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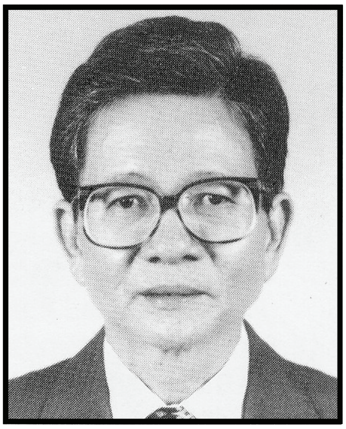
AAR - NEWS

EDITORIAL

Another Milestone in AAR's History



Chan Khoon San retiring in August'96

Our Chemist Chan, as Khoon San is popularly known by old-timers, will retire this year and in doing so, sets an important milestone in AAR's history. Although AAR was formed only in 1986, the staff in the then HRU and KLK's Agronomic Unit who joined AAR at its formation are considered to have served continuously and Khoon San will be the first Research Officer of many who have passed our 'portals' to retire from service.

Since joining HRU in 1971, he has seen the plantation industry pass many phases; the heydays and decline of rubber, the growth of the oil palm industry and the rapid rise and fall of cocoa. At each phase, he was actively involved. The mainstay of the laboratory is leaf and soil analysis but many other analytical services were also carried out at the lab; firstly with SMR testing for rubber, then quality tests for palm oil and cocoa, and then effluent tests and treatments for both rubber and palm oil factories. In addition, water, fertiliser and other analytical services were also provided in support of the extensive and varied requirements of the estates, factories, advisory and experimental programmes. Besides these highly varied routine activitities, there were also developmental and experimental programmes at the lab to develop new testing, treatment and analytical techniques on fertilisers, effluent treatment, oil analysis and determination which may be gleaned from the list of his publications at HRU and AAR. Many of these have been adopted and used by AAR's agronomists to obtain better insights on the processes involved and results obtained in their agronomic trials.

The remarkable thing perhaps is that quite often, these testing and analytical activities were on very large scale but carried out by a small core of staff only and with fairly basic equipment. Khoon San and his team just churned out the results and as readers will appreciate from the article in this issue on the interlab cross-check results nationally and internationally, AAR lab's results for leaf, soil and fertilisers are highly reliable and overall, second to none. This strong confidence which Khoon San and his team has built up in their analytical results has enabled the AAR agronomists to perform their advisory roles more effectively and most importantly, build up an extremely large database of nutrient values for oil palm, rubber, cocoa, fertilisers and soils which are now being utilised for our very important thrust research areas on nutrient balance, crop and nutrient modelling to establish accurately the fertiliser requirements of our important crops.

The labs which Khoon San have led have been commercial successes as well as leaders in many areas of analytical expertise, accuracy, consistency and in development. Most of the important developmental work anticipated has been completed by him and he leaves AAR with a proud and difficult- to-beat reputation as Chemist Chan, 'the man who did it all'.

We wish Khoon San a "Happy Retirement" and his family, Soo Lean, Chin Ching and Chin Wei, many Happy and Healthy Years together.

(Chew, P.S.)

CONTENTS

CHAN KHOON SAN, AAR'S VETERAN CHEMIST

To Khoon San, to be the first and excel in whatever he does is quite normal to him. In fact some of them come naturally to him. He will be endowed with another first come August 1996 when he will be the first AAR officer to retire at the usual retirement age of 55.

Chemist Chan as he is popularly known (there is a Rubber Chan at AAR) is the youngest child in a big family. He grew up in Penang in a tough environment and had to struggle and fight (he still practices the latter occasionally) to be what he is today. To be concise, he started his working life as a Brinsford trained teacher, tied the knot and then proceeded to University Malaya to obtain a First Class Honours in Chemistry and then back to work as a Chemist with the then Syarikat Penyelidikan Pertanian Barlow Boustead Sdn Bhd (SPPBBSB). He has remained at the same job ever since oblivious to the corporate changes that took place over the years.

When asked to write about his working experiences for AAR Newsletter, he offered his curriculum vitae which is reproduced below :-

CURRICULUM VITAE

Name	Chan Khoon San
Date and Place of birth	8th August, 1941 Penang
Marital status	Married with 2 daughters
Education	University of Malaya B. Sc. (Hons.) 1971

Job Experience

1) Chemist, HRU Sdn. Bhd. (1971-86)
2) Chemist, Applied Agricultural Research Sdn. Bhd., Sungai Buloh (June 1986-present)

Training courses attended

RRIM course on SMR Testing (1971), Soil studies (Rothamsted and East Mailing, 1974)

Setting up of Chemistry Lab. at HRU in 1971 and at AAR in 1986.

Speciality of work

Analytical chemistry of plant, soil and fertilizer testing, rubber and latex testing, palm oil, effluent and water testing. Design and analysis of laboratory crosschecks, palm oil quality, sampling for mill oil losses and pollution consultancy. Specialization on urea volatilization losses and amendments including patent on binding and coating agents for urea and other fertilizers. Fomulation of organic, foliar, hydroponic and micronutrient fertilizers. Hydroponic culture. Organising cross-checks on plant and fertilizer analysis for the Soil, Plant & Fertilizer Standardisation Committee.

Chemical studies of rock phosphates and magnesium limestones.

Oil to bunch (0/B) determination in f.fb. by the oil balance method.

Professional Societies

1) Associate of Malaysian Institute of Chemistry.
2) Member of the Malaysian Society of Soil Science
3) Member of SIRIM Technical Committees
   Plant Chemical Analysis (1976)
   Soil Chemical Analysis (1976)
   Specification and Analysis of Fertilizers (1991)
4) Chairman (1992-94) Secretary (1989) Co-ordinator (1990) Committee on Standardization of Soil, Plant and Fertilizer Analysis in Malaysia.
5) Co-ordinator of fertilizer cross-checks in Malaysia (1994 -1996)
6) Member of the following Committees in the past:
   D.O.E. Effluent Testing Committee. MOPGC and MRPC technical committees.

Papers published

1) Sampling of oil palm bunch stalk refuse to determine oil loss. International Symposium on oil palm processing and marketing, 1976.
2) The effects of moisture on free fatty acid and peroxide formation in palm oil during storage. Conference on Chemical Research in Malaysia, 1979.
3) The estimation of mill oil losses. Selangor Planters Association Journal, 1982.
4) Palm oil mill effluent treatment by ponding. Workshop on palm oil mill technology and effluent treatment, 1982.
5) Inter-laboratory variability in palm oil mill effluent (POME) analysis. Workshop on rubber and palm oil effluent testing, 1981.
6) Proposed revision of the standard chemical oxygen demand method. 3rd Workshop on rubber and palm oil effluent testing, 1981.
7) Review of inter-laboratory variation in effluent test ing 1983-84. 3rd Workshop on rubber and palm oil effluent testing, 1985.
8) Volatilisation losses of urea on various soils under oil palm. Seminar on fertilizers in Malaysian Agriculture, 1983.
9) Patent application on coating, binding and sealant materials for fertilizers and other substances. British patent application 1985.
10) The simple open soil method of measuring urea volatilisation losses. Plant and Soil 92, 73-79(1986).
11) Coating and binding agent for urea fertilizers. International symposium on urea technology and utilization, 1987.
12) Boric acid and fertilizer borate for improved urea fertilizer efficiency. International symposium on urea technology and utilization, 1987.
13) Report on local plant analysis cross-checks 1986-1987. 9thSeminar on standardization of soil and plant analysis, 1988.
14) The choice of a foliar fertilizer, I.C.I. marketing seminar, 1988.
15) Choice of foliar fertilizer. The Planter, vol. 66, No.774, September, 1990.
16) Comparison of soil available phosphorus detennination using manual shaking and orbital shaker. Seminar on Progress in Soil, Plant and Fertilizer Analysis. 4-5 August 1992, Sabah.
17) Fertilizer analysis cross-checks in Malaysia 1990-1991. Seminar on Progress in Soil, Plant and Fertilizer Analysis. 4-5 August 192, Sabah.
18) Fertilizer Analysis in Malaysian Laboratories. Seminar on Advances in Soil, Plant and Fertilizer Analysis and the 12th Standardization Meeting. 15-17 June 1994, Penang.
19) Fertilizer Analysis Cross-Checks in Malaysia for l992 -1993. Seminar on Advances in Soil, Plant and Fertilizer Analysis and the 12th Standardisation Meeting. 15-17 June 1994, Penang.
20) Characteristics of phosphate rock reactivity and implications on management practices in Malaysia. MSSS Soil Science Conference 1994, 18 & 19/4/95, K. Lumpur.
21) Dissolution of Calcium and Magnesium limestone in soil. Seminar on Advances in Soil, Plant and Fertilizer Analysis 1996. 17-18 April 1996 Kuching, Sarawak.
22) Fertilizer Analysis Cross-Checks in Malaysia for 1994-1995. Seminar on Advances in Soil, Plant and

Fertilizer Analysis 1996. 17-18 April 1996 Kuching, Sarawak.
23) Oil to bunch (0/B) determination by the oil balance method. AAR Internal Report 1996.

Obviously Khoon San has had an illustrious and productive career. But what about his personal side? Some parting shots from his colleagues might shed some interesting aspects of his character.

1) **On work**
His laboratory is the number one in the world in terms of reliability of test results and efficiency.
Minimum input/maximum output
2) **On Food/Drink**
He finished his liquor quota more than 10 years ago (before AAR was born) for he used to represent the entire HRU officers in beer drinking sessions with the estate managers. Now he only eats healthy food (low fat/cholesterol) and drinks mainly distilled water (not spirits).
3) **On Health**
He rejuvenated himself recently with six coronary artery by-passes (one more than our PM). Another first! Samy V. can make millions collecting toll from these by-passes!
4) **On Happiness**
Most happy when he visits the old folks homes and homes for the physically and mentally retarded and orphanages to cook beggar's chicken for them! He hopes to be visited in turn.
5) **On Religion**
Cannot wait to retire - already arranged to go to Burma to answer a higher calling. Ultimate aim - to become a famous monk. It is rumoured that monks are rewarded to their hearts' desires when they join Buddha.
6) **On Hobbies**
Meditation
Jogging (marathon running)
Swimming in monsoon drains (in his younger days)
7) **On Arts/Culture**
Only appreciates live specimens
8) **On Money Matters**
A "tahan lama" stock holder. Never sells any stocks without profits no matter how long he has to wait. Khoon San's Law:
"Buy dirt cheap, sell damn high" or "buy high and sell higher".
9) **On Friendship**
A truly reliable and loyal person, he stands by his friends through thick and thin.
10) **Attitude in Life**
He has this religious singlemindedness to push himself to the limit in doing the things he believes in e.g. his office projects, jogging, religion, etc. You really have to admire the man for his strong will and determination.

PERFORMANCE OF AAR LABORATORY IN INTERNATIONAL AND LOCAL CROSS-CHECKS ON PLANT, SOIL AND FERTILIZER ANALYSIS 1990-1995

Accuracy comes first in an analytical laboratory. Wrong results are of no use to the consumer as they can lead to wrong conclusions and disputes. Regular cross-check exercises play a useful role in ensuring that participating laboratories are kept alert in their analysis, that results produced are reliable and that those using the analytical data are confident of their accuracy.

AAR is a member of the Committee on Standardization of Soil, Plant and Fertilizer Analysis in Malaysia and has participated in all the analytical cross-checks since 1986. In addition, we also participate in the International Plant-Analytical Exchange (IPE) conducted by Wageningen Agricultural University which groups over 200 analytical laboratories from 50 countries around the world.

Table 1 shows the results of the Wageningen IPE cross-checks on plant analysis conducted from 1990 to 1995. In terms of reliability, AAR ranks No.1 among local and international labs by producing the least number of anomalous or rogue results todate. Our reliability of analysis is 99.7%!

Tables 2 and 3 show the performance of Malaysian laboratories which participated in the local cross-checks on fertilizer and soil analysis organised by the Standardization Committee from 1990 to 1995.Again AAR ranks No.1 in fertilizer analysis and No. 2 in soil analysis with reliability of 100% and 98.7% respectively!

THE CHAMPION TEAM AT AAR ANALYTICAL LABORATORY

The record of AAR's analytical performance has been excellent since its formation in 1986. Credit for this outstanding performance should go to the Chemist and laboratory staff namely Ms. Tan Lei Hong, Lim Lee Hua and M. Rukmani of the leaf/fertilizer section and Mr. Nadisin and En. Mohd Kamal of the soil section, who have worked conscientiously to ensure accuracy and user confidence in our laboratory results.

(Chan KS.)

TABLE 1 : WAGENINGEN INTERNATIONAL PLANT ANALYTICAL EXCHANGE (IPE) RANKING OF LABORATORIES ACCORDING TO FREQUENCY OF ROGUE RESULTS

Rank	Name of lab.	% rogue results recorded each year (*)						Mean 6 yrs.
		1990	1991	1992	1993	1994	1995	
1.	**AAR, M**	**0**	**0.6**	**0**	**0.7**	**0**	**0.5**	**0.3**
2.	AARCWSG, B	-	-	0.9	1.4	0.8	1.1	1.1
3.	OPRS, M	0	0	0	3.2	2.4	1.2	1.1
4.	TAIKO, M	1.6	1.2	0.8	4.0	-	-	1.9
5.	HAMELIN, G	1.6	3.4	0.8	0.6	2.0	3.8	2.0
6.	ASL, NZ	3.4	1.6	1.9	1.7	1.7	3.1	2.2
7.	FELDA, M	2.2	2.2	1.7	1.2	4.4	2.2	2.3
8.	EBOR, M	1.1	4.4	1.4	1.0	3.7	2.5	2.4
9.	CHEMARA, M	4.2	4.6	1.4	1.8	3.9	1.1	2.8
10.	FRI, NZ	5.2	0.9	1.9	4.2	4.8	1.7	3.1
11.	URAPLANT, F	3.9	2.5	3.0	2.5	3.2	5.9	3.4
12.	K. LUMPUR, M	7.7	3.3	5.0	0	4.7	2.5	3.9
13.	WAGENINGEN, H	4.2	1.3	2.0	2.6	5.7	8.1	4.0
14.	EAST MALLING, B	9.7	5.2	2.6	1.1	3.3	3.8	4.3
15.	IOI, M	5.2	5.4	3.8	1.2	5.6	5.3	4.4
16.	SADEF, F	9.8	4.0	3.9	1.7	5.2	4.2	4.8
17.	DGCCRF, F	-	3.8	7.4	4.6	4.9	5.1	5.2
18.	RRIM, M	11.1	3.3	2.0	4.0	6.7	4.9	5.3
19.	AAA GROUP, I	-	-	13.8	3.2	5.2	0.8	5.8
20.	ALBERTA, C	7.3	6.5	5.7	4.8	7.5	9.3	6.9
21.	CSIRO, A	8.2	3.3	1.5	6.7	-	16.8	7.3
22.	MUENCHEN U, G	18.3	3.2	4.1	5.2	10.2	3.9	7.5
23.	SABAH, M	11.0	10.6	1.1	4.4	15.3	5.3	8.0
24.	CIAT, Co.	14.9	9.3	4.2	7.1	8.6	5.3	8.2
25.	MARDI, M	2.1	6.6	12.7	14.4	12.8	13.1	8.4
26.	QUEENSLAND, A	10.6	7.1	4.6	4.9	13.9	13.7	9.1
27.	WEXFORD, Ir.	6.8	6.3	5.6	9.3	12.8	22.9	10.6
28.	DOA BELFAST, B	11.3	11.6	14.4	10.0	11.3	9.2	11.3
29.	IRRI, P	16.0	8.6	15.2	10.6	21.6	5.5	12.9
30.	IAPAR, Br.	4.9	6.1	8.6	22.8	15.7	21.2	13.2
31.	MARIHAT, I	18.1	18.8	20.8	7.1	4.8	14.6	14.0
32.	SOIL SURVEY, Pa.	25.7	16.3	5.6	21.0	0	25.0	15.6
33.	AL-AZIZAH, SA	33.5	14.8	7.4	12.8	6.8	26.7	17.0
34.	EPA, M	8.6	13.3	18.5	15.0	30.0	22.3	18.0
35.	SARAWAK, M	25.0	29.2	23.1	27.0	25.2	11.9	23.6

Key : A = Australia, B = Britain, Br. = Brazil, C = Canada, Co. = Colombia, F = France, G = Germany, H = Holland, I = Indonesia, Ir. = Ireland, M = Malaysia, NZ = New Zealand, P = Philippines, Pa = Pakistan, SA = Saudi Arabia

$$\text{*\% rogue results} = \frac{100 \times \text{Total no. of rogues}}{\text{Total no. of analysis}}$$

References : International Plant-Analytical Exchange (IPE) reports for 1990-1995 by V.J.G. Houba et al. Published by Department of Soil Science and Plant Nutrition, Wageningen Agricultural University, The Netherlands.

TABLE 2 : MALAYSIAN CROSS-CHECKS ON FERTILIZER ANALYSIS, RANKING OF LABORATORIES ACCORDING TO FREQUENCY OF OFF-SPECIFICATION RESULTS

Rank	Name of lab.	Total no. analysis	% off-spec. results recorded (*)			Mean 6 yrs.
			90-91	92-93	94-95	
1	**AAR**	**288**	**0**	**0**	**0**	**0**
1	FELDA SABAH	48	-	-	0	0
3	EBOR	288	1.0	0	0	0.3
3	OPRS	288	1.0	0	0	0.3
5	AGRI-SABAH	112	-	0	1	0.5
6	UNITED PLANT	288	2.1	0	0	0.7
7	FELDA SG.TEKAM	288	2.1	1.0	0	1.0
8	TAIKO, SABAH	272	1.3	1.0	2.1	1.5
9	CHEMARA	288	5.2	0	0	1.7
10.	CCM	272	3.8	3.1	0	2.3
11.	RRIM	288	3.1	1.0	7.3	3.8
12.	CHEMSAIN	32	-	12.5	0	4.2
13.	EASTERN PLANT	288	7.3	5.2	7.3	6.6
14.	DOA, KL	288	11.5	4.2	6.3	7.3
15.	PETRONAS	48	-	-	8.3	8.3
16.	SOCFIN	272	16.3	7.3	4.2	9.3
17.	RISDA	240	17.7	5.2	6.3	9.7
18.	DOA, SARAWAK	288	16.7	3.1	12.5	10.8
19.	IOI	288	14.6	11.5	6.3	10.8
20.	FPM	240	13.8	12.5	7.5	11.3
21.	DOA, SABAH	252	13.2	13.5	7.3	11.3
22.	ASIATIC	160	14.1	7.8	15.6	12.5
23.	PORIM	272	12.5	15.0	16.7	14.7
24.	SIRIM	176	-	19.8	13.0	16.4
25.	UPM	272	22.9	12.5	14.6	16.7
26.	ARAB	192	32.3	47.9	18.8	33.0
27.	MARDI	148	72.5	20.5	9.4	34.1

$$\text{*\%Rogue results} = \frac{100 \times \text{Total no. of rogues}}{\text{Total no. of analysis}}$$

References
Report on fertilizer cross-checks in Malaysia presented during various seminars in Soil, Plant and Fertilizer Analysis by Chan Khoon San (1990-91, 1992-93 and 1994-95). Committere on Standardisation of Soil, Plant and Fertilizer Analysis. Malaysian Society of Soil Science.

TABLE 3 : MALAYSIAN CROSS-CHECKS ON SOIL ANALYSIS, RANKING OF LABORATORIES ACCORDING TO FREQUENCY OF OFF-SPECIFICATION RESULTS

Rank	Name of lab.	Total no. analysis	% off-spec. results recorded (*)			Mean 6 yrs.
			90-91	92-93	94-95	
1.	OPRS	1104	1.6	0.8	0.8	1.1
2.	**AAR**	**1100**	**0.8**	**0.8**	**2.2**	**1.3**
3.	FELDA, SG. TEKAM	1061	2.2	3.2	1.1	2.2
4.	CHEMARA	1100	3.7	1.7	4.4	3.3
5.	EBOR	1104	5.8	1.1	3.9	3.6
6.	TAIKO	1052	4.9	6.1	2.6	4.5
7.	UNITED PLANT.	1104	3.4	6.1	5.3	4.9
8.	RRIM	1039	1.9	12.5	5.0	6.5
9.	DOA, SABAH	1036	4.9	3.7	12.0	6.9
10.	RISDA	572	15.5	0.8	7.4	7.9
11.	FELDA, SABAH	180	-	-	8.3	8.3
12.	UPM	860	8.7	9.6	8.1	8.8
13.	MARDI	1000	5.3	11.7	11.3	9.4
14.	DOA, SARAWAK	1056	18.5	15.3	2.81	2.2
15.	IOI	676	13.8	15.4	9.6	12.9
16.	PORIM	896	15.4	12.7	12.7	13.6
17.	CHEMSAIN	186	13.3	16.7	-	15.0
18.	DOA, KL	980	11.8	10.3	27.5	16.5
19.	FRIM	958	17.9	10.4	21.5	16.6
20.	EASTERN PLANT	992	17.7	16.5	24.7	19.6
21.	SABAH FOREST	400	-	21.1	21.3	21.2
22.	ARAB	616	19.5	42.5	14.3	25.4

$$\text{*\%Rogue results} = \frac{100 \times \text{Total no. of rogues}}{\text{Total no. of analysis}}$$

References
Report on inter-laboratory soil cross-checks presented during various seminars in Soil, Plant and Fertilizer Analysis in Malaysia by Ishak Ariffin and Razman Raof (1990-91), Ishak Ariffin and Shaidi Hamzah (1992-93) and Suhaidi Hamzah and Abdul Malek Aziz (1994-95) Committee on Standardisation of Soil, Plant and Fertilizer Analysis in Malaysia, Malaysia Saociety of Soil Science.

Oil to bunch (O/B) determination by the oil balance method

ABSTRACT

Oil to bunch (O/B) determination by conventional bunch analysis based on total mass balance tends to overestimate the actual value due to positive bias arising from moisture loss in every step of the analytical process. O/B determination by total oil balance is more accurate because weight losses due to moisture evaporation can be ignored. When the 2 methods were compared, bunch analysis gave results which were higher than the O/B obtained by oil balance, ranging from -0.7 units to + 9.9 units with mean difference = + 3.34 units or 15% of the mean O/B. On the other hand the O/B and K/B (kernel to bunch) figures obtained by the oil balance method appeared to agree closely with mill oil and kernel extraction rates after taking into account of harvesting and processing losses.

In order to speed up the analysis of O/B by the oil balance method, the fruitlets separated from the spikelet sample of each quarter were cut into 2 longitudinal halves, dried and after separating the kernels, the dried mesocarp and shell were macerated for oil determination thereby eliminating the tedious task of depericarping the fresh fruitlets for oil determination. With all fruitlets from the whole bunch separated and weighed, the analysis of 4 samples (1 sample per quarter) and oil determination of 8 sub-samples gave coefficients of variation (c.v.) of 2.70% for K/B and 2.18% for O/B. When the fruit weight was estimated from 1 quarter of the bunch with analysis of 1 sample from the quarter and oil determination of 2 sub-samples, the C.Vs were 7.28% for K/B and 6.00% for O/B.

Using the modified method which is precise (low c.v.), it was found that O/B decreases as bunch weight increases in ffb. from an area where the bunch sizes varied from 26 to 59 kg. The reason for this phenomenon was due to the decreasing oil content of the fruitlets as the bunches become larger.

INTRODUCTION

In the past, oil to bunch figures obtained by the bunch analysis method of Blaak et al. (1963) seldom agreed with the oil extraction rates (OER) obtained in the palm oil mill even after taking into account of the oil losses during processing. Lim K.H. and Toh P.Y. (1984) showed that the Blaak method tended to overestimate the oil to bunch (O/B) ratio due to positive systematic errors in the various bunch component ratios used to calculate the oil to bunch figure. To overcome bias due to loss of moisture in every step of the process of analysis, the authors proposed a method to account for a component balance of oil or kernel which is superior to total mass balance because weight losses due to moisture evaporation can be ignored. The oil balance technique consists of dividing the spikelets into 4 quarters and each quarter is subdivided into 2 sub-samples. For oil to mesocarp determinations, duplicate analysis is carried out per sub-sample giving a total of 16 oil determinations. For kernel analysis, all eight sub-samples are totally determined for kernel yield.

Although the oil and kernel balance technique of determining oil to bunch (O/B) and kernel to bunch (K/B) is accurate, but the actual process has been found to be very time consuming and impractical when a lot of large bunches (>40 kg) have to be analysed as the major part of the work involved manual depericarping many fruitlets of variable mesocarp thickness. To overcome the tedious process of removing the mesocarp manually and carrying out the oil determination after drying, the fruitlets from a sample were cut longitudinally into 2 halves, and dried in an air oven after which the dried kernels were removed. The dry mesocarp and shell were macerated in an electric chopper and the oil content determined by Soxhlet extraction. A total of 28 bunches from a trial area and 45 bunches from a commercial area were analysed to determine the various sampling and testing errors using this technique.

MATERIALS AND METHODS

1. **<u>FFB from Plant Breeding Trials in Balau Estate</u>**

<u>Preparation at Balau Estate</u>

Bunches were harvested at Balau and f.f.b. weight recorded. The bunches were chopped and spikelets separated from the stalk. After taking a sample of spikelets for bunch analysis at Balau, the remaining spikelets as well as fruitlets separated during bunch analysis were sent to AAR for testing at the Chemistry laboratory.

<u>Sampling and Testing at AAR</u>

All the fruitlets received were weighed and a sample approximately 500 g was taken. The fruitlets of the sample were cut into 2 longitudinal halves and dried at 80°C overnight. After drying, the kernels were separated from the dried mesocarp and shell from which the % Dry Kernel to Fruit (% DKF) and the % Dry Mesocarp & Shell to Fruit (% DMSF) were obtained.

For the spikelets, 2 samples each approximately 800 g were taken and allowed to stand for 3 days after which the fruitlets were easily separated from the empty spike-lets. These fruitlets were also cut into 2 longitudinal halves, dried and % DKF and % DMSF were determined. All fruitlets separated from all spikelets received were weighed.

For oil determination, each half of dried mesocarp and shell (DMS) were chopped in a National Super Chopper, mixed thoroughly and 2 sub-samples each weighing 10 g were taken and dried overnight. The moisture content was detennined and used for moisture correction when calculating the total oil. The finely chopped DM5 were packed in dried filter papers and placed in a Soxhlet extractor and oil extracted by hexane overnight. After extraction, the packets of DMS were dried to determine oil loss from which % Oil in Dry Mesocarp & Shell (% ODMS) were calculated.

<u>Calculation of Oil to Bunch (O/B) and Kernel to Bunch (K/B)</u>

(a) Total oil (g) = Fruits (g) x DMSF x ODMS x Moisture correction

$$O/B = \frac{\text{Total oil}}{\text{Bunch wt.}} \times 100$$

(b) Total kernel (g) = Fruits (g) x DKF

$$K/B = \frac{\text{Total kernel}}{\text{Bunch wt.}} \times 100$$

Note : Fruits (g) include the 500 g taken for bunch analysis at Balau

2. **<u>FFB from commercial areas in Tuan Mee Estate</u>**

Harvesting at Than Mee Estate

Six bunches were harvested every week, 3 on Monday and 3 on Friday. The fields chosen were all Chemara DxP materials planted in 1970, 1972, 1973, 1976 and 1977. Ripeness was set at 1 loose fruit per bunch and only undamaged bunches were used. All loose fruits were collected and included in the ffb weight. The ffb harvested had weights ranging from about 26 kg to over 59 kg.

Sampling and Testing at AAR

The bunches were dissected with an axe and spikelets were separated from the stalk. The spikelets were thoroughly mixed and divided into 4 quarters and weighed. From each quarter, a random sample of one-eighth (1/8) of the total spikelets was taken and kept separately. Both the quarter and its sample were allowed to stand for 3 days. After 3 days, all fruitlets from the 4 samples and 4 quarters were separated from the empty spikelets and weighed. The percentage fruit to spikelets (% FS) for all quarters of every bunch was determined by dividing the fruit weight with the initial spikelet weight.

The fruitlets from each sample were cut into 2 halves longitudinally and dried in an air oven at 80^0C overnight. After drying, the kernels were separated from the dried mesocarp and shell from which the % Dry Kernel to Fruit (% DKF) and the % Dry Mesocarp and Shell to Fruit (% DMSF) were obtained. The dried mesocarp and shell (DMS) from each half of sample were finely chopped in a National Super Chopper and after overnight drying at 80^oC, the % Oil in Dry Mesocarp and Shell (% ODMS) were determined by Soxhlet extraction.

RESULTS AND DISCUSSION

Results of the 0/B determination by the oil balance method at Balau are summarised below.

Overall, the mean difference in O/B between conventional bunch analysis and the oil balance method was 3.34% units. In a similiar exercise by Lim K.H. (1984) the difference was 3.72% units. In our Balau exercise, conventional bunch analysis appeared to overestimate the mean O/B value by 15%. Linear regression analysis showed very highly significant regression between the 2 sets of O/B with the R value 0.86.

	Bunch wt. (kg)	% O/B (x) Oil Balance	% O/B (y) Bunch analysis	Difference (y-x)
Mean	13.8	22.05	25.39	3.34
s.d.	2.29	3.72	4.48	2.21
c.v. %	16.6	16.9	17.6	66.2

The relationship between the O/B determined by oil balance (x) and conventional bunch analysis (y) may be represented by the equation $y = 1.033\ x + 2.61$

Highlights of the results of 45 bunches from commercial areas in Tuan Mee Estate are summarised below and compared with figures obtained at Tuan Mee Palm Oil Mill during the period of exercise.

During mill processing oil loss is about 8% of total oil.

	Oil balance method			Tuan Mee Mill Results		
	Bunch wt.(kg)	% O/B	% K/B	Month	OER	KER
Mean	41.44	21.10	6.93	Feb.	19.30	7.07
s.d.	8.25	3.91	1.47	Mar.	19.55	7.02
c.v. %	19.9	18.5	21.2	Apr.	18.79	6.77

Assuming another 5% loss during harvesting, the OER in this exercise is expected at around 18.4% which is lower than the actual OER at Tuan Mee mill during the period. As the actual crop will have lower mean bunch wt., the O/B will be higher at around 22-23% and so OER is expected at 19-20% taking into account of the losses. Thus the O/B figures obtained by the oil balance method appears to agree with the mill figures. As for the kernel to bunch (K/B) figures, the mean value obtained by the same technique also agrees with the mill kernel extraction rate (KER).

Linear regression of bunch weight (x) against its O/ B (y) showed highly significant regression with an R value of 0.43. Their relationship may be represented by the equation $y = 29.58 - 0.205x$.

The negative regression co-efficient means that O/B (y) decreases as bunch weight (x) increases. Since O/B is obtained from the product of F/B (fruit to bunch) and O/F (oil to fruit), linear regression analysis shows no regression between bunch weight and F/B but highly significant regression between bunch weight (x) and O/F (y) represented by the equation $y = 50.44 - 0.362\ x$ with an R value of 0.48. Thus the phenomenon of lower O/B with increasing bunch weight may be due to the decreasing oil content of the fruitlets as the bunches becomes larger.

SAMPLING AND TESTING ERRORS

Statistical data derived from the analysis of variance (ANOVAR) of the various bunch components in the oil and kernel determination exercises at Balau and Tuan Mee are summarised below.

Comparison of the bunch component ratios in Summary 1 shows that the co-efficients of variation (c.v.) of bunches and samples are higher in Tuan Mee Estate than in Balau Estate for % DMSF and % ODMS. This is probably

Summary 1	% DKF		% DMSF		% ODMS	
	Balau	Tuan Mee	Balau	Tuan Mee	Balau	Tuan Mee
Mean value	6.83	11.3	59.9	57.5	68.7	63.0
S.d. (bunch)	2.61	2.18	3.00	4.56	5.78	6.59
S.d. (sample)	0.395	0.607	0.940	1.42	0.425	0.855
S.d. (half)	-	-	-	-	0.316	0.824*
S.d. (analysis)	-	-	-	-	0.76	
C.V. % (bunch)	38.2	19.3	5.01	7.93	8.41	10.5
C.V. % (sample)	5.78	5.40	1.57	2.47	0.62	1.36
C.V. % (half)	-	-	-	-	0.46	1.31*
C.V. % (analysis)	-	-	-	-	1.11	-

*includes error of analysis

Summary 2	% Fruit to Spikelet (F/S)
Mean value	69.6
s.d. (bunch)	4.31
s.d. (quarter)	1.31
C.V. % (bunch)	6.19
C.V. (quarter)	1.88

due to the larger bunch sizes and variation of sizes of f.f.b. harvested at Tuan Mee Estate. However for % DKF, the c.v.. is higher at Balau Estate as the bunches were harvested from breeding trials using various progenies.

Errors in Kernel to Bunch (K/B) Determination

$$K/B = \frac{\text{Fruit wt.}}{\text{Bunch wt.}} \times \frac{\text{Dry Kernel (DKF)}}{\text{Fruit}}$$

(a) <u>All fruits in the bunch are weighed</u>.

The error comes from estimating the % DKF. Using data from Tuan Mee in Summary 1, the sample C.V = 5.40 %
For 4 samples per bunch C.V = 2.70%

(b) <u>Total fruit wt. is estimated by taking a quarter of the bunch</u>

Total fruit wt. = Total spikelet wt x F/S

$$K/B = \frac{\text{Total spikelet wt}}{\text{Bunch wt.}} \times F/S \times DKF \ \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Using data from Tuan Mee in Summary 1 and 2,
For % F/S : C.V. (quarter) = 1.88
% DKF : C.V. (sample) = 5.40

Using Equation (1), CV for K/B = 1.88 + 5.40 = 7.28

Note: When a parameter (K/B) is obtained by multiplying the bunch component ratios as in Equation (1), the total error is obtained by adding all individual errors of bunch component ratios used.

Errors in Oil to bunch (0/B) Determination

$$O/B = \frac{\text{Fruit wt.} \times DMSF \times ODMS \times \text{Moisture correction}}{\text{Bunch wt.}}$$

(a) <u>All fruits in the bunch are weighed</u>.

Error in moisture correction is negligible, so the total error comes from 2 component ratios. Using the data from Tuan Mee,
For % DMSF = C.V. (sample) = 2.47
At 4 samples per bunch, c.v. = 1.24%
For% ODMS =C.V (sample) = 1.36, C.V (analysis) = 1.31
At 4 samples and 2 analysis per sample

$$C.V = \left(\frac{1.36^2}{4} + \frac{1.31^2}{8}\right) = 0.944$$

Overall C.V for O/B = 1.24 + 0.94 = 2.18%

(b) <u>Total fruit wt. is estimated by taking a quarter of the bunch</u>

$$O/B = \frac{\text{Total spikelet wt.}}{\text{Bunch wt.}} \times F/S \times DMS \times ODMS \ldots\ldots\ldots(2)$$

For F/S. C.V (quarter) = 1.88 %
% DM5, C.V (sample) = 2.47 %
%ODMSC.V (sample) = 1.36 % C.V (analysis) = 1.31
At 1 sample and 2 analysis, C.V 1.65%
For Equation (2), C.V for 0/B 1.88 + 2.47 + 1.65= 6.00

CONCLUSIONS

Comparison of O/B figures showed that the conventional bunch anlaysis method tended to produce higher results compared with the oil balance method. The differences ranged from -0.7 units to + 9.9 units with average difference = + 3.34 units or 15% of the mean O/B. On the other hand, the O/B and K/B results obtained by the oil balance method appeared to agree closely with mill oil and kernel extraction rates after taking into account of losses during harvesting and processing.

In order to save time in depericarping the fruitlets, the method has been modified whereby the fruitlets are cut into 2 longitudinal halves, dried and the mesocarp and shell analysed after removal of the kernels. The errors in K/B and O/B determinations are as follows :-

(a) Fruits from all 4 quarters weighed

Analysis of 4 samples/bunch and oil determination of 8 sub-samples
K/B : C.V. = 2.70%
O/B : C.V. = 2.18%

(b) Fruit weight estimated from 1 quarter

Analysis of 1 sample from quarter and oil determination of 2 sub-samples
K/B : C.V. = 7.28%
O/B : C.V. = 6.00%

Using this modified method which is precise (low C.V.) it was found that O/B decreases as bunch weight increases in f.f.b. from an area where bunch sizes varied form 26 to 59 kg. The reason for this phenomenon was due to the lower oil content of the fruiflets as the bunch becomes larger.

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(Chan, KS.)

SOCIAL AND PERSONAL

Welcome to :-

Eswaran Padmanabhan

Dr. Eswaran Padmanabhan who joined us on 15/1/96 as an Assistant Research Officer, to work as Soil Scientist in the agronomy section.
Born in 1962 at Kluang, Johore; B.Sc. (UM), MSC (Ghent), PhD. (Canada). Ph. D. thesis entitled "Mineralogy, microscopy and classification of Oxisols and related soils".

Cogratulations to :-

Gopal Kulandai

Mr. Gopal Kulandai on his promotion to Field Assistant Manager on 1-1-96. Gopal was born in 1946 and joined HRU in 1969 after completing his Senior Cambridge. He is based at AAR sub-station at Balau Estate where most of AAR's oil palm breeding trials and seed production unit are located.

Tan Lei Hong

Madam Tan Lei Hong on her promotion to Lab. Manager on 1-1-96. Madam Tan Lei Hong joined Highlands Research Unit on July, 1972 after completing her Senior Cambridge. While on the job, she attended courses in Licientiate for Plastics and Rubber and Advanced Certificate in Purchasing and Materials Management. She specialises in SMR, palm oil, effluent, latex, leaf, soil and fertilizer analysis and foliar fertilizer production.

* Puan Hatina bt. Mohamad on the birth of her second child, Hariz Izzuddin bin Hasri on 16/3/96.
* Puan Mahizan bt. Mohamad on the birth of her first child, Nurin Izzati bt. Abd Razak on 25/3/96.
* Puan Siti Norasikin bt. Hj. Moksen on the birth of her first child, Nursyazwani bt. Md. Suhaili on 25/5/96.

New Employees:

Chen, KC.)

Name	*Designation*	*w.e.f.*
Cik Rusdiana Bauceng Zainuddin	Clerk AAR KDC	1/2/96
Mr. Selvarajah S/L Chandran	Accounts Clerk	6/3/96
En. Jamaludin Bin Mohamad	Res. Asst.	21/5/96