October'97

AA RESEARCH NEWS

EDITORIAL

We have devoted this issue of our Newsletter to highlight the major research projects drawn up at AAR for 1998. They are broadly grouped under oil palm and rubber agronomy, oil palm breeding and tissue culture, plantation forestry, techno-economic and management, plant protection, information management and soil survey.

We hope this overview will provide you with a better insight of what we do at AAR. Please give it some thought and let us know your views. Suggestions for research in areas which you think are important but are not covered in our research programmes are most welcome.

Estate managers have always played an important role in our research work. This is particularly so in estates where our trials are sited and the estate managers are called upon to assist us to carry out the trials. We are happy to report that we can always count on the managers when help is needed.

We wish to take this opportunity to thank you for the assistance rendered and look forward to continued collaboration in our research for excellence.

Ooi, L.H.

Happiness

"The place to be happy is here. The time to be happy is now. The way to be happy is to help make others happy."

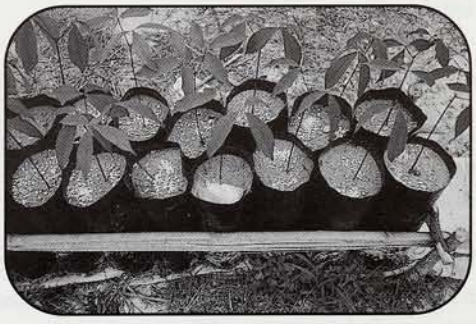
In Search of Management-Friendly And Labour-Saving Plantation Practices

← *Newly planted oil palm mulched with AA+ Palm Mulching on Paloh Estate*

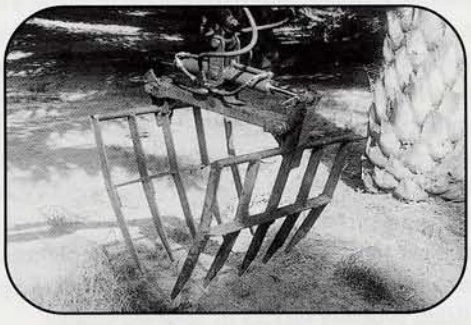
AA+ Palm Mulching

Mulching of newly planted oil palms with AA+ Palm Mulching will solve planters' woes of frequent circle weeding and manuring during the first 12 to 18 months after field planting. In addition, AA+ Palm Mulching promotes better palm growth and reduce herbicide spray drift damage to young palms.

Quah, Y.T.



Evaluation of various slow release fertilizers in rubber nursery by Chan, W.H.



A prototype Porim EFB grabber extensively modified by Tuan Hj Sharudin Jaffar of Sg. Jernih Estate

The modified grabber, attached to a Scanmech crane, is able to "grab" more than 200 kg of EFB at a time. The system has been mounted onto a "Rambo" for EFB mulching on Sg. Jernih Estate.

CONTENTS

Oil Palm Breeding and Tissue Culture - Overview of Progress and Current Strategies

Ten years have passed since AAR started oil palm breeding, seed production and tissue culture.
So far we have been evaluating and making use of the genetic materials we inherited from HRU.
We are now on the next phase of the programme where we will be making further improvements and exploitation on these inherited materials.
What we propose to do in this write-up is to give an overview of where we came from, where we are at and the direction we are heading in these related areas.

Breeding And Seed Production Overview

Basically what we inherited from HRU were 3 dura (D) trials, 3 pisifera (P) trials, 3 DxT (tenera) progeny test trials and 10 transplanted seed production pisiferas planted at Balau in 1986 and 1987.

We embarked on commercial seed production in 1989 using surrogate mother palms from IOI and Felda (as our duras were still too young) and our transplanted pisiferas at Balau. We were producing about 1-2 million seeds per year.
We began to use our own mother palms at Balau in 1992 and by 1995 we produced 3 million seeds per year from solely our own mother palms.

We produced 4.5 million seeds this year and will achieve 5-6 million by next year.

AAR materials produced todate are of good quality with low dura contamination, high yield potential and high oil content and a shorter trunk, comparable if not better than other leading sources.

From the progeny test trials, we have identified the better combining D and P parents from HRU. By concentrating parent palm selections from the selfed, sibbed and intercrossed progenies of these parents, we can make some improvements to our current DxP materials.

More significant improvement can be made when we move to the next hybrid improvement cycle where we progeny test and self/sib selected palms from the selfed/sibbed progenies of the good combining D and P/T parents.

We will also clone these selected palms to produce clonal (mono/biclonal) seeds.

These programmes are underway and we have obtained some selfed/sibbed progenies and a dura clone for field planting next year.

The DxP progenies derived from these parental palm selections in the progeny test will be duplicated and planted as identified progeny blocks in selected estates.
These will provide the ortet source pool for the scaled-up clonal propagation programme as will be explained later.

The intercrosses involving parents of different genetic origins in both the D and P sides will form the recombinant phase for sustained longer term improvement of AA DxP.

Clonal Propagation Programme

The first ortet clones we produced in 1989 were derived from HRU palms. As these were produced from our share of the HRU cultures which were received when not in a healthy state we only managed to produce a few thousand ramets which were planted as a trial in Balau and as a semi-commercial evaluation block in TRP.

The next source of explants for clonal propagation progamme were 3 recreated crosses of the top progenies in a HRU DxP progeny test trial. We produced 80,000 ramets from these materials for trials and semi-commercial plantings in various estates e.g Kampar, Paloh, A.Hitam, Golden Sphere etc

With the encouraging early results of the first ortet clone trial, recloning the ramets of the proven clones was the obvious strategy as we did not have the original ortets and a bigger number of ortets must be available for larger scale propagation.

We have produced and distributed about 70,000 ramets of these reclones to various estates but mixed together with recreated cross clones in each consignment. We have since discontinued this approach when early results indicated higher risk of abnormal plants.

The clones we produced to date have high yield potential and oil content when planted in areas which allow their expression e.g. Kampar, TRP, Balau, Coalfields.

To exploit the full potential of our clones we will confine future plantings to selected sites in selected estates where their full potential can be expressed.

From this year onwards we will be producing about 150000 ramets per year from ortets in Balau trials.
These ortets have been selected for high oil yield and short stature.

As Dumpy Avros type of materials are less well represented in the current list of clones we have decided to select ortets in high yielding AA DxP commercial fields e.g. Kampar, if available.

Current Strategies

We have worked out from our current cloning efficiency that we need to clone about 100 ortets a year to achieve a clonal production capacity of 1/2 million ramets per year. This precludes the idea of cloning the few very best ortets even if we can identify them.

One approach which may be less efficient is to select from high yielding commercial fields. We prefer to select from families which have been proven to be superior to the commercial DxP control in trials. Since 1992 we have planted identified duplicate blocks of DxP families involved in the trials. The duplicate blocks will serve as ortet source for the proven best families. We have identified at least 3 such good families.

Another approach is to make repeated DxP crosses from good combining parents and plant them as identified progeny blocks in choice sites in selected estates. These will serve as enlarged ortet source pool for large scale clonal production.

Soh, A.C.

Rubber Agronomy

1997 Highlights

The metal jacket lost its initial appeal due to reportedly poorer response than the plastic jacket despite its advantages of ease of fixing and freedom from monkey damage over the latter. Several areas on metal jacket were inspected and it was observed that fixing of the jackets had been poorly done resulting in leakage of chemicals. Estates still using the jackets have been advised to spike the device to the correct depth of bark to prevent leakage.

The trials on advanced planting material and young budding have been completed. Results were presented at the International Planters Conference in May 1997 and the paper was well received.

Two whorled buddings of the RRIM2000 series which are latex timber clones have been sent from Kerling estate to regional centres for further multiplication.

Mainly satisfactory to good results were obtained from sulphur dusting of PB217 in Bahau, Karak and Central Perak. Success was poor in GT1 areas. All PB217 in these areas should continue to be dusted in 1998.

Under commercial activities, a new ethephon product, Esigel, was formulated for sale to outside estates. Hiftech Sdn. Bhd. continued to market AAR exploitation products.

Trials terminated

i) Rainguards

The two trials on metal rainguard would be terminated end 1997. The rainguards were found to be ineffective as they loosened and dislodged from the bark after 4 months.

ii) Exploitation

The trial on short cuts combined with stimulation in Sg. Gapi Estate was terminated after 18 months due to sale of estate. All treatments on short cuts suffered precoagulation of latex on the tapping cut, particularly during refoliation.

iii) Planting practices

The trial on improvement of growth of immature rubber in a marginal soil area in Segamat was terminated after 30 months due to lack of response to use of larger planting hole and mulching.

Trials in progress

i) Exploitation

a) Short cuts with stimulation (2 trials)

Over 24 months, the trial in Kombok estate gave about 5% lower yield and in Sg. Kawang estate 40% lower yield where severe precoagulation of latex on the tapping cut was experienced.

b) Low frequency tapping with stimulation (7 trials)

Over 24 months, yield per tapper of PB217 rose by 30-50% on 1/2 Sd4 + 6-8 rounds of 2.5% E compared with 1/2 Sd3 control. Yield per ha ranged from 2% lower to 12% higher than control.

On PB260, yield per tapper was 9 to 13% higher on 1/2 Sd5 + 6-8 rounds of 2.5% E compared with 1/2Sd4 control. Duration of recording was also 2 years. Over 1 1/2 years, yield per tapper of RRIM600 increased by 42% on 1/2 Sd4 + 6-8 rounds of 2.5% E compared with 1/2 Sd3. Yield per ha was also higher by 6-8%.

Two more trials evaluating the above systems on clones PB260 and PB217 were laid down recently. Results are preliminary.

c) Evaluation of Esigel with low frequency tapping systems.

Six trials were laid down in mid 1997. Results are preliminary.

ii) Control of leaf disease

Three trials on sulphur dusting to control Oidium SLF were laid down in early 1997. Improved canopies were observed in two trials. Yield results are preliminary.

New trials

i) Two trials on slow release fertilisers have been planned on nursery rubber.

The latex timber clones (LTC) comprising the RRIM2000 series have been sent to other estates as two whorled buddings for further multiplication. These clones will be planted in commercial blocks from 1999 onwards.

Chan, W.H.

Oil Palm Agronomy

The short to medium term OP agronomic research programme at AAR may be divided into 3 broad areas :-

1. Maximum yield and site yield potential (SYP) programme
2. OP nutrient balance and cycling programme
3. Efficient fertiliser use and responses programme

1. Max. yield and SYP programme

There are 3 projects in this programme

a) Max. yield project

There are currently 2 existing trials and 2 new trials proposed for 1998. The main objective of the project is to maximise OP yields on any given site, taking into consideration the yield limiting factors that may be present for the site. The yield limiting factors are identified and where possible appropriate agronomic inputs are drawn up to minimise these limitations. The site yield potential is estimated and the trial is set up to test if the SYP can be achieved with all the appropriate inputs given. Results from these multifactorial trials will help to verify the SYP model. The effects of various factors tested can be quantified and will provide data for further refinement of the model. In addition, these trials will provide reliable data for vegetative growth and yield profile of current oil palm planting materials from planting to maturity. One of the proposed new trials (MF5/98) will be on AAR clonal materials to test clone x environment interactions.

b) Site characteristics and SYP project

There are 2 trials in this project. The main objective is to evaluate specific site factors that affect OP yields. High watertable, poor or inadequate drainage have been identified as common limitations for oil palms on riverine and alluvial flats. Thus in SE4/97, the effects of poor drainage are assessed in 2 estates.

The study will include assessment of current drainage status, drainage requirement in terms of depths and intensity, and how to plan and maintain an effective drainage system.

In SE2/93: The effect of various replanting techniques on soil chemical and physical properties will be assessed including the effects on subsequent OP yields.

c) Yield Improvement Project

In this project, a number of relatively lower yielding estates were selected for more detailed study. SYP of the estates were estimated and compared with actual yields. Where large discrepencies occur between SYP and actual yields, possible yield limiting factors are identified and appropriate agronomic inputs drawn up for correction and yield improvement. Yields are then monitored to check effectiveness of the recommendations.

2. Oil Palm Nutrient Cycling and Balance Programme

There are also 3 projects in this programme

a) Runoff and erosion studies

The main objective of this set of trials is to assess the amount of nutrients lost via surface runoff and soil erosion on sloping land especially after fertiliser applications. Results todate indicated that substantial nutrient losses can occur and timing of application is a crucial factor in reducing such losses. Results from these trials will provide data for computation of nutrient balance in the oil palm system and therefore enable us to make more accurate estimates of fertiliser requirements. This will directly help to improve our fertiliser recommendations to the estates. We will also be checking the effect of nutrient sources (eg. AS vs urea vs compounds) on these losses in the next phase in 1998.

b) Nutrient requirements and distribution in oil palms

In this series of trials , whole palms are dissected and sampled from our trial at various ages to determine the dry matter (DM), growth and nutrients immobilised in the oil palm from planting to maturity. Results from this work provide valuable data for our oil palm growth and yield model. The model when fully completed will enable us to predict growth and yields as well as the impact of various factors on these 2 parameters. So far we have 5 data sets for palms ranging in age from 18 months to 7 years.

c) Oil Palm mineralization project

In line with greater awareness of sustainability and environmentally friendly practices, the emphasis now is maximum utilisation of palm oil mill by products eg. POME and EFB. There is also an extremely large pool of plant nutrients in the palm canopy and trunk at replanting. In mature palms, pruned fronds totalled > 10 t DM/ha/yr.

In the OP mineralization project, the main objective is to quantify the nutrients present in these oil palm residues and by products as well as to quantify the rate of nutrients released from these sources. Ways to recycle the nutrients can then be formulated to possibly reduce the dependence on costly inorganic fertilisers.

3. Fertiliser response and efficient fertiliser use programme

There are 2 main projects in this programme.

a) Efficient fertiliser use project

Currently there are 3 trials covering the following areas:

(i) P dissolution of various phosphate rocks

(ii) Effects of soil moisture and rainfall intensity on fertiliser losses and

(iii) Efficiency of AS fertiliser in young oil palms

The overall objective is to understand the dynamics of fertiliser-soil-plant interactions once the fertiliser is applied. This will help to improve our fertiliser use efficiency.

b) Fertiliser response project

This is a series of trials in Sabah to determine the fertiliser response of oil palm in various soil types and climatic conditions in Sabah. Uptil now there has been very few good fertiliser trials in Sabah. These trials will fill this gap and provide the necessary fertiliser response curves to enable us to make more site specific recommendations in Sabah.

In the near future, we will also be setting up fertiliser response trials in Indonesia in view of the increasing OP areas over there.

Kee,K.K.

Techno-economic and management

The main task of the techno-economic and management (TEM) team is to study the technical and economic aspects of estate management with the principal aim of improving the efficiency of estate practices and productivity of the workers.

Todate, the TEM team has developed several labour saving planting practices for the estates. For example, the no weeding technique of leguminous cover crop establishment, the use of plastic sheet mulch for newly planted oil palm and slow release fertilizer for the nursery.

In regard to mechanisation, the TEM team has successfully promoted wider use of mini-tractor fitted with grabber and highlift trailer for in-field ffb evacuation and EFB mulching and tractor mounted mechanical spreader for fertilizer application in the estates. However, problems like difficult terrain, resistance to change, unsatisfactory productivity, frequent breakdown of machinery, inadequate planning, construction and maintenance of in-field mechanisation paths have hampered the acceptance of these mechanisation work.

Some of these problems will be investigated in the following on-going and new projects :-

1) **Trial TEM/FAM 97-1** : To study the land preparation and maintenance requirements and costs involved in the introduction of mechanised in-field ffb evacuation and fertilizer application in oil palm estates.

This trial will also investigate the effects of the following factors on in-field road construction and maintenance :-

1) Load bearing capacity of the soil
2) Terrain
3) Drainage
4) Rainfall
5) In-field road construction and maintenance techniques
6) Traffic

2) **Trial TEM/FAM 97-3** : To use aerial photographs, GPS/GIS for planning and design of an efficient road and transportation system for mechanisation of in-field ffb evacuation and fertilizer application in oil palm estates.

Preparation of basic maps and desk study of Bebar estate which has been chosen for the study has commenced. Field evaluation will be carried out in 1998.

3) **Trial TEM/FAM 97-4** : To study the impact of mechanisation on soil physical properties, interrow vegetation and yields in oil palm estates.

This trial was proposed to investigate the probable adverse consequences of mechanisation such as soil compaction, damage to interrow vegetation (bare ground) run-off/erosion and yield depression.

4) **Project TEM/FOPP 98-1**: To study the needs of the oil palm plantations of the future.

As our country progresses towards industrialisation, the oil palm industry will have to adjust itself to keep up and compete with the other sectors.

The oil palm plantations will experience greater labour and wage pressure. At the same time, plantation practices will have to be more environmentally-friendly.

A likely scenario in our future oil palm plantations is that there will be fewer but more skilled workers, more operations will be mechanised or automated and a shift towards zero emission. This calls for drastic changes in the way we manage our plantations. This project will look into the future management/labour/technological needs of the oil palm plantation industry.

The other on-going trials under TEM are :-

Oil Palm Replanting System

1) **TEM/OR1/97** : To quantify and qualify oil palm replanting management and operations (Tuan Mee estate).

This project looks at ways to assist the manager in planning and implementing efficient replanting programme of oil palm.

Oil palm new planting - labour saving technique and system

1) **TEM/WC 14/96** : Plastic mulching of newly planted oil palm in the field (Batang Jelai estate).

This is the third trial since 1992 on plastic mulching of oil palm new planting. This new technique has been modified to simplify the technique and reduce the labour requirement during first two years of oil palm new planting.

2) **TEM/WC 15/97** : Plastic sheet mulching of new oil palm plantings in the field (Paloh estate). This trial has two objectives, namely :

a) To determine the cost and labour requirements of a 100 -ha plastic mulching in a new oil palm planting.
b) To evaluate the effects of plastic mulch on the growth of oil palm.

This trial has been started in Paloh in Aug.,1997.

3) **TEM/Ad hoc(1)/98** : The use of SRF (slow release fertilizer) in oil palm nursery (Balau).

Currently, only one brand of SRF has been recommended for oil palm nursery. In view of the very high price of this product, a new range of cheaper products will be tested for use in oil palm nursery.

Ooi, L.H. Mohd, M.M. & Quah, Y.T.

Crop Protection

1. Pest control in oil palm

1.1. Control of *Oryctes rhinoceros* in oil palm

The control of rhinoceros beetles in oil palm ,especially oil palm to oil palm replants, is the most pressing crop protection problem in oil palm now. Thus, the control of this pest is a thrust crop protection project in 1998 and for the next 2-3 years.

The main objectives of this project are to refine the present techniques, to develop new techniques for better control of the pest and to reduce labour requirements for its control.

a) Chemical control

The 2-weekly cypermethrin spraying has been effective against rhinoceros beetles. However, inadequate labour to maintain the high spraying frequency has resulted in unsatisfactory control in many estates.

A concluded trial (RBC No. 96/7 (1996-97)) evaluating the feasibility of reducing the interval of cypermethrin spraying, to reduce the spraying labour requirement, through increasing the cypermethrin dosage and addition of adjuvants did not give positive results.

AAR is currently collaborating with M/s Emdek Sdn Bhd to produce a spraying system to mechanize cypermethrin spraying. After 4 field testings, this exercise (RBC No. 97/13 (1997-98)) has come out with a final version, which is a 1-man operated tractor mounted spraying system. This will be demonstrated to the planting personnel of M/s BEA and TPSB in April, 1998.

Mechanization of cypermethrin spraying with this spraying system will reduce labour requirement for chemical control of rhinoceros beetles by many folds. However, the non-provision of in-field access paths in most oil palm to oil palm replants will be a major hindrance. The need for these paths from the start of replanting should be reconsidered, especially in areas with endemic rhinoceros beetle problem.

Further work on the chemical control of rhinoceros beetles in 1998 is confined to the evaluation of nozzles and sprayers to further refine cypermethrin spraying (RBC No. 97/11).

b) Cultural control

The approach taken now for effective long term and immediate control of rhinoceros beetles in oil palm to oil palm replants is to reduce the population of the pest through reduction of its breeding in the replants.

A concluded trial (RBC No. 96/5 (1996-98)) evaluating the effect of various treatments of the previous palm trunks on rhinoceros beetle breeding in an oil palm to oil palm replant showed that the shredded palm materials allow minimal beetle breeding for about 9 months after palm felling when thinly spread over the interrow areas. The shredded palm materials, when heaped or windrowed, breed beetles for 2 years, while intact felled trunks breed beetles for about 2 1/2 years before their decomposition is completed.

However, when 2-3 m wide mechanisation paths are provided for in alternate interrows, the spread of the shredded palm materials will not be thin enough to minimize beetle breeding (RBC No. 96/6 (1996-2000)).

The barrier technique has been very promising in preliminary trials (RBC No. 97/12 (1997-98)) in reducing beetle breeding in the biomass of the previous palm trunks in oil palm to oil palm replants. A series of trials (RBC No. 98/16 - 20) have been proposed over the next 3 years (1998-2000) to develop this technique into an effective cultural measure for the control of rhinoceros beetles.

This technique has also been proven to be a good research tool for the study of certain aspects of rhinoceros beetles (RBC No. 97/12)

Patent application for this barrier technique is under preparation.

c) Biological control

A trial (RBC No. 98/ 15) has been proposed for 1998 if a ready to use formulation of virus is available.

d) Advisory work

More time will be spent in 1998 to evaluate the effectiveness of rhinoceros beetle control in commercial areas and to assist estates to achieve better control of the pests.

1.2. Control of other pests and diseases of oil palm

a) Propagation of host plants of predators and preliminary evaluation of its effects on the populations of leaf eating caterpillars in oil palm will be initiated under ad hoc studies in 1998.

b) Other work mainly involve assisting estates to control problematic outbreaks of pests and diseases.

2. Ground cover management

The prime objectives are to reduce labour requirements for leguminous cover establishment and weed control and to reduce herbicide phytotoxicity in immature oil palm.

2.1. Establishment of leguminous covers

The usefulness of controlled/slow release fertilizers for leguminous cover establishment (GCM/CE No. 98/13) and the feasibility of sowing the cover seeds by broadcasting prior to palm felling (GCM/CE No. 98/14) will be evaluated in 1998. These techniques, if successful, will significantly reduce labour requirements for leguminous cover establishment, in addition to the " no weeding" technique of leguminous cover establishment developed earlier.

2.2. Weed control in immature oil palm

High labour requirements for weeding and high risk of herbicide phytotoxicity are the main problems in weed control in immature oil palm. With current herbicides and herbicide applicators, the scope for improvement is very limited.

An alternative approach is to control the weeds prior to replanting. 2 trials (GCM/WC No. 98/1a and 1b) have been planned in 1998 to look into the feasibility of this approach.

Mohd M.M.

Information Management

The 1998 research programme is drawn up primarily to complete the 1997 research objectives and place AAR in a good position to exploit new technologies and development in computer science. Therefore, the emphases for 1998 are to fine tune and validate the individual modules, compile each module as a stand-alone package, and integrate the modules into a full-fledged software package. This will be carried out under trials CM1/92 to CM5/96.

CM6/96 will be expanded to include palm census, determine the planting density and assess the planting pattern in the estate using remote sensing. These factors are partly responsible for the site yield potential in the estate and are critical towards many management decisions.

Four new projects are proposed,

i) CM7/97 on "Development of knowledge-based expert systems for pest and disease control and mixed weed control" using induction learning method,

ii) CM8/97 on " Creation of an intelligent search engine in oil palm database" using fuzzy logic,

iii) CM9/97 on "Intranet and multimedia system for plantation (office) management", and

iv) CM10/97 on "Development of intuitive data mining tools for oil palm database" using induction learning method.

These experiments explore some useful tools in computer science and set the stage for AAR to capitalise on new technologies in precision agriculture. For example, we need an expert system to recognise weeds in plantation (CM7/97) before the machine can identify and control them in the fields (there is active research on this in the USA now). Moreover, AAR will have an increasing circle of new research officers who will contribute to the decision-making process and advise the estates on the best practices. Although they may not actually make the final decision yet, these people are responsible for giving recommendations based on their knowledge of the business (industry). Most of them, if not all, are not data analysis specialists or statisticians and therefore, need data mining tools (CM 10/97) that are easy to understand but nevertheless reliably reveal the multi-faceted relationships in oil palm industry. This should allow them to more quickly and knowledgeably recommend actions to the management that are consistent, accurate and transparent to the stakeholders.

Goh, K.J.

Soil Survey

The objectives of our soil survey programme have been expanded to include:

i) the study of geomorphology and genesis on soil development in Sabah and Indonesia, and their implications on the management of oil palm,

ii) the development of a soil-climate classification system for oil palm in Malaysia and Indonesia, and

iii) the identification of problems in using Soil Taxonomy for field mapping.

These aims complement our current 3 basic (primary) objectives as follows:

i) To map and update the soils inventory of all AAR advisory estates. Detailed or semi-detailed soil survey will be carried out and soil survey reports with soil maps will be produced. Other supplementary data eg. terrain, climate, etc will be included to allow crop-soil suitability assessment for the estates.

ii) To collect and update relevant manuring block and estate data for all AAR advisory estates in order to build up the database required for computerisation of the AAR fertiliser recommendation system. The database also provides the bases for implementation of our on-going yield improvement project.

iii) In conjuction with the GPS/GIS team, the soil survey team will also assist in GPS mapping of the estates prior to actual soil survey and/or GPS mapping for special purposes eg. block boundary, road maps, replants etc.

In addition, the soil survey section will conduct soil inspection/soil surveys (as appropriate) when requested by the principals to assess the soil suitability-crop potential of new areas prior to acquisition or development.

Goh, K.J.

Plantation Forestry

The venture into the cultivation of timber trees by AAR's principals was prompted by several reasons. The main ones are :-

Firstly, there is a severe labour shortage in the traditional plantation crops, in particular, rubber where tappers are scarce.

Secondly, on hilly terrain unsuitable for oil palm and where tappers are not available for rubber, planting of timber trees appears to be the logical choice.

The third reason is both social and economics. Tropical timber is expected be in short supply due to the dwindling natural forests and the world-wide concern to preserve these forests. Member countries of International Tropical Timber Organisation (ITTO) have agreed to trade only tropical timber that is produced on a sustainable basis by the year 2000.

Forest plantation is much easier to manage on a sustainable basis and the market for timber produced is expected to be good. Thus, high value timber trees have the potential of becoming the third plantation crop.

The research programme for plantation forestry is planned in the following phases:

1) Timber species evaluation
2) Mass vegetative propagation
3) Silvilculture and field management
4) Timber qualities
5) Thinning, logging, kiln drying and sawmilling

Phase 1 - Species evaluation

High value timber species are currently being evaluated in trials in Sabah, Kelantan, and Selangor. Small-scale plantings on a commercial basis have started in Trengganu, Kelantan, Pahang, Sabah and Sarawak.

After three years, the timber species identified to have good potential are the mahoganies, teak and a very fast growing timber called Gmelina.

Phase 2 - Mass vegetative propagation

After selecting potential species for commercial planting, we realised the problem of obtaining large and constant supplies of good and reliable planting materials.

Propagation trials, nursery techniques and systems were investigated over the last three years for various species. The results have been so encouraging that we have recently set up a mass propagation nursery at Renjok estate that will produce 100,000 rooted cuttings this year. Production is expected to increase to 1.2 million in three years' time. These planting materials are for AAR's principals' planting programme.

Phase 3 - Silviculture and field management

The trial plantings for species evaluation are in their third year. Various planting density, pruning, thinning and fertiliser treatments have been imposed along with the species evaluation.

Growth habits of these species from field planting are closely monitored so that appropriate silvicultural regimes can be formulated to provide guidelines for commercial plantings.

Plantation forestry differs from oil palm and rubber cultivation in that the planting density is very high. Thus the work involved in the nursery, field planting and upkeep differs considerably. New planting techniques and systems need to be developed.

Phases 4 and 5

Only Gmelina have undergone thinning operation while the other species are still too young to be thinned currently.

Results

Although several suitable timber species with good growth have been identified, there are still many unknowns to be solved. Many problems such as choice of planting materials, pests and diseases and management problems in the field have been encountered. It would probably take another 5 to 10 years before large scale commercial plantings can be recommended with a high degree of confidence.

Quah, Y.T.

Developments of Promising Timber Species For Plantation Forestry

Vegetative propagation nursery on Renjok Estate

18 months old teak (*Tectona grandis*) on Jatika Estate

Two years old mahogany (*Swietenia macrophylla*) on Balau Estate

***Gmelina arborea* on Jatika Estate (2 3/4 years old)**

Quah, Y.T.

SOCIAL AND PERSONAL

Congratulations to :

Madam Lutchumy a/p Poosari - birth of 1st child - Gunaselan a/l Subramaniam on 17/8/97.

Cik Norimah bt Mohd Amin - married to En Mohd Nadzri B. Burhan on 3/8/97.

Staff promotion/recruitment

Name	Date joined/promoted	Designation
Taliu bin Mudah	01/07/97 (Promoted)	RA IV
Suzame Bin Yusuf	01/08/97 (Promoted)	RA IV

Chen, K.C.