October'95

AAR NEWS

EDITORIAL

CONTENTS

At AAR's Board meeting held in January 1995, a suggestion was made to hold ajoint meeting of BEA/AAR and TPSB/AA.R crop committees which had been meeting separately at quarterly intervals. This materialised in the form of a Field Day held at Balau Estate, Broga on 10-10-95.

The main purpose of holding the joint meeting was to provide a forum for AAR's Principals to interact and exchange ideas.

The Field Day kicked off after a nasi lemak and kuih breakfast and a short welcome address by Mr. Chew Poh Soon, Head of Agricultural Research.

The first item of the day was Harvesting in tall palms. A Mr. David, an experienced harvester from Indonesia, harvested two tall palms each with Sime's Ultraligtit and Guthrie's Lightweight Harvesting Poles for the participants to grade the poles for themselves. This was followed by demonstrations of In-field ffb evacuation systems by three agricultural machinery companies i.e. Messrs. Kubota, Teck Seng and Hap Heng. Messrs. Emdek continued the show with a superb display of their Turbo-spin tractor mounted fertilizer spreader applying aminonium chloride. The spreader was then quickly adapted on the spot to dust sulphur to a height of about fifty feet. The prelunch presentation was by Dr. Kee K.K. who updated the participants with the latest results from his Run-off and erosion studies.

A suitable buffet lunch was served at about 1.00 p.m. Lunch time entertainment was provided by Messrs. UMW's Case *1845* Uni-Loader Skid Steer accompanied by Case 80 H.P tractor and Manitou MT727. Mr. Mike Paran of UMW also provided beer to those who needed a boost in their "spirit" level.

After lunch programme comprised field visits to view A new method of establishing leguminous cover crop in oil palm with minimal weeding and the latest progress in Oil palm breeding and clonal programmes and DxP seed production. The field visit was followed by three more items at AAR's Balau field office i.e. the use of Slow/controlled release fertilizers and lightweight planting medium, Herbicide phytotoxicity in oil palm and Geographical Information System (GIS) and Global Positioning System (GPS) for use in plantations.

As most of the items discussed during the Field Day are of interest to the planters; we have decided to publish part of relevant proceedings in this issue of AAR News. The balance will be published in the next issue.

We hope readers will find them useful.

Mr. Chew Poh Soon welcoming the participants

Breakfast

UMW's highly manoeuvrable sikd steer uni-loader. Manitou M727 in the background

Ooi, L.H.

MECHANISATION OF FERTILISER APPLICATION IN OIL PALM

1. Reasons for mechanization

a) to complete the annual manuring recommendations
b) to improve fertiliser efficiencies through
   i) correct timing of fertiliser application and
   ii) correct spread of fertilisers.

The above are the pre-requisities for high yields and the achievement of the site yield potentials.

c) to improve workers' productivity and hence wages to make it more attractive for them to remain as plantation workers.

2. Machine on demonstration EMDEK TURBO-SPIN 600.

2.1 Main features

a) Hopper capacity: Maximum 600 kg. Optimum 450 kg
b) Effective fertiliser spread: 15-18 m or 2 palm rows on either side
c) Tractor speed : 3rd gear low giving a PTO speed of 540 rpm.

2.2 Performance

On Pamol estates where the fertilizers are handled in bulk, a manuring team comprising the following was able to apply 10kg fertilizer/palm in 6 applications/year over 6800 ha.

i) 1 supervisor
ii) 1 Bobcat shovel operator
iii) 1 tractor/trailer driver
iv) 4 tractor/fertilizer spreader drivers

The main advantages of bulk handling and mechanised application of fertilisers are

a) A saving in fertiliser cost of about RM3O per t (no bagging).
b) Low manuring cost of about RM23 per ton and
c) Improved workers' wages of RM30-40 per day

3. Other applications of Thrbo-spin 600

At the request of the participants, the demonstration unit was fitted with two simple funnels for sulphur dusting. The change-over was easily carried out. The unit was able to deliver the sulphur to about 50 feet height. The manufacturer is currently looking into the possibility of adapting the unit for loose fruits collection.

Mohd, M.M.

Emdek turbo-spin fertilizer spreader fitted with funnels for sulphur dusting to a height of about 50 feet

Emdek turbo-spin tractor mounted fertilizer spreader applying ammonium chloride

COMPARISON BETWEEN SIME AND GUTHRIE POLES

1) Introduction

One of the main reasons for replanting is poor crop recovery in tall palms. With suitable harvesting poles, it is possible to improve crop recovery in tall palms and hence extend the economic life-span of the palms.

2) Field demonstration

2.1 Sime's Ultra-light Harvesting Pole
2.2 Guthrie's Lightweight Harvesting Pole

Details of Sime and Guthrie poles are listed in Table 1.

The field demonstration was carried out in a 1975 planting by an experienced Indonesian harvester, Mr. David who harvested two palms each with the two poles. Results are tabulated below:-

Mr. David preferred Guthrie's pole to Sime's because the former did not sway as much and hence was easier to handle and use. The other advantage of Guthrie pole is that it is more durable and less prone to damage and breakage.

According to Mr. David, when he first came to Malaysia to work in an estate near Port Dickson about three years ago, he could hardly harvest 20 bunches a day It took him more than a year to become really proficient in harvesting tall palms. Today, he can harvest 200 bunches a day without much problem. Injuries caused by the falling fronds and bunches are obviously not uncommon. In fact Mr. David had to seek medical help three times in as many years.

Ooi, L.H.

Table 1 : Details of Sime and Guthrie poles

Particular	Sime		Guthrie	
	bottom	top	bottom	top
1) External diameter (mm)	42	38	44	40
2) Thickness (mm)	1.40	1.40	1.25	1.20
3) Weight (kg/m)	0.49	0.44	0.47	0.41
4) Weight of whole tube (kg)	3.0	4.0	3.76	3.28
5) Weight per set (kg)	20'+30'=7.0		26'+26'=7.04	
6) Material	Alluminium Alloy		Alluminium Alloy	
7) Cost per set of 2 (RM)	20'+30'=180		8m+8m+sickle=550	

	Sime pole		Guthrie pole	
	Palm 1	Palm 2	Palm 3	Palm4
Palm height (ft)	46	47	46	48
No. of fronds cut	2	4	3	19
No. of bunches harvested	2	1	2	2
Time taken (sec)	84	90	83	238

INTEGRATED IN-FIELD COLLECTION AND DIRECT LOADING SYSTEMS

Mr. David harvesting a 48 feet tall palm

(i) Kubota Agricultural Machinery Sdn. Bhd.
Product
Kubota L2050 mini- tractor (Engine gross power =25 HP; PTO power = 20 HP) fitted with Scanmech fib 270 grabber and scissor-lift trailer.

(ii) Teck Seng Agricultural Machinery Sdn. Bhd.
Product
Jentani JN204 mini-tractor (20 HP) fitted with Scanmech grabber

(iii) Hup Heng Pembekal Ladang Sdn. Bhd.
Product
Wu's Bison fitted with side loader and high-lift dumper. This is a prototype machine.

3) General impressions

Among the three, Kubota's system appeared to be the most promising in terms of performance.

The Chinese tractors (Jentani) were priced very competitively at only about half that of comparable Japanese models. Mr. Quek J.B. of Teck Seng Agricultural Machinery S/B assured the participants that the Chinese tractors are reliable, durable and cheap to maintain. They are built to OECD standards. He also assured good after-sales services.

The prototype model from Messrs HupHeng was able to collect fib on one side of the path only and thus is of limited use in its current state.

Ooi,L.H.

1) Introduction

Commercially viable systems of in-field fib evacuation and direct loading of fib with mini-tractors fitted with grabbers and scissor-lift trailers are now available.

Pamol group of estates in Kluang has been very successful with Yanmar mini-tractor fitted with grabber and scissor-lift trailer (AAR technical reports no. 20/94/OLH and 8/95/OLH/at).

2) Field Day Participants

1. Presentation

Kubota's in-field ffb evacuation system

Teck Seng's Jentani JN204 mini-tractor in action

Hup Heng's Prototype machine (Bison)

A NEW TECHNIQUE OF LEGUMINOUS COVER CROP (LCC) ESTABLISHMENT

The comparative results of the standard and new techniques of LCC establishment were presented.

2. Demonstration site

21 month old LCC established with the standard and new techniques in an ex-coconut area.

3. LCC establishment techniques

3.1 Only *Puerariaphaseoloides* @ 11½ kg per ha planted in drills spaced at 1 m apart.

3.2 Special soil and cover treatments were applied to pro mote growth of the legumes in the new technique

3.3 Weeding
Pre-planting :1 round blanket spraying with Wallop at 3 days before cover sowing.
Post-planting : Nil

3.4 Pest/disease control : Nil

4. Results

4.1 Dry matter yields (kg/ha)

4.2 Remarks

	Standard technique	New technique
LCC	4583	5633 (123%)
Weeds	3300	2050 (62%)
Litter	1310	5067 (387%)
Total	9193	12750 (139%)

Figures in brackets are % of control

Fields looked "dirty" during the initial months of LCC establishment.

5. Recommendations

The following LCC establishment procedure has been proven to be successful over limited hectarage

5.1 Soil pH and P amelioration.

Special AAR treatment

Apply the current rates of treatment before cover seed

sowing. Consult your AAR agronomist.

5.2 Pre-planting weed control

Blanket-spray the weeds using glyphosate-based herbicide mixtures like Wallop, Starmix, Round-up/Ally or equivalent mixtures. Use controlled droplet application (CDA) equipment at 25 1 solution/ha and 501 solution/ha for light and medium-thick to thick weeds respectively. Systemic herbicides have a distinct advantage over contact herbicides. The slower weed kill by the former allows for slower weed regeneration which in turn allows for longer weed-free period during the initial stage of LCC establishment.

This pre-planting weed spraying is to be carried out 1 day before cover-sowing to allow for longer weed-free period after LCC sowing.

5.3 LCC seed planting

5.3.1 Seed mixture

The recommended seed mixture is as follows:-

This mixture gives approximately 30 viable seeds per meter of planting drill.

Species	Total seeds (kg/ha)	Min. seed viability
P. phaseoloides	2.00	50%
C. mucunoides	3.00	50%
C. caeruleum	2.00	20%

5.3.2 Seed treatment

a) Soak the seeds in cold water over-night. Hot water treatment is to be avoided for scarified seeds.

b) Drain out excess water from the seeds and inoculate the seeds with Rhizobium compost at 50 g compost for 10 kg seeds. Mix seeds with compost well.

Rhizobium compost is available from RRIM, Jalan Ampang, Kuala Lumpur and cover seed species to be inoculated are to be specified when ordering the Rhizobium compost.

c) Mix the inoculated seeds with double the seed weight of JRP.

All treated seeds are to be sown on the day of treatment.

5.3.3 Planting time

As usual, LCC planting should be at the onset of wet period or as soon as land preparation is completed.

Sow LCC seeds 1 day after pre-planting weed spraying. This is to allow for a longer weed-free period during the initial stage of LCC establishment.

5.3.4 Planting pattern

a) Straight line planting areas.
5 evenly spaced drills along the interrows.

b) Contour/terrace planting
3 drills evenly spaced along the terraces,
1 drill along terrace back and another drill along terrace-lip.

5.3.5 Planting depth

Sow seeds evenly along the drills to a depth of 1-2 cm. Cover all drills.

5.4 LCC fertilisation

Consult your AAR agronomist for for specific recommendations.

Most treated viable cover seeds will germinate within 1 week of sowing and the first fertiliser application is applied in the third week after seed sowing.

Fertiliser applications should not deviate from the recommended schedule to ensure fast early growth and improved ability of the LCC to out-compete the regenerating weeds.

5.5 Post-planting weeding

No post-planting cover weeding is necessary except for the removal of strongly-competitive creepers like *Mikania micrantha* which is to be weeded bi-monthly up to fourth month after LCC sowing. Thereafter, Mikania control should be as per the usual estate practice. This weed may be spot-sprayed with contact herbicides like paraquat dichloride.

Field-weeding of woody erects/shrubs/bushes such as *Melastoma malabalrichum, Chromaleana odoratwn* (formerly *Eupatorium odoratum)* and *Clidemia hirta* will be as per the usual estate programme.

Control *ofAsystasiagangetica* may commence from the fourth month after cover sowing. 2,4-D at 4 ml in 18 1 water using manual knapsack sprayer is recommended.

Use of strongly systematic herbicides for broad-leaf weeds such as Ally, Starane and Garlon or their equivalents and mixtures for interrow weeding must be avoided at least up to six months after cover sowing to avoid setback to LCC establishment. Legume purification techniques are not recommended.

5.6 Pest and disease control

Monthly prophylactic methamidophos (Tamaron) mistblowing may be necessary up to 3 months after cover-sowing where attack of leaf-eating insects is endemic.

Control of leaf-eating *Larnprosema bisemenalis* is necessary when heavy signs of attack are noticeable.

5.7 General

The success of this technique of LCC establishment is dependent on the following factors:-

a) Improved ability of the covers to out-compete the weeds through improved vigour and growth rate of the covers which is achieved by:
   i) Adequate amelioration of the soil condition.
   ii) Adequate cover fertilisation in terms of fertiliser rates and timing of application.
   iii) Adequate inoculation of cover seeds with Rhizobium.
   iv) Uninterrupted cover growth through effective pest and disease control during the early establishment stage.

b) Improved rate of ground coverage by the covers through
   a) Adequate seeding rates of the viable seeds of the recommended cover species.
   b) Correct planting pattern as recommended.

Mohd, M.M.

USE OF SLOW/CONTROLLED RELEASE

Objective : To evaluate the possibility of using

LCC established with the standard technique

LCC established with the new technique

Mohd expounding his new technique of LCC establisghmment

USE OF SLOW/CONTROLLED RELEASE FERTILIZERS IN OIL PALM NURSERY

slow and controlled release fertilizer to substitute the conventional compound fertiliser in oil palm nursery.

Trial site : Balau Estate
Soil types : Rengam series & Bungor series
Experimental design : RCBD
Replications : 5 each on the 2 different soil types
Seedlings / plot : 6
Age of seedlings : 3 month-old seedlings at start
Polybag size : 30cm x 50 cm
Basal fertilizer : 100 g / bag of JRP mixed with soil. Trial was conducted for main nursery stage. 3-month old uniform seedlings were selected for the above purpose.
Remarks : Trial was conducted for main nursery stage. 3-month old uniform seedlings were selected for the above purpose.

Treatments :

A - Control
AAR standard; 9 rounds CCM45 compound fertiliser application.

B - SLF1 (lx 50g)
One-off application of 50g SLF 1 in the planting hole at the time of planting.

C - SLF1(3x25g)
75g of SLF 1 in 3 equal applications. First 25 g in the planting hole at the time of planting. Second 25 g as top dressing at 3 months after transplanting. Third 25 g as top dressing at 6 months after planting.

D - SLF1(1x75g)
One-off application of 75 g SLF1 in the planting hole at the time of planting.

E - SLF2 (5 pellets)
5 pellets of SLF2 buried 2 cm below the soil surface around seedling at the time of planting.

F - SLF2 (5 pellets) + 25 g SLF1
Same as E but additional 25 g of SLF 1 was given at 3 months after planting.

G - SLF3
3 equal applications of SLF3 at 50 g each. First 50 g in the planting hole at the time of planting.
Second 50 g at 3 months after planting and the third 50 g at 6 months after planting.

J - No fertiliser at all

Results: 9-month old seedlings

Treatment	Palm height (cm)		Frond length (cm)	
	Rengam	Bungor	Rengam	Bungor
A	81.2	79.4	41.1	38.9
B	79.4	79.6	39.6	39.8
C	80.1	75.6	39.8	37.1
D	**82.9**	**78.7**	**41.1**	**38.4**
E	72.6	68.2	36.3	34.3
F	77.9	74.1	38.3	35.9
G	75.1	74.0	36.6	35.3
J	55.5	55.6	26.0	26.3

Results: 12-month old seedlings

Treatment	Palm height (cm)		Frond length (cm)	
	Rengam	Bungor	Rengam	Bungor
A	101.1	99.2	75.1	72.4
B	85.3	88.1	66.0	68.5
C	94.8	89.9	73.3	69.3
D	**91.4**	**91.2**	**70.3**	**69.7**
E	74.1	70.4	58.0	56.0
F	84.5	82.2	66.6	64.2
G	85.8	85.3	65.7	65.9
J	47.6	47.6	37.2	37.6

Results: 12-month old seedlings

Treatment	Palm height (cm)		Frond length (cm)	
	Rengam	Bungor	Rengam	Bungor
A	0.88	0.82	374	362
B	0.64	0.66	354	340
C	0.76	0.68	362	338
D	**0.68**	**0.68**	**360**	**348**
E	0.50	0.52	322	322
F	0.60	0.64	342	334
G	0.62	0.68	340	340
J	0.26	0.32	284	284

Recommendations:
75 g of SLF 1 in the planting hole at the time of planting and supplemented with CCM45 compound fertiliser at 30 g per seedling at months 11 and 12.

Tey, S.H.

Objectives:

PALM KERNEL SHELLS (PKS) AND COCOPEAT AS LIGHT WEIGHT PLANTING MEDIUM IN OIL PALM NURSERY

(1) To evaluate the use of PKS and cocopeat as light weight planting medium in oil palm nursery
(2) Incorporation of SLF1 (a controlled release fertiliser) with the light weight medium

Treatments:

The following treatments were imposed and laid out in a randomised complete block design with 6 seedlings per plot and replicated 5 times (Table 1).

Method

Table 1 : Treatments

	Planting medium	Fertiliser	Rate/.seedling
A	- Cocopeat + PKS (6:1)	SLF1	75g
B	- Cocopeat + PKS (6:1)	SLF1	2x75g
C	- Cocopeat + PKS (6:1)	-	-
D	- Cocopeat + PKS (6:1)	CCM 45	180g
J	- Cocopeat only	SLF1	75g
K	- Cocopeat only	SLF1	2x75g
L	- Cocopeat only	-	-
M	- Cocopeat only	CCM 45	180g
N	- Rengam soils	SLF1	75g
P	- Rengam soils	SLF1	2x75g
Q	- Rengam soils	-	-
R	- Rengam soils	CCM 45	180g

Uniform 3-month old seedlings were selected and transplanted into 15x20 inch polybags at the commencement of the trial. SLF1 was placed at about 1-2 cm below the soil surface. Palm kernel shells were then used to mulch all the polybags to reduce weeding and caking of soil surfaces. For compound fertiliser applications, these were carried out at monthly interval.

Results:

Recommendations

1) PKS + cocopeat mixed at 6:1 ratio by weight is a suitable light weight planting medium for oil palm nursery.
2) Apply SLF1 at 75g per seedling at transplanting from pre-nursery to main nursery.
   At month 11 and 12, supplement with CCM 45 at 30g per seedling per month.

Treatment	13 month old seedlings	
	Leaf area (m2)	Frond dry wt (g)
A	0.77	420
B	0.83	437
C	poor	poor
D	0.69	410
J	0.83	419
K	0.93	451
L	poor	poor
M	0.83	424
N	0.70	416
P	0.69	404
Q	poor	poor
R	0.76	440

Cost per Seedling

The cost of fertiliser and labour to raise a 12 month old oil palm seedling is estimated at RMO.20 and RMO.47 seedling for compound and SLF1 fertilisers respectively.

Discussion

SLF1 may be suitable for large scale planting such as the oil palm nursery at Belitung Island, Indonesia.

Other advantages of SLF1 claimed include uniform seedling growth and minimum fertiliser scorching.

To a query in regard to the use of SLF1 in one-stage oil palm nursery, QYT replied that he had not used it in one-stage nursery. He pointed out that SLF1 is effective for only 7 months. Hence two split applications may be necessary

Quah, Y.T.

COMPARISON OF SLOW/CONTROLLED RELEASE FERTILISERS IN RUBBER NURSERY

Successful establishment of young budding of rubber depends upon the production of active root mass within the polybag soil medium, which in turn depends upon the correct rate and source of applied nutrients. These were initially based on fertiliser slurry, followed by slow release fertiliser nuggets (SLF2, SLF4) or combinations of nugget-slurry-foliar nutrients. A new source of "controlled" release fertiliser (SLF1) vis-a-vis the slow release types was compared with the conventional sources to evaluate the effect on growth of young budding, ease and cost of applications.

1) Introduction

2) Experimental design

o Completely randomised

	Fertiliser	Rate/bag	Application schedule
1.	SLF2 (N2)	2x7 gm	1st pellet at 1 month after sowing seed 2nd pellet at 2 months after cutback
2.	SLF4 (K3)	3x7 gm	1st pellet at 1 month after sowing seed 2nd pellet at 3 months after sowing seed 3rd pellet at 2 months after cutback
3.	SLF4 (K6)	6x7 gm	1st pellet at 1 month after sowing seed and balance were at 1 pellet per month for 5 consecutive month
4.	SLF1 (AG)	12 gm	One-off surface application at 1 month after sowing seed
5.	SLF2 + Slurry + Foliar (N2F2)	2x7 gm	SLF2 applied as treatment 1 above and slurry at 50 ml/bag, once per forthnight. Foliar solution applied twice per week.
6.	0 (Control)		Nil

- o 4 replicates per treatment (except for control, which has only 2 observation plots)
- o 100 bags (18 cm x 38 cm layflat) per plot

4) Schedule in the establishment of 2 whorls young budding

	Establishment schedule	Date	Months from sowing
1.	Sowing of seeds (GT1)	5.10.89	0
2.	Budded with PB260	15.1.90	3½
3.	Cutback	27.2.90	5
4.	End of trial	4.9.90	11

5) Results

1. SLF1 shows significant differences against SLF2 (2 pieces) and SLF4 (3 pieces) in terms of:-
   a) Percentage of plants attaining 2 whorls (Figure l)
   b) Dry weight of 2-whorl plant(Figure 2)
   c) Mean height and diameter of 2-whorl plant (Figures 3 and 4)

2. Effects of SLF1 on above parameters are generally comparable with SLF2 (2 pieces) - cum-Foliar-Slurry or SLF4 (6 pieces)

6) Recommendations

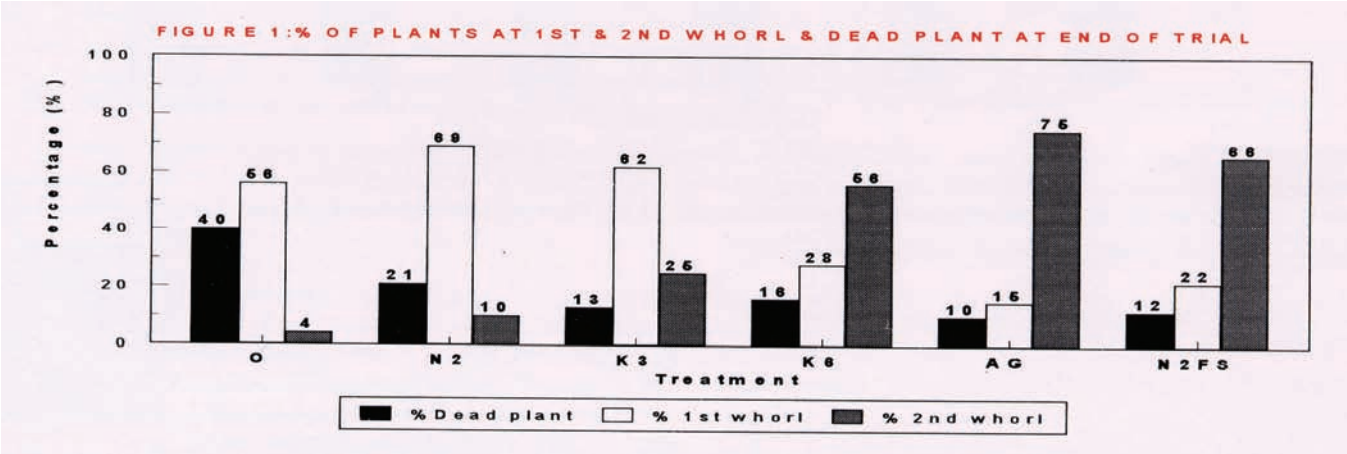
1) One-off application of SLF1 (16: 8: 9:3) at 12-15 gm per bag (18cm x 25cm layflat) is adequate for raising 2-whorl young buddings, and cheaper than application of SLF4 at 6 pieces per bag.
2) The SLF1 granules are to be applied on the polybag soil surface at 2 weeks after sowing the germinated seeds.
3) No fertiliser slurry need be applied. Foliar nutrients maybe sprayed together with fungicide solution at no extra labour cost.

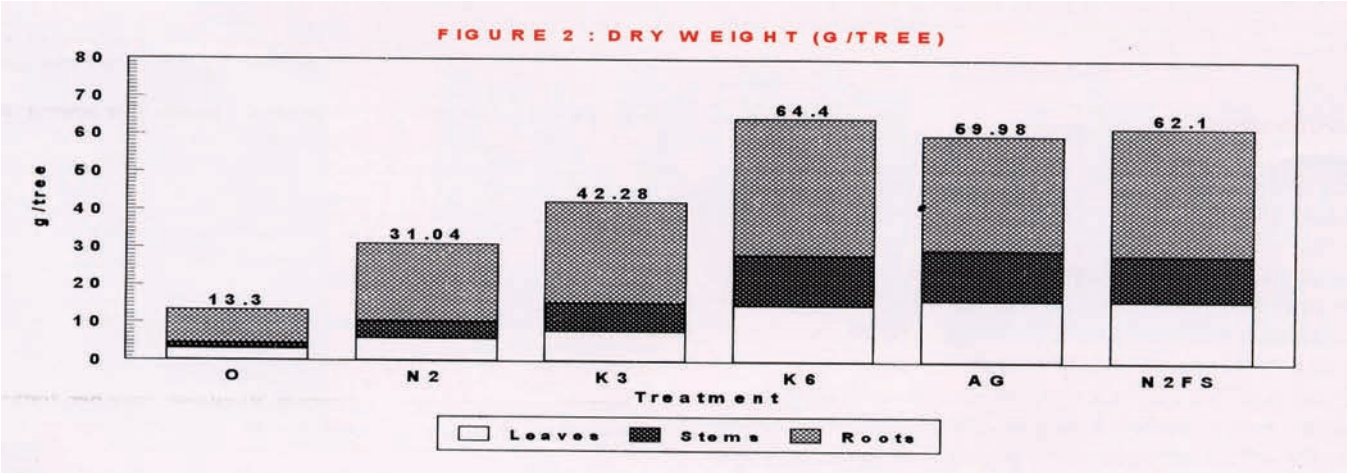
7) Comments from the participants

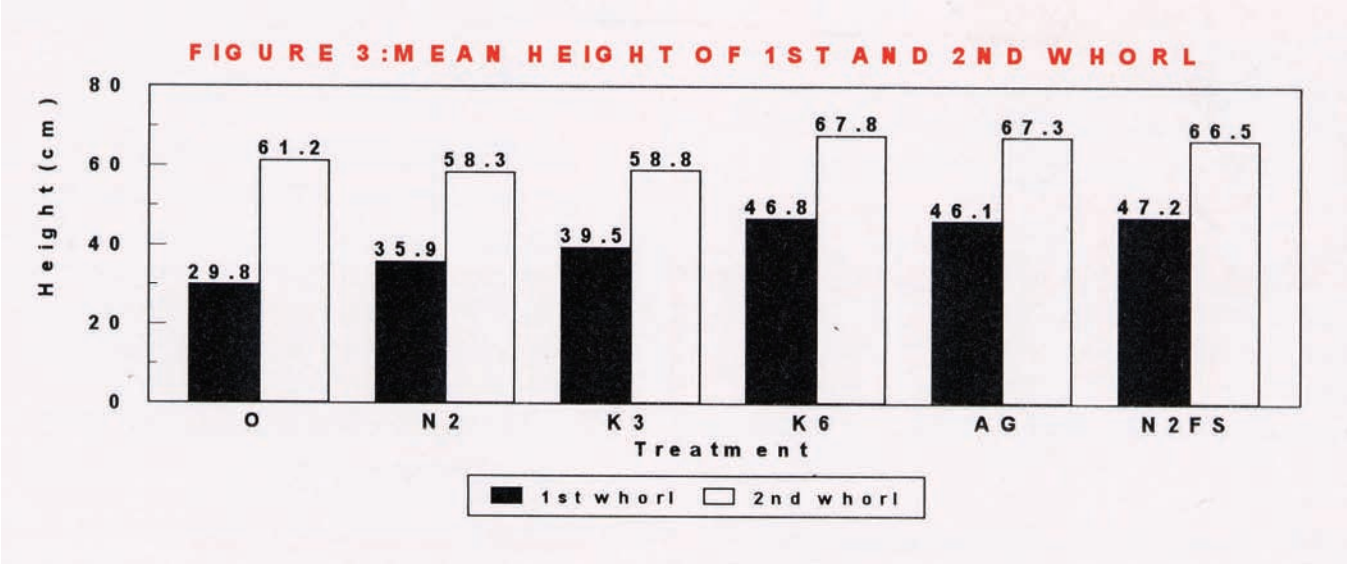
Everyone appeared to acknowledge the superiority of SLF1 for manuring rubber nursery in place of SLF4 or conventional manuring with SLF2 supplemented with foliar nutrient and fertiliser slurry. Besides the ease of application (one-off) and lower cost, it was also stated that SLF1 improved peelability of budding window of root-stock and enhanced budding success.

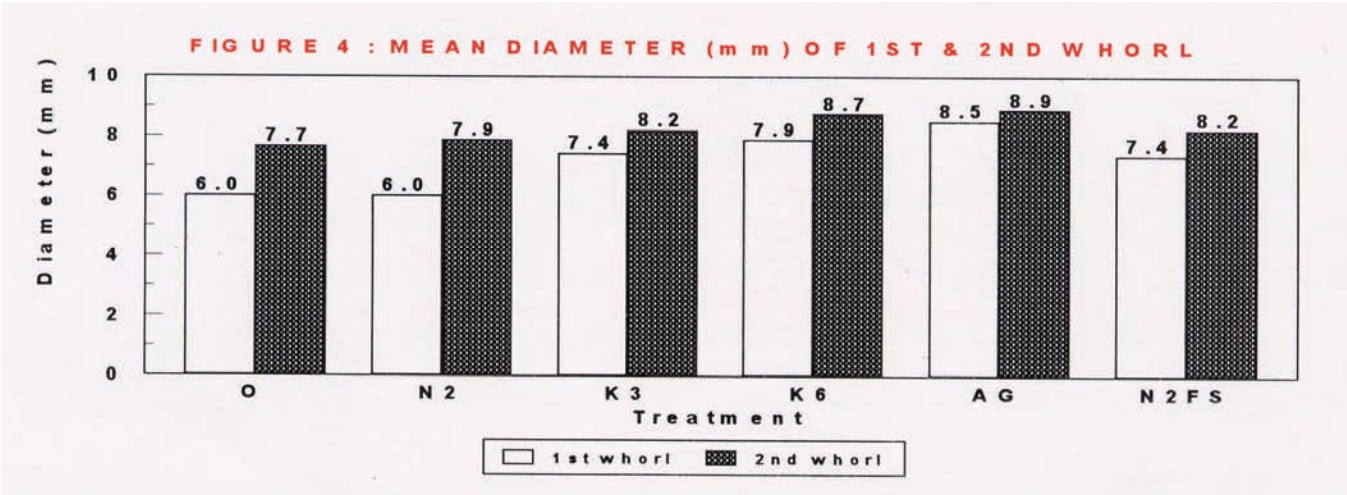
Ong, T.S.

Congratulations to:









SOCIAL AND PERSONAL

* Mdm Lim Lee Hua on the birth of her 2nd daughter on 4/9/95.
* Puan Norlela Bte. Nordin on the birth of her son on 6/10/95.
* Cik Siti Norasikin and Encik Suhaili Bin Saarani who tied the knot on 13/8/95.
* Mr. Krishnan Kumar and Miss S. Nagaletchumi who tied the knot on 9/6/95.

Welcome to:

Mr. Loh Kah Seng

Mr. Loh Kah Seng who joined us on 1/6/95 as Assistant Research Officer,to work as oil palm agronomist.

Born 1971. Home town: Taiping, Perak. Education: B.Sc,Agric., UPM, 1995 (1st class Hons). Final year project entitled "Clay-organic matter interaction and its effect on aggregation and aggregate stability of sandy soils" was awarded the Best Degree Project of 94/95 Session by the Ministry of Science, Technology and Environment.

Mr. Heng Yong Choon who joined us on 26/10/95 as Assistant Research Officer,to work with the agronomists on the AAR agrononuc database and computer applications

Mr. Heng Yong Choon

Home town: Kota Tinggi, Johor. Graduated from Royal Melbourne Institute of Technology (Melbourne, Australia) in 1994 with A Bachelor Degree Of Applied Science In Computer Science. Familiar with Oracle, C, C++ and X-Window programming tools, which run under UNIX environment. Used to work on projects such as Object Relational Database and User Interface Programming.

Staff promotions/Confirmation:

Name	From	To	wef
Cik Nora bte. Annuar	Comp. Op.	Res. Tech. IV	1/8/93
En. Rosazanian bin Moh Nor	Res.Tecb.IV	Res. Tech. Conf	1/10/95
Miss A.S. Jeyanthi A/P Alchuntah Singh	Res.Recorder	Res. Clerk IV	1/8/95
En Azhar bin Musa	Res.Recorder	Res. Tech. IV	1/10/93
En. Mohd Al Hakim MobdZain	Res.Recorder	Res. Tech. IV	1/7/95
Mr. N. Kumaran	Res.Recorder	Res. Tech. IV	1/7/95
En. Isnain Norhasan	Res.Recorder	Res. Tech. IV	10/7/95
En. Zainuddin bin Husin	Res.Recorder	Res. Tech IV	1/7/95

Chen, K.C.