**January'99**
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# AAR - NEWS

## E D I T O R I A L

*A warm welcome to our first issue of AA Research News for 1999.*

*The low OER problem reported since 1992 and highlighted in our May'95 AAR News is still with us today. However, more data are now available to confirm that one of the causal factors is the big bunches produced by the older palms. This and other OER issues are elucidated in our main article. Read on to find out more !*

*At the 1999 Porim International Palm Oil Congress (PIPOC), AAR presented two papers and a poster. Abstracts of the papers are reproduced on pages 6 and 7. Please do not hesitate to contact the authors if you require more details.*

Happy Reading !

*OOI,L.H.*

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|---|---|


## AN AAR UPDATE ON THE MALAYSIAN OIL PALM INDUSTRY LOW OER PROBLEMS

by Chew Poh Soon, Goh Kah Joo & Gan Huang Huang

It is widely appreciated that many factors, including uncontrollable factors e.g. weather, planting materials, age, and controllable factors e.g. harvesting standards, choice of planting materials (prior to planting), certain agronomic practices can affect OER. Unfortunately, it appears that no clear-cut consensus has emerged from the host of papers on this multi-faceted problem although certain sectors have repeatedly put the cause to managerial problems principally as a result of poor harvesting discipline causing cutting of unripe bunches and missed loose fruit collection e.g. at the conclusion of the 1993 PORIM seminar and the MOPGC Technical Committee (comprising mainly palm oil mill engineers and chemists) minutes of 11th February, 1999.

Many plantation groups including BEA, TPSB and Sime Darby Plantations (Ho *et al*. 1996) put in considerable efforts and expenditure to improve harvesting standards, loose fruit collection and removal of trash in the fields but without any significant improvement in OER results since 1993(Fig. 1 and Table 1). OER in many mills has remained much lower than in the late 1980s although distinct differences between mills have been noted despite generally similar field management standards (Fig. 2). These results reinforced the views that biological non-controllable and non-management factors were also important in the low OER results seen.

In 1995, we put forward the view that besides the obvious managerial factors, uncontrollable biological factors were involved. The principal factor identified was very heavy bunch sizes which usually are a consequence of old palm age or low number of bunches produced. This was thought to account for the distinct differences noted at different mills but an exercise to prove this could not be carried out then due to lack of adequate reliable OER data from adequate bunch analysis tests and/or special batch milling tests for OER.

Much of the earlier confused views on OER problems and causes were due to unreliable data and experiences quoted from commercial milling results. Fortunately, more reliable data on the relationship of age or bunch sizes and oil to bunch or OER from modified bunch analysis and special milling batch tests are now available especially from the R&D at Sime Darby and United Plantations. This subject can be revisited now with some of our data to elucidate the reasons for the low OER results widely seen in the industry.

Figure 1 : OER for BEA, TAIKO and Other Mills (PM) Jan 1989 - Dec 1998

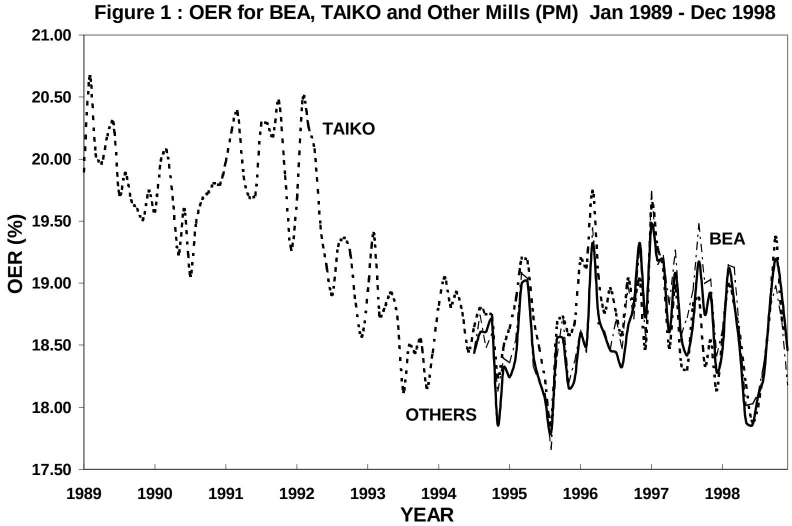


**Table 1: Relationship between harvesting standards and OER**

| Fin. year | Harvesting interval (days) | Loose fruits/ bunch (No.) | Unripe (%) | Overripe (%) | Rotten (%) | Observed OER (%) |
|---|---|---|---|---|---|---|
| 86/87 | 12.1 | 2.3 | - | - | - | 20.17 |
| 87/88 | - | 3.9 | - | - | - | 19.65 |
| 88/89 | - | 18.5 | 9.0 | 9.6 | 1.3 | 19.95 |
| 89/90 | 13.4 | 31.6 | 13.7 | 9.1 | 1.9 | 19.73 |
| 91/91 | - | 32.0 | 11.2 | 10.0 | 2.6 | 19.50 |
| 91/92 | - | 29.7 | 11.3 | 11.5 | 2.1 | 19.20 |
| 92/93 | 13.8 | 18.8 | 9.3 | 12.4 | 1.9 | 19.13 |
| 93/94 | - | 26.3 | 8.0 | 13.5 | 1.5 | 18.63 |
| 94/95 | 11.2 | 17.3 | 4.3 | 14.7 | 1.0 | 19.05 |
| 95/96 | - | 16.0 | 4.1 | 17.0 | 0.9 | 18.99 |
| Correlation with OER | 0.04ns | -0.38ns | 0.55ns | -0.78* | 0.27ns | |

Source : Ho C.Y., et al. 1996

**Figure 2: OER for 2 Mills (PM) and 2 Mills (Sabah) Jan 1989 - Dec 1998**

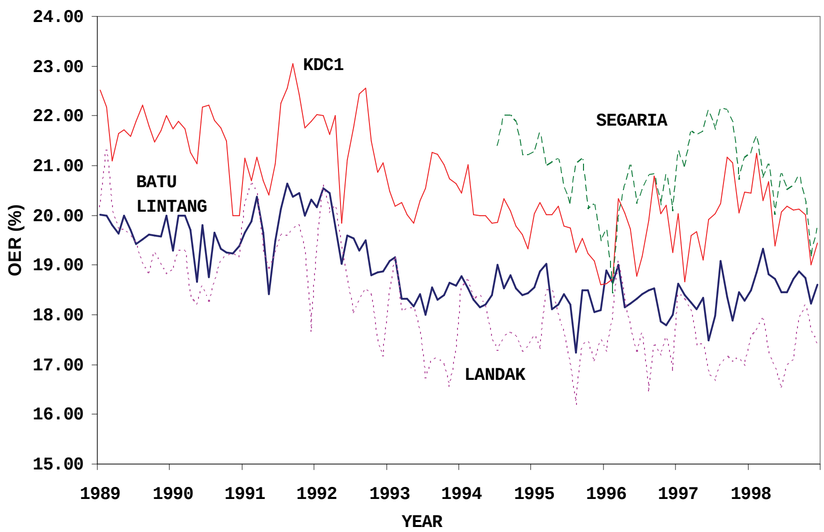



**Table 2 : Achieved OERS and estimated O/B from milling and bunch analysis and a derived expected characteristic OER for each planting block**

| Planting block | Oil | | | | | | | Characteristic oer** |
|---|---|---|---|---|---|---|---|---|
| | Milling in ffb indicated test | | | | | Bunch analysis o/b | | |
| | Recoverable + | | | Estimated o/b++ | | | | |
| | 1 | 2 | 3 | 1 | 2 | 1984 | 1987 | |
| A 1980 | 24.68 | 25.98 | | 26.95 | 28.3 | 24.5 | 25.6 | 25.3 |
| B 1979 | 26.62 | 25.59 | | 28.96 | 27.74 | 28.2 | 28.7 | 26.1 |
| C 1970, 75-78 | 19.04 | 18.84 | | 21.80 | 21.44 | 24.0 | 21.8 | 18.9 |
| D 1972-74 | 24.24 | 24.95 | | 26.75 | 27.25 | 26.3 | 26.6 | 24.6 |
| E 1965-68 | 16.14 | 16.60 | | 19.16 | 20.01 | 21.8 | 22.4 | 16.4 |
| F 1964-65 | 19.26 | 19.52 | | 21.96 | 22.00 | 22.9 | 24.9 | 19.4 |
| Various outside sources | 18.68 | 15.04 | 16.79 | * | * | * | * | 16.8 |

Source : B.J. Wood *et al.* 1987
+ Actual recovered plus expected recovery from recyclable bunches
++ Recoverable plus all known or estimated losses
* No estimate (field losses cannot be estimated) or not done
** Mean of recoverable in the milling exercise

**Bunch Analysis results**

Several sets of bunch analysis results, usually with the standard or modified Blaak technique, are available which show changes in oil to bunch ratios with age or bunch size. Pre-weevil results indicated a steep rise in oil to bunch to about 5 kg bunch weight (or 3.5 years age) and plateauing between 5 kg and 8 kg bunch weights (Corley and Gray, 1982). Poor correlation of $R^2 = 0.046$ for oil to bunch in these bunch analysis results and bunch weight were seen (e.g. Hor *et al.* 1997). Post-weevil correlations with oil to bunch and bunch weights from 10 kg to 45 kg were low (Hor *et al.*, 1997). A correction factor of 0.855 is usually applied by CIRAD (formerly IRHO) to relate bunch analysis results to mill extractions.

Modified bunch analysis techniques have been attempted to overcome the problem of low correlation with milling results e.g. Wood *et al.* 1987, Mukesh *et al.* 1998, Chan *et al.* 1999. Wood *et al.* (1987) obtained good correlations in extensive tests to relate their bunch analysis results to OER in an attempt to establish potential OER values for evaluation of management standards achieved (Table 2). Chan (1996) obtained highly significant regression of bunch weight against oil to bunch (Fig. 3). More detailed modified bunch analysis results in Fig. 4 confirmed the strong negative relationship between bunch size and oil to bunch and over-estimation of oil to bunch in large bunches (Tan *et al.* 1995, Mukesh *et al*, 1998)

**Mill Batch Test Results**

Wood *et al.* (1987) published results of 12 batch tests from plantings of various ages (Fig.5). A regression of OER and palm age was subsequently published (Fig. 6, quoted in Ho *et al.* 1996). The available results have been included to AAR/Taiko's 6 tests from old palms carried out in 1993 (Chan *et al.*1995) and the relationship from the 18 available tests is shown in Fig 7. While the other results were from composites of different fields and estates, Mukesh (1998) reported mill test results processing crop from one estate with mainly 1974 DxP plantings over 15 years. His results showed steady OER from years 7 to about 14 ( mean bunch weights between 13 to 21 kg), a marked decline from about 20.5 to 18.5 % OER between years 14 to 19 (bunch weights between 21 to 26 kg), and steady low OER after that till year 22 (bunch weights between 26 to 30 kg) as the palms aged (Fig.8).

In 1996, BEA carried out 4 batch tests with commercial crop of mixed ages. These results, the AAR/Taiko tests and Wood *et al.* (1987) results where applicable were used to test the original Wood results, the published regression equation in Fig. 6, our combined results (Fig. 7) and Mukesh *et al.* (1998) relationships with age

Figure 3: Relationship between Bunch wt. (x) and oil/Bunch (y)

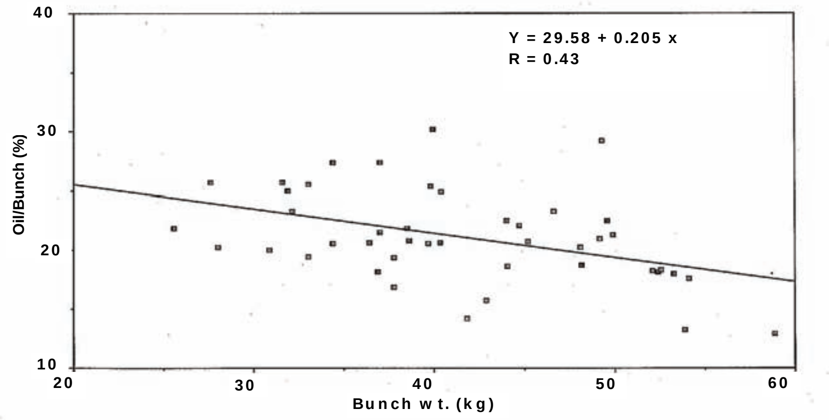
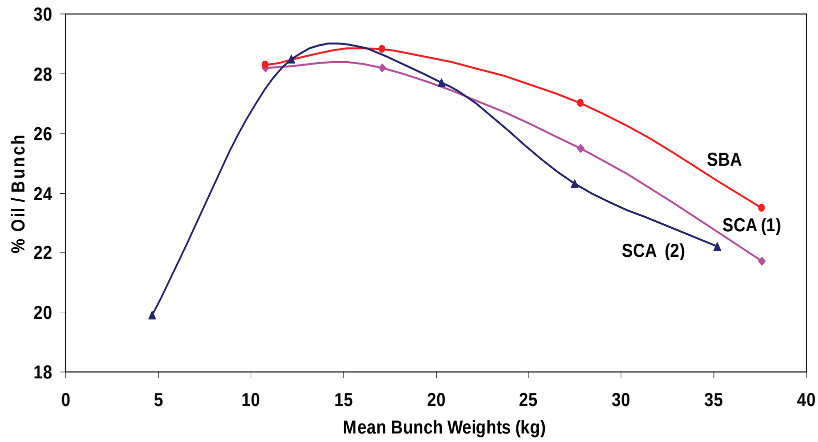



Figure 4: Oil to Bunch Results Comparing Standard Bunch Analysis (SBA) and Split Component Analysis (SCA) Techniques (after Mukesh, 1998) at Different Bunch Weights




Note : 1) SCA (1) and SBA on same set of 32 bunches
2) SCA (2) for different set of bunches

in Table 3.

The predicted OER results with the Wood et al. (1987) and combined Wood *et al.* (1987)/ AAR results appeared fairly satisfactory at less than ± 8% except for two tests including Batch 1 (BEA) which appeared much lower than predicted. This latter test was carried out on a day with 50 mm rain and gave very low OER despite correction of 5% for FFB weight. The regression equation in Fig. 6 by Wood gave poor agreement with the actual results. The relationship from Mukesh *et al.* (1998) was very inconsistent against Wood *et al.* (1987) results but gave better agreement with the BEA tests. Some of the differences could possibly be due to different planting materials used in their plantations.

Ho *et al.* (1996) carried out a multiple regression analysis on his organisation's mills results from 1986/87 to 1993/94 and concluded that more than 40% of the observed OER decline was accounted for by changes in the age profiles of the palms i.e. the predicted fall from 1986/87 was 0.64% while the observed fall was 1.54% (Table 4).

**Discussions and Conclusions**

The Industry-wide phenomenon of reducing and now low stable OER appears to have been caused to a large extent by large bunch sizes, probably mainly a consequence of increased palm ages. The major expansion of the industry was from the mid-1960s to mid-1970s and the low OER results had affected all the major plantation companies mainly due to increased proportion of old palms e.g. for KLK (Table 5). Mills which processed only crop from old palms e.g. Landak mill exhibited the lowest OER (Fig. 2). Also, mills processing crop from the same palms showed declining trends as the palms became older e.g. Mukesh *et al.*'s results in Fig. 7 and KDC mill, even in Sabah which had shown higher OER results earlier (Fig. 2).

The larger number of modified bunch analysis results and mill batch test results have confirmed the lower oil to bunch content and OER obtainable from the large bunches from old palms. Conflicting results were seen by Chan and Lee (1994) and Chin *et al.* (1997). They analysed bunches from small numbers of palms (11 and 3 palms respectively) over many years and found no significant changes of oil to bunch. High CVs for bunch analysis are common and it is possible that inappropriate techniques or inadequate bunches have been used in their experiments to characterise the oil to bunch results. Chin *et al.* (1997) postulated that the

Figure 5 : Relationship between OER and Palm Age (Ebor Data)

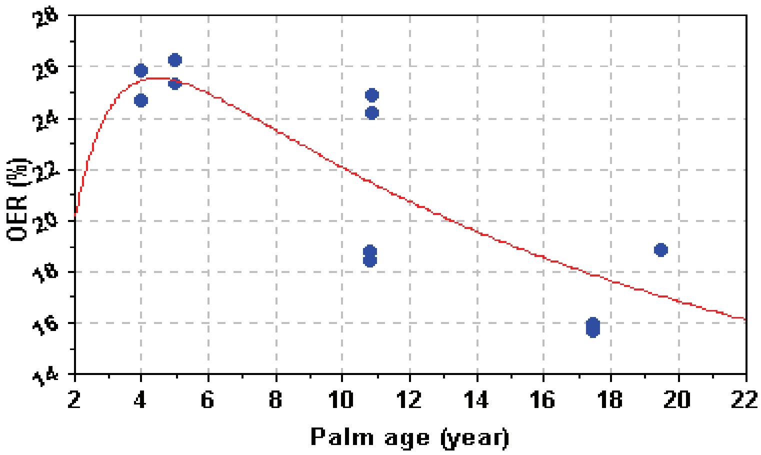
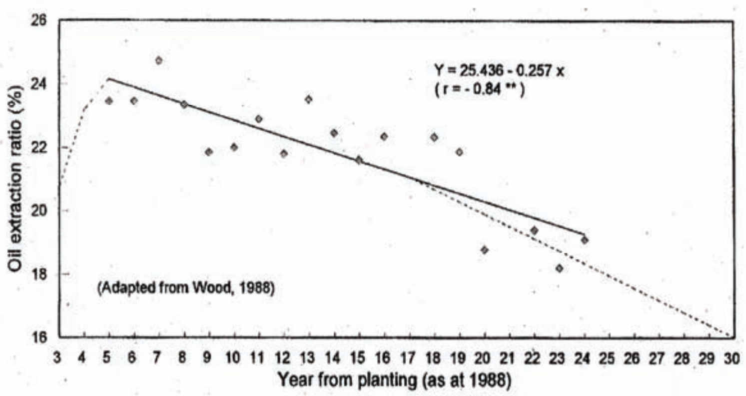



Figure 6: Relationship between OER and palm age



differences could have arisen from incomplete recovery of loose fruits from the old tall palm areas in the large scale milling tests.

Visual and analytical data confirmed the lower oil contents of large proportion of inner fruits in large bunches which account for their lower oil to bunch (e.g. Law and Syed 1985, Chan and Lee 1993, Hor *et al.* 1996). This phenomenon arose after the introduction of the pollinating weevil and consequent effective pollination results of the inner flowers of the inflorescences. It remains to be seen if the resultant increased kernel contents of these bunches have also been a factor in the lower OER as an inverse relationship is seen e.g. higher OER in Indonesia, PNG and Sabah but lower KER results

Another factor which may have resulted in lower OER was the switch to lower minimum ripeness standards of 1 loose fruit per bunch (Wood *et al*. 1985 ) which gained large numbers of converts from the early 1990s as the labour situation worsened on the estates. Wood *et al.* 1985 and Ho *et al.* 1996 reported extensive batch tests to confirm that no loss in OER resulted. However, recent PAMOL results (Rao, pers. comm) indicated that differences in moisture content could arise from the various ripeness categories harvested at the new lower ripeness standards and longer harvesting intervals, giving rise to variable oil to bunch e.g. 21% for just ripe FFB, 25% for ripe FFB and 22% for over-ripe FFB and lower oil to bunch overall as more over-ripe bunches are harvested.

The results available on the effects of higher bunch weights and/or old palm ages (exceeding 10 to 18 years and 20 kg bunch weights) appear adequate to explain the lower OER obtained in many cases. However, the regular apparent seasonal OER variation and the marked declining trend seen in 1992 over the whole country remains to be satisfactorily explained. It now appears necessary to factor in lower OER results to old palms when computing their profitability and assessing needs for replanting. At 15% reduction in OER rates, costs per ton CPO increased by 17% and profits decreased by 31% in a high yielding estate and 59% in a low yielding estate (Chew 1996).

Our previous suggested strategies to sustain high OER results and maximal oil production of high quality i.e.

1. planning for shorter palm generations, say 20-22 years at maximum
2. ensuring rapid high FFB production and oil yield precocity in all new

**Figure 7 : Relationship between OER and Palm Age (Ebor + Taiko Data)**

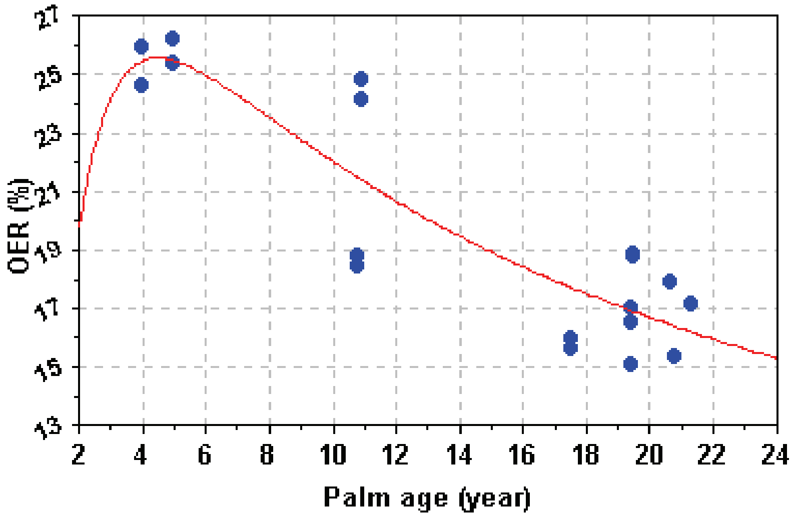
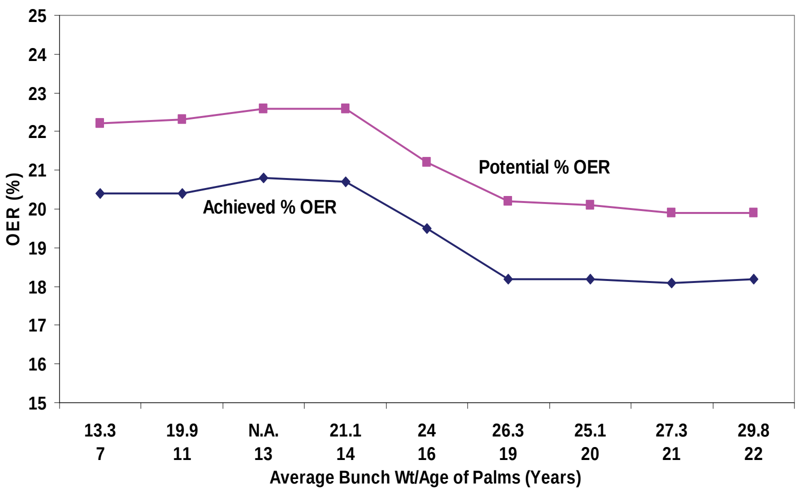



**Figure 8: Potential and Achieved OER Data from Mill Tests on One Estate with Generally Similar Planting Materials for 1981-1996**




after Mukesh *et al* (1998)

**Table 3 : Comparison of Predicted and Actual OER**

| Company/ Batch | Mean Age (year) | Actual OER (%) | Predicted Wood *et. al* (Fig.4) | Predicted Wood *et al*.& AAR/Taiko (Fig.6) | PredictedWood in Ho, C.Y. (Fig. 5) | Predicted Mukesh | % diff. Wood et. al. | % diff Wood et al & AAR/ Taiko | % diff Wood in Ho, C.Y | % diff. Mukesh |
|---|---|---|---|---|---|---|---|---|---|---|
| BEA/1 | 9.8 | 18.24 | 22.19 | 22.17 | 22.93 | 21.01 | 21.66 | 21.55 | 25.71 | 15.21 |
| BEA/2 | 17.4 | 18.88 | 17.43 | 17.75 | 20.96 | 19.17 | -7.68 | -5.99 | 11.01 | 1.52 |
| BEA/3 | 18.3 | 18.60 | 17.54 | 17.39 | 20.74 | 18.91 | -5.70 | -6.51 | 11.52 | 1.69 |
| BEA/4 | 14.6 | 18.76 | 19.25 | 19.14 | 21.69 | 20.03 | 2.61 | 2.03 | 15.63 | 6.76 |
| Taiko/1 | 19.4 | 16.52 | 17.10 | | 20.46 | 18.58 | 3.51 | | 23.85 | 12.48 |
| Taiko/2 | 19.4 | 17.02 | 17.10 | | 20.46 | 18.58 | 0.47 | | 20.18 | 9.15 |
| Taiko/3 | 19.4 | 15.09 | 17.11 | | 20.46 | 18.58 | 13.39 | | 35.60 | 23.15 |
| Taiko/4 | 21.3 | 17.16 | 16.39 | | 19.96 | 18.01 | -4.49 | | 16.29 | 4.94 |
| Taiko/5 | 20.7 | 17.88 | 16.62 | | 20.12 | 18.20 | -7.05 | | 12.55 | 1.77 |
| Taiko/6 | 20.8 | 15.36 | 16.56 | | 20.08 | 18.15 | 7.81 | | 30.74 | 18.16 |

**Table 4 : Age distribution and associated production of mature areas and their contribution towards overall OER**

| Financial year | Year in harvesting 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | >26 | OER predicted (%) | OER observed (%) | Outside crop (%) |
|---|---|---|---|---|---|---|---|---|---|
| 86/87 (a) | 5.93 | 18.63 | 30.87 | 32.07 | 11.67 | 0.82 | | | |
| (b) | 12.16 | 23.01 | 31.02 | 29.29 | 4.32 | 0.21 | 21.56 | 20.17 | 13.7 |
| (c) | 2.868 | 5.247 | 6.726 | 5.894 | 0.788 | 0.034 | | | |
| 88/89 (a) | 5.51 | 15.23 | 25.24 | 29.98 | 21.95 | 2.08 | | | |
| (b) | 7.50 | 21.04 | 33.00 | 30.93 | 7.35 | 0.18 | 21.19 | 19.95 | 19.5 |
| (c) | 1.752 | 4.816 | 7.117 | 6.128 | 1.346 | 0.030 | | | |
| 90/91 (a) | 13.50 | 9.67 | 17.82 | 28.74 | 28.46 | 1.79 | | | |
| (b) | 11.72 | 17.10 | 26.45 | 28.48 | 15.77 | 0.49 | 20.97 | 19.50 | 15.5 |
| (c) | 2.732 | 3.896 | 5.686 | 5.676 | 2.900 | 0.080 | | | |
| 93/94 (a) | 12.05 | 16.28 | 14.35 | 23.17 | 26.91 | 7.24 | | | |
| (b) | 17.80 | 13.46 | 20.21 | 29.28 | 18.64 | 0.60 | 20.92 | 18.63 | 32.0 |
| (c) | 4.177 | 3.096 | 4.371 | 5.819 | 3.360 | 0.101 | | | |

Source : Ho C.Y. *et al.* (1996)

Note: **(a)** Age distribution (%) of mature palms

**(b)** Production distribution (%) for different age groups

**(c)** Contribution towards overall OER by respective age groups using modified regression equation

**Table 5 : Palm age (yr) distribution of Taiko Estates in different regions**

| Year | PM | Sabah | Lahad | Tawau |
|---|---|---|---|---|
| 1998 | 17.7 | 11.4 | 5.4 | 14.9 |
| 1997 | 17.7 | 11.0 | 4.8 | 13.9 |
| 1996 | 17.4 | 11.7 | 4.7 | 13.6 |
| 1995 | 16.8 | 12.6 | 4.9 | 13.5 |
| 1994 | 16.5 | 13.0 | 6.0 | 13.1 |
| 1993 | 16.0 | 12.2 | 5.0 | 12.3 |

plantings from correct choice of planting materials and good agronomic 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 still stands.

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## LIQUID SUSPENSION CULTURE - A POTENTIAL TECHNIQUE FOR MASS PRODUCTION OF OIL PALM CLONES

**By Wong, G., Chong, S.P., Tan, C.C. and Soh, A.C. (Paper presented at 1999 PIPOC)**

**ABSTRACT**

The current tissue culture process for the clonal propagation of oil palm is carried out on gelled medium. This tends to give rise to concurrent growth phases of embryoid proliferation and germination, thus requiring much labour and skill to separate out the latter for shoot development and the former for further proliferation. The ability to coax cultures to be either proliferating or germinating allows clones to be handled in batches of uniform development and of desired quantity for commercial production and automation. Towards this objective, liquid suspension cultures are more amenable than cultures on gelled medium in promoting a uniform mass of proliferating friable embryogenic callus which can then be easily sieved out according to size for either germination or further proliferation.

Suspension cultures of embryogenic calluses from pinnal segments of young leaves were initiated and proliferated at monthly subcultures in liquid Murashige & Skoog (MS) media incorporated with 2,4-dichlorophenoxyacetic acid and α-naphthalene acetic acid. Conversion of embryogenic callus to embryoids and subsequent germination of the latter were effected at monthly subcultures on MS media solidified with gelrite in the absence of exogenous growth regulators.

Of the 65 embryoid lines from 29 clones put through the liquid suspension protocol, 49 embryoid lines (75%) from 26 clones (90%) gave good suspensions of embryogenic calluses with sustained multiplication rates of 6-7 folds per subculture from subculture 4 onwards. Embryogenic calluses from all proliferating lines converted to embryoids and subsequently to plantlets after 6 monthly subcultures on gelled media.

The advantage of the AAR liquid protocol besides the high success rate is the absence of activated charcoal in the medium, enabling a smooth transfer of the suspension cultures to fresh media. Also, all the proliferating lines are still embryogenic and able to produce shoots after more than 24 subcultures in liquid. This promotes flexibility in the system wherein shoot production of desired clones can be scheduled for clonal packaging for field planting. Nevertheless, the economic feasibility of the liquid system can only be realised after field evaluation for clonal fidelity. About 3000 ramets from 25 clones have been planted in large polybags between August, 1997 to April,1998 for this purpose.

Keywords : Tissue culture, in vitro culture, clonal propagation, *Elaeis guineensis* Jacq., production costs

## AN INTEGRATED WEED MANAGEMENT SYSTEM FOR ASYSTASIA GANGETICA SUBSP. MICRANTHA IN OIL PALM ESTATES

**By Quah Yin Thye, Chew Poh Soon and Ruth Kiew (Paper presented at 1999 PIPOC)**

**ABSTRACT**

*Asystasia gangetica subsp. micrantha is a problematic weed in Malaysian oil palm estates. The common practice of periodic herbicidal spray on Asystasia is not effective in the long term management of the weed. Detailed biological studies showed that its success in invading estates over a wide geographical range may be attributed to its fast establishment, rapid growth rate, early seeding and transport between estates. The total dry matter production was very large when nutrient supply was high i.e. 16 tonnes in 4.5 months when extrapolated to per ha of oil palm basis. Studies on its reproductive behaviour indicated that a single Asystasia plant produced 2600-4500 seeds within 4.5 months. While the quantity of seeds produced was not high in comparison with other weeds, they had a superior germination strategy which is opportunistic in nature. Asystasia can rapidly colonise freshly disturbed fertile sites and the seeds may remain dormant for long-term survival and dispersion.*

*An integrated weed management system is suggested for the control of Asystasia based on its biology, life-cycle, seed germination/dormancy and site characteristics, using appropriate herbicides and timely applications in specially programmed field upkeep regimes. This integrated approach incorporating site-specific control strategies and measures is the suggested approach for the development of improved techniques to control problematic weeds in oil palm estates.*

Keywords: *Asystasia*, integrated weed management, life-cycle, seed germination/dormancy, site characteristics, herbicides.

# SOCIAL AND PERSONAL

## 1998 ANNUAL DINNER ROLL OF HONOUR

### a) Top Student Award

| Exam/Result | Student | Parent |
|---|---|---|
| UPSR(5A) | Cindy Chong Mei Ching | Joyce Chong |
| PMR(4A) | Syarul Faizal bin Hashim | Sulimah |
| SPM(5A) | Yogeswari a/p Krishnan | Krishnan |

### b) Full Attendance Award

| | | |
|---|---|---|
| **Main Office** | - | Mohd. Radzi Ariffin, Mohd. Fabli Salleh & Alatipah Husin |
| **T.C. Lab** | - | Junifer Robert |
| **Balau** | - | G. Parvathy, D. Kogilavani |
| **Paloh** | - | Suresh Selvaraj |

### c) Outstanding Employee Awards

| Awards | Employee | Section | Officer |
|---|---|---|---|
| Dedication | Noraini Mohd Noor | M.Office | Mr.OLH |
| Dedication | Norfazilah A. Latiff | M.Office | Ms. Joyce |
| Dedication | Md.Roslan b. Husain | M.Office | Mr.CWH |
| Dedication | Minin bin Tuboh | Sabah | Mr.TCB/TCC |
| Innovation | K.. Kumar | Paloh | Mr.HTY/TCC |
| Initiative | Md. Radzi b. Ariffin | M.Office | Dr.KKK |

### d) Long Service Awards

**10 years and above**

Shanmugam a/l Paikery (Balau)

Selvam a/l Perumal (Balau)

Jariah Bt. Kasmat (TC)

Mahizan Bt. Mohd (TC)

**25 Years and above**

Mr. Chan Weng Hoong

## Recruitment

| Name | Designation | Date Joined |
|---|---|---|
| Mdm Wong Peck Leng | Research Asst IV | 01/11/98 |
| Alias B. Che Husain | Research Asst III | 18/12/98 |

## Promotions

| | Designation | | Names | |
|---|---|---|---|---|
| 1. | ARO2 | : | Mr. K. Gopal | Mr. Heng Yong Choon |
| | | | Ms. Tan Lei Hong | Mr. A. Periasamy |
| 2. | ARO1 | : | Mdm. See Choon Mooi | |
| 3. | Res. Clerk II | : | Miss Vijaya Kumary | |
| 4. | Res. Asst. II | : | Pn. Mahizan bt. Mohamad | En. Isnine Norhasan |
| | | | En. Jamaludin Mohd | Mr. Shanmugan Paikery |
| 5. | Res. Asst. III | : | En. Shabry bin Ahmad | En Zulkifli bin Zakaria |
| | | | En. Saruddin Selamat | |

## Resignation

En. Mohd Mat Min joined AAR Sdn. Bhd. on 6/6/86 from HRU and resigned on 6/9/89. He re-joined AAR on 10/4/91and was promoted to Senior Research Officer on 1/1/92. He resigned again on 28/7/98. We wish to thank him for his outstanding service and the best in his new job.

## Congratulations

AAR extends heartiest congratulations to Ms. G. Wong for being one of the 5 Malaysians selected to participate in a course on 'New Technologies for Agricultural Research - Managing Biotechnology in a Time of Transition'. on November 2-13, 1998 at Haikou, Hainan organised by the Intertnational Service for National Agricultural Research (ISNAR). The course was to provide key agricultural personnel from selected Asian countries with the opportunity to enhance their management & leadership skills, with special emphasis on biotechnology.

## 1998 AAR Sports Club Highlights

The main event for the year was the AAR Annual Dinner 1998 (Malam Tradisi) held at the Glenmarie Pan Pacific Resort on 12th December. More than 270 members, including their family members and guests turned up to enjoy the sumptuous dinner and the performances presented by the talented staff members. Members were in their best with many in their traditional costumes.

In May 1998, 150 Sports Club members enjoyed a 3 -day-2-night trip to Pulau Langkawi. Many interesting places were visited but shopping was on top of the list.

The other interesting event for the year was the Family Day held at FRIM on 6th September'98 where members were taken back to nature and pampered with a fantastic hawker styled buffet lunch.

**Tey, S.H.**

*AAR Annual Dinner 1998*