollinations were effected by the weevils carrying pollen (D and P) from T palms in commercial D x P fields and/ or from D palms in the seed producer's seed garden. Illegitimate contamination in this case was detected from the presence of thick shell fruited D palms in the commercial T fields. Illegitimate and legitimate T palms cannot be easily differentiated morphologically. Since 1990 stringent controlled pollination protocols have been instituted by established seed producers and D contamination has become minimal and rare.

A more serious problem is the planting of illegitimate D x P seedlings from illegal or illegitimate seed suppliers. If the seeds are obtained from open pollinated commercial D x P or T plantings, the seeds are essentially derived from a T x T cross and the seedlings will grow up to give 25% D, 25% P and 50% T palms in the planting resulting in reduced yielding ability. If the seeds are obtained illegitimately from a D seed garden, then only D contaminants can be detected.

An advisory circular on the identification of D (and P) contaminants in commercial D x P planting has been written earlier (AAR Advisory Circular No.2/89). This pertains to field bearing palms and is the only sure but belated way. Early detection of illegitimate seeds prior to nursery planting is only possible if the illegitimate seeds are obtained from open pollinated T field palms i.e. seeds are generally smaller and upon cracking the shells are noticeably thinner. Illegitimate seeds from D seed gardens cannot be differentiated from legitimate D x P seeds in this manner.

The only assured way to avoid risk of planting illegitimate D x P seedlings is to obtain the seeds/seedlings directly from reputable seed producers.