AA RESEARCH NEWS

Oct '90

EDITORIAL

AAR's Research Programmes

In this issue of AAR News, the main research results at AAR for 1989 are highlighted to make readers aware of the progress of the research programmes. Research and development (R&D) work is one of the principal functions of AAR and is vital for maintaining a vigorous and competitive situation in the estates. Good R&D programmes and work are essential in our industry now hard-pressed by severe constraints of labour, rising costs and low commodity prices.

Research in perennial tree crops especially production research presents several great difficulties and challenges. The very long time interval for results and the neccessity to lay down large field trials for recording and maintainence over many years are probably the most problematic. Large resources in terms of land, man-power and supervision and exclusion of extraneous factors are all required. Cooperation and help by managers of host estates are essential to ensure the fidelity of the trials.

The very large effort and costs involved therefore makes it essential that the research objectives and results obtained are worthwhile. This is particularly so as the industry (especially rubber and oil palm) may now be considered to be 'mature' in terms of basic information and planting practices in many aspects.

AAR's research programmes are drawn up by the research officers after studying the principal problems and needs of the estates, followed by discussions with colleagues and vetting by the section heads. For major research programmes eg. oil palm tissue culture, a research group may be set up to discuss periodically the programmes, results and further research needed. A research committee has been set up to vet proposals for all major trials. AAR has also an external consultant who visits every three years to discuss the research programmes, results and new directions. Further, the research officers are encouraged to discuss their projects with relevant experts where available. All the research programmes are submitted and approved by AAR Board.

AAR is still a 'young' organisation, particularly in terms of its research programmes and trials. However there has been significant progress made in a number of areas as seen in the results highlighted in this issue. Todate the emphasis in the research has been more on the 'technical' aspects eg. run-off of fertilizers rather than the 'practical' aspects of planting practices. It is appreciated that the latter is now a great problem with the shortage of labour and research officers have been requested to look into feasible ways of improving the situation. However it is probable that in these areas the managers, assistants and field staff faced with the problems everyday and knowledgeable about their field conditions are in better positions to generate new ideas for evaluation and testing. Where necessary and possible, AAR will be pleased to assist in evaluation of the technical aspects involved eg. effects on growth of the palms or soil properties etc. and co-operate or assist in laying down observations and trials. Recognising the complaints of 'stealing' of ideas made in "The Planter" magazine in early 1989, AAR has no hang-ups over giving credit where it is due. We are present to try and help the estates within our capabilities.

COCOA RESEARCH THRUST AND 1989 TRIAL RESULTS

1) COCOA BREEDING AND SELECTION

The main emphasis is to breed, evaluate and select for materials that are high yielding, have satisfactory bean quality and are tolerant to VSD (Vascular Streak Dieback) disease.

Two separate but inter-related programmes i.e. breeding to produce new hybrids and selection for outstanding clones are being pursued concurrently to achieve the objectives.

1.1 Progeny trials

New trials

Three progeny trials have been laid down in 1989/90 to evaluate new hybrids derived from VSD resistant parents. The main aim is to select outstanding individuals for planting as clones. Another such trial will be drawn up jointly with another plantation research company in 1991.

As the trials have all been planted only recently, it is too early to draw any firm conclusions at this stage.

Old trial

There was only one trial planted in Sept.'85 in Sandakan. The top ten crosses from the Department of Agriculture (DOA) Sabah Series III progeny trial were evaluated against UIT1 x NA33 and ICS60 x NA33 control hybrids.

All the Series III hybrids except PA76 x P4 and PA156 x P4 outyielded the control hybrids. Unfortunately, all the outstanding hybrids have small bean size with bean count of more than 100 beans per 100 g. Hence they cannot be recommended for commercial scale planting unless the bean size can be improved.

A good attribute of the Series III hybrids is that they are generally more tolerant to VSD.

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HIGHLIGHTS

Some outstanding individuals that are both tolerant to VSD and have bean weight of 1 g and above will be selected for clonal trials.

1.2 Clonal trials

New Trial

A trial to compare the performance of some of the widely planted VSD tolerant clones and some selected seedling hybrids has been laid down in 1989. The clones were planted as fan-buddings.

The main aim is to confirm the performance of the recommended VSD tolerant clones. The other purpose of the trial is to check the differences between clones and seedlings.

Early results indicated that seedlings tended to succumb to VSD more easily than the clones. The morphology of the cocoa plant appeared to play an important role in the resistance mechanism during early establishment. Newly planted young seedlings having only a single growing point once attacked by VSD usually died or became severely stunted and deformed and seldom recovered into normal plants. While the fan-buddings if attacked appeared to possess greater ability to recover and grow into normal plants.

Old trials

More than 300 clones from various sources have been evaluated in five trials, four of which are in Sabah. The promising clones are being shortlisted for further proof clone trial.

2) COCOA AGRONOMY

The main thrust area is to define the nutrient requirements of cocoa more accurately. Yield improvement through liming, foliar fertilizer, pesticides and maintaining a second storey of fan-branches are also being investigated. A cocoa/oil palm and cocoa/coconut intercropping trial has also been laid down.

2.1 Nutrition trials

Two nutrition trials have already been laid down and another three more will be put down in 1990/91 to investigate the NPK and liming requirements of cocoa in Sabah and yield improvement through application of foliar fertilizers and pesticides in Pen. Malaysia.

The nutrition trials involved are :-

1) P sources, method of application and rates trial (laid down in Nov'88. Treatment started in Jan.'90)

2) fertilizer rates and application of foliar fertilizer on newly matured cocoa to sustain and improve high early yield (trial started in July '89)

3) NPK trial

4) liming and fertilizer requirements of cocoa and

5) effects of Grofas foliar fertilizers and pesticides on cherelle wilt and yield.

For the first trial, only the pre-treatment results are available. Hence, it is too early to draw any meaningful conclusions at this stage.

Initial results (July - Dec. '89) from the second trial indicated that 0.5% Grofas Calplus (15:15 + 20 CaO + TE) applied as foliar spray at 250 ml/plant/application during the peak cherelle formation period for three months at 10-daily intervals has a positive effect (though statistically not significant) on yield and canopy growth (leaf flushing) of cocoa.

2.2 Miscellaneous

One trial each on cocoa/oil palm, cocoa/coconut intercropping and single, double storey cocoa.

The main objectives of the two trials are to find out the most profitable intercropping system and to check if it is possible to improve the yield of cocoa by having a second storey of branches.

The trials are still new and it is too early to draw any recommendations at this stage.

CONCLUSION

In comparison to oil palm and rubber, cocoa is considered a relatively new crop. Many agronomic problems have yet to be solved. It is an exciting crop with tremendous scope for further improvement. Much progress has, however, been achieved. With the current planting materials and expertise, it is now possible to obtain yield in excess of 1.5 to 2.0 t/ha under suitable growing conditions. At 1.5 t/ha, the cost of production is about $2/kg dry beans. For the efficient producers, there are still profits to be made from cocoa even at current low prices.

OOI, L H

RUBBER RESEARCH HIGHLIGHTS – 1989

The highlights of the 1989 rubber research programme were:-

a) tree dryness in PB260 and PB235 clones
b) rainguards
c) stimulation of old rubber prior to replanting
d) chemical control of White Root Disease
e) evaluation of APMs as a form of planting material

Tree dryness in PB260 and PB235

The survey in 1988 to assess the dryness incidence of PB260 and PB235 in some group estates was continued in 1989. The results indicate that moisture stress is probably an important factor influencing tree dryness, manifesting in much higher tree dryness on shallow soil areas where moisture stress is higher than on deep soils where moisture stress is lower. This is shown in Table 1.

Table 1 : Influence of moisture deficit on tree dryness

Estate	Field details	Soil series	Panel	Period tapped	Mths/yr. with moisture deficit	Dryness %
A	81/90	Gajah Mati	BO-1	7	3.0	4.3
	PB235	Bungor	BO-1	7	1.0	0.8
B	79A/79	Malacca	BO-1	29	3.6	6.0
	PB235	Prang	BO-1	29	2.0	3.5
C	80/41	Gajah Mati	BO-1	31	1.0	8.9
	PB235	Munchong	BO-1	31	0	4.6
A	76/12	Gajah Mati	BO-2	72	4.1	16.8
	PB260	Segamat	BO-2	72	1.0	7.3

One of the measures to minimise tree dryness therefore would be to confine the planting of dryness prone clones to deep soil areas.

Rainguards

Three trials were laid down to compare the effectiveness of three types of rainguards and one trial to evaluate the economics of aluminium based rainguards. The results are shown in tables 2 and 3.

Ebor Eaves gave the best performance among the rainguards in two locations where there was considerable monkey damage to the other rainguards. In the absence of monkey damage in the other locations, Ebor Eaves and AA Experimental Rainguards were generally similar in effectiveness. RRIM GUD was poorest.

Table 2 : % leakage of rainguards

Location	Rainguard		
	AA Experimental	Ebor	RRIM GUD
Estate A	10	8	24
Estate B *	28	15	54
Estate C *	59	37	67

with monkey damage.

Owing to premature monkey damage to the aluminium based rainguards, a loss of $95.00/ha over 12 months was incurred in the rainguard areas compared to the control.

Table 3 : Economics of AA Experimental Rainguard (SMR CV = $2.50/kg) - 12 months

Item	Rainguard		Control	
	No.1	Scrap	No. 1	Scrap
Yield (kg/ha)	1290	373	1215	405
Gross revenue ($/ha)	4064		3948	
Expenditure (")	1884		1673	
Profit (")	2180		2275	
Loss (")	(95.0)		-	

On the basis of the results, it would appear that aluminium-based rainguards should not be installed in areas infested with monkeys.

Stimulation of old rubber prior to replanting

Three trials on the above were laid down in 1987 and results to end 1989 are shown in Table 4.

The results indicated a clonal variation in yield response to increased frequency of stimulation.

GT1, a slow starter clone gave a sustained response over the period reviewed while PBIG and RRIM605 showed a decline in response when the frequency of stimulation was increased from 12 rounds to 18 rounds.

For GT1, 18 rounds (rds) x 5 % ET (Ethephon) gave the highest cumulative response exceeding the control by 21%. The best stimulation treatment for PBIG and RRIM605 was 12 rds x 5% ET.

Table 4 : Trials on stimulation of old rubber

Treatment	1963, GT1 Jun.'87-Nov.'89	1961 PBIG Feb'88-Nov.'89	1961, RRIM605 Jun.'87-Oct.'89
1. 2 C2d4 + 6x5% ET (Control)	7221 (100%)	2610 (100%)	4288 (100%)
2. 2 C2d4 + 6x10% ET	7176 (99%)	2457 (94%)	4254 (99%)
3. 2C2d4 + 12x5% ET	7756 (107%)	2937 (109%)	4492 (105%)
4. 2C2d4 + 18x5% ET	8745 (121%)	2644 (101%)	4334 (101%)

( ) - %

Chemical control of white root disease

Treatments were applied in January 1989 on 18 month old PB260 and the results obtained nine months later are shown in Table 5.

Table 5 : Preliminary results of chemical control of White Root Disease (9 months)

Treatment	Status		
	Surviving	Dead	Surviving as % total
A. Bayfidan 10 ml/lit/tree	2	3	40
B. Bayfidan 20 ml/lit/tree	4	1	80
C. Bayfidan 40 ml/lit/tree	1	0	100
D. Bayleton 10 ml/lit/tree	2	2	50
E. Bayleton 20 ml/lit/tree	4	1	80
F. Std. Estate practice	5	0	100
G. Control (No treatment)	0	3	0

Bayfidan and Bayleton at 20 ml and 20 g lit/tree respectively gave good results with 80% of treated trees surviving. Casualties were high at the lower rates of 10 ml and 10 g/l./tree.

Standard estate practice gave the best results with all trees surviving.

Trees which were observed to be slightly to moderately infested with mycelium at the root collar responded better to the chemical treatments than trees which were severely infested with the fungi.

Further investigations in this area including testing of other chemicals have been planned.

Evaluation of APM's as a form of planting material

The planting of core stumps over 19 ha was delayed due to late preparation of land and was completed only in late December 1988. The APMs encountered three dry spells, each lasting about 10 days in the subsequent two months but mortality rate was below 5.0%.

In the comparison of core stumps with young buddings, the rate of girthing was much better for young buddings at 5.52 cm compared with 3.35 cm for the core stump in the first year (Table 6). This was to be expected as the initial growth in core stumps was mainly on canopy formation at the expense of girth increment.

Overall girth of core stumps was however still better at 12.06 cm compared with 8.71 cm for young buddings after one year. Growth of core stumps would be expected to develop rapidly after the first year.

Table 6. Comparison of growth of core stumps with young budding after 12 months

Planting material	Girth (cm)		
	Initial	After 12 months	Increment
Young budding	3.19	8.71	5.52
Core stump	8.71	12.06	3.35

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HIGHLIGHTS OF THE OIL PALM AGRONOMY SECTION RESEARCH PROGRAMME 1989

The AAR Oil Palm Section research programme may be grouped under the following headings.

1) Maximum yields

2) Nutrient balance studies

3) Efficient use of fertilisers

4) Planting practices and miscellaneous studies

1. MAXIMUM YIELD STUDIES

i) Yield prediction techniques

Studies on yield prediction methods of PORIM, Indonesia (Zulkarnain Poeloengan, 1990) were conducted and compared to AAR method. The Indonesian technique which is based on yield predictions on a land index of soil physical and chemical properties gave very poor comparison with actual yields realised on one estate in Malaysia. Predicted yield of a group of eight fields gave 10.9 t/ha versus 30.2 t/ha realised yield.

PORIM yield predictions were closer to AAR predictions and fair agreement with realised yields was seen especially in the 16 year old palms. The results for five estates over the country for 1989 are in Table 1.

ii) Irrigation and fertilizer application trial

This trial in Kelantan examines the effect on yields of 1970 palms on irrigation and application of three NK fertiliser rates.

The irrigated palms gave average yields of 33.7 t/ha versus 28.1 t/ha for the non-irrigated palms i.e. nearly 20% yield increase. Average response over the past four years was 15% with control yield level at 21.7 t/ha/yr.

Unfertilised plots gave 23.2 t/ha in 1989 versus 39.4 t/ha for the highest fertiliser rate. Cumulative yield over the past four years showed 32% yield response to fertiliser applications. No interaction between irrigation and fertiliser treatments has been detected todate.

Responses to irrigation may be expected to vary from year to year due to climatic variations and further results will be useful to characterise the yield response of oil palm to irrigation and the economics of the exercise in commercial areas.

Table 1 : Actual vs predicted yields over 5 estates in 1989 (ffb t/ha/yr)

Age group (yrs)	Estate A				Estate B				Estate C				Estate D				Estate E			
	Flds.	Act. yield	Pred.yield 1	2	Flds.	Act. yield	Pred.yield 1	2	Flds.	Act. yield	Pred.yield 1	2	Flds.	Act. yield	Pred.yield 1	2	Flds.	Act. yield	Pred.yield 1	2
7-11	5	28.6	30.8	28.1	7	29.8	28.3	29.3	-				10	20.8	29.2	28.0	-	-	-	-
12-16	3	25.9	28.5	26.1	7	29.1	29.5	26.7	5	24.1	28.6	28.6	5	25.3	30.9	24.5	8	23.2	27.2	25.2
17-21		-			4	26.0	27.6	26.3	7	21.0	28.1	29.3	-	-	-	-	11	18.7	28.2	24.5
22+		-			2	18.6	28.5	28.5	2	18.1	28.0	30.5	20	20.0	29.3	23.6	28	17.3	25.9	25.5

Pred. yield 1 = AAR prediction
Pred. yield 2 = PORIM prediction

2) NUTRIENT BALANCE STUDIES

i) Erosion and run-off trial on Rengam series soil.
Establishment of 12 erosion plots in a 1976 oil palm area on 6-8° slope oil palm was completed at end of 1988. All the inter-row vegetation in each plot was sprayed out and cut fronds were stacked across each plot between every palm. Rainfall, run-off water and sediments were collected and measured after each rain. Samples were also taken for nutrient analysis.

1989 was a very wet year and the total rainfall was 2632 mm over 129 days. Run-off loss of water was about 20% (of total rainfall) and soil loss 7.1 t/ha for the year. Litter loss was about 20 kg/ha/year.

Fertiliser nutrient loss was very variable depending on timing of application. In a wet month, 22.5% of N fertiliser was lost in run-off while in a dry month, loss was less than 1.0%. Full nutrient analyses of the samples are not yet available.

Despite uniform treatment, similar slope and soil conditions, very high variability of run-off losses were encountered probably due to micro-topographical and other local differences within the plots. This probably reflected well the field situation and reflects to large extent, variability for individual palm yields etc. seen in fields.

ii) Soil conservation and rainfall partitioning studies
Simpler techniques to study soil loss in detail in the field were tried out at the end of the year. A study was also made to check rainfall distribution in a mature oil palm field. These studies within and nearby the soil erosion plots will allow better interpretation of the main erosion studies in future.

3) EFFICIENT USE OF FERTILISERS

i) The joint AAR-PORIM urea trial in Kelantan completed its sixth year of recording. This trial is part of the large PORIM project with the oil palm industry to study the effects of N sources, N rates and application methods. The results showed 36% response to N fertilizer application in 1989 and increased yield responses to N fertilizer application to the highest rate of 1.6 kg N/palm/year or about 3.5 kg urea/palm/year.

No consistent differences between urea and ammonium sulphate were seen and in 1989, fertiliser application methods gave similar results although cumulative results still indicated that overall broadcasting of urea was superior to palm circle application.

Using PORIM's technique of fertiliser recommendation, N rate recommended for the area was 0.63 kg N/palm/year. Yields obtained were intermediate between the N1 (0.4 kg N/palm/year) and N2 (0.8 kg N/palm/year) and below the mean yields for the trial.

ii) Assessment of urea volatilisation losses made in the joint urea trial showed similar N recovery for the two types of urea used in the trial as rain fell within the first three days after application on both occassions when application was made. Volatilisation losses were estimated at 40% to 50% with highest recovery at the lowest rates of application.

iii) Studies on variation of nutrient contents in the soil after fertiliser application were made in the irrigation cum fertiliser trial in Kelantan. Samples taken at one, three and six months after fertiliser application showed that nutrient rates were highest after fertiliser application and decreased with time. However there was considerable build-up of P, K and Mg down to 30 cm in the application areas from the fertilizer application made over six years. There was differential distribution of nutrients in the palm circles and inter-rows and over the two depths sampled, probably due to displacement effects by added nutrients eg. lower Mg and Ca were seen in the palm circles, as well, as by palm uptake.

iv) **Root studies.**
A start in studies on root distribution of oil palm was made. In mature oil palm, the highest number of roots and dry weight was in the palm circles followed by frond heaps. The inter-row and harvester path areas had similar results. Root length per core was similar for palm circle and frond heaps areas and again much higher than in the inter-row and harvester's path which were similar.

The root distribution down the soil profile was similar for all the sites and root density was highest in the top 0-15 cm.

4) PLANTING PRACTICES AND MISCELLANEOUS STUDIES

i) Growth regulator studies.
Two field trials on mature palms studying the effects of growth regulators did not show significant differences between treatments since application started in late 1987.

ii) Suspected manganese (Mn) deficiency studies.
Prominent small patches of chlorotic palms with small canopies and limp fronds were noted on an estate in S. Johore. Analyses of leaf samples from apparently deficient and normal palms showed normal nutrient analyses except for Mn at < 20 ppm for palms with deficiency symptoms and > 20 ppm from apparently normal palms. Mn leaf levels for commercial areas with no symptoms on the estate ranged from 32 to 162 ppm. Two small trials were laid down to confirm the presence of Mn deficiency, methods of correction and assess effects on growth and yield of oil palm

GENERAL

The experimental programme todate has emphasised understanding the factors affecting yield performance of the oil palm and probable fate of fertilisers applied to the palms. Quantification of the various aspects involved has been a problem due to few or general studies done previously AAR's studies as seen in the results obtained todate should contribute to the objectives desired. Other aspects of agronomy research and planting practices which affect the results obtained by the estates are being drawn up and will feature more prominently in future as staff position at AAR improves.

References

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HIGHLIGHTS OF OIL PALM BREEDING, TISSUE CULTURE AND OTHER CROPS RESEARCH

As indicated in the January, 1988 issue of this newsletter, AAR is capable and are producing (although still on a limited scale) commercial DxP materials which are not only as high oil yielding as the best commercial materials but are about 20% shorter which will reduce harvesting cost and extend the economic life of the crop. While this type of materials can sustain us for the next few years, to remain competitive both as seed-producer and an oil palm plantation company, we need to continuously improve our planting materials besides our agronomic and management practices.

To do so, AAR has spelled out its vision of an ideal oil palm or ideotype which is capable of producing 40 t/ha/yr of dry matter, 60% (i.e. 40 t/ha FFB) of which is channelled into production of bunches with an oil content of 34%. The palm is also 50% shorter than current commercial materials and its oil is 70% unsaturated.

AAR has identified the various sources of genetic materials to be introgressed into its rather genetically restricted materials and has drawn up cooperative breeding and exchange programmes with other research bodies (both public and private) which possess these materials to achieve this end. Most of the cooperative breeding/exchange programmes have been completed and resultant progenies field-planted although it is still ongoing and will likely remain so as in most breeding programmes. Table 1 summarises the status of the resultant field trials from the crossing programmes.

Among the selected parents used in the crossing programmes are individuals which possess more than 30% oil to bunch, close to 90% mesocarp to fruit, more 80% oil to dry mesocarp, small canopies and short trunks.

Some of the resultant field planted progenies of these parents have come into bearing. Results are still preliminary. Nevertheless from field observations some of these desirable characteristics have been transmitted to the progenies. Promising dura and pisifera/tenera progenies have been selected and a concerted DxP/T progeny-test crossing programme has been initiated. It is envisaged that a new improved AA DxP material will be available before the end of this decade.

Table 1 : Status of AAR's Oil Palm Breeding Field Trials

Programme	Year	No.of trials	No.of progenies	Hectarage
Dura Improvement	1986	2	39	18.2
	1987	1	8	3.5
	1989	2	41	13.0
	1990	1	25	11.4
				46.1
Pisifera Improvement	1986	1	12	4.5
	1987	1	15	2.5
	1989	2	24	4.9
	1990	3	54	20.2
				32.1
Progeny-Test	1986	1	31	16.8
	1987	2	35	19.0
	1990	1	7	7.3
				43.1
Oil Quality Improvement	1990	1	11	6.0
Germplasm Collection	1986	1	12	2.0
			Total	129.3

PAPAYA BREEDING AND SEED PRODUCTION

AAR has been cooperating with Mardi since 1987 to test and produce their Line 19 x Line 20 Eksotica hybrid which is an improved version of the Eksotica (Line 20); the new export papaya variety recently released. The new hybrid variety is scheduled to be released by Mardi in 1991.

In AAR's test plot of the new hybrid papaya, about 80 t/ha of fruit over 20 months harvesting was obtained. The test confirmed the superior yielding (about 20% higher), better cosmetic (less fruit freckling) and eating (sweeter, firmer, fragrant) qualities of the new hybrid variety over the Eksotica variety.

AAR seed-garden trial for hybrid seed production demonstrated the non-feasibility of a seed-garden design with natural pollination (as done in cocoa) due to poor seed set and illegitimate pollination. Female flower isolation and hand-pollination are necessary. A well pollinated fruit can produce up to 15 g of dry seeds.

AAR has initiated a modest breeding programme to further improve the Eksotica papaya in terms of smaller fruit size (for the Western market), firmer and sweeter fruits and shorter plant stature.

TISSUE CULTURE

A) Oil Palm

Oil palm tissue culture R&D work comprises two concurrent programmes:

i) Clonal Selection Programme
Objectives :
Selection of palms for cloning
Production of clones for evaluation
Field evaluation of clonal performance
Field and nursery testing of laboratory protocal/technique
Recloning of ramets from field or test-tubes.

This programme has progressed very well and many of the ramets (clonal plants) have been planted in field trials, field observation plots, APM (advanced planting material) nursery trials and observations. The status is summarized in Table 2. The programme is still on-going.

Field trial results are again preliminary. From observations, it appears that some of the more heritable characteristics of the selected parent palm (ortet) eg. oil to bunch, plant form, are transmitted to their clonal offsprings. Some of the selected ortets had an oil yield potential of 9.4 t/ha, an oil to bunch of 32% and a height increment of 35 cm/year. The frequency of flower abnormality in AAR clones appeared to be very low todate.

ii) Tissue-Culture Technique Research Programme

The objective of this programme is to define and refine the tissue culture with respect to efficiency of propagation and minimising risk of clonal abnormality.

In terms of propagation efficiency, AAR has achieved rates which are comparable if not better than the best rates reported by other leading laboratories. Nevertheless, there is still need to further improve propagation efficiency i.e. embryogenesis rate, not only to reduce production cost but also to minimize risk of clonal abnormality. A number of experiments involving media modifications are still being conducted.

The feasibility of direct embryogenesis and micropropagation which are methods to minimize risk of clonal abnormality, did not appear promising from early results but needs further verification. Other approaches involving hormone withdrawal, antagonism and balance are being pursued.

Table 2 : Status of AAR Clonal Trials

Year	No. trials	Ha	No. clones	No. Ramets	Type
A) Field Trials					
1986	2	6.9	9	750	Selected adult (ortet) and seedling palms
1987	1	4.6	7	630	Ortet
1989	2	22.8	24	3000	Ortet
1990	1	8.7	14	1000	Selected seedling
Total	6	43.0	54	5380	
B) APM Nursery Trial					
1989	4		58	14540	Ortets and selected seedlings
1990	2		87	14297	Selected seedlings
Total	6		145	28,837	

B) Other Crops

The primary role of AAR's Tissue Culture Lab. is to ultimately micropropagate elite oil palm clonal materials commercially to supply our own estates. However, in view of the yet unresolved problem of abnormal bunches in clonal oil palms, we are not producing our clonal oil palm materials commercially although we already have the technique. As a result of this, we have surplus facilities in our lab. In order to make full use of these facilities as well as to generate some income for the tissue culture lab, we have embarked on a programme to micropropagate other crops which are in big demand by growers. The crop species we are willing to micropropagate are mainly those which have already been micropropagated on commercial scale with little problems.

We started looking into the tissue culture of other crops in 1987. Todate we have developed techniques for micropropagation of orchids, namely Arandas, Vandas, Ascocendas and Dendrobiums and Baby's Breath, a small white flower used as an accompaniment in floral bouquets. We are accepting orders for the above species for commercial production and Table 3 indicates our production todate of orchids.

Table 3 : Commercial Micropropagation of Orchids

Genus	Nos. produced todate (Oct.'90)
1. Aranda	181445
2. Vanda	8955
3. Ascocenda	21665
4. Dendrobium	11815
Total	223880

We have also successfully micropropagated the hybrid Eksotica papaya and also a promising pineapple variety. The papaya tissue-cultured plants performed true-to-type i.e. all hermaphrodite, the desired plant type, and were more vigorous and precocious than the parent seedling variety as shown in MARDI and AAR field trials.

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PRODUCTION COST OF COCOA IN NORTH SUMATRA

A group of Malaysian Cocoa Grower's Council Agricultural Committee members visited Bah Lias Research Station, PTP V1 and RISPA in September 1990 to view the cocoa industry in North Sumatra.

An outstanding feature of the cocoa industry there is the very low producton cost. The 1989 production costs quoted by the first two organizations were $ 1.20/kg dry beans at yield level of 1006 kg/ha and $2.09/kg at yield of 867 kg/ha respectively.

The main factors that contributed to the low production cost are cheap labour cost (between $1.80 to $6.00 per manday) less pest and disease problems (*Conopomorphacramerella* Cocoa Pod Borer is absent and *Oncobasidium theobromae* Vascular Streak Dieback is not a problem) and generally fertile soils which require lower fertilizer inputs. Besides, the main fertilizers such as triple-superphosphate, rock phosphate, ammonium sulphate, urea and muriate of potash are also cheaper by 10% to 40% as compared to Malaysian prices. Manuring cost including liming was quoted to be in the region of $270 /ha on Bah Lias Estate (BLE).

The comparative production costs between North Sumatra and a hypothetical Malaysian estate are tabulated in Table 1.

Table 1 Comparative production costs

Cost items	Cost $/kg BLE 1989	PTPV1 Jan-Aug 1990	A Hypothetical Malaysian Estate
1) Yield	1006 kg/ha		1000 kg/ha
2) Upkeep cultivation	0.54	1.12	1.50
3) Harvesting and Collection	0.24	0.34	0.50
4) Manufacturing/ Processing	0.19	0.18	0.20
5) General charges	0.23	0.27	0.50
Total	1.20	1.91	2.70

Note

1) PTPV1's 1989 cost was $2.09/kg at yield level of 867 kg/ha.

Bah Lias Estate's production cost in 1989 was only about 44% of the above average Malaysian cocoa estates. Judging from the site yield potential of BLE, it is anticipated that the estate's average yield could be easily improved to 1.5 t/ha. This would reduce the production cost to below $1/kg at 1989 prices. The fact the labour cost in Sumatra is on the increase is no ground for consolation as Malaysian labour cost is also expected to rise rapidly as the country moves towards industrialization.

The scenario appeared rather unfavourable for the Malaysian cocoa industry. However, we could remain competitive by becoming more efficient. Efficiency does not mean cutting cost at the expense of yield. The main areas that we need to focus our attention are yield improvement, minimization of wastes and making sure that one gets value for every cent invested. Careful planning to ensure everything gets off the ground correctly right from the start beginning with land suitability evaluation cannot be over-emphasized. The triple gems of the planters i.e. reduction in immaturity period (RIP), high early yield (HEY) and sustained high yield (SHY) if practised religiously will certainly be extremely rewarding. Let us rise to the Indonesian challenge by becoming more efficient and productive.

OOI, L.H.

OTHER NEWS

A.A.R.

Michele Sandra de Silva joined AAR on August 1 as a computer programmer to replace Saw Eng Guan who left in July.

AAR Sports Club

AARSC - Boustead S.C. Games

After a lapse of two years, the AARSC - Boustead S.C. annual games series was revived with Boustead S.C. hosting the games on 10-11 November. On the first day, the games tally stood at 2-all, with AARSC winning at football and netball while Boustead S.C. won at tug-o-war (men and ladies), a reversal of fates of the previous encounter. The games encounter (badminton, table-tennis, carroms and darts) on the second day was a complete walkover by Boustead S.C., except for volleyball in which the fighting spirit of AAR S.C. team gave Boustead S.C. some anxious moments. Boustead S.C. graciously hosted an entertaining dinner-cum-dance.

OBITUARY : APPATHORAI A/L TANGAIAN

Appathorai, age 37 passed away at 2 a.m. on 25.12.90 after a long illness of cancer. He leaves behind a wife and four young children, brothers, sisters and parents to mourn the loss.

Appathorai joined AAR as a soil tester since AAR was formed in 1987. Prior to that, he worked with us at HRU from 1974 onwards. During the 17 years I have known Appathorai, I have found him to be a very industrious lad, soft spoken and good natured, seldom complaining and well liked by all his colleagues. Even in his final year with us, he still maintained this soft spoken uncomplaining nature in spite of the pain he endured. He is dearly missed by all who worked with him.

We extend our deepest condolences to his widow and children in their bereavement.

CHAN, K.S

"Let's get 'em!"

"Belle of the Ball!"