AA RESEARCH NEWS

May '90

EDITORIAL

A hot topic in recent months among many oil palm agronomists and physiologists is the exceptionally high bumper crop in 1989 (more than 10% over the previous year's yield) and the explanations for it. In this issue, AAR oil palm agronomist (CSP) attempts to explain the reasons for the high yields obtained in some areas and the not so high yields obtained in others, in our advisory groups of estates as continuation of the analyses of 1989 crop yields which was the theme in the previous issue.

Included in this issue is also a comprehensive report on the 3rd International Conference on Plant Protection in the Tropics by three research officers covering the relevant papers in their respective crop sections.

ANALYSIS OF 1989 OIL PALM YIELDS OF AAR ADVISORY ESTATES

INTRODUCTION

The overall FFB yield in AAR oil palm advisory estates has increased substantially in 1989 as compared to the previous three years (Table 1).

Table 1 : FFB yield summary of AAR advisory estates (1986-89)

	Pen.Malaysia		Sabah		Total	
Year	Ha	t/ha	Ha	t/ha	Ha	t/ha
1986	60996	18.5	12634	19.4	73630	18.7
1987	62685	18.4	14279	17.8	76964	18.3
1988	66240	19.2	15804	18.7	82044	19.1
1989	69811	21.0	16937	21.9	86748	21.2

To view the 1989 yield performance on a more meaningful basis, comparisons were made between the various climatic/geographical regions in Peninsular Malaysia and Sabah on:

a) mean yield profile in relation to palm age (1986-89)
b) hectarage distribution by yield performance (1989)
c) yield profile distribution by number of fields (1989)

All the estates were distributed in five climatic regions each with their own distinguishing characteristics in Peninsular Malaysia and three geographical regions in Sabah:

Region	Location	Key characteristics
Pen.Malaysia		
1	Central Kedah and P. Wellesley	Dry season too long for good yields
2	North Perak and South Kedah	Surplus rainfall may cause flash floods
3	Central Perak, North Johore, N. Sembilan and Pahang	Irregular rainfall (short dry spells) may depress yields
4	Central and South Johore, Selangor and South Perak	Insufficient solar radiation in some months
5	Trengganu and Kelantan	Dry season too long for yields, insufficient solar radiation in some months surplus rainfall may cause flash floods.
Sabah		
6	Tawau	
7	Lahad Datu	
8	Sandakan	

MEAN YIELD PROFILE IN RELATION TO PALM AGE

The individual field yields of all the AAR advisory estates from 1986 to 1989 were grouped into the eight regions and separated according to palm age from < 4 to 20+ years within each region. The results are summarised in Figure 1 to reveal the regional yield profiles from 1986 to 1989. There were insufficient data from the Lahad Datu and Sandakan region.

a) The yield profiles in relation to palm age were dissimilar between regions in all the four years. There were also noticeable fluctuations in the individual regions between years. However some fairly consistent yield profile differences between the regions can be picked out.

b) The best early yields of the palms from < 4 to 7 years were obtained in Region 2 but Region 6 has made very marked advancements in 1989. On the other hand, Region 3 and 5

HIGHLIGHTS

- **Analysis of 1989 Oil Palm Yields**
- **3rd International Conference on Plant Protection in the Tropics**

produced the poorest early yield profiles. Apart from the unfavourable rainfall regime of this two regions, the initial low yields could have been aggravated by prevalent and consistent cattle/goat damage on the young palm canopies of their estates particularly in Negri Sembilan and Kelantan.

c) In the 8-13 and 14-19 year old palms, better yields have been achieved in regions 2, 4, and 6 as compared to the other two regions. Regions 1 and 5 suffered severe soil moisture deficits during the prolonged dry period, typical of the two regions, almost every year.

d) In the >20 year old palms, which would have grown to considerable heights and harvesting would have become more difficult, the regional yields were more erratic between years. It is interesting to note that in Region 3 the yields in this age group have been higher than the other regions in most years. Probably this can be attributed to the more efficient harvesting and crop recovery of the much shorter palms in many of the Negri Sembilan estates which comprised about 35% of the total regional hectarage under this palm age group.

e) The superior crop in 1989 was reflected in all the regions primarily in the 6,7,8-13 and 14-19 year old plantings. Many individual fields have surpassed the 30 t/ha mark. The more favourable nationwide rainfall over the last two years coupled with improvements in agronomic inputs as well as on the harvesting frequency and crop recovery in many of the estates are believed to be the main contributing factors. With reference to the estates in central Kedah of Region 1 which suffered very severe and prolonged drought during the first quarter of 1986 and 1987, the rainfall during this period has improved tremendously in 1988 and 1989.

The 1989 mean FFB yields of the various palm ages in the respective regions are presented in Table 2 for more vivid comparisons.

Table 2 : Mean FFB yield (t/ha) in 1989

Palm age (yrs)	Region 1	2	3	4	5	6	7	8
< 4	8.4	13.9	6.2	6.3	2.8	-	5.5	5.0
4	14.1	17.6	12.4	11.7	10.3	17.6	17.4	16.8
5	19.5	22.9	14.1	16.7	17.1	23.8	14.9	-
6	19.8	27.3	21.9	21.1	23.7	23.4	-	-
7	25.2	26.9	18.0	25.0	21.4	26.7	-	-
8-13	23.9	25.7	24.3	25.4	20.7	25.6	-	-
14-19	19.4	25.3	24.4	25.5	21.5	23.6	-	-
20+	15.1	16.5	23.7	19.5	19.1	-	-	-
Overall Mean	19.4	23.4	22.6	21.6	20.1	25.1	10.9	9.2

The overall yield profiles were the poorest in regions 1 and 5 due mainly to the serious climatic limitation of prolonged drought during the first half of the year. In Region 3, rainfall can be limiting in some years but the shorter palm height in some of its estates have helped to sustain satisfactorily high yields in the older plantings. Regions 2, 4 and 6 have comparatively better yield profiles but could not maintain the performance in the >20 year old palms in regions 2 and 4 probably due to difficulty in harvesting and crop recovery.

HECTARAGE DISTRIBUTION BY YIELD PERFORMANCE

The hectarage distribution of the good and poor yielding areas will determine the overall performance of each region. In Figure 2, the hectarage distributions according to the 1989 yield levels under the various palm age groups in each region are illustrated.

a) Much higher proportion of the better yielding areas was found in the 8-13 and 14-19 palm age groups. A breakdown of the percentage hectarage distribution in relation to palm age under the yield levels of < 20 to > 30 t/ha is shown in Table 3.

Table 3 : Percentage hectarage distribution in relation to palm age of different yield levels in 1989

Palm age (yrs)	Yield Class (t/ha) < 20	20-24	25-29	> 30+	Total
< 8	50.6	9.5	8.2	21.8	21.9
8-13	14.4	43.6	45.1	45.4	35.6
14-19	9.3	32.6	40.0	30.3	27.9
> 20	25.7	14.3	6.7	2.5	14.6
Total ha. (%)	24895 (29.4)	28598 (33.7)	25961 (30.6)	5356 (6.3)	84810 (100)

The 8-13 and 14-19 year old plantings covered very substantial percentages of the areas that yielded > 20 t/ha whereas the lower yielding areas were occupied mainly by the < 8 years and > 20 years old palms. Overall 36.9% of the total hectarage produced > 25 t/ha of which 6.3% exceeded 30 t/ha in 1989. Out of the total hectarage, 63.5% belonged to the 8-13 and 14-19 year old palms.

b) The hectarage distributions under the yield levels of < 20 to > 30 t/ha in the respective regions were also summarised as given in Table 4. Region 4 had the largest whereas Region 8 had the smallest hectarage. The above hectarage distribution reflected clearly the overall yield performance of each region.

c) Regions 2 and 6 produced the best results with 47.6% and 63.6% of their total hectarage respectively having cropped > 25 t/ha. The good yields in Region 2 came from the < 8, 8-13 and 14-19 year old fields which comprised of 92.7% of its total hectarage as shown in Table 5. The outstanding performance in Region 6 was because of its high hectarage distribution in the 8-13 year old palms which yielded well which is also conspicuous in Fig. 2, and the absence of plantings in the very young mature stage.

d) Regions 1 and 5 which sufferred from serious climatic limitations were the poorest yielders in 1989 with 19.4 and 20.1 t/ha respectively. The low overall yield in Region 1 was accentuated by the comparatively large proportion of its hectarage under either young mature palms or very old plantings as indicated in Table 5. In Region 5, the yield levels of many of the palm age groups were actually inferior to those of Region 1 but in view of its low percentage of young mature and old plantings, managed an overall better yield than Region 1. Also the normally heavy monsoon rains in the last quarter of the year did not occur in Kelantan in 1989. This allowed for much more efficient harvesting and crop recovery during this high crop period.

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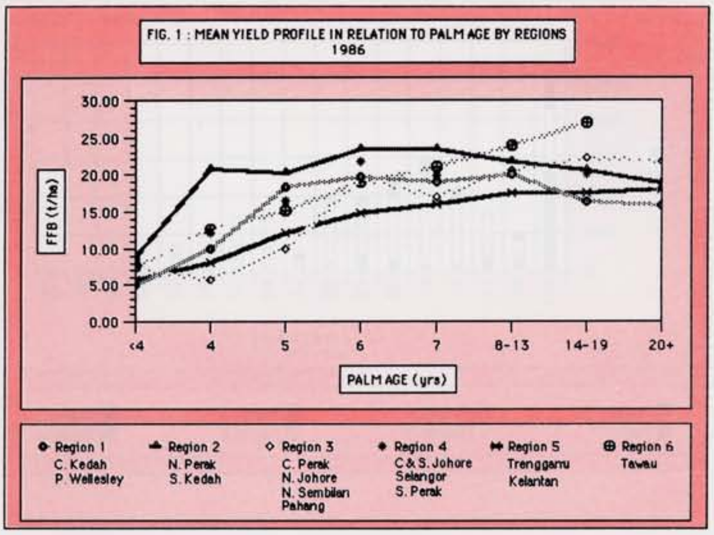
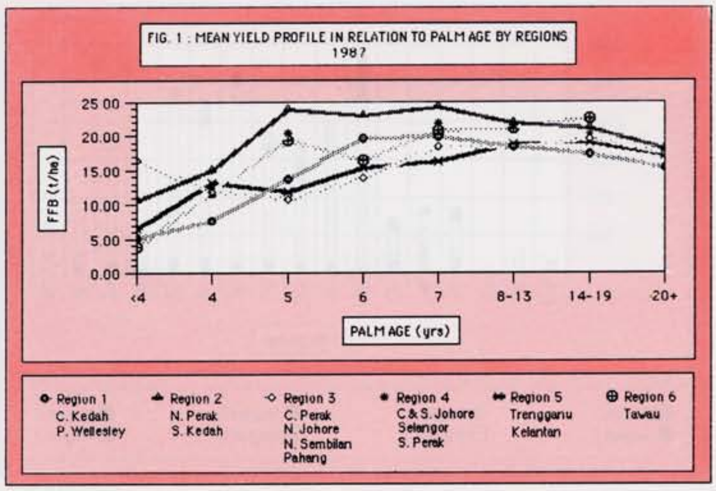


FIG. 1 : MEAN YIELD PROFILE IN RELATION TO PALM AGE BY REGIONS 1986



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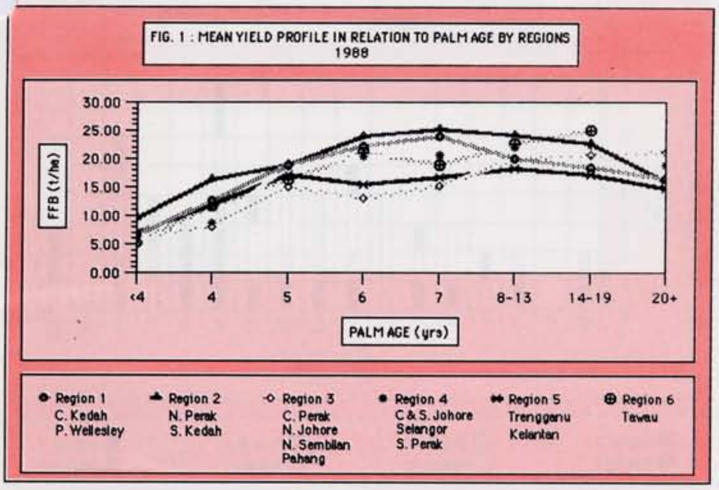

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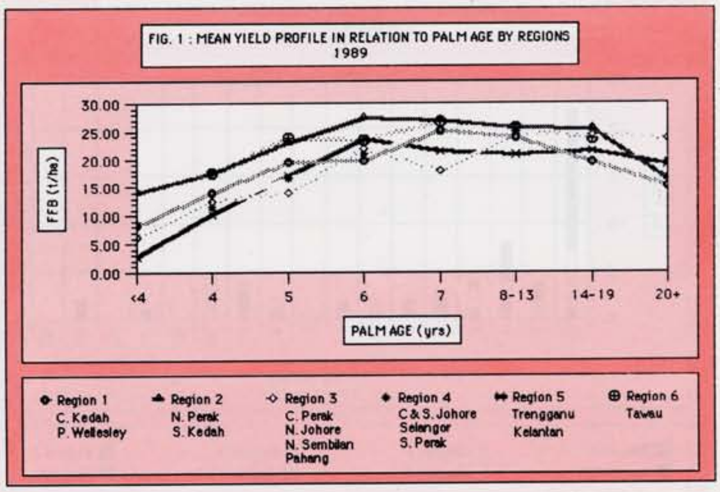

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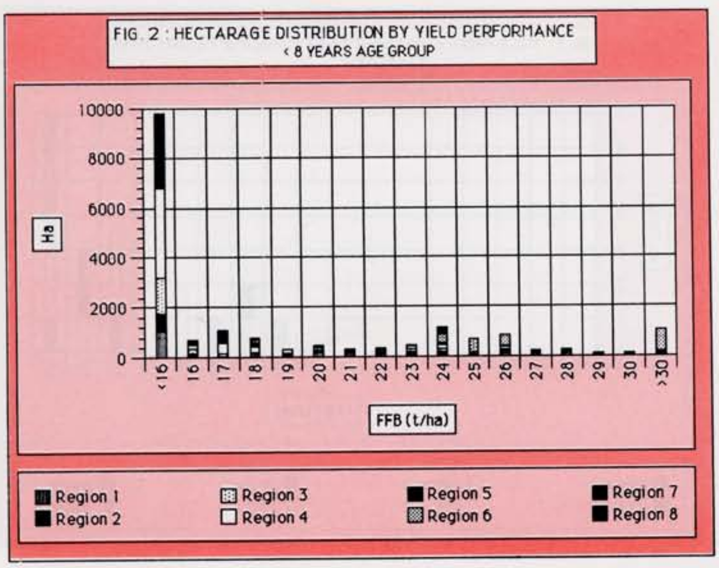


FIG. 2 : HECTARAGE DISTRIBUTION BY YIELD PERFORMANCE < 8 YEARS AGE GROUP

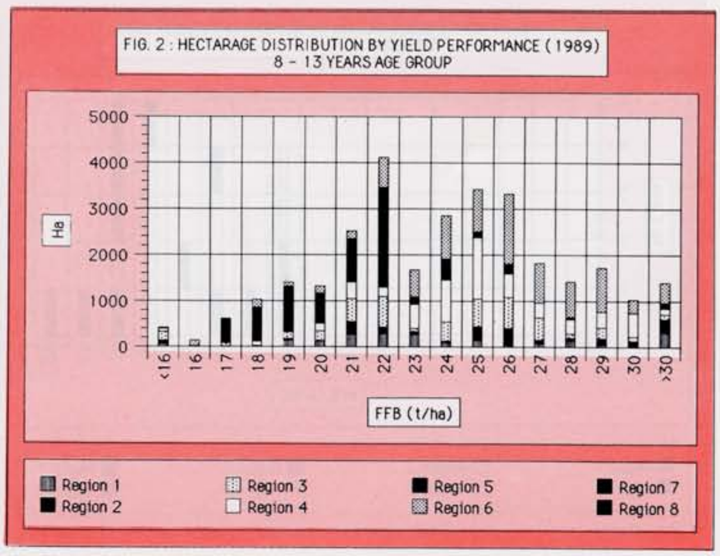


FIG. 2 : HECTARAGE DISTRIBUTION BY YIELD PERFORMANCE (1989) 8 - 13 YEARS AGE GROUP

FIG. 2 : HECTARAGE DISTRIBUTION BY YIELD PERFORMANCE (1989)
14 - 19 YEARS AGE GROUP

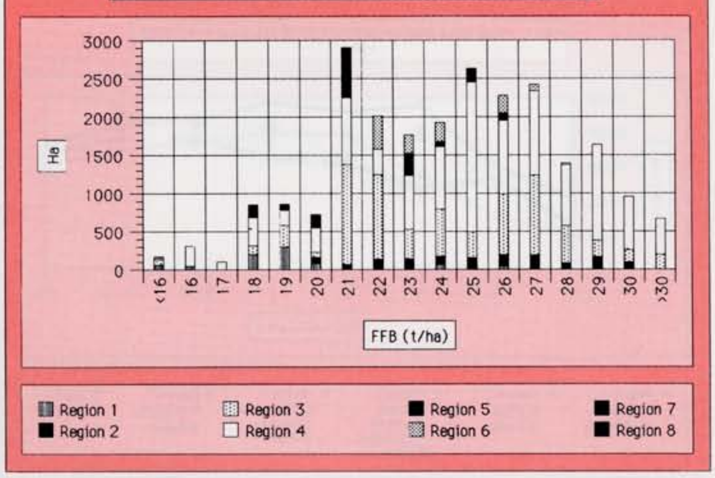


FIG. 2 : HECTARAGE DISTRIBUTION BY YIELD PERFORMANCE (1989)
> 20 YEARS OLD

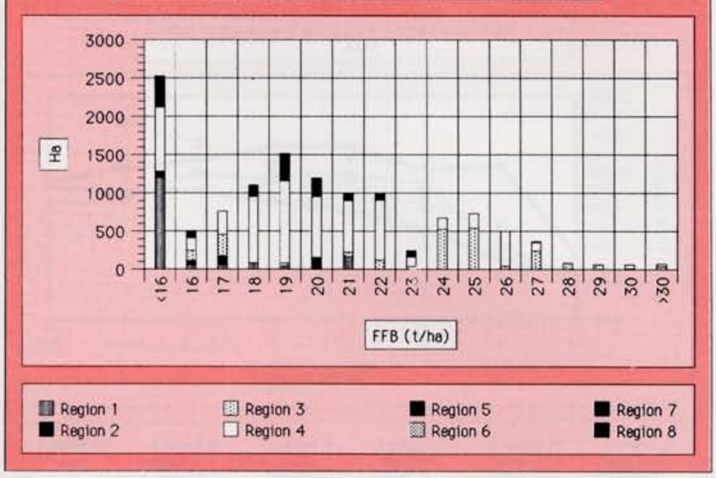


FIG. 3 : YIELD PROFILE DISTRIBUTION BY NUMBER OF FIELDS (1989)
3 YEARS OLD

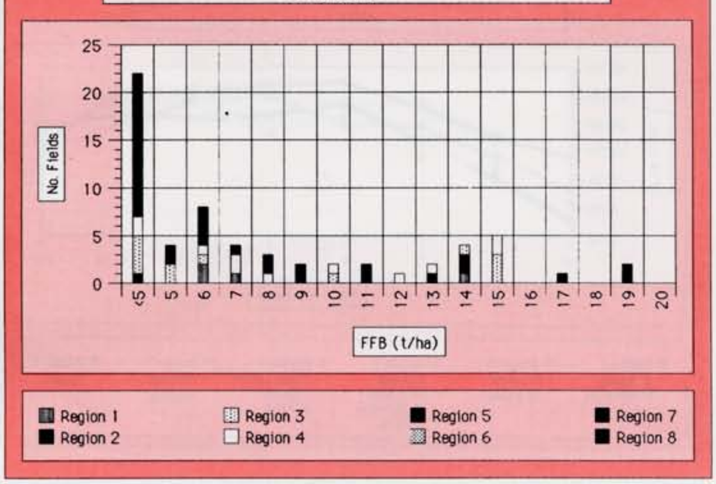


FIG. 3 : YIELD PROFILE DISTRIBUTION BY NUMBER OF FIELDS (1989)
4 YEARS OLD

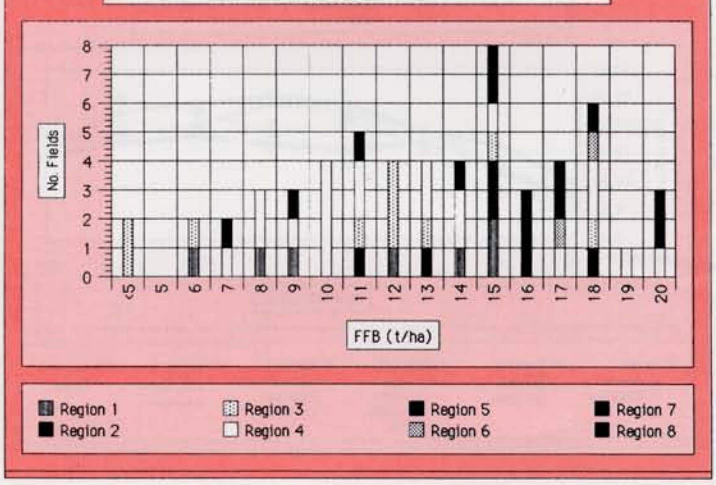


FIG. 3 : YIELD PROFILE DISTRIBUTION BY NUMBER OF FIELDS (1989)
5 YEARS OLD

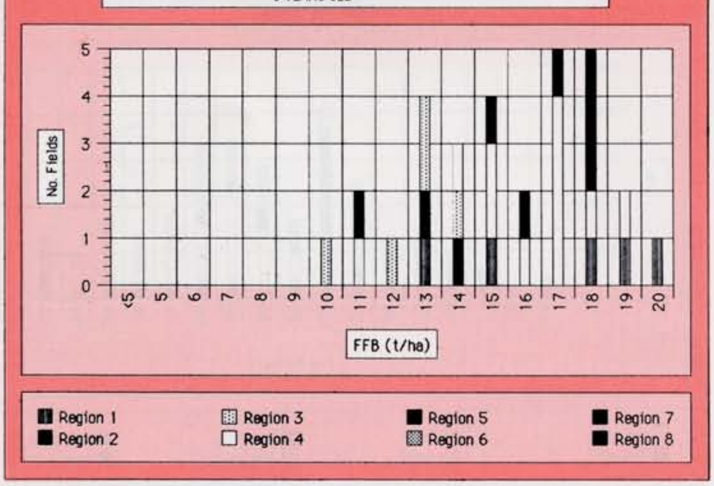
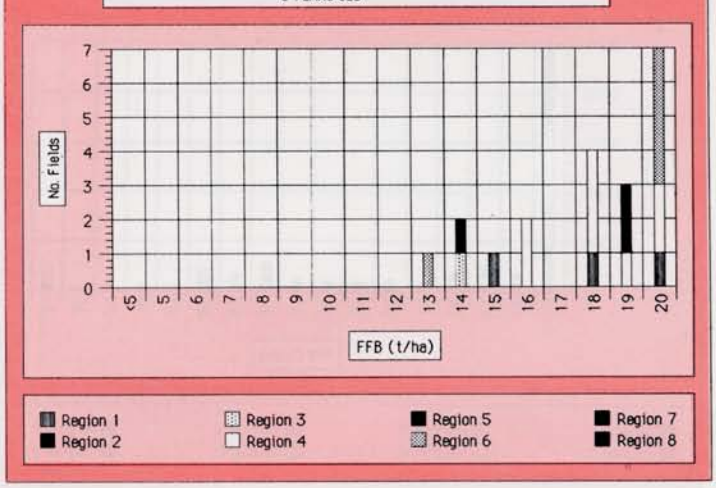
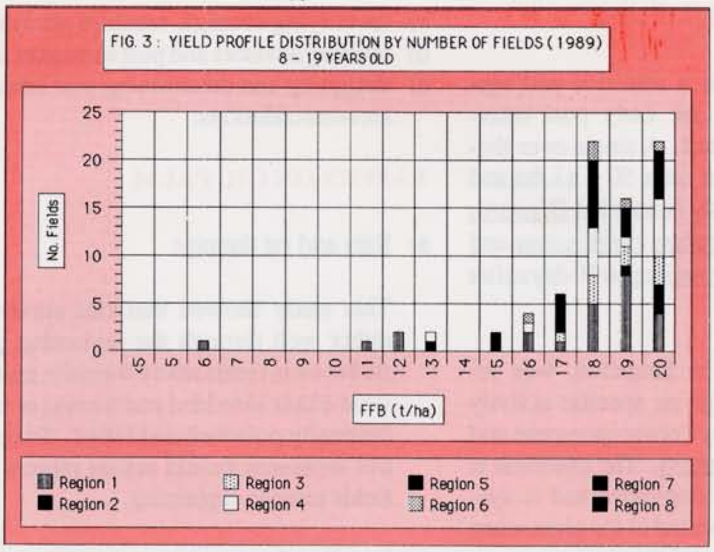


FIG. 3 : YIELD PROFILE DISTRIBUTION BY NUMBER OF FIELDS (1989)
6 YEARS OLD





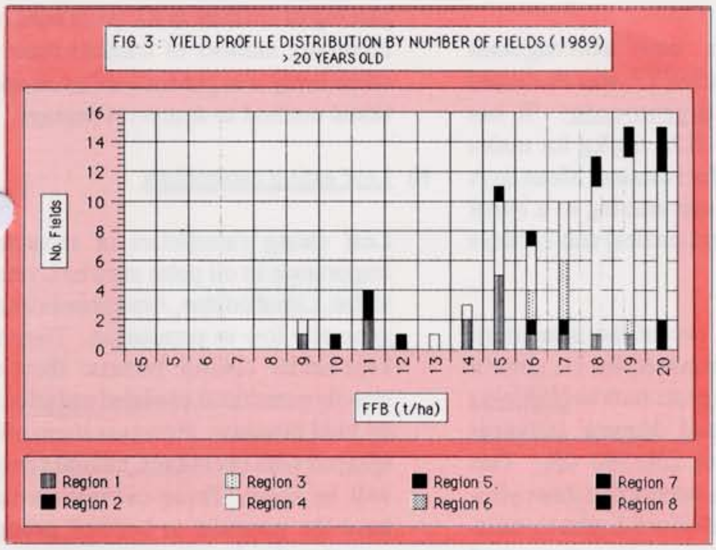


Table 4 : Percentage hectarage distribution of different yield levels in the respective regions in 1989

Region	Yield class (t/ha) < 20	20-24	25-29	> 30	Hectarage total/ha.	%	Overall mean yield (t/ha)
1	53.6	28.3	13.3	4.8	6632	(7.8)	19.4
2	24.4	28.6	35.0	12.6	5555	(6.6)	23.4
3	19.4	39.0	37.6	4.0	16150	(19.0)	22.6
4	30.8	28.4	34.1	6.7	29104	(34.3)	21.6
5	38.4	54.3	6.3	1.0	11258	(13.3)	20.1
6	4.5	31.8	50.7	12.9	12672	(14.9)	25.1
7	83.4	16.6	-	-	2519	(3.0)	10.9
8	100	-	-	-	920	(1.1)	9.2
Total ha(%)	24895 (29.4)	28598 (33.7)	25961 (30.6)	5356 (6.3)	84810	(100)	

Table 5 : Percentage hectarage distribution in relation to palm age of the regions in 1989

Palm age (yrs)	Region 1	2	3	4	5	6	7	8	Total
< 8	32.2	32.3	13.1	18.5	8.6	21.8	100	100	21.9
8-13	31.4	35.4	28.4	20.0	63.1	68.3	-	-	35.6
14-19	12.1	25.0	44.7	38.7	15.1	9.9	-	-	27.9
20+	24.3	7.3	13.8	22.8	13.2	-	-	-	14.6
Total ha	6632	5555	16150	29104	11258	12672	2519	920	84810

e) The extremely low yields in regions 7 and 8 were because all their mature palms were in the initial years of harvesting.

YIELD PROFILE DISTRIBUTION BY NUMBER OF FIELDS

The distribution on the number of fields with yield levels ranging from < 5 to > 30 t/ha in 1989 were compiled for palm ages of 3 - > 20 years in each region. The results were illustrated in Figure 3.

a) The progressive shift on the number of fields from lower to higher yields with palm age was evident from 3 to 8-19 years but subsequently there was a general yield decline in most of the fields.

b) In 1989, 37% of the fields at 6 years old were able to exceed 25 t/ha. This category of the fields increased to 55.8% for the 7 year old palms and maintained at 46.4% in the 8-19 year old palms as indicated in Table 6.

Table 6 : Percentage distribution on the number of fields in relation to palm age by yield performance in 1989

Palm age (yrs)	Yield class (t/ha) < 10	10-14	15-19	20-24	25-29	> 30	Total no. of fields
3	68.9	18.0	13.1	-	-	-	61
4	17.9	31.3	32.8	13.4	3.0	1.5	67
5	-	23.9	39.1	23.9	8.7	4.4	46
6	-	6.5	21.7	34.8	30.4	6.5	46
7	-	2.3	11.6	30.2	46.5	9.3	43
8-19	0.2	0.8	7.8	33.7	43.6	2.8	38
> 20	1.3	6.7	38.3	33.6	17.5	2.7	149

c) The bulk of the lowest yielding fields were those in the first year of harvesting and about half were located in Region 7.

d) Palms as young as 4-5 years old were capable of hitting > 30 t/ha on inland soils in regions 2 and 6.

e) The regional yield distribution by number of fields as shown in Table 7 was fairly similar to yield distribution by hectarage in Table 4.

f) The mean hectarage of the individual fields was variable between regions but did not show any bearing with the overall yield performance.

Table 7 : Percentage distribution on the number of fields by yield performance in 1989 in the respective regions

Region	Yield class (t/ha) < 10	10-14	15-19	20-24	25-29	>30	Total no. fields	(Mean ha/fld) %	Mean overall yield (t/ha)
1	7.9	11.9	32.7	26.7	14.9	5.9	101	(66)	19.4
2	1.7	10.3	6.9	29.3	34.5	9.5	116	(48)	23.4
3	5.5	7.1	10.9	24.0	42.6	9.8	183	(88)	22.6
4	2.7	4.4	15.2	31.2	39.8	9.1	407	(72)	21.6
5	4.4	5.5	33.0	45.1	11.0	1.1	91	(124)	20.1
6	—	0.9	5.9	32.2	50.9	10.2	118	(107)	25.1
7	65.6	3.1	21.9	9.4	—	—	32	(79)	10.9
8	60.0	40.0	—	—	—	—	5	(184)	9.2

CONCLUSIONS

In general, regions with more favourable climatic conditions produced better overall yields. Hence in 1989, the yield performances of regions 2, 3, 4 and 6 were superior to those of regions 1 and 5.

They covered about 75% of the total hectarage.

The yield improvement in 1989, indicated that high yields can be achieved when climatic, agronomic and management limitations are minimal. The site yield potential is a useful criterion for evaluating the performances of individual oil palm plantings which takes into consideration the climatic and edaphic constraints as well as genetic potential of the planting material used.

Cheong S.P.

A Report on the 3rd International Conference on Plant Protection in the Tropics Organised by the Malaysian Plant Protection Society on Mar 20-23 1990 at Genting Highlands.

INTRODUCTION

There were a total of 221 papers presented and 167 poster papers displayed. Only 5 plenary papers were delivered.

The relevant topics and papers are highlighted under the following headings:

1) Pest control
2) New chemicals
3) Microcomputers in pest management
4) Papers on oil palm
5) Papers on rubber
6) Papers on cocoa
7) Discussions
8) Conclusion

PEST CONTROL

Three major components of integrated pest management (IPM) are host resistance, pesticides and biological control.

Biological control was given considerable attention above the other two methods. This heightened awareness was a result of increasing reports on pests and pathogens developing resistance to some pesticides. Moreover, some chemicals that were effective in controlling the pests in the past have been banned due to the more stringent rules and regulations on pesticides, and new chemicals are very expensive to develop.

There has been a continuing flow of significant biological control successes in countries such as Hawaii, California and Australia. The benefit : cost ratios have been extremely high and success has frequently been correlated with care and effort expended.

NEW CHEMICALS

a) Propaquizafop is a selective and systemic herbicide for early post emergence grass control. A single over-the-top application at rates 50 g a.i./ha and higher, effectively controlled *Digitaria ascendens*, *Paspalum conjugatum* and *Paspalum comersonii* up to 30 days after treatment.

b) Dimethomorph, a fungicide, was reported to have given specific activity against the family Peronosporaceae and genus *Phythophthora*. The chemical is a cinnamic acid derivative and is systemically translocated in the plant when applied to the roots/stem.

c) Flocoumafen, a new anticoagulant rodenticide from SHELL was evaluated against *Rattus. argentiventer*. It has LD50 values of 0.25 mg/kg for males and 0.37 mg/kg for females. Mean days to death in rats succumbing to a lethal dose were 6.0 days (males) and 7.2 days (females).

d) Beta-cyfluthrin, one of the isomers of cyfluthrin, was reported for the control of lepidopterous pests such as *Heliothia assulta* Quen and *Mamca testulalis* Gayer at rates of 250-380 -l/l. This chemical is twice more active than cyfluthrin. When applied at 5.6 g/ha by misting, it is effective against cocoa pod borer.

e) Andalin, an insect growth regulator (IGR) showed acaricidal as well as insecticidal activities. It is only effective against the larval stages of the pests. On insect larvae it mainly acts as stomach poison and on mites, toxicity is due in part to oral and contact activity.

f) Phosphorous acid } Details in the
g) Triadimefon (Bayleton) > rubber section
Triadimenol (Bayfidan) }
h) Prochloraz (Sportak)

MICROCOMPUTERS IN PEST MANAGEMENT

In keeping up with the advent of high technology, microcomputers have been developed for use in managing a range of pest problems. Expert systems, database management systems and simulation model techniques are being developed on such topics as

a) pest diagnosis
b) forecasting pest outbreaks
c) identifying strategic research priorities
d) training advisors and pest managers and
e) designing and determining pest control recommendations.

PAPERS ON OIL PALM

a) Rats and rat damage

This study showed that rats survived rather well through the replanting period even in fields where the palm trunks were either shredded and burned or traditionally poisoned and felled. So control measures should not be relaxed in fields prior to replanting.

In tall palm areas a new method i.e. placing of fruitlets at the palm base and recording number of fruitlets eaten or taken away was put forward as an additional method to assess rat damage.

b) Leaf eating caterpillars

Leaf eating caterpillars of secondary importance in oil palm such as Lymantridae, Limacodidae, Amanthusiidae are generally low in population. They are kept under control because they are heavily parasitised, predated and affected by viral diseases. However if too often sprayed with chemicals, natural control will be upset. These caterpillars then have the potential to become primary pests in oil palm.

c) Ganoderma

During the conference a few interested participants got together to discuss their experiences on *Ganoderma* disease.

The current trend in Malaysia indic[ates] that the palms in the coastal areas are more prone to infection than the inland estates. In jungle to oil palm planting *Ganoderma* infection would come only 10 to 12 years after planting and only about 25% of the reported area was infected. In coconut to oil palm or oil palm to oil palm planting palms were infected only 5 years after planting and incidence reported was around 35%.

A survey on a coastal estate in Sumatra reported that there was no correlation between the disease and landforms or soil types.

Taiwan reported that *Ganoderma* was cultivated instead of eradicated because of its medicinal properties.

Dr. Ko (U. of Hawaii), PORIM's consultant on *Ganoderma* disease presented a few hypothesis regarding the disease:-

i) In coconut there is *Ganoderma* incidence only after the coconut is killed, so dead coconuts might produce stimulants for *Ganoderma* growth.

ii) He suggested not to use soil from infected field for seedling growth due to the presence of the pathogen in the soil.

d) Miscellaneous

The "Methods for rodenticide evaluation" paper actually was a comparison on the performance of rat baits based on brodifacoum, bromadiolone and warfarin and no new technique was introduced.

The paper on naturally occuring biocontrol of coconut and palm pests reported the use of parasitic *Tachinid* flies, the *Reduvid* beetles and virus to control leaf eating caterpillars.

On the diseases of oil palm in India, Dr. Babu mainly concentrated on the different types of crown diseases.

Vascular Wilt disease (*Fusarium oxysporum*) is the most serious disease of oil palm in West Africa. As oil palm pollen and seed are widely transported between countries in extensive breeding programmes, such movement of plant materials could allow the introduction of the pathogen in new areas. Rapid assessment methods for isolate pathogenicity and methods of decontamination of pollen and seed were reported in another paper.

a) New fungicides

The paper by Chee K.H. briefly touched on some newer fungicides which are promising against the following diseases:-

White Root Disease : *"Tilt"* (Ciba Geigi) Bayleton (Bayer)
Pink Disease : *Daconil*
Black stripe : Trunk injection with phosphorous acid
Secondary Leaf Fall (SLF): Sportak (*Colletotrichum, Oidium*)

Alternative approach for SLF control is by defoliation with low concentration of Garlon applied from air. No cost was given.

b) Phyphthora Leaf Fall

Tan, A.M. reported on trunk injection with phosphorous acid (PA). Treated trees had better canopies (or less *Phytophthora Leaf Fall*) and were free from *Black Stripe* even one year after injection. 16 gm of PA were injected into four holes drilled at graft union area. Time taken for drilling, waiting for latex to coagulate and applying fungicide is 1 to 1 1/2 hours. No cost was given.

Lim T.M. (et. al.) too reported on promising result of trunk injection with PA (one injection at 4 gm/tree) in controlling *Phytophthora Leaf Fall* in Burma and *Black Stripe* in Malaysia.

c) Root disease

Ng K.Y. and Yap T.H. from Bayer reported preliminary (one year) finding on control of root disease from four trials on 6 months to 8 years old rubber. Bayleton and Bayfidan were found to be highly effective against *White Root Disease*. Rates recommended were 2.5 gm a.i./1 litre water for trees less than two years old and 5.0 gm a.i. in 2-3 litres water for older trees. These were to be re-applied at 6 monthly interval.

d) Herbicides

Chee Y.K. et. al carried out strip and topical spray to check on herbicide phytotoxicity on 2-whorl buddings which had been planted into the field. "Safe" herbicides for strip spray were Roundup, Ally, Basta, Paraquat and Paracol.

Faiz's paper was on efficacy of herbicides for strip spraying in immature and mature smallholder rubber. *Glyphosate* mixtures with Banvel or Tordon or Ally or Starane, or Assault by itself (at given rates) were found to be more effective than *Glyphosate/Amine* or *Paraquat/Diuron* or *Paraquat/Amine*. Under mature rubber, lower rates of the *Glyphosate* mixtures or Assault resulted in comparable control as that of *Paraquat* mixtures.

a) Vascular Streak Dieback (VSD)

The following new fungicides were introduced for VSD control:-

i) Terbuconazole (Folicur 250 EC) a systemic, sterol biosynthesis-inhibiting, triazole fungicide by Bayer. The new product is said to be superior to their previous two products, Bitertanol (Baycor) and Triadimenol (Bayfidan) when used as a foliar spray at 0.00625% a.i. at 7 to 14-daily intervals in the nursery, providing 100% control against VSD. In young field plantings Folicur at 0.0125% a.i. applied at 14-daily intervals as a foliar spray provided 95% protection.

ii) Flutriafol, a systemic triazole fungicide by ICI is said to have both prophylactic and curative properties.

The recommended dosage for prophylactic treatment in the nursery is 100-200 ppm foliar spray at fortnightly intervals or soil drenching at 5-15 mg a.i./plant at monthly intervals. For newly planted cocoa, soil drenching at 25-100 mg a.i./plant is suggested.

Monthly soil drenching at 5-10 mg a.i./plant and 50-100 mg a.i/plant in the nursery (exposed to VSD for 18 weeks) and in the field (exposed to VSD for 3 months) respectively provided good control against the disease.

iii) CGA 169374 or Score, a systemic broad-spectrum triazole fungicide by Ciba-Geigy. Foliar spray at 0.02% a.i. gave good control against VSD in the nursery.

b) Phytophthora diseases

Trunk injection of phosphorous acid (PA) or neutralised phosphonic acid (NPA) was found to provide good control against both Phytophthora *Black Pod* rot and *Stem Canker* in cocoa.

Trunk injection of 2 g PA/plant was found to be effective against *Black Pod* in Jerangau.

In PNG, trunk injection of NPA at 2 gm per metre canopy diameter was superior to Ridomil. Both *Stem Canker* and *Black Pod* can be controlled by two initial injections of NPA at half-yearly followed by annual application of the same thereafter. Ridomil seed soaks (1%) or foliar spray (0.8%) was superior to NPA for the control of *Phythophthora Seedling Blight* in cocoa nursery.

A poster paper from Trinidad indicated that Phytophthora *Black Pod* rot can be controlled by tying a piece of linen (e.g. napkin) impregnated with 5-10 g of any copper fungicide around the branch/ trunk of the cocoa plant.

c) Helopeltis

Gamma-HCH which is the standard insecticide for controlling Helopeltis may be replaced by synthetic pyrethroids such as:-

1) Cyhalothrin at 2.1 to 4.2 g a.i./ha
2) Deltamethrin at 2.2-2.6 g/ha (eg. Decis)
3) Cypermethrin (38/62) at 9.5 g a.i./ha (eg. Ripcord, Barricade & Triocord)
4) Cypermethrin (80/20) at 2.8-5.1 g a.i./ha (eg. Fenom)
5) Alphamethrin at 1.9-4.0 g a.i./ha (eg. Fastac)

Addition of additives/adjuvants generally did not improve the efficacy of the pesticides as the same have already been incorporated into most of the pesticides.

Dolichoderusthoracicus ants may be used as a biological control agent against *Helopeltis*.

d) Cocoa Pod Borer(CPB)

There was no new development except that Lamda-cyhalothrin and Beta-cyfluthrin (synthetic pyrethroids) were found to be effective against the pest.

e) Cocoa pollinators, Forcipomyia

Continuous use of insecticides (6 months) such as gamma-HCH, synthetic pyrethroids and Malathion had no significant effect on the emergence of *Forcipomyia* insects from the breeding sites on the ground and effective pollination. More flowers and hence better yields were recorded in the insecticide treated plots because the plants were healthier.

f) Pythium vexans-Stem Canker

The disease is less virulent than Phytophthora *Stem Canker* but should be similarly treated i.e. by scraping the affected bark and then paint with 0.25% metalaxyl.

Dead plants or plants beyond saving should be dug out and the sources of inoculum removed.

Unlike *Phytophthora,Pythium Stem Canker* is always underground. It is closely associated with heavy rainfall.

DISCUSSIONS

A few new products reported at the conference deserve our closer attention for evaluation. One such chemical is propaquizafop, a pre-emergent herbicide. Since labour is becoming more scarce and expensive, propaquizafop should be considered as an alternative to hand weeding to keep the weeds out at the initial stage of covercrop establishment.

Next is the flocoumafen, a rodenticide. Due to increasing reports on rats developing resistance to warfarin, flocoumafen looks like a good substitute because of its effectiveness especially against *Rattus, argentiventer*. However, for estates that are also using barn owls to control the rats, this is not recommended because flocoumafen produces secondary poisoning.

Finally, andalin, a pesticide, is a potentially useful chemical to control leaf eating caterpillars due to its specificity of only killing the immature stages of insects and mites. The adults are not affected and thus other beneficial insects can be preserved.

CONCLUSION

Plant protection techniques are now moving towards less dependency on chemicals. This is because pests have been developing resistance to various chemicals at an alarming rate and some chemicals that were effective in the past have been banned due to their undesirable properties. Furthermore, stricter rules and regulations regarding their use and abuse are making pesticides more expensive to develop and manufacture.

Integrated pest management (IPM), the combination of using host resistance, biological control in addition to using pesticides as a mean to combat pests, introduced in early part of the century, is one of the techniques that is being promoted again as a feasible alternative.

In the plantations sector, IPM programmes has been researched to a certain extent. For example, in host resistance aspects, oil palm are being bred for resistance to Fusarium wilt and cocoa with thick cocoa pods are being selected as one way to combat cocoa pod borers (CPB). In the bio-control aspect, the natural enemies such as ants (D. thoracicus) and *Trichogramma* flies are being propagated to control the *Helopeltis* bugs in cocoa and the *Bacillus* virus are being used to control leaf eating caterpillars. In the chemical aspect, specific chemicals are being used to control specific pest without causing injury to others. For example the trunk injection of Monocrotophos to control bagworms and other leaf eating caterpillars.

From the above results, IPM programmes look promising. However, it has to be stressed that to be successful, the bio-control or the host resistance technique does not always provide sat[illegible] factory control on its own. Chemical treatn[illegible] has to be included to control the pest damage. A more extensive research and review programme needs to be done on IPM before it can be fully implemented on a commercial scale basis in plantations.

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AAR NEWS

AARSC - Kelco SC Games

In May, about 50 AAR S.C members led by their President, Mr. Saw Eng Guan went to Ipoh for the annual AARSC-Kelko S.C home and away games series. Despite the enthusiasm and spirit of its members, AAR S.C. lost all (badmi[illegible] volleyball, netball and football) but one game (table-tennis). The games ended with a dinner and dance warmly hosted by Kelko S.C.

"Mine, mine, mine!"

"The Sporting Crowd"