AA RESEARCH NEWS

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EDITORIAL

ASSESSING RESULTS

In this issue of AAR News, the yield results for 1989 for rubber, oil palm and cocoa are analysed and discussed. The importance of high yields to the profitability of our plantation industry has been discussed at length in previous AAR News issues. The very high capital and fixed costs in the plantation system and foreseeable low commodity prices make it imperative that the highest yields are attained from each field to derive the best possible return. High yields also mean low unit cost production in our plantation system. Further discussion on the objective assessment of yields achieved by individual estates and managers will be useful.

It is common for the public eg. investors to look only at one figure i.e. average yield per hectare or gross yields in comparing the performance of various companies. This is convenient and as a quick role of thumb, especially if checked over a number of years, usually gives a fairly good idea of relative performance. This technique however has several major defects for an objective assessment of the performance of managers in the companies concerned including the failure to take yield potentials and age distribution into account.

It is also common for yield performances to be judged against the averages achieved in the company or the country. This could again be misleading in assessing performance, for example, beating the average if the rest of the country is doing very poorly cannot really be difficult.

Finally and most commonly, yield performances are compared against the yield estimate for the fields and estate. This is definitely the best approach but it depends very much on how the yield estimates are drawn up. Commonly, techniques seldom go beyond averaging yields achieved over the past three to five years and possible adjustments for experiences in other fields on the estate. Then PAs/VAs may adjust the figures to reset the yields based on their experiences or sometimes simply to those which they would like to see. The results of this approach in many cases still revolve around the average yields achieved.

In recent years, AAR has introduced the concepts of genetic yield potentials and site-yield potentials to focus on the attainable yield levels if all managerial decisions and inputs are correct and adequate. Various other information such as climatic patterns and soil information have also been discussed in previous AAR News and in manuring reports relating to the site yield potentials.

Estimated yields for individual blocks in estates should aim towards the targetted site-yield potentials. Efforts and inputs by managers should be geared towards these targets. The agronomists and PA/VAs will also be involved as they formulate the desired inputs with the manager. This approach advocated should result in yields and profitability above the rest of the industry which are still focussed on averages and offers challenges to our teams involved to break down the barriers to attainment of our yield targets. With accurate site-yield potential estimates, an objective assessment of the performance of the management team can also be obtained.

Various difficulties may be encountered, for example, with the very large biomass system as in old crop areas, there may be delayed yield response systems (as in oil palm) and accurate yield records. Yield responses may take years and specific annual estimates should consider this. It is also very difficult to judge yield performance and assess input requirements in blocks larger than 50 to 100 ha, so recording blocks should be broken down to manageable sizes.

In our opinion, managers make or break the yields. So, ask your Agronomist for your site yield potential to check on on how well you are doing.

HIGHLIGHTS

- **Assessing Results**
- **Analysis of 1989 Cocoa Yields**
- **1989 Performauce of AAR's Rubber Advisory Estates**

ANALYSIS OF 1989 COCOA YIELDS

INTRODUCTION

In 1989, AAR provided advisory services to 36 cocoa estates with a total area of about 14194 hectares.

The estates were scattered throughout Malaysia. The main cocoa areas were in Tawau, Lahad Datu and Sandakan (Table 1).

Table 1 : Distribution of cocoa estates under AAR advisory services in 1989

Regions	No. of estates	Total hectares
Tawau	13	5108
Sandakan	5	3590
Lahad Datu	7	3943
Pen. Malaysia	11	1553
Total	**36**	**14194**

For the current study, the cocoa estates were grouped broadly into the four regions under three age groups:-

1) 5 years old and younger
2) 6 to 10 years old
3) more than 10 years old

The yields for all the non-calender year estates were also re-computed on calender year basis. The yields for 1987, 1988 and 1989 were analysed.

RESULTS

The 1987 to 1989 yield trends for the three age groups in the four regions are tabulated in Table 2 :-

Table 2. Cocoa yield trend for 1987, 1988 and 1989

Region	Age group* (years)	Yield trend kg/ha					
		Ha	1987	Ha	1988	Ha	1989
Tawau	≤ 5	104	349	355	246	364	520
	6-10	3311	1033	3448	1104	3490	1148
	> 10	107	1415	107	1094	105	1038
Sandakan	≤ 5	710	169	710	422	980	215
	6-10	577	402	577	666	577	514
	> 10	176	673	176	610	176	560
Lahad Datu	≤ 5	1680	235	1742	642	1742	670
	6-10	1292	494	1392	636	1392	614
Pen. Malaysia	≤ 5	25	303	64	546	164	566
	6-10	943	766	942	852	946	989

*At each corresponding year

5 years old and younger areas

Yield trends for these young mature cocoa areas are difficult to interpret because they were very variable. Also, different plantings were involved in different years. The mean yields for 1989 for the four regions were generally low and varied from 215 kg/ha to 670 kg/ha.

However, some fields performed very well in 1989 eg. one 1986 planting (78 ha) in Tawau yielded more than 1 t/ha. In Pen. Malaysia, an outstanding 1984 planting (25 ha) in Kuala Lipis yielded more than 1.5 t/ha.

The advantages of reduction in immaturity period (RIP) and high early yields (HEY) are obvious. Hopefully more estates will be able to achieve RIP and HEY in the near future.

6 to 10 years old areas

The mean yields for Tawau and Pen. Malaysia in 1989 continued to improve although marginally for the former region which was affected by a VSD (Vascular Streak Dieback) outbreak. However, the cocoa on the fertile volcanic hills were relatively unaffected by VSD and the yield improved by a bigger margin. Many areas recorded yields of about 2 t/ha.

The estates in Lahad Datu and Sandakan where the rainfalls were generally higher and less evenly distributed were less fortunate. The wet weather in 1988/89 resulted in severe VSD outbreak, poor flowering and fruit set. The yield which was already low in 1988 declined further in 1989. The cocoa in Sandakan region were particularly badly affected.

11 years and older areas

The performance of cocoa under this age group was rather disappointing. This was mainly because many areas had low stands of productive bushes.

The generally poorer performance of the older cocoa should not be taken as the normal yield trend of cocoa. The yield of cocoa will decline with age only if they are not well looked after. In fact the highest yield recorded in Sabah were from well maintained cocoa which were more than ten years old.

FORECAST FOR 1990

The 1990 yield in Sabah will most likely improve. The optimism is mainly based on the generally improved cocoa canopy and plant vigour. The only reservation is the prolonged dry weather experienced in early 1990 which had caused widespread and severe abortion of cherelles.

Some improvement in yield may also be expected for the Pen. Malaysia estates.
On a longer term basis, the yield is expected to improve significantly when the current rehabilitation and supplying work produce their full effects.

Ooi, L.H.

PERFORMANCE OF RUBBER AREAS UNDER AAR SERVICES IN 1989

There were 68 yielding rubber estates with a total of 37,182 hectares under AAR advisory service in 1989 (ending in September for Taiko and June for BEA estates - Table 1)

Mean rubber yield for 1988/89 dropped to 1653 kg/ha, 6% lower than yield of 1775 achieved in the previous year.

Yield per tapper too declined from 23 kg to 21 kg, or about 9%.

Figure 1 shows the number of estates in the respective yield classes, i.e. yield/ha/yr and yield/tapper for the 1987/88 and 1988/89 financial years. Number of estates with yield in classes ranging from satisfactory to very high (1701 to over 2000 kg/ha/yr) dropped to 30 in 1988/89 (44%), as against 41 in previous year. More estates were yielding in low to very low classes (< 1550 and < 1300 kg/ha/yr) accounting for 26 estates (38%).

Figure 2 shows estate distribution based on yield per tapper. Estates with yield per tapper of 24 kg and less accounted for slightly over 80% of the total estates.

Table 2 shows yield performance by states. Compared to the previous year, yield decline could be noted in every state. This was mainly due to increasing incidence of leaf diseases leading to patchy canopies, and to depleting bark reserve in the early 1960s' fields. Nevertheless, yields in the states with fairly big rubber hectarages were still fairly satisfactory, as follows:-

State	Ha	Yield per ha (kg)
Pahang	4433	1808
Kedah	8121	1781
Kelantan	3535	1768
Johore (North)	3588	1760
	19677	**1781** (weighted mean)

Yields in the balance of rubber areas were less satisfactory, as follows:-

State	Ha	Yield per ha (kg)
Perak	4724	1599
Johore (South and Central)	1518	1592
Selangor	4485	1508
Malacca	1455	1435
N. Sembilan	5323	1428
	17505	**1509** (weighted mean)

Age distribution of rubber areas is shown in Table 3. It can be seen that the satisfactory yielding states of Pahang, Johore (North) and Kelantan had fairly high percentage of prime 1970s' rubber, ranging from 38% to 61%. As for Kedah state, even though the rubber were mostly 1960's (54%), its satisfactory yield was due to better foliage than states south of it, in view of its more pronounced dry period at the beginning of each year, resulting in uniform wintering/refoliation. The overall drier climate in the rubber districts of Kelantan, Kedah, Johore (North) and Pahang also contributed towards better yield in terms of lesser crop loss from rain interference and root disease.

The states with moderate to low yields i.e. Perak, Selangor, N. Sembilan, Malacca and Johore (South & Central) had fairly high percentage of old 1960s' fields (30% to 68%), with depleting bark reserve, increasing root disease and dry tree incidence to cause yield decline. Leaf disease too were more rampant in these states due to protracted wintering and refoliation.

Key factors for future improvement in rubber yield would appear to hinge on aggresive replanting to phase out low-yielding 1960s' rubber, choice of clones resistant to leaf diseases or implementing treatments to achieve satisfactory foliage and ensure appropriate management practices to minimise loss of yielding stand due to root disease and dry trees.

Table 1 : Mean yield of rubber estates under AAR Advisory services

Year	1987/88	1988/89
Mean yield/ha (kg)	1775	1653
Mean yield/tapper (kg)	23	21
No. of estates	66	68*
Mature ha.	38678	37182

* Additions being Serting and Eng Leong estates

Table 2 : Mean rubber yield of estates in different states under AAR advisory services

	1987/88				1988/89			
Year State	Mature Ha	No.of estates	YPH (kg)	YPT (kg)	Mature Ha	No.of estates	YPH (kg)	YPT (kg)
Kedah	8773	11	1839	23	8121	11	1781	22
Perak	5103	14	1649	22	4724	14	1599	21
Selangor	4827	9	1657	22	4485	9	1508	20
N.Sembilan	4930	7	1733	23	5323	8	1428	20
Malacca	1547	3	1549	21	1455	3	1435	22
Johore JH1#	3544	4	1908	22	3588	4	1760	21
JH2	94	1	1341	25	78	1	1515	23
JH3	1655	3	1727	19	1440	3	1596	18
(Johore)	(5292	8	1842*	22)	(5106	8	1710*	20)
Pahang	4471	6	1899	27	4433	7	1808	24
Kelantan	3736	8	1853	22	3535	8	1768	20
	38678	**66**	**1775***	**23**	**37182**	**68**	**1653***	**21**

Re : #JH1 = North Johore (low rainfall, 2 dry periods/yr)
JH2 = South Johore (high rainfall, no dry period/yr)
JH3 = South/Central Johore (moderate rainfall, 1 to nil dry period/yr)
YPH = Yield per ha
YPT = Yield per tapper

*weighted

FIG 1. DISTRIBUTION OF ESTATES BASED ON CLASSES OF YIELD/HA/YR

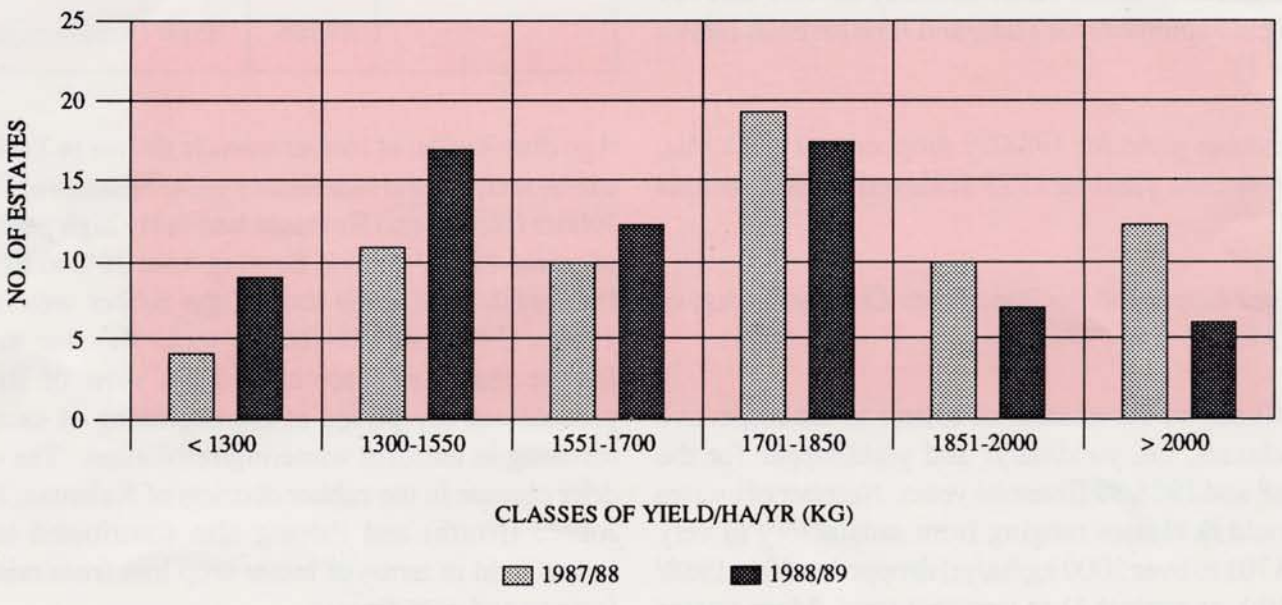
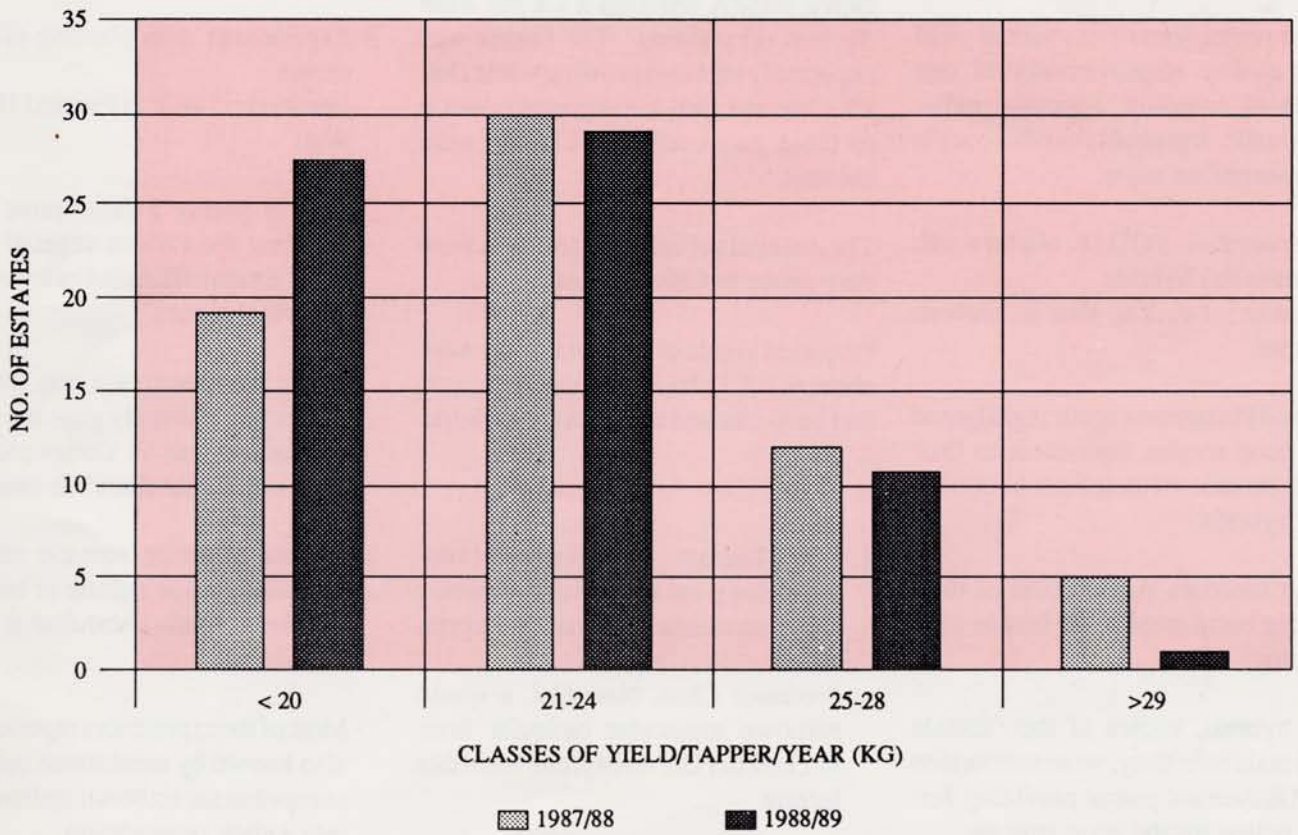


Table 3 : Percentage distribution by age for rubber under AAR advisory services in the respective states.

Estate		Total rubber ha	1950s'	1960s'	1970s'	1980s' (mature)	1980s' (immature)
Kedah	2	8536	6%	54%	24%	3%	13%
Perak	5	5990	1%	30%	34%	8%	27%
Selangor	6	5951	0%	32%	29%	13%	26%
N. Sembilan	8	6270	1%	49%	11%	18%	21%
Malacca	7	1474	0%	40%	32%	19%	9%
Johore – JH1	4	4149	0%	26%	42%	12%	20%
JH2		589	12%	62%	23%	3%	0%
JH3		1328	0%	68%	32%	0%	0%
Pahang	1	5507	0%	12%	61%	6%	21%
Kelantan	3	4830	0%	27%	38%	5%	30%
Total		**44624**	**1%**	**36%**	**33%**	**9%**	**21%**

FIG 2. DISTRIBUTION OF ESTATES BASED ON CLASSES OF YIELD/TAPPER/YEAR



Ong, T. S.

1989 PORIM PALM OIL CONFERENCE

Highlights
A. Breeding Papers

1. Guest Lecture 1 : An overview of breeding technology and selection in E. guineensis.
   Speaker : **E.A. Rosequist**

   This was mainly a historical review. Of interest to note is that other countries and groups (Unilever, H&C, IRHO, Marihat) are concertedly assembling and interbreeding a wide range of advanced breeding material.

2. Genetic resources - its use to oil palm breeding
   Speaker : **N. Rajanaidu et al.**

   This paper highlights the attributes of some selections of PORIM's Nigerian prospected materials eg. high oil yield, short height and particularly high I.V. (iodine value i.e. oil unsaturation), which are being distributed to the research stations in the industry.

   Their projections of substantial yield and quality improvements in one cycle of breeding, appeared rather optimistic. It probably needs a couple of generations more.

3. The potential of OG (**E. oleifera** x **E. guineensis**) hybrids
   Speaker : Tan Yap Pau & Mukesh Sharma

   United Plantations again highlighted the good results, equivalent to DxP performance, of their F1 & backcrossed hybrids.

   Most breeders are sceptical of their claims because of likely bias in their results;

i) the hybrids, known of their female and male infertility, were surrounded by Guineensis palms providing fertile pollen for the good fruit set

ii) Although the hybrids have high FFB equivalent to those of DxP, the bunches are of varying fruit set, fertility and parthenocarpy. Bunch analysis were done only on good fertile bunches. As such projected oil yields tended to be inflated.

Most breeders concur that it needs about 5-6 generations of backcrossing to incorporate the desirable genes of the Oleifera i.e. short stem, high IV, into current DxP materials.

3. Oil palm seed production strategy at Marihat
   Speakers : R.A. Lubis and B. Mony

   The paper projected their breeding and seed production strategy modelled after IRHO's.

   Marihat produced about 35 million seeds of six types of DxP material.

Deli x RISPA (AVROS origin)		
Deli x LaMe	}	IRHO origin
Deli x Yangambi	}	
Deli x D Sinumbah	}	
Deli x Bah Jambi	}	Indonesian origin
Deli x Marihat	}	

Deli x RISPA and Deli x La Me were the best oil yielding. The former was expectedly vigorous growing while Deli x La Me and Deli x Yangambi (similar to those produced by FELDA) were shortest.

The materials of Indonesian origin were very prone to Crown Disease.

Projected yields of their materials were about 6.7-7.1 t/ha oil and over 6 t/ha oil had been claimed in commercial fields.

B. Tissue Culture - Biotech Papers

1. Guest Lecture – The impact of biotechnology on crop improvement : recent successes and future prospects.

   Professor Chua, Nam Hai, a would reknown molecular biologist from Rockefeller University, delivered this lecture.

He outlined the exciting recent advances in the ability to genetic engineer plants using molecular biology techniques and described the successes todate eg. herbicide (Basta, Roundup) and pest resistant (with Bacillus thurigensis toxin gene incorporated) tobacco, improved keeping quality of tomato fruit.

All the successes came about through R&D in the following basic areas.

i) knowledge of the biochemistry of the trait
ii) isolating and cloning the desired gene
iii) genetic transformation - transfer and incorporation of the gene into the plant
iv) plant regeneration from tissue culture

He stressed that with this approach, primary commodity producers can respond quickly to the quick changing consumer demands, with the faster production of cultivars.

As for the oil palm, all the four basic areas are deficient, as such a firm commitment has to be made quickly so as not to be left behind.

2. Experiences with planting oil palm clones
   Speakers : Tan Yap Pau and Ho Yuk Wah

   This is purely a descriptive paper detailing the various vegetative & floral abnormalities in Unilevers' four abnormal clones.

   While the description was informative, it unfortunately gave the wrong impression that all clones produced will necessarily share the same fate.

3. Factors affecting somatic embryogenesis in tissue culture of oil palm
   Speakers : Ruslan Abdullah & Harun Abdul Aziz

   Most of the experiences reported were also known by most tissue culturists except that the authors translated them into a slick presentation.

The central problem of all palm tissue culture is not the ability to regenerate plants efficiently which most laboratories can do but to regenerate normal clonal palms consistently.

4. Current status and strategies in oil palm tissue culture
Speaker : K. Paranjothy et al.

Paranjothy presented evidence from field and laboratory observations and experiments that the abnormal flowering behaviour of clones was a feminisation process induced by the built-up of endogenous cytokinins (a plant hormone) in the culturing process.

The way to avoid this is to limit production per culture, and two strategies to circumvent this constraint and to make it into a commercial proposition are being contemplated by some laboratories.

i) Clone the parents of a superior cross which can then be used to produce clonal seeds

ii) To limit the production (say perhaps 1-5,000 plantlets per clone) of a package (10-12) of clones. Incidences of abnormal ramets are generally low with initial production and can be compensated by the presumably high oil yields of the normal ramets.

This strategy needs a number of clone packages in the pipe-line i.e. a large continuous breeding programme needed.

One could then presumably reproduce clones which have been proven to be superior from the field evaluation, by recloning the original parents, the field tested clonal offsprings, the cryopreserved embryoid cultures. The clonal fidelity of the latter two methods has yet to be confirmed, while with the first methods the level of plantlet production will again be limited.

It appears therefore that certain critical issues still need to be resolved before oil palm clones can be truly commercialised.

C. Agronomy Papers

1. Weevil pollination

The paper by Taniputra et al. from Indonesia and that by Chan K.W. et al. from Malaysia confirmed earlier reports of weevil pollination effects on average bunch weight, bunch number and FFB yield. The previous annual yield pattern of fully mature palms of two unequal peaks and a mild trough has shifted to a single large peak and a deep trough.

2. Yield forecasting

Ahmad Alwi of Chemara presented the ARIMA (Auto-Regressive Integrated Moving Average method as cheaper but equivalent to the Ulu Bernam bunch census system in precision for forecasting the monthly oil palm yield for the group. The forecasting accuracy on individual estate basis, however, is not known.

3. Underplanting

Loong S.G. of Ebor Research presented the results of several from underplanting treatments in comparison with that of clean clearing. Highest total yield (from the old and new stand) was achieved where half of the old stand was poisoned at six months and the balance half poisoned at 24 months after field planting, which implied favourably to underplanting in exploiting the yield of the old stand during replanting. However, severe Oryctes beetle infestation was also reported in the underplanting treatments and the damage to the new planting which was difficult to quantify could be greater than the yield gain.

4. Soil erosion control

Lim K.H. of Ebor Research reported on the importance of pruned fronds in soil erosion control and that soil losses were more effectively reduced where the cut fronds were more evenly distributed on the ground. This supports our current recommended estate practice.

5. Thinning out

The paper by Mohd Nazeeb et al. of Ebor Research showed that at high planting density of 184/ha the adverse yield effect of interpalm competition became apparent from the fifth year of harvesting. On the other hand, he also found that thinning of up to 33% of the original stand could raise the yields of old palms planted at high density. The appropriate intensity of thinning would depend on the prevailing palm stand.

6. Empty fruit bunch (EFB) application

Lim K.C. and Chan K.W. of Chemara confirmed the earlier reports on the benefits of EFB application on palm growth and yield. The Seri Pelangi system of EFB transport and application which uses a spring tine to spread the EFB, as presented by Gurmit Singh et al. of United Plantations, can only be adopted where the infield accessibility and terrain are conducive. Lim K.H. of Ebor Research discussed his attempts to convert EFB to more suitable or less voluminous forms for application, through shredding, pressing or composting. The pressed EFB was still not satisfactory retaining about half the nutrient content of the fresh EFB and was still voluminous. The EFB compost has higher nutrient contents but could be more difficult to handle.

7. Natural enemies of leaf eating caterpillars

The two papers from Marihat Research Center indicated the possibility of the Hemipteran, Eocanthecona as well as the virus, B. Nudaurelia for integrated pest control on commercial scale.

Mohd Basri b. Wahid et al of PORIM revealed that repeated use of met-

amidophos and monocrotophos tended to have deleterious effects on the natural enemies of the bagworm, Metisa plana, trichlorfon and diflubenzuron were comparatively harmless on the natural enemies. For treatment of bagworms monocrotophos should be used only for trunk injection whereas trichlorfon and diflubenzuron are preferred for foliar spraying.

8. Weed control

The competitiveness of Ischaemum muticum was emphasised by Teo Leng et al of Eastern Plantation Agency. He reported that the dry matter of this noxious weed, if dominant, could amount to 12 t/ha and large quantities of N (75 kg N) and K (226 kg K2O) would be immobilized per ha. in both the aerial parts as well as the rhizomes. On eradication of the weed, the FFB yield was recorded to improve by > 20% annually over the following few years.

Khairuddin H. and Teoh C.H. of HMPB Prang Besar Research evaluated 32 herbicide treatments against the standard of Harquat (2.8 l/ha) + Diuron 80 WP (0.7 kg/ha) for general weed control. Anuron, Check-thru and Paracol which are pre-mixed formulations containing the same active ingredients of paraquat + diuron were superior to the standard. Starane, Ally and Banvel which are essentially broadleaf herbicides, in combination with Roundup also performed better than the standard.

9. Rat control

Wood B.J. et al. of Ebor Research reviewed the reports of resistance of warfarin in rat control and showed further evidence from laboratory tests results. They found the occurrence of warfarin resistant rats to be restricted to certain localities but the distribution of these localities appeared to be random.

In such warfarin resistant areas, satisfactory effectiveness with the 'second generation' anticoagulants in restoring and maintaining control was also reported.

Smal, C.M. of PORIM as well as Duckett J.E. and Karuppiah S. of Austral Enterprises Bhd discussed the use of barn owl (Tyto alba sp.) for biological control of rats in oil palm estates. Smal reported that high barn owl densities had been established in mature oil palm areas in Selangor and Negeri Sembilan but not in young and short palm areas. Warfarin baiting would be carried out in the presence of barn owls but other rodenticides might be toxic to the owls.

10. Nutrition

Gurmit Singh of United Plantations presented the results of six fertiliser experiments on marine and riverine alluvium which were fairly close to the findings reported earlier on similar soils. Yields improved mainly to nitrogen by 10-30% but were generally not responsive to potassium on marine and mixed marine/riverine alluvium. Bunch ash, because of its liming quality, was superior to muriate of potash on acid sulphate soils.

Wilkie S.A. and Foster H.L. of Oil Palm Research Association of Papua New Guinea discussed the results of three fertiliser trials on soils of volcanic origin in Papua New Guinea. Yield improvements were achieved mainly with ammonium sulphate and potassium chloride but not with triple superphosphate and kieserite. Optimum yields were obtained at leaf N levels of 2.5-2.6%, rachis K level of 2% and leaf Cl levels of about 0.4%. With optimum fertiliser application the yields peaked at 34-38 t/ha in the seventh year after planting.

Mohd Tayeb et al. of PORIM reported from the results of three fertiliser trials on inland soils that high FFB yields of 30 t/ha/yr or more can be sustained with adequate fertiliser inputs of N, K and P. There should also be no climatic and crop recovery constraints.

Yampubolon of P.T. Socfindo, Indonesia together with Daniel C. and Ochs R. of IRHO-CIRAD of France found that the volcanic or sedimentary soils in Northern Sumatra gave marked yield responses to nitrogen (as urea) and often to phosphorus (as triple superphosphate) as well. From the trial results, critical leaf N and P levels as well as optimum N/P balance equations were established.

Wanasuria S. and Gales K of PT Sadang Mas Research Station reported that copper (Cu) deficiency was encountered on very sandy soils in northern Riau, Sumatra with severely stunted growth and leaf chlorosis/necrosis. The deficiency was corrected with foliar spraying of copper sulphate or copper EDTA solution. The high incidence of Cu deficiency was observed to be associated with high N (ammonium sulphate) and P (triple superphosphate) applications whereas K (muriate of potash) application tended to enhance the uptake of Cu.

Zin Z.Z. et.al presented the findings of 18 fertiliser trials for evaluating urea as a nitrogenous fertiliser for oil palmsas compared to ammonium sulphate. Urea was inferior when applied in the weeded circle but when broadcasted over the whole area forestry grade granular urea (7 mm size) was similar to ammonium sulphate in yield. It should be borne in mind that urea is highly susceptible to volatilization N loss and proper timing of application to coincide with suitable weather conditions is critical to achieve a satisfactorily high level of efficiency.

Suwuandi and Martoyo K of Marihat Research Centre confirmed that dolomite (Ground Magnesium Limestone) can be suitably used as a source of Mg in place of kieserite for mature oil palms.