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EDITORIAL

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The low oil extraction rates (OER) have plagued the oil palm industry in Pen. Malaysia since 1992 and more recently East Malaysia as well. The fact that our close neighbour and rival Indonesia is still getting OER of above 22% really worries us. The low OER will undoubtly erode our competitiveness. The slightly higher kernel extraction rates (KER) that came with the low OER is obviously inadequate to make up for the loss of the latter. In view of the seriousness of the problem, we have devoted this entire issue of our News to this thorny issue with the Head of Agricultural Research taking on the subject himself.

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INDUSTRY'S LOW OER PROBLEMS - IMPACT, OUTLOOK AND IMPLICATIONS

Introduction

The Malaysian palm oil industry is arguably the most advanced and developed in the world. Malaysian palm oil yields are acknowledged as among the highest in the world and over 65% of the world's palm oil trade was produced by our country in 1994. The tremendous strides in production and productivity over the past 30 years of major expansion of the industry have come from effective implementation of results from breeding and agronomic research (Davidson, 1991).

It has been demonstrated recently that with current planting technologies, fresh fruit bunch (FFB) yield plateaus i.e. maximum yields for current oil palm planting materials are realisable on commercial basis (Goh *et. al.* 1994). Realistically, depending on the actual environmental conditions and types of planting materials, this would be mainly in the range of 26 to 37 t FFB /ha/year with some annual yield fluctuations. It also appears that improvements in FFB yield from breeding progress may be expected to be slow due to low heritablility for this multigenic trait. Improvements from clonal selections should yield faster progress but reported results from most trials appear to bear out the problems of selecting high FFB yielding oil palms. More rapid improvements in selection of planting materials with higher oil contents, both from improved seedling and especially clonal materials, are likely.

Given the likely scenario of limited potential for increased FFB yields and only a gradual replacement with planting materials with higher oil contents on replanting of the existing areas, it is indeed disconcerting that the recent phenomenon of low oil extraction rates (OER) which has hit the country does not have a solution or even a dear explanation in sight. It is even more disconcerting when it is realised that this problem of low OER appears to be unique to ourselves in Malaysia, especially in Peninsula Malaysia, and does not appear to be abating despite research efforts into the problem by the Industry induding AAR.

It has long been acknowledged that field yields should be expressed as palm oil produced per hectare. However, there are severe practical difficulties to attempt accurate distribution of oil produced from processing different crops in a mill, even on a monthly basis. The bunch analysis technique used by the breeders are mainly for study of the various components e.g. the fruits and its components, stalk etc. of the bunch. It is useful for relative comparisons but is much less useful for correlation with OER achieved by the mills. However, it has been used as an indicator of absolute OER realisable with a standard correction factor of 15% to express the results on factory extraction basis. Moreover the exercise is tedious and labour-intensive at 0.5 m.day per bunch with analysis of at least 50 bunches required to achieve an accurate mean result. The commendable but usually meaningless exercise to express oil yield per field instead of FFB therefore has not been adopted by the industry overall.

The severe difficulties of accurate determination of oil yield in the mills for individual batches of FFB and in the laboratories have shown up in the very limited studies on factors affecting oil yield in the bunches harvested from different agronomic and management treatments. Most results are available from different fertiliser treatments while some effects from spacing and ablation studies are also known.

The confused and obfuscated situation on oil in FFB is probably best expressed in the outdated and inaccurate theoretical OER table for FFB crop from fields of different ages (Table 1), taken as gospel but widely acknowledged as inaccurate, used in the industry for so

Table 1 : Table of theoretical extraction rates (% FFB)

Age in months from planting	25-27	28-33	34-39	40-48	49-59	60-74	75-108	109-240	241+
DxP	12	15	18	20	21	22	22	21	20.5
DxT	N.A.								19
DxD (post-war)	N.A.								17.5
DxD (pre-war)	N.A.								17
DxD (dumpy)	N.A.								16

long that no one appears to be sure of its origins or basis.

The paucity of information on accurate OER information and factors which affect it, especially since the introduction of weevil pollination, and poor knowledge of the basic physiological processes of development, ripening and oil synthesis of the oil palm fruits within the bunch and their responses to various bunch development and growth factors has exposed a severe weakness in our R&D programmes. This is exacerbated even more since the first signs of the current low OER problems were seen in 1992 and repeated outcrys for help by the Industry since then to investigate the causes have not yielded any concrete research or results.

This paper will attempt to put a perspective to the current low OER problems by reviewing briefly the state of knowledge on factors affecting OER in the bunches and the steps that may be taken to maximise oil yield by management in the estates. The low OER problems also have implications on planting policies and strategies and these possibilities are discussed to reduce the impact of the problem, until more is known about it.

Palm Oil in the Bunch

The oil palm (*Elaeis guineensis*, Jacq.) is the highest oil producing crop cultivated, exceeding its nearest production rival, the soyabean, by a factor of nearly 10. Average palm oil production in Malaysian plantations is about 4.25 t per ha per year.

The oil are produced in the fruits, which have two oil bearing components, on the FFB. Palm oil is obtained from the fleshy fibrous mesocarp layer around the nut in the fruit while kernel oil is obtained from the kernel within the nut. There can be several hundreds to thousands of oil bearing fruits on an oil palm bunch, the number depending on the size of the bunch and the level of pollination of the bunch. Bunch sizes increase with age and are affected by number of bunches produced as well as palm conditions and agronomic factors. Pollination is usually by the weevils (*Elaeidobius kamerunicus*), which were introduced in Malaysia since 1981.

After pollination, the fertilised flowers on the bunch develop into ripe fruits over a period of about 160 days. Kernel development occurs more rapidly than the mesocarp. Palm oil formation in the mesocarp occurs mainly in the last 35 days or so before fruit abscission, increasing rapidly over the period. During this period, there is also usually a change in colour of the fruits from black to orangish red (in the nigrecens fruit types grown commonly). Maximum oil content in the fruit is reached when fruit abscission occurs. Fruit abscission in an individual bunch occurs over 28 to 33 days, with more rapid abscission in small bunches (from young palms).

A commonly observed phenomenon in the bunches, especially large bunches from old palms, is the nearly complete pollination of the flowers and very compact development of the fruits in the inner layers of the spikelets of the bunch (Fig. 1). This results in vastly larger sizes and thicker mesocarp contents of the fruits on the outer layers of the spikelets with more space for development as compared to the inner fruits (Fig. 2). The larger outer fruits also have higher carotene and oil contents as compared to the inner fruits. As the kernel development occurred over an earlier period with less space constraints in the bunch, differences in kernel contents of the fruits are relatively small.

Recent research work has also shown that in the weevil pollinated bunches, oil content in the fruits in

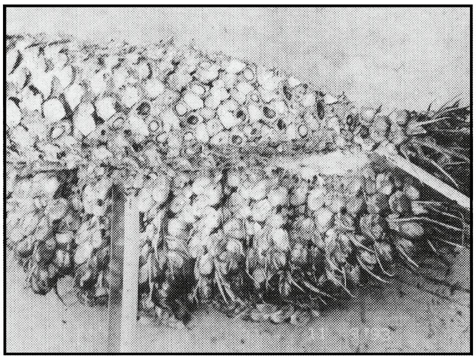

Fig.1:Compact arrangement of fruits in big bunches

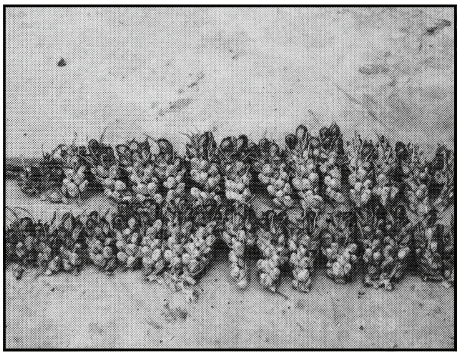

Fig.2:Fruit development on spikelets in big bunches

the bunches does not increase significantly after the first few fruits have abscissed (Fig 3). Effectively therefore, the maximum oil content in the bunch has been reached by then.

FIGURE 3: EFFECT OF FRUIT DEVELOPMENT ON OIL TO DRY MESOCARP

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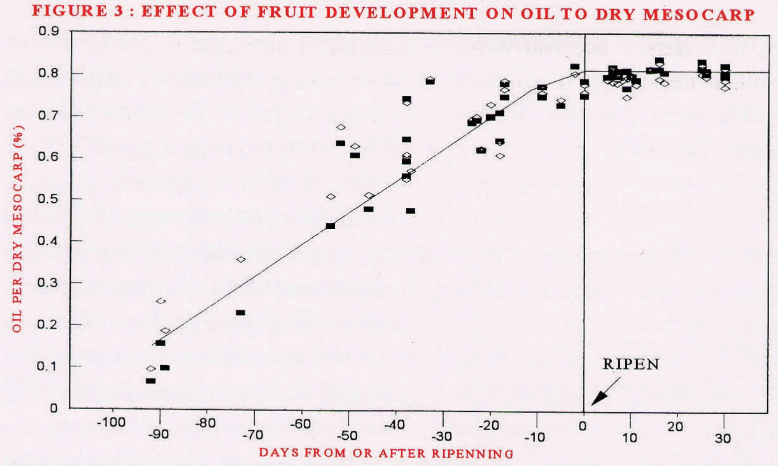


The palm oil yield in each bunch is therefore determined mainly by the bunch weight (determining the number and weight of fertilised fruits) harvested and the ripeness of the bunch (determining the oil content in the mesocarp). In practice, an optimal harvesting interval is set and a minimum ripeness standard drawn up to harvest all bunches with high oil contents and in good condition (not over-ripe), avoid excessive loose fruits production and consequent losses in the fields as well as with good oil quality. This is the primary duty of management on the estates and fruit grading standards have been drawn up to assist in this task.

Oil Extraction Rates

At the palm oil mill, the OER is expressed as the palm oil extracted from the FFB crop received. A formal FFB grading system has been established to monitor quality of FFB received from the individual contributing estates. On an individual day, FFB from many different fields of different planting ages and sources from all contributing estates are received in a typical mill. The FFB are processed continually, thereby mixing the crop and oil extracted. Due to processing practices and variation in estate practices in despatch of FFB crop, daily OER figures fluctuate very widely. Weekly OER figures appear more stable but usually, the most reliable figure is the monthly OER as all crop and oil extraction figures are reconciled for purposes of oil distribution and payments.

Unfortunately, due to logistical and technical problems, the FFB grading scheme can only be very gross, due to the small samples taken and no correlation with final OER results. It is useful only in maintaining awareness of the importance of good FFB quality and identifying the worst FFB received. Processing control measures such as the mass passing to digester (MPD) composition commonly carried out in some groups and checks on oil losses in pressed fibre etc. are also gross and with poor correlation with the final OER results (Lee and Shawaluddin, 1994). Kernel recovery figures which, in pre-weevil days, used to be indicative of pollination levels in the FFB and OER can be confusing now as frequently, apparently inverse relationships are seen.

It has frequently been stated that the palm oil is made and lost in the field. This is usually correct as managerially and technically, control in the mills is easier to monitor and correct. Therefore, with any problems on OER, the palm oil mill should be the first to be checked and investigated. The possibilities of quickly ruling on the situation there will allow focus on the problems where they occur in the field.

The Low OER Problem

Whether there is a nation-wide problem with low OER is disputed by some groups. The problem appears to vary in magnitude in different areas and some smaller plantation groups claim to be able to maintain their OER results. However, all the large plantation groups and apparently, many of the small estate sector (from complaints by privately run millers) have this problem.

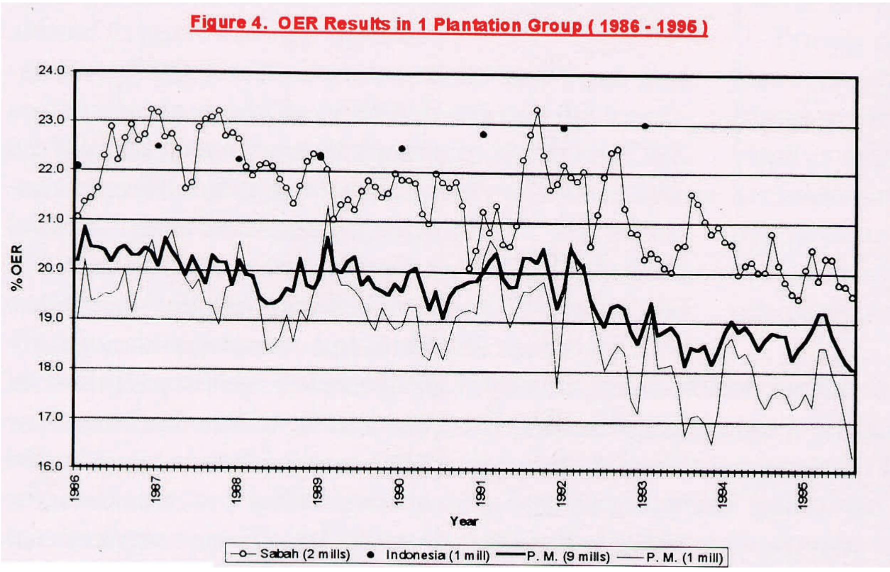
We think that this somewhat confused situation is actually symptomatic of the problems of determining OER accurately. This problem is probably compounded in commercial practice over the industry by varying computational formulae for OER as well as different treatment of poor quality FFB crop received at some mills.

The problem is therefore best examined over wide areas and groups for general trends and levels. The OER and KER results from 1986 to August 1995 for P. Malaysia (9 mills), Sabah (2 mills), in one large well-managed plantation group with 9 mills over different areas in P. Malaysia and one mill which processes FFB crop from old palms mainly are shown in Figures 4 and 5.

The declining trends in the OER results achieved are undisputable and reflect the trends in all the large plantation groups. The worrying aspect is the continuous declining trend over the period from 1992 indicating that there is no apparent arrest of the problem/s involved.

The other evidence for low OER is in the absolute OER results achieved now. The ‘good’ old theoretical OER tables established many years ago set a plateau extraction rate of 22% at year 8-9 and declining to 20.5% in much older palms. In fact, many mills will struggle to achieve 18.5% now, nearly 15% less. Experimental evidence for the actual decline in OER for batches of FFB tested in special tests conducted in the late-70s in pre-weevil days and recently again by our Chemist, Chan K.S. in co-operation with the mill engineers and G.E. Departments of our principals confirms the problem (Table 2).

OER of upto 22% were achieved in pre-weevil days from young crop



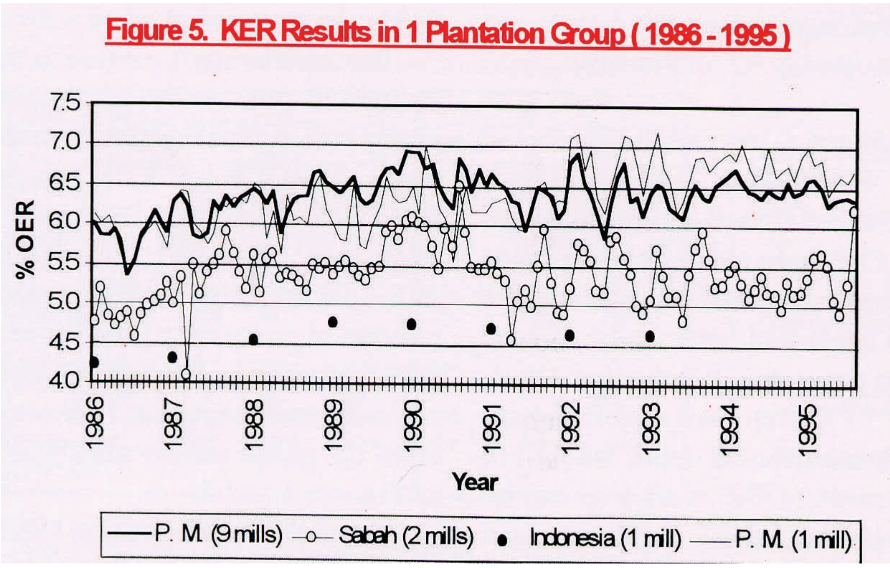


TABLE 2 : OER BATCH TEST RESULTS

On Pre-weevil FFB during 1976/77						
PalmOil Mill	P.Material	Ages(yrs)	No.tests	OER(%)	Total O.B(%)	Theo.,OER(%)
Kalumpang	`66 DxP	10	8	18.9	20.1	22
Riverside	`66/DxP `70 DxP	10 6	6 4	21.1 20.2	22.3 21.5	22 22
5 mills	`71 DxP	5	11	19.8	21	18.7
Elmina	`50s DxD	20	9	17.4	18.9	18
On Post-Weevil FFB during 1993						
Landak	`72/75 DxP	20	3	16.2 (15.1-17.0)	17.8 (16.6-18.6)	
Paloh	`67/76 DxP	24	3	16.8 (15.4-17.9)	18.4 (16.9-19.5)	

but the recent tests on FFB from old palms gave OER of only 16-18% as against 20-21% for older crop and even 17.5% for old Dura materials (DxD plantings at Elmina estate). It may be worth mentioning too that the FFB taken for the special tests recently excluded obviously poor quality FFB harvested.

As we now know that young FFB crop one year after commencement of harvesting can realise high OER near or exceeding the theoretical maximum rates, overall results of all groups in the country may be seen as being significantly lower than pre-weevil days i.e. all have suffered a significant drop in OER from the 20-21% figures of former years.

There are therefore two major problems involved:

1. low OER and
2. the declining OER trend.

It remains to be seen if the causes are similar or related.

Causes of low OER

It should already be obvious that many factors could affect OER results. This can in fact be confusing and it may be useful to categorise the factors into

A. Factors outside Estate Management Control

1. Biological factors such as
1.1 OER potential of planting material in existing areas
1.2 Dura contamination in existing areas but unlikely to cause drop of the magnitudes seen
1.3 OER changes due to possible climatic factors such as haze or volcanic eruptions e.g. Mt. Pinatubo, wet weather effects on pollination levels etc.
1.4 OER changes due to age (weight) of bunches
1.5 OER changes due to changes in partitioning of assimilates or oil synthesis in the bunch for unknown eg. ‘premature’ ripening or environmental reasons e.g.

soil

B. Factors within Estate Management Control

1. Managerial factors such as

1.1 Harvesting standards e.g. harvesting intervals and minimum ripeness standards set which determine quality of FFB possible

1.2 Harvesting quality e.g. thoroughness of work achieved particularly in keeping to harvesting standards set, completeness of loose fruit collection and omission of ripe bunches at each round

1.3 FFB transport and despatch arrangements for timely evacuation of all FFB and loose fruits as well as delay and other problems from rainy weather affecting OER

1.4 Availability and orgamsation of labour and other resources for the tasks required.

2. Agronomic factors such as

2.1 Palm density effects with high density increasing OER (Donough, 1991)

2.2 Nutrient effects with high K applications and Mg deficiency reducing OER but high N increasing OER indicating the need to avoid nutrient imbalances e.g. excessive K (Foster et al., 1988).

2.3 High sex ratios in very large young plantings especially may result in inadequate male in florescences and pollen for the weevils to breed and spread the pollen around (Law, I.H. pers. comm.)

2.4 Pest and disease losses eg. rats

3. Milling factors such as

3.1 Mill equipment and maintenance

3.2 Processing efficiency

3.3 Ramp and FFB reception facilities and organisation

In any one milling situation, many factors are usually in play and, as we know well, these change daily or even hourly as different estates supply the FFB from several locations which could be hours apart and with different managerial factors involved. The problems of obtaining reliable data on FFB quality of individual batches and oil contents have been discussed earlier. The mill can provide one daily OER figure for the mass of crop received which may not reflect fully the day's oil yield in the crop received for processing.

Faced with the above situation, it is no wonder that little progress has been made over the years in getting theoretical OER more accurate and that there has been so little progress in pinning down the causes of the low OER problems faced by the Industry todate with only general survey commercial data available and very few research data to examine.

In 1993, a National Seminar on Palm Oil Extraction Rate: Problems and Issues (Ariffin and Jalani, 1994) was organised by POR[M to investigate and discuss the possible reasons for the low OER seen in the country. An important conclusion pointed to major weaknesses in harvesting and loose fruit collection standards due to the severe labour problems faced by the industry as a principal causal effect. Strenuous efforts in some groups to arrest the decline and raise OER have not improved the situation. The unfortunate emphasis on simple managerial factors at this meeting may have delayed initiation of research efforts into possible biological reasons for the low OER results as seen by the changes on the detailed bunch analysis results for old palms after introduction of the pollination weevil (Law and Syed, 1984), our batch test results on FFB from old palms discussed earlier and more recently. by bunch analysis results from United Plantations (Table 3) It may also be appropriate to remark here that previous experience in pre-weevil days and more recent experience post-weevil (Ho, 1994) show strong common seasonal effects in OER results from even different management groups but with consistent differences in the results between the groups. This indicates the prominence of biological and environmental factors in the trends of OER results achieved by the individual groups the absolute levels being probably more determined by a combination of management and biological factors.

Table 3 : Bunch Analaysis Results of FFB of different sizes

Bunch	Position	%Fruit	%M/F	%O/	%Moisture in	%O/B	Total
4.7	Outer	75.0	82.1	49.0	37.3	15.1	19.9
	Centre	25.0	76.5	48.1	37.5	4.8	
	Inner	-	-	-	-	-	
12.2	Outer	49.6	84.4	55.9	30.6	15.0	28.5
	Centre	31.8	77.7	55.4	31.7	8.9	
	Inner	18.6	74.9	52.5	36.5	4.6	
20.3	Outer	53.6	85.3	57.0	29.5	16.8	27.7
	Centre	26.8	77.7	53.4	33.3	7.3	
	Inner	19.6	74.5	41.0	45.2	3.6	
27.5	Outer	48.4	82.1	51.7	35.0	14.0	24.3
	Centre	33.3	74.1	48.4	38.3	7.7	
	Inner	18.3	69.7	33.1	53.0	2.6	
35.2	Outer	45.6	81.5	52.0	34.0	12.7	22.2
	Centre	30.6	72.9	45.8	40.1	6.7	
	Inner	23.8	68.9	68.9	60.7	2.8	

Source: Modified from Tan Y.P. et. al.(1995)

It is clear from the discussions above that there must be a major national research effort to clarify the situation and seek resolutions to the problem in view of the enormous difficulties and financial implications involved to the industry. Leadership in this research effort is needed from PORIM.

Impact of Low OER

Immediately, assuming everything else as unchanged, several effects of low OER results may be measured

1. Oil yield is reduced for same FFB harvested
2. Estate costs per ton oil produced increase due to higher FEB required, harvesting and transport costs etc.
3. Processing and maintenance costs at the mill also increase, needing more FFB processing per ton oil.

Recently, we examined the effects of reduced OER on the profitability and sustainability of estates with different yield levels and cost situations. The effects on costs and profits are shown in Table 4. At 15% reduction in OER rates, costs per ton CPO increased by 17% in both estates and profits decreased by 31% in the high yielding estate and 59% in the low yielding estate. Profitability of our oil palm plantations is therefore reduced by low OER results, showing a similar trend to low FEB yields achieved. The converse of course will apply if we could raise our OER results. On a company basis, the impact could be easily computed as all the figures are available.

Table 4 : Effects of OER changes on CPO Production Costs (RM/t) and Profitability

Estate	A			B		
OER	0.85 x	1.0 x	1.15 x	0.85 x	1.0 x	1.15 x
FFB (t/ha)	26.9	26.9	26.9	22.5	22.5	22.5
CPO (t/ha)	4.38	5.16	5.93	3.77	4.43	5.10
Overhead costs	131	111	97	182	155	135
Upkeep costs	54	45	39	58	50	43
Manuring costs	91	77	67	121	103	90
Harvesting costs	115	98	85	123	105	91
FFB transport	103	87	76	64	54	47
Mill processing	170	145	126	165	140	122
Prod. dist./cess	26	25	24	54	52	51
Total costs	690	588	514	768	659	579
Net Revenue	920	1335	1750	309	748	1186

Source Modified from Chew *et al*. (1994)
NB[1] : at CPO price of RM700/t and KNL price of RM420/t

Unfortunately, biological systems are complex and if biological factors are involved as strongly suspected, then there are usually compensating factors and adjustments overtime. Two immediate situations may be seen.

Firstly, the low OER is invariably accompanied by higher KER. Total oil loss in FEB now is slightly less than perceived from OER figures alone (Table 5). The kernels have an economic value, although lower on unit basis, and compensate somewhat therefore for the reduced OER. Due to the rise of the fatty acid industry and higher demand for kernel oils, it is possible that prices will rise and mitigate the impact of the low OER results.

Table 5 : Estimated effects of changes in OER and KER on total oil production in FFB

	Estate A		
	Previous	New	
FFB yield (t/ha)	26.9	26.9	
OER (%)	20.5	18.5	(-9.8%)
KER (%)	5.9	6.4	(+8.5%)
PKO (%)	43.9	43.4	(-1.1%)
CPO (t/ha)	5.5145	4.9765	(-9.8%)
K.O. (t/ha)	0.6967	0.7472	(+7.2%)
Total oil (t/ha)	6.2112	5.7237	(-7.9%)

Energy required for oil formation is much higher than other bunch components (Table 6). Due to less energy expanded in oil formation, larger bunches could result or more bunches could be produced bythe palms in compensation resulting in similar or higher oil yields per hectare despite lower OER results. Unfortunately, in this case, the higher cultivation and transport and processing costs cannot be escaped.

TABLE 6 : THE ENERGY VALUE OF PRODUCTS AND BY-PRODUCTS FROM A PALM OIL MILL SERVING ESTATES PRODUCTING MEAN 18 T/HA (20 tonne/ha ffb from 90% mature areas)

Component	Proportion of FFB input	Energy values values/ha	Energy
Palm oil	18-25%	0.0399 Gj/Kg	154.41
Palm kernel oil	1.68-3.36%	0.0382 Gj/Kg	17.33
Palm kernel cake	2.32-4.64%	0.0166 Gj/Kg	10.40
Total for main products			182.14
Fibre	12-25%	0.0193 Gj/Kg	32.83
Empty fruit bunch (EFB)	20-24%	0.0193 Gj/Kg	26.75
Shell	4-7%	0.0193 Gj/Kg	16.24
Effluent	50-70%	0.0193 Gj/Kg	10.42
Total for by-products			86.24
Grand total			268.38

Source: Wood &Corley 1993

Finally, we mentioned earlier that for reasons which are still unclear, our major competing oil palm producer and neighbour with fairly similar environmental conditions, Indonesia, and other oil palm producing countries in the world do not appear to have this problem. It was thought earlier that Sabah was also free from this problem but as seen in recent results (Fig. 4), the declining trend has set in. If not arrested, our competitiveness in oil palm production will be eroded as a result of lower yields or higher costs of production resulting from low OER.

Implications of Low OER Problems

Given the difficulties of OER research, the strong possibility that resolution and improved understanding of the causal factors will take some years of research and that some important factors causing the low OER may be outside managerial control, it is useful to reassess the situation and discuss the possible courses of action that could be taken to mitigate the problem and stay highly competitive.

1. Management factors. Firstly, the estate management factors involved must be brought under improved control if not already done so. This is basic management with emphasis on getting good quality FEB crop and all the loose fruits into the mill as quickly as possible. Standards will improve if the harvesting intervals do not exceed 14 days and are preferably at 10 days. Minimum ripeness standard should be reduced to 1 loose fruit per bunch especially in tall palm areas and where harvesting intervals exceed 10 days. Pruning in all areas and especially tall palms should be uptodate to avoid missed bunches and reduce trapped or spilled loose fruits outside the palm circles. Such measures will ensure that maximum OER and more importantly, maximum oil production is achieveable, irrespective of whatever is affecting the OER results.

In the excitement of the low OER problems, total oil production must not be overlooked. The consequences of losing FEB in the field due to long harvesting intervals, inadequate pruning and supervision and inappropriate standards far outweigh the low OER results in estates with tall palm areas in some cases. Fortunately, the two problems may be solved with the same solutions.

The known agronomic factors affecting OER results are more difficult to manipulate as e.g. K is required for high bunch production. Fortunately, it appears that balanced nutrition with adequate N application will nullify the K effects, so the current practices to ensure balanced nutrition to the palms are satisfactory. High density may increase OER but has other detrimental effects from lowered bunch production in later years to increased height increments and reduced economic lifespan for the palms. Again therefore, current practices will result correctly in maximum oil production per hectare rather than maximum OER results.

Milling management are generally under competent control from our batch test results and observations so far. However, it is essential to keep the key milling facility in good condition at all times.

2. Biological factors. The tendency to low OER results now places a greater premium on choice of planting materials which produce high oil in the bunch and with at least comparable FEB production. Such materials should also have low height increments to reduce harvesting problems and collection of loose fruits (as a result of drops from height) as well as produce many bunches of moderate weights. Purity of the planting materials, which plagued the industry after introduction of the pollinating weevil, is also an important factor.

Fortunately, AAR planting materials have many of these desired characteristics and we are well placed to exploit the improvements possible from development of clonal materials to exploit the best characteristics to reduce the problem in future.

There is presently a strong association of low OER with very big bunches and old (tall) palms. Crop loss due to harvesting difficulties is also most problematic in these areas. It may be useful therefore to consider earlier replanting and achieve a more balanced spread of palm ages in the plantations which for historical development reasons have a narrow spread of palm ages.

Strategy in light of low OER problems

From the foregoing, a general strategy of sustained high OER results and maximal oil production of high quality can be evolved. This entails the following

1. planning for shorter palni generation periods, say 20-22 years at maximum
2. ensuring rapid high FEB production and oil yield precocity in all new plantings from correct choice of planting materials and good agronornic management practices from planting
3. maximal FFB yield production practices over the life of the plantation and
4. ensuring good harvesting and crop recovery (from palm to mill) standards and practices at all times. The technologies and systems for all these practices are in place and it is up to management to implement them effectively.

Conclusions

The low OER problem has exposed the lack of research resources in this important aspect of the industry and confused the plantation industry in Malaysia. Scarce research data, the multi-faceted multi-factor problem, and differing opinions based on varied experiences make it very difficult to establish the causes of the problem. As the low OER problem appears country-wide, it could be associated with a general phenomenon such as changes in the environment or management practices applied everywhere. Unfortunately, there is no evidence for this although locally, there are undoubted difficulties with harvesting and good crop recovery which affect OER results. The problem has been compounded by the fact that our neighbours do not suffer the same problems despite fairly similar planting conditions. However, there is increasing evidence that very large bunches from old palms have lower oil content in Malaysia than thought previously. It has also been observedthatthe low OER problems are worst in mills receiving a high percentage of crop from such areas. Based on the general difficulties of achieving good harvesting results consistently in tall palm areas and this observation, a strategy which relies on good basic management practices for harvesting and new plantings for reducing the low OER problems and achieving maximum oil production over the longterm has been recommended.

It is also stressed that the focus on OER results should not be to the detriment of total oil production which remains the principal objective of the plantations.
Chew,P.S.

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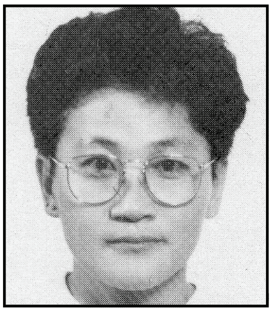
We would like to take this opportunity to welcome

SOCIAL AND PERSONAL

Dr. Ang Ban Na who joined us on 26/4/95 as Assistant Research Officer. She wrote the following introduction of herself after several persuasions:-

Ang Ban Na. Born 1962. Education : B.Sc.Agric. (UPM) 1986, M.Sc.Agric.(UPM) 1988, Ph.D.Entomology(Virginia Tech) 1992, Postdoc. Res. Assoc. (Virginia Tech) 1992-94. Worked on the use of the cocoa black ant, Dolichoderus sp., for the biological control of cocoa mirid, Helopelthis sp., for B. Sc. andM. Sc.; andthe use of a shield beetle, Cassida rubignosa, for the biological control of a noxious weed, canada thistle, Cirsium arvense. Was also involved in research on the use of pheromones for the control of insect pests in apple, peanut and forestry environments.



Congratulations to:

* Mdm. Norlela Nordin and Abdul Rahim Tandil who tied the knot on 1/1/95.
* Mdm. Mahizan Mohd and Abdul Razak Rahim who tied the knot on 14/5/95.

Staff promotions/Confirmation :

Name	From	To	w.e.f.
Letchumi a/p Poosari	Computer Operator	Res.Tech.IV	1.1.95
Rosazaman Mohd Nor	Res.Recorder	Res. Tech.IV	1.4.95
Rosli Bin Hamzah	" "	" "	1.3.95
A. Rahim Ibrabim	Res.Technician	Res.Asst.III	1.1.95
Alice Thomas	Res.Clerk II	Res.Clerk I	"
Mohd Apandi Husin	Res.Asst.III	Res. Asst.II	"
Noraini Abd. Latif	Res.Tech.IV	Res.Tech.III	"
Noraini Mohd Noor	Res.Clerk II	Res.Clerk I	"
Subramaniam Velu	Res.Asst.III	Res.Asst.II	"
Sulimah Osman	Res.Clerk II	Res.Clerk I	"
Yee Kiat Ng	Res.Clerk II	Res.Clerk I	"
Lily Loo	Res.Clerk I	Sp. Grade	"
See Choon Mooi	Res.Clerk I	Sp. Grade	"
Junainah Ibrahim	Computer Operator	Res.Tech.IV	1.2.95

New Employment:

Name	Designation	w.e.f.
Muhammad Abdullah	Res. Assistant III	1.1.95
Wan Nazlee Bin Rhanlli	" " "	"
Aminah Othman	" " "	8.3.95
Vanaja Mani	" " "	2.5.95 (re-employed)

Lily Loo