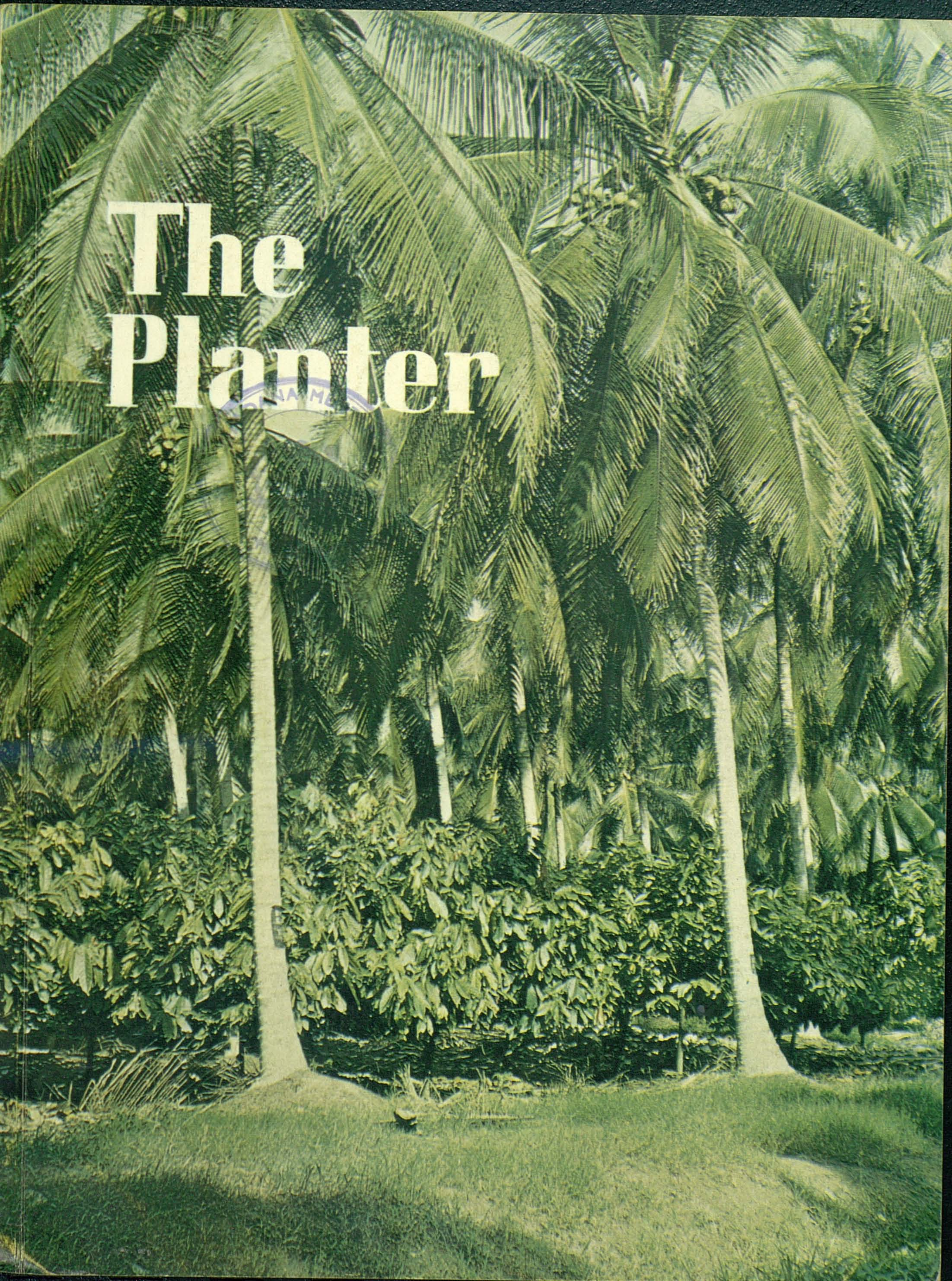
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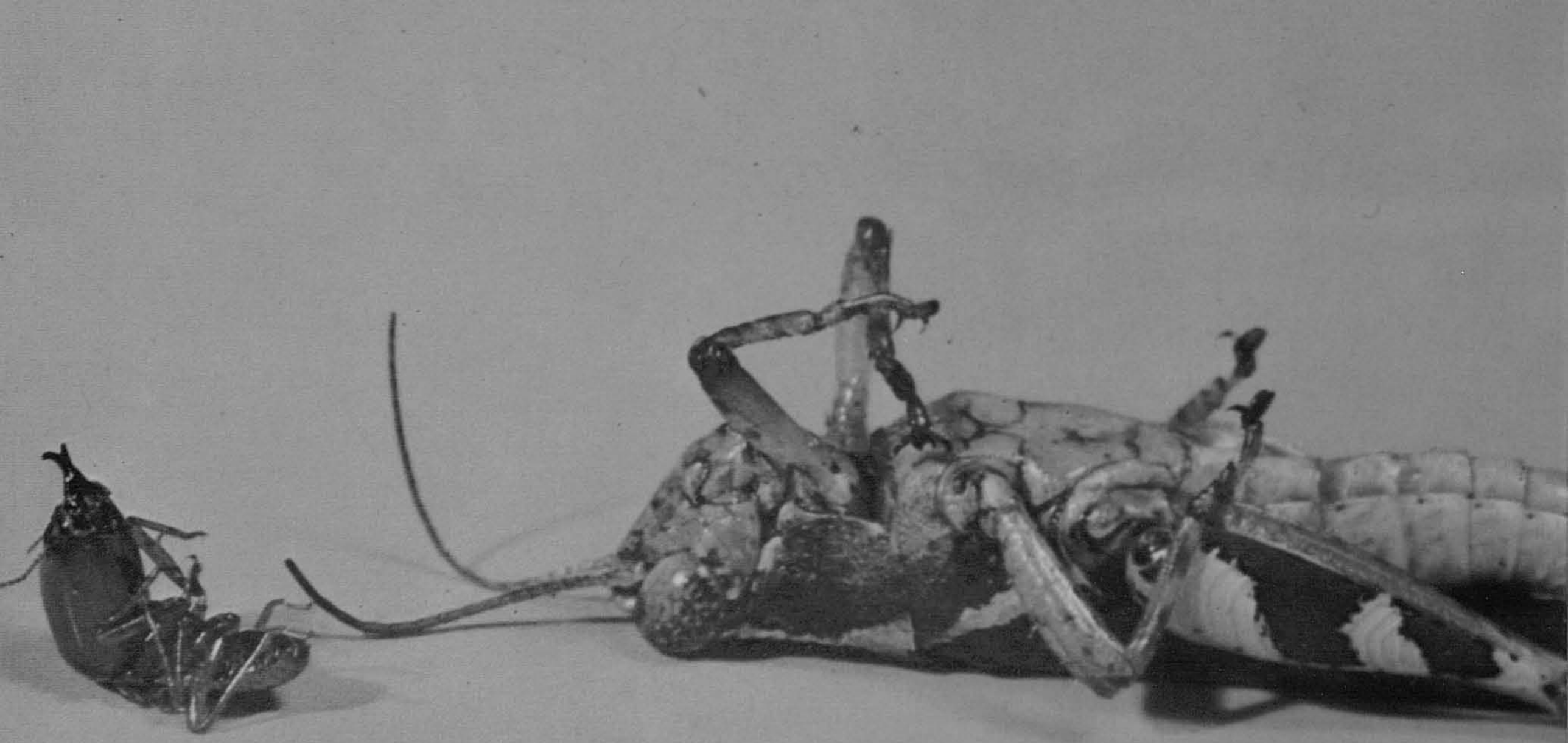
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VOL. 47 **AUGUST 1971** **No. 545**

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THE DEMON STOCKPILE

In an address recently to the Kuala Lumpur Rotary Club, the First Secretary of the American Embassy, Mr. Morris Crawford, after presenting his listeners with what he described as "an agreeable portrait of the economic relations between our two countries", continued thus:

"I should like to turn for a moment to the one feature that occasionally blemishes the face of this picture, that is, the problem of our strategic stockpiled materials, especially rubber, and of our disposal policy. It is not surprising that the Malaysian Government and people are concerned about the state of the rubber market, and that they react strongly to any action that they consider damaging to the rubber market.

Let me be quite frank and say that we share the Malaysian Government's desire to rid ourselves of this irritant. We have worked long and hard in consultation with all rubber-producing countries to find acceptable methods of disposal and we will continue to do so until the problem is solved. It has been most re-assuring for us that the Government of Malaysia has shown understanding in this matter in seeking, in the words of the Minister for Commerce and Industry, a 'permanent solution' to the problem. We are most encouraged by the constructive and forthright attitude that is being taken by Malaysia, along with other rubber-producing countries, to find a mutually acceptable solution."

Mr. Crawford then went on to close his address with expressions of confidence in Malaysia's economic future.

A search among Mr. Crawford's words to discover a hidden message, a hopeful augury, some meaningful hint of an imminent solution to the US rubber stockpile problem as it continues to affect Malaysia, unfortunately yields nothing.

From July this year the General Services Administration will sell from its stockpile 6 000 tons of rubber a month for the next 12 months. The new selling programme incorporates both quantity and price limitations: the 72 000 long ton maximum, and a selling price "set by GSA at the market price but at a level no lower than the average of the daily R.T.A. price for RSS1 in the preceding month". The GSA also promises due regard for the "protection of producers, processors and consumers against avoidable disturbance of their usual markets". They would also "closely observe natural rubber markets at all times until the total excess is sold. Appropriate notification will be given in the event that any changes in the Government's sales programme are considered."

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Given all these comforting assurances there would seem very little to worry about. But just how big is the stockpile? How old, and of what sort is the rubber in it? And since we never hear of its being added to, must it not be getting smaller?

There is a third factor in addition to the two already announced which will govern sales from the stockpile. This is "a price variable" in the discount allowed for deterioration. The August issue of *Natural Rubber News* points out that: "Deteriorated rubber can be very useful for manufacturing purposes that wouldn't know a RSS1 straight off the boat from a RSS1 out of one of the GSA warehouses. This has always been a fact of sheet-rubber bargaining, and certainly the US government inspectors, aware as anyone of the rubber facts of life will get the best price they can for the rubber sold. This element of negotiable discount does however introduce a variable which tends to mitigate somewhat the breaking effectiveness of tying to last month's price."

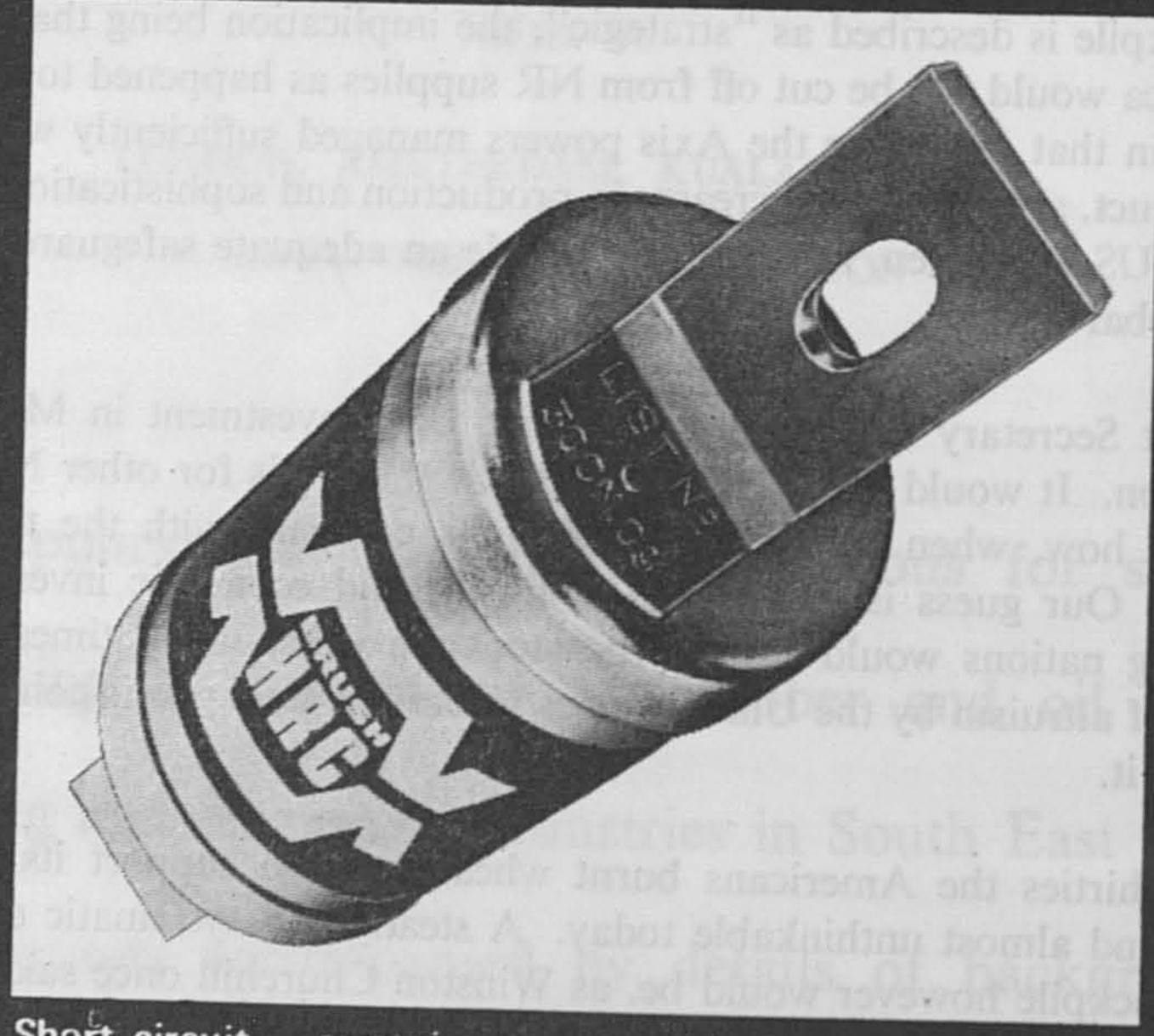
The stockpile is described as "strategic", the implication being that in the event of war America would not be cut off from NR supplies as happened to her in World War II. But in that same war the Axis powers managed sufficiently well with their synthetic product, and the huge increases in production and sophistication of synthetic rubber in the US since then, must surely provide an adequate safeguard in the event of another global conflict.

The First Secretary told his listeners that U.S. investment in Malaysia totals US$200 million. It would be interesting to know the totals for other NR-producing countries and how, when combined, these sums compare with the total value of the stockpile. Our guess is that total US aid to, and economic investment in the NR–producing nations would exceed the stockpile value many times, and that a supreme act of altruism by the United States where the stockpile is concerned would be to destroy it.

In the Thirties the Americans burnt wheat-grain to support its price—a sin against mankind almost unthinkable today. A steady and systematic destruction of the rubber stockpile however would be, as Winston Churchill once said of US Lend Lease: a "most unsordid act".

The Americans are known to use over 600 000 tons of natural rubber a year. Why then do monthly sales from the stockpile of only 1% of this tonnage so intimidate the natural rubber producers, and throw the world's markets into depression and uncertainty? If the stockpile is not a myth then the answer must lie in the machinations of that most powerful of human agencies: Big Business. Perhaps the Demon of our title is not all that fanciful a notion. After all, Zurich has its Gnomes.

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by

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Rubber Research Institute of Malaya

Clonal Variation in Seedfall

The seedfall was determined in single counts in three clone trials, (*Table II*). There was no flower protection and it was a poor season. The mean seedfall for clones represented in two or more fields are given, the mean for all clones recorded in a field, and the clones bearing most and least seed, unless already included above. There is a positive but not significant correlation between the seedfall of the same clones in Fields 48A and 60D. The range from the poorest to heaviest seed-bearers was from 50 to 100 fold in the three fields.

Table 11. Average seed production per hectare in single counts

Clone	*Field 48A (21 clones)*	*Field 48D (13 clones)*	*Field 60D (44 clones)*
RRIM 501	344	117	482
RRIM 600	1060	—	633
RRIM 603	463	—	86
RRIM 605	133	—	472
RRIM 607	182	—	57
RRIM 610	265	—	158
RRIM 612	285	—	86
RRIM 614	440	—	319
RRIM 623	—	3184	445
Mean	999	408	593
RRIM 602	6311	—	—
RRIM 622	—	61	—
Ch 26	—	—	4588
PR 248	—	—	5

The proportions of seed from each of 6 clones in the Smallholders Seed-garden, when a trial of them was planted in 1956, were: —

AVROS 157	0.4%	PR 107	0.8%	Tjir 1	17.0%
PB 49	21.7%	BR 2	26.6%	RRIM 501	33.5%

Ten years later, the proportion of flowers which set fruit in a flower protection experiment (Subramaniam 1966) were: —

PR 107	3.4%	AVROS 157	4.0%	RRIM 501	4.4%
PB 49	8.0%	Tjir 1	32.4%	BR 2	47.6%

* Part I appeared last month. Part III will appear next month.

Admittedly the results were expressed on different bases; even so there was no significant correlation between these two sets of data. However, AVROS 157 and PR 107 were poor seed producers on both occasions, whereas BR 2 and Tjir 1 were fair to good. Reference back to *Tables 5*, *6* and *8* shows that there were not very marked differences in the success of hand-pollination using AVROS 157, PB 49, RRIM 501 and Tjir 1, although AVROS 157 was poor especially in the diallel. Therefore other factors, such as number of flowers available, as well as fertility, probably determine the seed set in open pollination.

Spacing Effects

A transect of 380 metres was laid across an old field of Tjir 1 from its boundary on one side with Tjir 3 to the other with Tjir 8. The transect consisted of 19 plots of 20 m. square. The thousands of seed per hectare collected during five months in successive plots were: —

35.6, 12.9, 24.2, 7.0, 4.2, 9.1, 4.8, 8.3, 2.4, 6.1, 6,0,
10.6, 8.9, 7.8, 18.0, 13.4, 25.9, 24.4, 43.9.

The original object of the experiment was to estimate how far pollen travelled, because it was supposed that there would be a decline in seed set towards the limit of pollen travelling from the Tjir 3 and Tjir 8, where only selfing putatively occurred. Although the seed fall from 60 m from the Tjir 3 to 100 m from the Tjir 8 was significantly lower than in the boundary plots, the pattern was not without inconsistencies.

The observation was repeated in a field of RRIM 501 from its boundary with a mixed planting across 180 m to a road running at right angles through the centre of the monoclone RRIM 501. The thousands of seeds per hectare in successive plots were: —

19.3, 7.3, 9.4, 4.5, 6.0, 6.0, 12.3, 12.0, 18.9.

Although there was a fall off in seed in the centre of the transect, there was heavy seedfall near the road, which had more monoclone RRIM 501 on the other side. It seemed that seed production was higher at a field boundary, perhaps because of the vacant row due to roads and drains rather than to the increased crossing due to the proximity of other parents.

Therefore the effect of spacing was investigated, first in a density of planting experiment with AVROS 50 which was then 30 years old. All plots were square planted except those at 289 trees per hectare, which were equilateral triangular planted. The results for the seed collected during one season are given in *Table 12*. The outer plots adjacent to roads or open spaces produced highly significantly more seed per hectare than the inner plots. The averages for all plots showed no significant differences between different planting densities in seeds per hectare, but the number of seeds per tree differed highly significantly.

Although the differences between densities were not significant for seed per hectare, there was a significant trend towards fewer seed per hectare with increasing density of planting, this was significant for the inner plots alone but not for the outer plots alone. The negative correlation between seeds per tree and the density was highly significant.

Table 12. Seed collected in density of planting experiment with AVROS 50

Trees per hectare	*Thousands of seed per hectare*			*Seeds per tree*
	*Inner**	*Outer**	*All**	
116	10.7	15.2	12.2	104
242	11.7	17.1	13.5	55
289	8.2	17.9	11.4	34
524	7.2	16.8	10.4	20
717	6.7	15.1	9.5	13
1045	6.5	11.2	8.1	8
Mean	8.5	15.6	10.8	40

* Inner, outer and all plots.

The higher seed production in the marginal plots and at the edges of the field are in accord with each other and with the commonly-held belief that seed-gardens should be planted in wide avenues to increase seed production. Therefore seed production in the comparison of systems of planting experiment in Field 53 of the RRI Experiment Station was investigated.

In this trial four clones LCB 1320, RRIM 513, 527 and Tjir 1 were planted at five distances between the rows, namely: —

6,10, 9.15, 15.25, 19.83 and 24.40 m.

The initial intervals between the trees in the rows were 3.66 in the 6.1 m avenues (*i.e.* 6.10 × 3.66) and 2.44 in the 9.15 m avenues. The wide avenues (15.25, 19.83 and 24.40 m) were each subdivided into three with respect to interval between trees in the rows, these were 1.83, 1.37, 1.07 m. in the 15.25 m avenues, 1.37, 1.07, 0.84 m. in the 19.83 m and 1.07, 0.84, 0.69 in the 24.4 m. However, it was not practicable to harvest the seed from these small subplots. The results are given for the main treatments—avenue widths and clones—only.

Seed was collected from 19 January to 24 February and from 5 August to 24 September 1970, when the trial was approximately 17 years old. *Table 13* gives the total seed in thousands per hectare in both collections. There was a significant decline in seed production with increasing avenue width. The rectangular plantings and moderate avenues (6.10 and 9.15 m) produced approximately twice as much seed per hectare as the hedge systems (15.25, 19.83, and 24.4 m). Thinning and wind damage had reduced the stand to an average of 272 trees per hectare. Using the actual number of trees in each plot, the following mean numbers of seeds per tree were obtained: —

Avenue width m.	6.1	9.15	15.25	19.83	24.4
Seeds per tree	111.3	125.5	60.9	50.4	53.1

Thus the marked decline in seed production with increasing avenue width was evident whether considered on a per hectare or a per tree basis. The trees in the best grown treatment were estimated to be 15% heavier than in the poorest. Not only was this inadequate to explain the twofold range in seed per tree, but the trees in the 9.15 m and the 19.83 m avenues were equally well grown.

Table 13. Thousands of seed per hectare collected in the system of planting experiment

Avenue width m. / *Clone*	*Tjir 1*	*LCB 1320*	*RRIM 527*	*RRIM 513*	*Mean*
6.1	43.4	35.1	26.3	25.5	32.6
9.15	35.2	37.1	21.9	27.1	30.3
15.25	26.4	27.2	11.5	10.9	19.0
18.2	23.1	15.5	9.6	3.5	12.9
24.4	29.8	12.2	9.1	3.2	13.6
Mean	31.6	25.4	15.7	14.0	21.7
Jan–Feb	15.5	8.6	12.2	7.9	11.1
Aug–Sept	16.1	16.8	3.5	6.1	10.6

It is commonly supposed that the corrugated canopy in hedge plantings exposes more foliage to the sun than do regular plantings with a level canopy. Moreover since top branches exposed to the sun bear more seed than lower shaded branches, the seed production in hedge plantings is expected to be greater. There is no satisfactory explanation for the unexpected result.

Seasonal Variation

The production during each season in the Field 53 experiment is given at the foot of *Table 13*. There was little difference between the two seasons for the mean of all clones, but there were differences for individual clones and their ranking. The percentage of the total seed falling in each week is given for each clone and season in *Table 14*. The sequence of heaviest seedfall was the same in both seasons, although the clonal peaks were at weekly intervals in the first season, wheares three were together in the second season with RRIM 513 a month later.

Table 14. Percentage of seed production in each week in the system of planting experiment

Clone / *Season* / *Week*	*RRIM 527* (1)	(2)	*Tjir 1* (1)	(2)	*LCB 1320* (1)	(2)	*RRIM 513* (1)	(2)	*Mean* (1)	(2)
1	26	25	13	17	10	20	27	0	21	18
2	27	53	20	40	9	49	8	0	17	42
3	22	14	37	23	16	13	7	1	22	16
4	16	5	22	13	30	9	15	5	20	10
5	6	2	5	4	28	3	37	2	17	3
6	3	1	2	3	7	4	6	39	4	6
7	—	0	—	1	—	2	—	33	—	4
8	—	0	—	0	—	1	—	20	—	2

Season (1) January—February. Season (2) August—September.

The seasonal nature of seedfall in familiar, but a few examples will reinforce the point. The percentage of seed collected each week from an area in Selangor during the periods 18 July to 31 December 1950 and 7 August to 31 December 1951 are given in *Table 15*. The percentage of seeds collected each month in the experiments reported by Watson and Narayanan (1965) were: —

	J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
F	16.4	12.1	5.0	2.8	1.9	0.8	3.9	20.4	20.1	4.8	4.7	7.3
SG	14.7	30.7	14.0	3.6	2.2	5.7	1.6	11.9	2.2	1.6	5.3	6.7

Table 15. Percentage of seed production in each week during the autumnal seasons of 1950 and 1951

Week No.	*1950*	*1951*	*Week No.*	*1950*	*1951*
1*	0.5	—	13	1.4	31.7
2	0.6	—	14	1.0	13.6
3	2.3	—	15	0.7	3.6
4	1.2	0.2	16	0.7	0.8
5	4.3	0.6	17	0.7	2.0
6	2.8	1.3	18	—	0.5
7	17.2	1.0	19	0.7	0.8
8	32.4	1.3	20	—	0.3
9	6.3	1.9	21	1.1	0.6
10	7.0	5.0	22	0.3	0.2
11	12.0	11.8	23	0.4	3.9
12	5.5	14.3	24**	0.9	4.5

* beginning 18 July.
** ending 31 December.

Effect of Fertilisers

Increased seed production was obtained by application of nitrogen in two experiments and a depression due to potash was observed in a third, Watson and Narayanan 1965.

Effect of Flower Protection

The Annual Reports of the Pathology Division, Rubber Research Institute of Malaya for 1966 to 1969 describe flower protection experiments in which sulphur was either dusted from the ground or a wettable powder was sprayed from the air. The results in kilogrammes of seed per hectare are given in *Table 16*. In those years such as 1969 when there was little *Oidium*, there was little effect of sulphur application. The amount of *Oidium* is related to weather conditions during refoliation and flowering. Pod rot due to *Phytophthora* may prove another limiting factor in North Malaya. Thus the weather, diseases and flower protection are among the many variables which determine seedfall.

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Table 16. Kilogrammes of seed per hectare collected in flower protection experiments

Treatment Year	*Control*	*Sulphur sprayed*	*Sulphur dusted*
1966	35	124	—
1967	78	100	—
1968	95	189	227
1969	245	261	268

Number of Seed per Kilogramme

Previously it has been assumed that there were approximately 100 fresh seeds per pound, *i.e.* an average weight of 4.54 gm or 220 seeds per kg. The fresh weight of seeds of seventeen clones have been determined for a total of 75 samples. There were from one to nine samples of each clone. Each sample was of 100 to 200 seed. Only fresh, apparently viable seed were selected. The results are given in *Table 17*. The mean fresh weight of all seed is 4.87 g, *i.e.* 205 per kg or 93 per lb.

Table 17. Mean fresh weights of seed in grams

Mother Clone	*No. of samples*	*Mean wt. g*	*Seed per kg.*
RRIM 623	7	5.81 ± 0.1497	172
PR 107	3	5.80 ± 0.3525	172
RRIM 603	1	5.80	172
RRIM 513	4	5.35 ± 0.1994	187
RRIM 605	6	5.26 ± 0.1569	190
PB 49	5	5.17 ± 0.4013	193
LCB 1320	7	5.05 ± 0.1852	198
Tjir 1	6	5.04 ± 0.1049	198
RRIM 701	3	4.92 ± 0.1578	203
AVROS 157	1	4.83	207
RRIM 519	1	4.61	217
RRIM 501	9	4.57 ± 0.1281	219
PB 5/51	8	4.51 ± 0.0734	222
RRIM 600	6	4.32 ± 0.0663	231
RRIM 527	4	3.78 ± 0.0574	265
GT 1	3	3.72 ± 0.01345	269
RRIM 628	1	3.60	278

Seeds per Hectare

The maximum number of seeds per hectare per year is probably about 160 000 from a seed-garden of prolific clones with continuous flower protection throughout the year. The bottom end of the scale is virtually zero in monoclone areas of poor seed-bearers without flower protection. With so many variables a reliable average figure is impossible, but a guess of 10 000 seed per hectare for moderate seed bearing clones without flower protection might be realistic.

(to be concluded)

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COCOA PROGENY TRIALS ON BAL ESTATES*

by

C. H. Shearing and Lim Hong Kee

BAL Estates Sdn. Bhd., Tawau

Amelonado cocoa pods from Ghana were imported into Malaysia in 1950 and following quarantine on an island off Singapore, seedlings were distributed to various agricultural stations in Malaya and Sabah. The first block of Amelonado cocoa which was planted on BAL Estates in 1954 comprised seedlings derived from that portion of the original introduction which was sited at Tuaran. All the commercially planted cocoa seedlings used in Sabah up to 1964 were derived from this six acre planting on BAL Estates.

A cocoa breeding programme was started in Sabah in 1963[1], with the aim of developing planting material well adapted to the local conditions and consequently higher yielding than the Amelonado. In view of the known hybrid vigour which results from the crossing of cocoa of different types and origins, the early emphasis in the Sabah breeding programme was focussed on the production of seedling families for performance-testing under Sabah conditions.

A collection of various cocoa clones had been established in Malaya in 1950/51, and fan-branch budwood from this collection, including 14 Upper Amazon (UA) clones, was introduced into Sabah in 1958 and budded onto Amelonado stocks at Quoin Hill. Hybrid seedlings derived from controlled crossings between UA clones and between Amelonado and UA clones were made available to a number of larger estates in Sabah during 1964 to permit the comparison of the performance of the progenies in various environments.

Two of these early progeny trials were sited on BAL Estates: the first which was planted in 1964, tests four Amelonado × UA crosses; the second, planted in 1965, includes five UA × UA families.

Although further progeny trials have been planted on BAL Estates during 1968 and 1969 using various F_1 and $F_1 \times F_0$ hybrids from the Quoin Hill Research Station, attention in this paper will be confined to our two early trials.

DETAILS OF THE TRIALS

Experiment CA7A

This progeny trial which is sited on marginal basalt soil on Table Estate was planted in 1965. Before being planted with cocoa the area had been under abaca both pre-war and again from 1950–1963, and analyses made by the Department

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* This paper, and the one that follows it (page 364) is one of seven presented at the Cocoa Seminar organised by the Sabah Planters' Association at Tawau, 20–21 November 1970. The paper is reproduced here with the permission of the Author and of the Association. A full set of preprints of the papers can be obtained from the S.P.A., P.O. Box 1204, Sandakan, Sabah, price $7.50.

of Agriculture showed that the soil, although having a pH and cation exchange capacity suitable for cocoa, was depleted of nitrogen, phosphorus and potassium[2]. There is no record of fertiliser having been applied prior to the light dressing of a 2: 1: 2 NPK mixture applied to the rows of *Leucaena glauca* shade which was established before the planting of the cocoa itself.

The five progenies tested in this trial are as follows: —

Pa7 × Na32; IMC60* × Na32; IMC60* × Na33

IMC76* × Pa7 and Pa35 × Na 32.

A control treatment of unselected Amelonado seedlings was included for comparison.

The trial is of a randomised block design with seven replications. Each plot has 15 trees (3 × 5) all of which are recorded. Cocoa tree spacing throughout is 10 × 10 ft (sq.) The cocoa seedlings were grown in polybags for 4–5 months and planted out in the field in February 1965 under *Leucaena glauca* shade which had been planted in rows 10 ft wide 28 months earlier. Areas of poor shade were supplemented by Gliricidia at 10 × 10 ft. *Parkia speciosa* had also been planted at 50 × 30 ft but was unsuccessful and was poisoned out.

Shade rapidly proved to be too dense and when the cocoa seedlings were six months old a programme of shade adjustment was started. Initially, alternate rows of shade were removed and the remaining shade trees were progressively poisoned out until at the present time the whole of the trial area is devoid of any overhead shade.

During 1965 the cocoa received 17.5 lb of N, 8.75 lb P_2O_3 and 11.25 lb K_2O per acre in two applications of straight fertilisers. This rate was doubled in 1966 and doubled again in 1967. During 1968 and 1969 Nitrophoska Blue Special was applied at 200 lb/acre/annum and urea at 81 lb/acre/annum in two applications. A supplementary round of Kieserite at 2 cwt per acre was applied in December 1969. For 1970 and subsequent years, an annual application of 7 cwt of Nitrophoska Blue Special per acre in two applications is planned.

Experiment CA7B

This progeny trial is situated on basaltic soil of the Table Series on Tiger Estate. The area prior to planting with cocoa had been under abaca pre-war and

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* The letters IMC indicate Iquitos Mixed Collection; a study of pod characteristics of IMC 60 and IMC 76 by the Government Plant Breeder indicated that these clones are in all probability not typical Iquitos types and that they more closely resemble certain Trinitario types. He therefore suggested that the IMC 60 and IMC 76 used in this progeny trial should be reclassified as UIT1 (UIT = Unidentified Trinitario) and UIT2 respectively[3]. This revised nomenclature is used throughout the remainder of this paper.

had reverted to secondary jungle. Although no soil analyses were carried out before this trial was planted it is probable that the nutrient status was similar to that on the site of trial CA7A.

In 1964 seedlings of four progenies (Aml × UITI; Aml × Na32; Aml × Pa35 and Aml × Pa7) were planted out by the Manager of Tiger Estate in a number of single rows ranging in length between 160 and 190 trees. The layout was such that a true statistical comparison between the hybrids and the rows of Amelonado seedlings on the margins was not possible. Fortunately however, the rows of hybrids could be arranged into six replicates of a randomised block layout with two rows of Amelonado at each margin for general comparison, and the planting was thus incorporated into the research programme. The plot size was reduced and standardised at 44 trees for the 1968/69 cropping season. Plant spacing throughout the trial is 10 × 10 ft (sq.).

Field planting of 5-month-old polybag cocoa seedlings was done in April 1964 in the case of the hybrids, the Amelonado seedlings used for comparison had been planted out in January and March 1964. The *Leucaena glauca* shade which was arranged in rows at 10 ft intervals was 10 months old and dense at the time of cocoa planting. The *Parkia speciosa* which had been planted was not successfully established.

When it was realised that shade intensity was quickly becoming too severe a programme of adjustment was undertaken. Initially a checkerboard system was adopted and subsequently alternate rows of *Leucaena* were completely poisoned out. Following this all remaining shade trees were progressively eliminated so that by March 1969 a condition of no-shade was achieved. This situation has been maintained.

Fertiliser applications in CA7B up to and including 1968 were made in accordance with contemporary estate practice. During 1969 Nitrophoska Blue Special was applied at the rate of 7 cwt per acre in two applications and it is envisaged that manuring at this rate will continue. A supplementary round of Kieserite at 2 cwt per acre was applied in December 1969.

PERFORMANCE OF THE PROGENIES DURING IMMATURITY

During the first two years after planting, growth rate was recorded by stem diameter measurements taken at one foot above ground level. In CA7A all flowers produced up to two years after planting were removed whilst in CA7B the size of the trial made it impossible to carry out such complete removal.

Stem diameters at various ages from planting are summarised in *Table 1*.

Table 1. Average stem diameters (cm) at 1 ft above ground

Months from planting	*Aml*	*Pa 7 × Na 32*	*UIT 1 × Na 32*	*UIT 1 × Na 33*	*UIT 2 × Pa 7*	*Pa 35 × Na 32*	*s.e. ±*
			Experiment CA7A				
1*	0.48	0.55	0.53	0.54	0.55	0.47	
7	1.12	1.34	1.36	1.39	1.24	1.26	0.034
12	2.23	2.72	2.70	2.82	2.43	2.73	
18	3.52	4.31	4.18	4.42	3.64	4.42	
24	4.98	6.10	6.12	6.30	5.24	6.21	

	Aml × UIT 1	*Aml × Pa 35*	*Aml × UIT 2*	*Aml × Pa 7*	*s.e. ±*	*Aml*
			Experiment CA7B			
13	1.28	1.67	1.69	1.97	0.088	1.40
18	2.31	2.76	2.76	3.22		2.29
24	4.57	5.02	5.25	5.47		4.30

* Recorded at 6 in. above ground level.

Of the hybrids tested in CA7A, UIT1 × Na 33 showed the greatest girth increments whilst in CA7B seedlings of the family Aml × Pa7 showed the most rapid growth rate during immaturity. In both trials the Amelonado seedlings were the least vigorous.

A study of the relationship between growth during immaturity and early yields for trial CA7A showed significant correlations between stem diameters at 7, 12 and 24 months of age and the yields during the 1966/68 period. Early vigour thus gives a good indication of early yield potential.

YIELD PERFORMANCE OF THE PROGENIES

General

Harvesting in trial CA7A began in June 1967 (*i.e.* 29 months after planting) and in trial CA7B harvesting commenced in July 1966 (*i.e.* 28 months after planting).

Prior to the reduction of plot size to 44 trees in 1968, recording in the Amelonado hybrid trial was confined to row by row counts of the numbers of pods in the categories 'healthy ripe', 'diseased ripe', 'diseased unripe' and 'rodent damaged'. Yields were calculated on the basis of 10 pods per 1 lb of dry cocoa beans.

From the start of harvesting in trial CA7A and also in trial CA7B from 1968 onwards, recording of numbers of pods in the various categories has been on an individual tree basis.

At each harvest, 100 pods are taken from each treatment (where sufficient pods are available) and these are split, separately fermented and dried. The weight of whole pods, wet beans and dry beans from the 100 pods is recorded as also is the weight of 500 dry beans. Using these records the pod values (*i.e.* the number of pods per 1 lb of dry beans) and the weights of 100 dry beans are calculated for each variety.

Yields of dry beans for a given variety have been calculated using the appropriate unweighted average pod values for the periods under consideration.

In calculating yields per acre of dry beans no correction has been made for vacancies as the policy has always been to supply up such vacant points with the appropriate variety where the canopy had not closed.

Yield levels and pod and bean characteristics

Yield data for the Amazon hybrids trial and the Amelonado hybrids trial are summarised in *Tables 2* and *3* respectively. Seasonal and cumulative yields from healthy ripe pods in these trials are illustrated graphically in *Figure 1*.

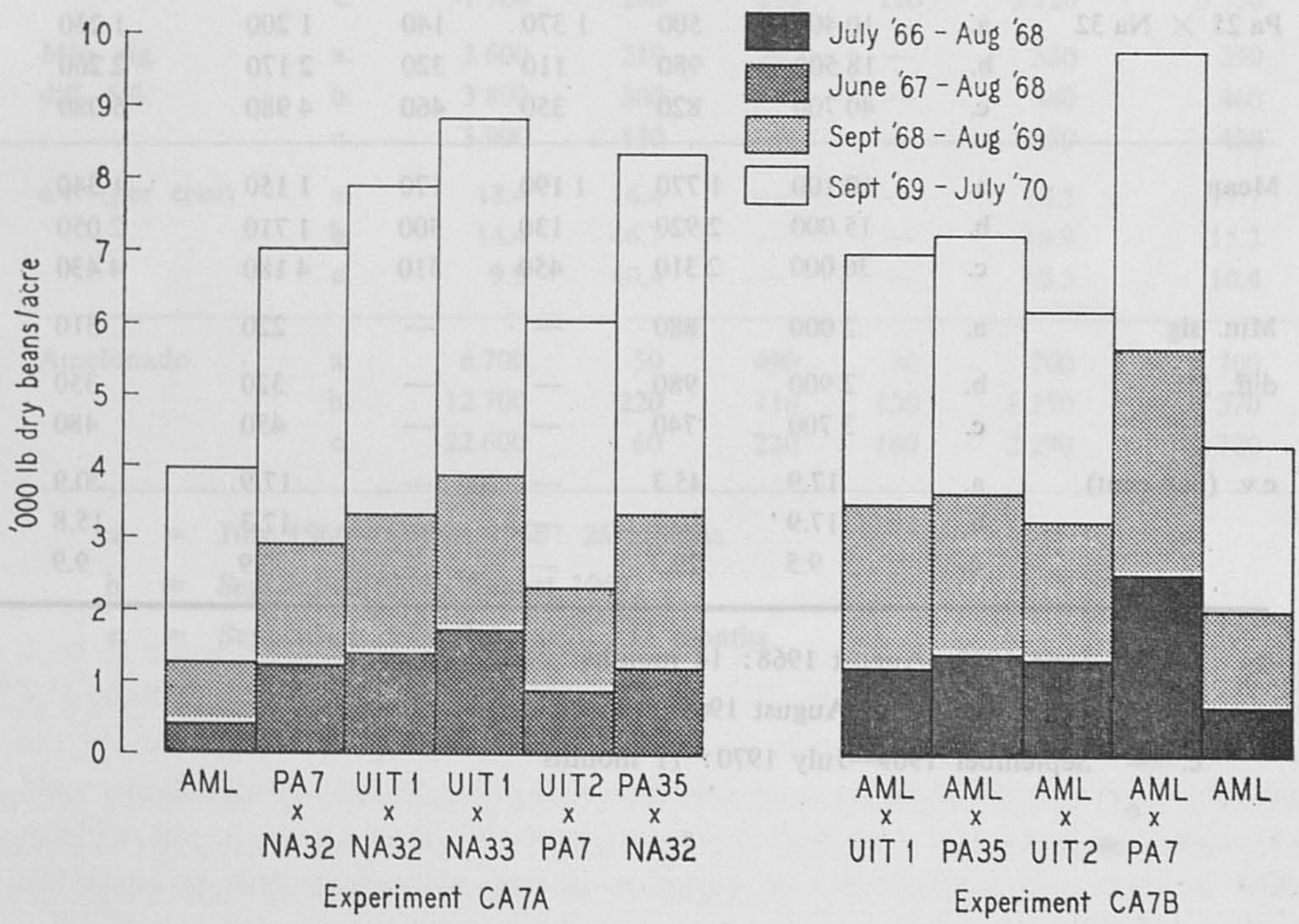


Figure 1. Cumulative yields of dry beans from healthy ripe pods (lb per acre)

Table 2. Experiment CA7A: Yield data for the period June 1967—July 1970

Variety	Period	Number of pods per acre				Dry cocoa per acre (lb)	
		(1)	(2)	(3)	(4)	(5)	(6)
		Healthy	Rodent damaged	Diseased Ripe	Diseased Unripe	Actual	Potential (1) + (2)
Amelonado	a.	4 000	490	490	110	420	460
	b.	7 900	530	40	80	840	920
	c.	25 200	930	170	560	2 690	2 790
Pa 7 × Na 32	a.	11 100	3 530	750	90	1 240	1 580
	b.	15 800	6 040	150	460	1 670	2 280
	c.	39 200	5 900	520	550	4 160	4 770
UIT 1 × Na 32	a.	11 500	1 440	1 570	180	1 400	1 590
	b.	15 600	2 300	190	350	1 920	2 200
	c.	36 600	1 660	470	500	4 590	4 790
UIT 1 × Na 33	a.	15 300	2 400	1 880	320	1 730	1 940
	b.	19 400	4 070	190	350	2 190	2 760
	c.	40 800	2 400	700	680	4 920	5 210
UIT 2 × Pa 7	a.	8 400	2 280	1 060	210	900	1 280
	b.	13 000	3 600	120	230	1 450	1 840
	c.	33 400	2 100	500	310	3 720	3 950
Pa 25 × Na 32	a.	10 400	500	1 370	140	1 200	1 230
	b.	18 500	980	110	320	2 170	2 260
	c.	40 700	820	350	460	4 980	5 080
Mean	a.	10 100	1 770	1 190	170	1 150	1 340
	b.	15 000	2 920	130	300	1 710	2 050
	c.	36 000	2 310	450	510	4 180	4 430
Min. sig. diff. 5%	a.	2 000	880	—	—	220	310
	b.	2 900	980	—	—	320	350
	c.	3 700	740	—	—	450	480
c.v. (per cent)	a.	17.9	45.3	—	—	17.9	20.9
	b.	17.9	30.7	—	—	17.3	15.8
	c.	9.5	29.3	—	—	9.9	9.9

a. = June 1967—August 1968: 14 months

b. = September 1968—August 1969

c. = September 1969—July 1970: 11 months

Table 3. Experiment CA7B: Yield data for the period July 1966—July 1970

Variety	*Period*	*Number of pods per acre*				*Dry cocoa per acre (lb)*	
		(1)	(2)	(3)	(4)	(5)	(6)
		Healthy	*Rodent damaged*	*Diseased Ripe*	*Diseased Unripe*	*Actual*	*Potential (1) + (2)*
Aml × UIT 1	a.	11 140	880	880	80	1 270	1 370
	b.	18 700	450	220	220	2 220	2 280
	c.	30 300	250	340	130	3 510	3 530
Aml × Pa 35	a.	13 100	1 080	1 080	50	1 450	1 570
	b.	18 600	290	150	160	2 230	2 260
	c.	31 000	110	300	170	3 580	3 590
Aml × UIT 2	a.	13 100	1 070	1 070	80	1 360	1 470
	b.	17 300	380	250	230	1 920	1 980
	c.	25 400	220	310	90	2 950	2 980
Aml × Pa 7	a.	27 100	1 230	1 230	110	2 550	2 670
	b.	30 300	1 100	190	220	3 180	3 290
	c.	40 000	470	370	90	4 050	4 090
Mean	a.	16 100	1 060	1 060	80	1 660	1 770
	b.	21 200	560	200	200	2 390	2 460
	c.	31 700	260	330	120	3 520	3 550
Min. sig.	a.	3 600	210	—	—	380	390
diff. 5%	b.	3 800	300	—	—	440	460
	c.	3 900	130	—	—	450	450
c.v. (per cent)	a.	18.4	16.4	—	—	18.5	17.7
	b.	14.4	46.7	—	—	14.9	15.2
	c.	9.9	40.4	—	—	10.3	10.4
Amelonado	a.	6 700	50	490	30	700	700
	b.	12 700	220	110	120	1 350	1 370
	c.	22 600	60	220	180	2 290	2 320

a. = July 1966—August 1968: 26 months

b. = September 1968—August 1969

c. = September 1969—July 1970: 11 months

It is immediately evident from the yield data that in both progeny trials, the Amelonado has given significantly poorer yields than the hybrids.

Yields of the hybrids in both CA7A and CA7B have been very satisfactory especially during the period September 1969—July 1970 when removal of shade and increased fertiliser applications have begun to exert a marked effect.

Of the progenies in trial CA7A, highest yields have been obtained from the crosses UIT1 × Na33 and Pa35 × Na32, with UIT1 × Na32 following closely in third place. As can be seen from *Table 4*, these families have very satisfactory pod values and bean weights.

In trial CA7B the cross Aml × Pa7 is by far the best yielder with the three other Amelonado hybrids grouped together at a yield level some 30 per cent lower. Unfortunately, the cross Aml × Pa7 despite its higher yield capacity has a lower pod value and a bean weight only slightly above 1 g per bean. Details of pod values and bean weights for trial CA7B are given in *Table 5*.

Rodent damage

Rodent damage has in both progeny trials been significantly lower in the Amelonado plots than in the majority of the hybrids. Crosses which have proved particularly subject to rodent attack are Pa7 × Na32, UIT1 × Na32 and Aml × Pa7. Obviously if losses of crop due to rodents could have been eliminated or at least reduced, then yields would have been much higher. Potential yields calculated on the basis of the total healthy ripe and rodent damaged pods are included for interest in *Tables 2* and *3*. It is worth noting that losses due to rodents have been much higher in general in trial CA7A which is in fact an isolated plot of cocoa surrounded on all sides by oil palms.

Losses due to diseased pods

Losses of mature and immature pods due to disease attack have been small. In trial CA7B there has been very little difference in this respect between the Amelonado and the Amelonado hybrids. In trial CA7A however, the losses of pods due to disease appear to have been lower in the Amelonado.

Yield variation within progenies

As a result of the individual tree recording which has been in progress in both progeny trials for some considerable time, it was possible to study the degree of yield variation within each seedling family. For the purposes of this study the number of pods produced has been taken as a fair indication of the relative yield capacity of a particular tree within its progeny; this assumption is not without fault as there will undoubtedly be variation in pod value from tree to tree even within a family.

The frequency distributions of number of pods produced per tree during the periods of individual tree recording are shown graphically in *Figure 2*.



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Table 4. Experiment CA7A: Mean pod values and weights of 100 beans

Period	Aml	Variety: Pa 7 × Na 32	UIT 1 × Na 32	UIT 1 × Na 33	UIT 2 × Pa 7	Pa 35 × Na 32	Mean
		No. of pods to give 1 lb dry cocoa					
1967/68	9.80	9.25	8.13	9.17	9.09	8.85	9.05
1968/69	9.09	9.61	8.13	8.85	9.00	8.54	8.87
1969/70	9.34	9.43	7.93	8.26	9.00	8.13	8.68
Mean	9.41	9.43	8.06	8.76	9.03	8.51	
		Wt of 100 beans (g)					
1967/68	112	118	139	127	127	131	126
1968/69	122	120	136	128	132	136	129
1969/70	122	118	132	130	126	130	127
Mean	119	119	136	128	129	132	

Table 5. Experiment CA7B: Mean pod values and weights of 100 beans

Period	Aml	Variety: Aml × UIT 1	Aml × Pa 35	Aml × UIT 2	Aml × Pa 7	Mean
		No. of pods to give 1 lb dry cocoa				
1966/68	9.50	8.78	9.18	9.34	10.44	9.45
1968/69	9.43	8.40	8.33	9.00	9.52	8.94
1969/70	9.84	8.65	8.65	8.59	9.88	9.12
Mean	9.59	8.61	8.72	8.98	9.95	
		Wt of 100 beans (g)				
1966/68	117	136	132	131	110	125
1968/69	117	131	134	133	119	127
1969/70	111	124	133	131	108	121
Mean	115	130	133	132	112	

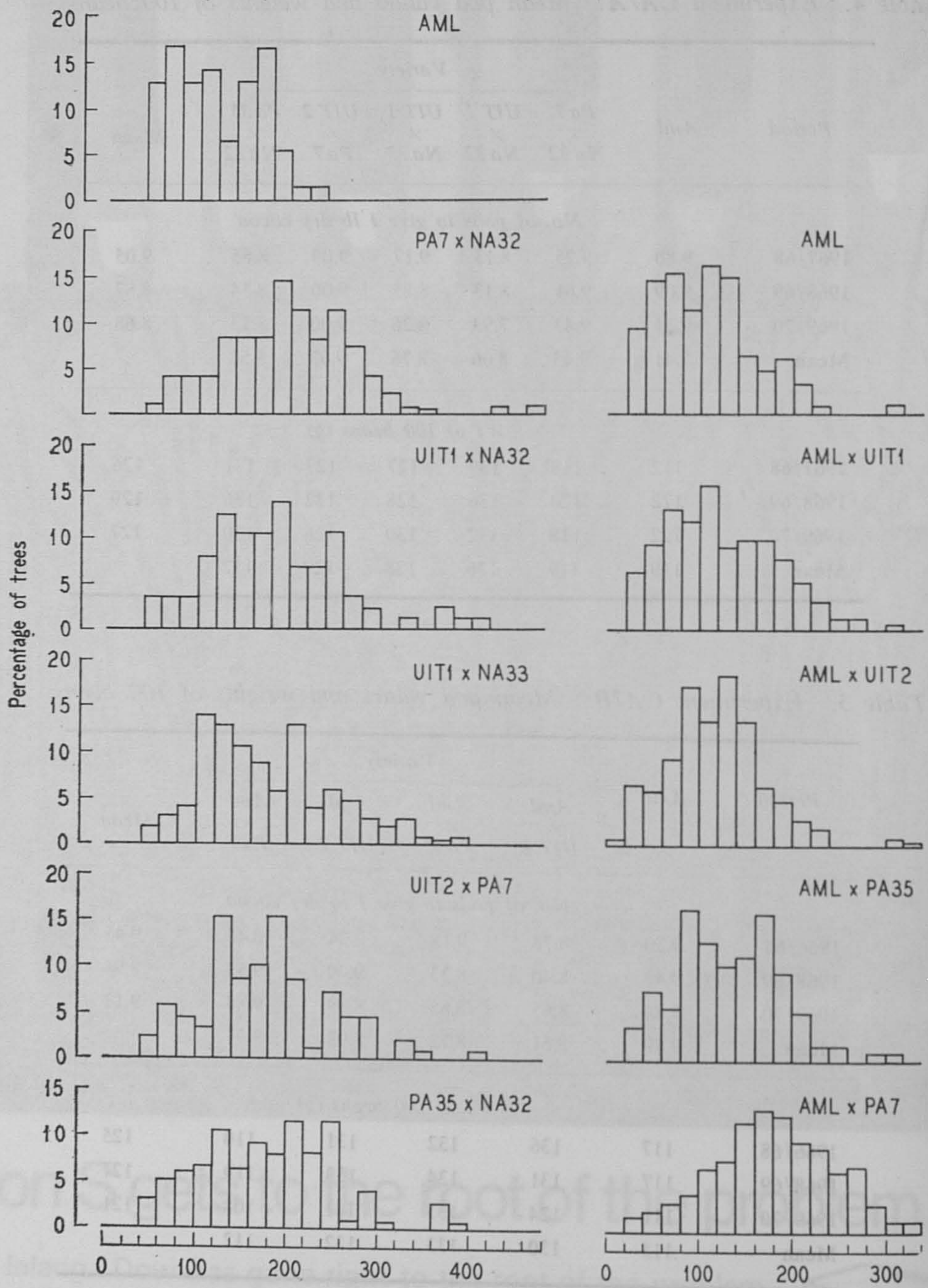


Figure 2. Frequency distribution of numbers of pods per tree (healthy ripe plus rodent damaged pods)

One point is immediately evident: that the degree of variability is much greater in the case of the hybrids than for the Amelonado seedlings. The Amelonado type has been highly selected and lacks the wider genetic variability possible with the hybrids. Inevitably, the wider variation shown by the hybrids means that in a commercial planting of such material a considerable number of lower yielding 'passengers' must be tolerated. This is however more than compensated by the very high yielders at the other end of the scale.

Wide genetic variability also presents the opportunity of selecting a number of very high yielding individual trees for use in future breeding programmes.

An interesting point emerged from a study of the data for Trial CA7A, which is an isolated block of cocoa in oil palms. The greatest loss of pods due to rodents has tended to occur in the highest yielding groups of trees within a family. Possibly those trees with higher yield also have more prolonged harvest peaks, thus giving the rodents a source of food when the majority of the trees bear no pods.

SECONDARY CHARACTERISTICS OF PROGENIES

Profuse flowering

When the Amazon hybrids in CA7A came into bearing in 1966 some trees were noted as producing inflorescences with many flowers. The symptoms resembled superficially those of flowery cushion gall disease which occurs in Central America but has not yet been recorded in Malaysia.

By October 1968 the incidence of this profuse flowering in CA7A had increased considerably and it was decided to investigate whether a pathogen was responsible. The incidence of profuse flowering in CA7A is shown in *Table 6*.

Table 6. Experiment CA7A: Incidence of profuse flowering

Variety	*Trees affected (per cent)*	
	30.9.68	*15.7.69*
UIT 1 × Na 32	13.3	46
UIT 1 × Na 33	7.6	60
UIT 2 × Pa 7	0.9	34
Pa 35 × Na 32	4.7	43
Pa 7 × Na 32	2.9	47

Isolates of *Calonectria rigidiuscula* were taken from the abnormal flower cushions but following large-scale pathogenicity tests at Tuaran, the Government

Pathologist has reported that no seedlings inoculated with seven isolates of the fungus have yet developed a gall. This would indicate that the abnormal flowering is likely to be a genetic effect rather than a pathological disorder[4].

At the time of writing* profuse flowering symptoms are virtually absent from all the trees in CA7A.

Tree form and canopy

Growth of all the hybrids was more vigorous than that of the Amelonado and a closed canopy had been formed within three years of planting. The Amelonado canopy is more open as a result of poorer vigour and also as a result of die-back following damage by insects and *Botryodiplodia* infection.

Although a policy of restrictive pruning had originally been intended, trees of all treatments have been allowed to run up to two or three jorquettes. In the case of the hybrids the branching systems of adjacent trees are closely interlaced allowing very little light to penetrate to ground level. This has caused shading out and death of many of the lower branches and gives rise to a certain amount of difficulty in harvesting pods on the branches.

DISCUSSION AND SUMMARY

Of the two early progeny trials planted on BAL Estates as part of the Sabah Government cocoa breeding programme, one compares the performance of Amelonado seedlings with that of three Amelonado × Amazon families and one Amelonado × Trinitario cross, while the second compares Amelonado seedlings with two inter-Amazon progenies and three crosses between Amazon and Trinitario types.

Growth and yield results so far obtained from these two trials show that on our basalt soils the performance of all the hybrids tested is much superior to that of Amelonado seedlings.

Since there is a difference of one year in the age of the cocoa in the two trials, direct comparison of the yield capacities of all the progenies is not possible.

From the results to-date however it is clear that the crosses UIT1 × Na33, Pa35 × Na32, UIT1 × Na32, Pa7 × Na32 and Aml × Pa7 are the best adapted to local conditions. All these crosses showed good vigour during immaturity and their early potential has been confirmed in the yielding period, with between 4 000 and 5 000 lb of dry cocoa beans being produced per acre during the period September 1969 to July 1970. Pod values and bean weights are satisfactory for all these promising crosses with Aml × Pa7 the poorest of the five in this respect. Although the appearance of profuse flowering in some of these crosses raised doubts regarding their suitability for commercial planting, recent findings have largely removed our concern over this characteristic.

(July 1970)*

Acknowledgements. The Authors thank the General Manager of BAL Estates Sdn. Bhd. for permission to publish this paper and for his co-operation during the progress of the trials. They gratefully acknowledge the efforts of Messrs. D. A. Ll. Brown and L. J. Foster for their earlier work in the planning and execution of the trials discussed here, and are also particularly appreciative of the assistance received from Mr. Phillip Chin Vui Pin who has had direct field control of the trials. They also wish to express their appreciation for the close co-operation received from the Government Plant Breeder and Pathologist.

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COCOA BREEDING IN SABAH†

by

Chee Yau Fah

Department of Agriculture, Sabah

Cocoa is a relatively new crop in Sabah, and much of the older cocoa plantations are planted with the unselected Amelonado variety. Though Amelonado has been growing well in the major cocoa producing countries of West Africa, its performance in Sabah is slightly below expectation. However, some trials in West Africa indicated that Upper Amazon (UA) varieties, originally imported to provide disease resistance, gave a better performance than Amelonado[4]. Subsequently the Sabah Department of Agriculture decided to set up a plant breeding section to provide improved planting material for distribution in the State.

BREEDING PROGRAMME

Since cocoa is not native to Sabah, clonal material had to be introduced; the first 60 clones, mainly of UA and Trinitario varieties, were introduced through West Malaysia. They were established at the Cocoa Research Station, Tawau in 1958/1959, after quarantine at the Agricultural Research Centre, Tuaran. Since then more clonal material has been introduced after quarantine at Kew, and Tuaran. To-date we have a stock of about 180 clones, a large proportion of which is made up of UA material.

As the phenomenon of heterosis or hybrid vigour is exploited in high yielding varieties, our aim is to build up a large and varied collection of clones so that a more flexible genetical manipulation is possible in the future breeding programme. The policy of Sabah and Malaysia is to produce bulk cocoa rather than fine flavoured cocoa, so the flavour of new hybrids should be as close to the West African Amelonado as possible. So far, the flavour of Amazon cocoa in commercial cultivation is much closer to that of Amelonado than is Trinitario which is nearer to the Criollo type. The genetical diversity between the Trinitario and UA clones should produce good hybrid vigor, but special care must be taken to avoid introduction of diverse flavours. Besides emphasis on the yield and flavour, other characteristics such as uniformity and size of bean, pod value*, shell, butter-fat content, growth vigour, mode of branching, earliness in fruit bearing, resistance or tolerance to die-back and other diseases, and the ability to thrive well in poorer soil are also considered.

Trinitario varieties usually have larger pods and beans and thicker pod shells than the UA varieties (*Table 1*). Smaller beans are wasteful because of the larger

---

* Pod value is the number of pods required to yield 1 lb of dry cocoa.

† *See* footnote to page 351.

Table 1. Average weight of dry beans (g)

UA Clones										
Na 33	Pa 7	Na 32	Na 34	Na 31	Na 35					
1.00	1.04	1.09	1.23	1.24	1.39					
Trinitarios										
ICS 95	ICS 98	ICS 45	ICS 84	ICS 6	ICS 16	ICS 39	ICS 40	ICS 89	ICS 60	
1.41	1.47	1.65	1.70	1.74	1.86	1.95	2.02	2.06	2.20	

proportion of inedible shell. The standard set by F.A.O. is a minimum dry bean weight of 1 g. Because of the small-sized beans the number of beans per pod of the Amazon varieties is higher than that of the Trinitarios.

Theoretically it would be very desirable to combine the larger pod and bean characteristics of Trinitarios with the thinner shell and larger number of beans per pod of the Amazon varieties. However, as mentioned earlier, special care must be taken to make sure that the introduction of Trinitarios does not upset the bulk cocoa flavour.

In view of the projected importance of cocoa as one of the major crops in Sabah, the Department of Agriculture intends to parallel the development of the crop with a long term cocoa improvement programme. The first phase will involve detailed study of each clone. This will be followed by intensive screening and selection of those with the most desirable characters. These characters can then be studied statistically to determine their heritability.

It is difficult and expensive to distribute superior varieties to the farmers by vegetative propagation such as cuttings and the alternative is to supply the material as seed. In seed propagation complete genetic uniformity within a variety is desirable and this can be achieved by establishing pure lines which can be obtained by repeated inbreeding. By inbreeding, desirable characters can be fixed and undesirable ones eliminated. Where possible homozygosity may be evaluated by test-crossing with a recessive parent. However, difficulty may arise in obtaining pure lines within the Amazon population, as most of the varieties are self-incompatible. Hence an indirect approach, which involves the use of pollen from another clone with an easily distinguishable marker gene may be necessary. The foreign pollen is used to induce a certain percentage of self-fertilisation in an otherwise self-incompatible clone[3].

In due course the data obtained for the clonal parents may be subjected to multivariate analysis. This technique can apply a statistical measurement to the genetical relationship of different clones[2]. By selecting parents with the widest genetical relationships, the production of high yielding hybrids may be anticipated.



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Table 1. Average weight of dry beans (g)

UA Clones										
Na 33	Pa 7	Na 32	Na 34	Na 31	Na 35					
1.00	1.04	1.09	1.23	1.24	1.39					
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ICS 95	ICS 98	ICS 45	ICS 84	ICS 6	ICS 16	ICS 39	ICS 40	ICS 89	ICS 60	
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PROGENY TRIALS

Progeny Trial I

This progeny trial at the Cocoa Research Station comprises three main groups of hybrids:

Upper Amazon × Trinitario
Trinitario × Trinitario
F_1 UA Hybrids

It was planted to give information on the heterotic effect of different groups of hybrids and their performance under Sabah conditions. The seed was derived from hand pollinations made at Serdang in West Malaysia, only a small number of pods were produced and most of the plots were planted with seedlings grown from the seed of a single pod. They were planted between October 1960 and January 1961 at 12 × 12 ft spacing. The plots were of unequal size and no proper replication was possible. However, a rough measure of the progeny performance can be obtained by comparing the plot yields with those of the Amelonado guard rows that surround them. Since the numbers of trees for the progenies are not equal and Amelonado trees were used to fill in the gaps, the calculated yields per acre might not be accurate. The mean yields for the two years October 1967 to September 1969 are presented in *Table 2*. The yields are

Table 2. Estimated Yields of Progeny Trial I

Progeny parents	*Yields of dry cocoa (lb per acre per annum)*		*Progeny parents*	*Yields of dry cocoa (lb per acre per annum)*	
Amazon × Trinitario	*Hybrids*	*Amelonado comparison*	*F_1 Trinitarios*	*Hybrids*	*Amelonado comparison*
Na 33 × ICS 16	2 760/28*	1 150/23	UIT 2 × ICS 6	2 060/34	1 390/26
Na 32 × ICS 16	2 480/30	1 520/22	UIT 1 × ICS 1	1 790/21	1 330/23
Pa 7 × ICS 95	2 420/29	970/17	UIT 1 × ICS 1	1 610/13	1 330/22
Pa 7 × ICS 60	2 120/17	1 150/20	UIT 1 × ICS 16	1 790/20	1 300/25
Pa 7 × ICS 60	1 520/16	820/18	UIT 1 × ICS 16	790/32	1 060/28
Na 32 × ICS 60	2 060/35	1 210/26	UIT 2 × ICS 60	1 330/24	1 120/27
Pa 7 × ICS 6	2 030/35	1 240/26	UIT 1 × ICS 60	1 270/15	1 270/20
Pa 7 × ICS 6	1 880/30	1 270/25	UIT 2 × ICS 95	1 270/28	1 360/25
Pa 7 × ICS 6	1 150/26	1 030/26	UIT 2 × ICS 95	1 210/20	1 210/24
UIT 1 × NA 34	2 000/33	1 180/27	UIT 1 × ICS 95	1 000/17	850/22
UIT 1 × NA 34	1 610/17	1 160/23	UIT 2 × ICS 1	910/18	1 150/22
Pa 7 × ICS 16	1 880/11	820/19	Weighted mean	1 380	1 220
Pa 7 × ICS 16	1 820/6	1 030/15			
Na 33 × ICS 1	1 760/28	1 030/24	*F_1 Amazon*		
Na 32 × ICS 1	1 610/28	1 120/25	Na 31 × Pa 35	1 970/4	1 030/16
Pa 7 × ICS 1	1 640/28	1 270/24	Na 32 × Pa 7	1 850/30	790/19
Pa 7 × ICS 1	1 420/34	700/26	Na 32 × Pa 35	1 540/19	1 000/24
Na 32 × ICS 6	790/9	970/17			
Weighted mean	1 890	1 100	Weighted mean	1 750	940

* Denominator indicates number of trees recorded.

of course approximations calculated from plots with unequal numbers of trees with gaps that have been filled by Amelonado supplies. Both the UA × Trinitario and the UA Hybrids have out-yielded their Amelonado guard rows by more than 70 per cent. The F_1 Trinitario crosses on the other hand, are only about 13 per cent better than the guard rows. The hybrid vigour of the UA × Trinitario crosses is not surprising, whereas of the F_1 Upper Amazon crosses indicated marked genetical variability amongst the UA clones. On the other hand, the genetical constituents of the Trinitario clones may be rather closely related as no marked hybrid vigour is demonstrated among their crosses.

Progeny Trial II — Amelonado × UA and Trinitario

The trial consists of three Amelonado × UA and one Amelonado × Trinitario hybrids. The trees were planted at 12 × 12 ft in December 1964 in plots of 15 trees replicated eight times in a randomised block design. Amelonado was planted as a control and the UA F_1 cross PA 7 × Na32 was planted as a link cross between this trial and the two others discussed below. It is also represented in progeny trials at BAL and Rumidi Estates.

Table 3. Progeny Trial II — Amelonado × UA and Trinitario

Progeny	Girth (cm)		Yield of dry beans (lb per acre)	
	1968	1969	1968	1969
Pa 7 × Na 32	29.4	35.2	493	1 013
Aml × Pa 7	29.7	35.9	365	1 003
Aml × Na 32	27.7	33.8	288	754
Aml × Pa 35	28.3	33.9	250	722
Aml × UIT 1	26.4	31.2	215	487
Amelonado	18.7	23.0	4	9

Table 3 shows the mean girth and yields of the trees; the Amelonado hybrids were very much more vigorous than their Amelonado control. There was a large increase in yield during the period of 1968–69 in which the yield of the Aml × UA hybrids almost tripled and that of one Aml × Trinitario cross and the Pa 7 × Na 32 doubled. Of the three Aml × UA crosses Aml × Pa 7 is the most vigorous, followed by Aml × Na 32, Aml × Pa 35 and Aml × UIT 1. Aml × Pa 7 is just as good as the UA cross Pa 7 × Na 32. The ranking of the progenies since 1968 is the same and the performance of Amelonado control is inexplicably very poor. As the trees are still young it is early yet to assess the real potential of the Amelonado hybrids, but their steep climb in yield at the fourth year since planting looks very encouraging.

Progeny Trial III — F_1 Upper Amazon and UA × Trinitario

This trial of Amazon and Amazon/Trinitario hybrids also included Amelonado as a control. It was planted at the same spacing and to the same design as Trial II.

The mean girths and yields of this trial are presented in *Table 4*. In this trial the F_1 UA crosses are more vigorous in growth than the UA × Trinitario crosses, but the latter (except for UIT 2 × Pa 7) have out-yielded the former. The extra control Pa 7 × Na 32 has a higher yield in this trial than it does in the adjacent Amelonado hybrid trial indicating a fertility change across the field.

Table 4. Progeny Trial III — F_1 Upper Amazon and UA × Trinitario

Progeny	Girth (cm)		Yield of dry beans (lb per acre)	
	1968	1969	1968	1969
UIT 1 × Na 33	30.7	35.6	1 229	1 559
UIT 1 × Na 34	32.4	36.3	1 023	1 458
UIT 1 × Na 32	32.4	36.2	969	1 416
Pa 35 × Na 31	33.1	38.3	917	1 374
Pa 35 × Na 32	34.1	36.4	785	1 253
Pa 7 × Na 32	30.8	37.0	746	1 222
UIT 2 × Pa 7	30.1	36.4	694	1 039
Amelonado	19.5	24.1	20	66

Therefore, one could expect the Amelonado hybrids to perform better in more fertile soil. Here again the performance of the Amelonado control has been extraordinarily poor and does not give a good comparison with the progenies.

Progeny Trial IV — F_1 × F_0 crosses

This trial planted concurrently with II and III, and with same spacing and design, compares back-crosses to Amazon and Trinitario parents with Pa 7 × Na 32. The mean girth and yields per acre are presented in *Table 5*. A second

Table 5. Progeny Trial IV — F_1 × F_0 progeny

Progeny	Girth (cm)		Yield of dry beans (lb per acre)	
	1968	1969	1968	1969
Pa 7 × Na 32	28.4	32.2	902	1 370
(Na 32 × UIT 1) × Pa 7	28.6	31.9	864	1 148
(Na 32 × Pa 35) × UIT 1	29.1	34.0	759	1 068
(Na 32 × Pa 7) × UIT 1	29.7	33.1	751	1 009
(UIT 1 × Na 34) × Pa 35	31.3	34.4	600	921
(Na 31 × Pa 35) × UIT 2	28.7	32.2	499	753

burst of hybrid vigour was expected in this trial but so far the results give no such indication. In fact these crosses have yielded less than their corresponding F_1 parents. However, the yields of these crosses are still increasing significantly and no conclusion can as yet be drawn on their vigour and yield potential.

Progeny Trial V (Rumidi)

In this trial there are seven progenies replicated seven times. The trees were planted in 1965 at 10 × 10 ft in 15-tree plots. The soil is Pinianakan series derived from ultra basic parent material, whereas that at Quoin Hill belongs to the Table sub-family and is derived from basalt. The girth and yield of the trees are presented in *Table 6*. All the progenies except UIT 1 × Na 32 show a 200–600 lb per acre decrease in yield from 1968 to 1969. The ranking of the progenies in yield has also changed since 1968. For example, UIT 1 × Na 32 ranked third in yield in 1968 but was the highest yielder in 1969.

Table 6. Progeny Trial V at Rumidi Estate: girths of trees (cm) and yields of dry beans

(lb per acre per year)

Progeny	*Girth (cm)*	*Yield (lb)*	
	1969	*1968*	*1969*
UIT 1 × Na 32	35.8	1 670	1 808
UIT 1 × Na 34	33.7	1 813	1 389
Pa 7 × Na 32	33.8	1 571	1 330
UIT 1 × Na 33	31.5	1 680	1 281
UIT 2 × Pa 7	35.5	1 551	1 200
Pa 35 × Na 32	34.5	1 441	1 087
Pa 35 × Na 31	33.2	1 493	881
Amelonado	33.5	970	735
Progeny mean	34.0	1 603	1 282
Increase (per cent)	1.5	65	74

COMPARISON OF C.R.S., BAL AND RUMIDI PROGENY TRIALS

It is interesting to compare the yield of the progenies planted at C.R.S., BAL and Rumidi (*Table 7*); of the three sites, BAL seems to be the most favourable in which the progenies give the highest yield. The yield ranking at C.R.S. and BAL was similar, and except for a small change at BAL there has been a significant increase in yield over 1968. At Rumidi, on the other hand, there has been a significant decrease in yield from 1968 to 1969 and the ranking of the progeny yields also changed. It is possible that the unexpected decline in yield may be attributed to the unusually dry weather in the early part of 1969, since the Pinianakan soil is of a very free-draining type.

Comparison between the three trials is made more difficult by the different spacings adopted: 12 × 12 ft at C.R.S., 10 × 10 ft at BAL and Rumidi. There is no experimental information on the relative performance of hybrids at these spacings and extrapolation of results can only be speculative.

Table 7. Comparison of yield for various progenies at BAL, C.R.S. and Rumidi

(Yields in lb dry beans per acre per year)

Progeny	*C.R.S.*		*BAL*		*Rumidi*	
	1968	*1969*	*1968*	*1969*	*1968*	*1969*
UIT 1 × Na 33	1 229	1 559	1 935	2 762	1 680	1 281
UIT 1 × Na 32	969	1 458	1 591	2 214	1 670	1 808
UIT 1 × Na 34	1 023	1 416	—	—	1 813	1 389
Pa 35 × Na 32	785	1 375	1 230	2 265	1 411	1 087
Pa 7 × Na 32	746	1 253	1 579	2 280	1 571	1 330
Pa 35 × Na 31	917	1 222	—	—	—	881
UIT 2 × Pa 7	694	1 039	1 281	1 843	1 551	1 200
Amelonado	20	66	457	925	970	735
Progeny mean	909	1 332	1 323	2 272	1 616	1 283
Increase (per cent)			189	156	67	75
Planting date	Dec. 1964		Feb. 1969		April 1965	
Amelonado hybrids						
Aml × Pa 7	365	1 003		3 293		
Aml × Pa 35	250	720		2 264		
Aml × UIT 1	215	487		2 279		
Amelonado	4	9		1 367		
Progeny mean				2 612		
Increase (per cent)				91		
Planting date	Feb. 1965		March 1964			

SEED PRODUCTION

A wide range of mixed hybrids, is available from a 30-acre seed-garden. Some of these are being tested in the progeny trials previously described while the quality of the others has been proven elsewhere, particularly West Africa. The following is a list of these crosses: —

Pa 7 × UIT 2	Sca 6 × Pa 35
Pa 7 × Na 32	Sca 6 × Pa 35
Na 32 × UIT 1	Na 32 × Pa 7
Na 34 × UIT 1	Sca 6 × Pa 7
Na 33 × UIT 1	Sca 12 × Pa 7
Na 32 × UIT 1	UIT 4 × Pa 7
Na 32 × Pa 35	Na 32 × Sca 12
Na 32 × Pa 35	Sca 12 × UIT 1
Sca 12 × Pa 35	Pa 7 × UIT 1

Advantages of planting mixed hybrids

For a variety of reasons it is recommended that cocoa plantations should be planted with mixed hybrids rather than only one type:

Flavour. As mentioned earlier the grading of bulk cocoa flavour is based on that of West African Amelonado. However, the flavour of the African cocoa is not necessarily due to the use of a single variety but because of the repeated blending during marketing of the produce of a multitude of tiny farms. While West African cocoa is mainly Amelonado with some Upper Amazon, it is this unique blending that gives the West African cocoa its desired flavour characteristics. Thus by planting mixed hybrids of the approved Amazon types in West Malaysia there is a very good chance of producing cocoa which has a flavour near to that of West African Amelonado.

Cross-compatibility. Experiments in Trinidad showed that if two parents are self-incompatible then the chances of the progeny being self-incompatible are very high. Since all the clones in the seed-garden are self-incompatible there is a possibility that some of the resulting hybrids will also be self-incompatible. If any one of these self-incompatible hybrids were planted separately a lower yield would be expected as the percentage of fruit set would be low. On the other hand most of these self-incompatible progenies are cross-compatible with other varieties[5], so that by planting mixed hybrids in a plantation, the effect of self-incompatibility would to a large extent be eliminated.

Disease resistance or tolerance. Many Upper Amazon clones are known to possess tolerance towards many cocoa diseases *e.g.* witches' broom and black pod diseases[1]. The clones in our seed-garden include a wide range of varieties known to be resistant to many cocoa diseases. Thus, by planting a wide range of mixed hybrids, a plantation is less likely to be wiped out should there be an epidemic outbreak of any one of these diseases.

Adaptability. Since cocoa research in Sabah and Malaysia is still in its early stage, the performance of all the varieties in different soil types and different climatic conditions has not been tested to the fullest extent. Hence it is difficult to recommend which variety should best be planted in which soil group or under which climatic condition. However, by planting a wide range of hybrids we can expect a large proportion of the plants to thrive well in any average soil type.

CONCLUSION

Cocoa can be quite a profitable crop both for smallholders and for large estates, if given the proper management. The margin of profit can be considerably increased by planting superior varieties. Realising that cocoa has a bright future as one of the major plantation crops, the Department of Agriculture is launching

a long term programme to improve the quality of cocoa planting materials. However, co-operation between the planters and the Department of Agriculture is necessary to ensure that research findings are converted into benefits in commercial practice.

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DISCUSSION *

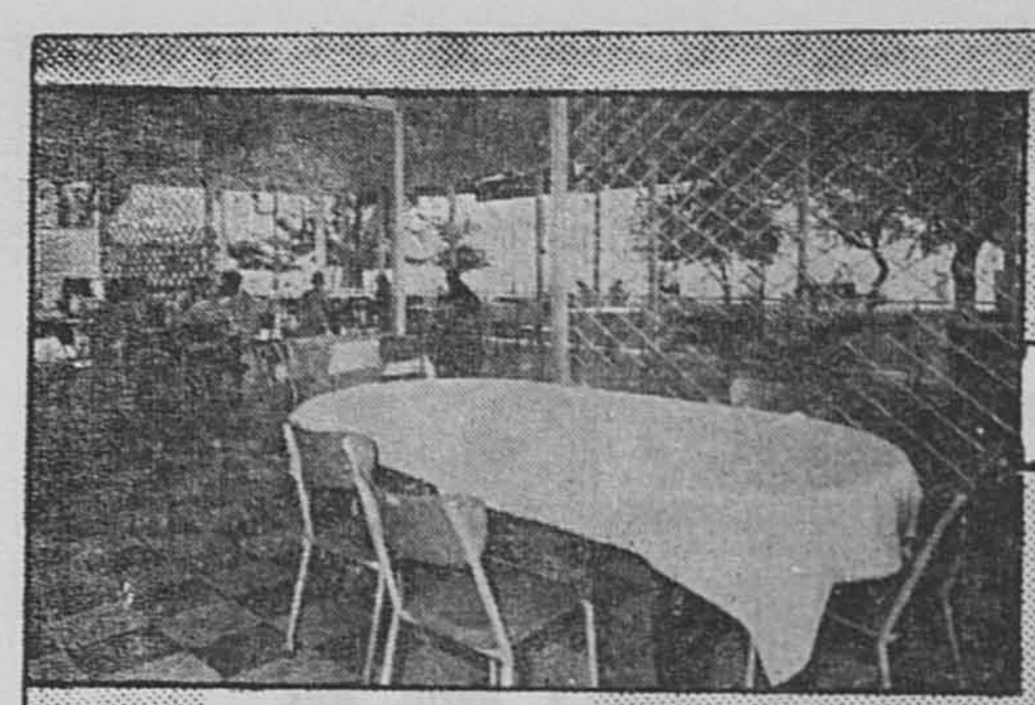
The remarkable yields harvested from these trials offer great promise for the future of cocoa in Malaysia; they must also remove all doubts as to whether fertilisers are necessary for mature cocoa, a topic on which some managements still had reservations only a few years ago.

Most of the hybrid cocoa in Sabah and elsewhere has been planted at an arbitrarily-chosen spacing of 10 x 10 ft. but spacing and thinning trials have started at several places. The virtues or otherwise of various methods of pruning provide topics for continuing discussion and investigation, for most trial plantings have not been pruned in the same way as commercial plantings. If a tree is not pruned it may develop three or four jorquettes and become very tall; nevertheless, difficulty of harvesting may be offset if the branches of lower jorquettes die or are pruned off, and a larger proportion of crop is borne on the branches than on the trunk. Restriction of the height of the tree to one or two jorquettes keeps the crop nearer to hand, but access may be impeded by profuse branching. Trials with trees growing two or more trunks have started and should give interesting results.

The removal of flowers from young trees just reaching bearing age was originally recommended as a means of improving the uniformity of variety trials; it is probably neither necessary nor economic in commercial plantings. The reported increase in fruit set obtained in Ghana by artificial pollination of many flowers is at variance with trials on this topic in the nineteen-fifties, it was speculated that there may be changes in the insect fauna after two decades of insecticide spraying.

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* The Chairman of the session, Dr. J. W. Blencowe, accepts responsibility for his summary of the transcript of the discussion of this and the preceding paper.



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Rodent damage on BAL Estates has been reduced in both commercial and trial plantings by the use of poison baits against rats; *musang* can also be controlled in this way (using different baits), but not squirrels. Most of the rodent damage now recorded is caused by squirrels.

The cocoa industry in both West and East Malaysia is almost entirely dependent on the Sabah Department of Agriculture for the supply of pedigree cocoa seed. This supply comes from the clonal seed gardens planted at the Cocoa Research Station, Quoin Hill. Planters who ask for large quantities of hand-pollinated seed of named parentage place considerable burdens on the available facilities. The number of pollinators is limited and inevitably their pollinating success, and the incidence of cherelle wilt varies from season to season.

However, large numbers of open-pollinated pods are harvested from self-incompatible trees in the seed-garden; the female parent is thus identified with certainty. The lay-out of the garden also gives good indication of the likely male parent, for desirable 'pollen parents' have been planted in adjacent rows. Planters would do well to ask for their supply of open pollinated seed to be identified as far as possible (and certainly by its female parent), for they would gain more information from its future performance than they would from plantings labelled anonymously as 'Sabah Mixed Hybrids'.



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HEADQUARTERS AFFAIRS

I.S.P. Group Insurance Scheme. Consultations are now going on between the Society and a leading Insurance Company with a view to the Society's assuming the functions of an agent for that Company and arranging Participating Endowment Assurance for Members. The Society would undertake responsibility for seeing that the best possible terms were secured for Members and that the difficulties sometimes experienced with individual insurance agents were avoided.

It is intended that a generous proportion of the agent's Commission derived from this activity would be rebated to Members; a small part of it would naturally have to be retained by the Society for administrative expenses.

The scheme is based on policies assigned to the Malayan Estates Staff Provident Fund but it is likely that additional policies not assigned to the MESPF and fresh policies from non-Members of the Fund would enjoy the same rebate terms. Full details of the scheme will be published in the Supplement to the September issue.

A Member of Malacca's Executive Council is quoted in *Asia Magazine* (August 1st) as saying: "An important factor recently was the pull-out of the Commonwealth forces stationed here. The camp occupied 200 acres and it contained 20 000 soldiers and their families."

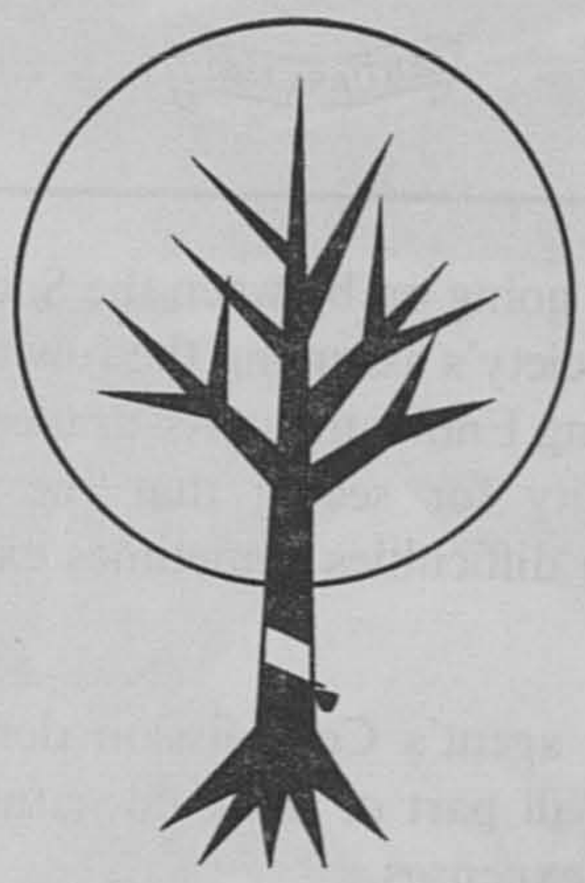
The Society's Annual Agricultural Conference is being held this year from 25–27 November at the Federal Hotel in Kuala Lumpur. It will consider Cocoa and Coconuts both separately and jointly and has attracted contributions from France (Ivory Coast), Great Britain, India, Pakistan, Indonesia, Japan, the Solomon Islands, New Guinea and the Food and Agricultural Organisation of the U.N., as well as from East and West Malaysia.

A registration form for participants will be found inside the front cover of this issue and once again we would urge you to register early. A provisional list of papers to be presented will shortly be available.

Singapore's Parliament must certainly have been jolted on the 3rd of August when, according to *The Straits Times* they heard their Minister of Social Affairs say that: "Mount Emily Girls Home was the only one run by the department to train juvenile prostitutes up to the age of 21."

Christmas and New Year Greeting cards for this year will again be obtained from *Rumah 'Amal Cheshire*, Selangor who have expressed their high appreciation of the past support from the Society and hope that Members will be as generous this year.

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The new cards measure 4½″ x 7″ and feature a most attractive colour reproduction of a painting by Chuah Thean Teng entitled The Banana Reaper. Season's Greetings are printed in four languages and the card will be inscribed : 'Sold for the benefit of Rumah 'Amal Cheshire by the Incorporated Society of Planters.

The cost to Members will be the same as before: $6.50 per dozen post free, plus $2.40 per dozen if you want your name and address overprinted on the card.

The plain card, bearing the Society's name and crest, can again be supplied, but only against firm orders which are received before the end of October. The price is $6.00 per dozen (plus $2.40 per dozen if the sender's name and address is included).

An order form for both types of card will be contained in the Supplement to the September issue.

Technical Education Scheme examination papers and examiners' comments will no longer be published in "The Planter" but will appear in the monthly Supplement issued for the confidential information of Members, and will be easily detachable for filing. As an economy measure the Society will shortly cease sending copies of past examination papers on request to Members. Having gone to the expense of publishing them in the magazine—or, as is shortly to be the case— in the supplement, we feel it is up to would-be candidates to retain or file their copies of these.

A Northern Club well-known to Planters has just had its Half Yearly General Meeting at which, according to the Minutes: "Mr. X felt that the word 'Executive' was a high-polluting word and the Committee should not be called 'Executive Committee' as they were elected Members."

Motorcars are like people in that they will respond to considerate treatment. If a Mr. Robert Glenton is to be believed, cars can also exact a terrible vengeance on those who abuse them. In his road test of a new quality car from Germany, Mr. Glenton wrote in *The Malay Mail* (4 August) "One had to kick down the throttle pedal before the engine took off all by itself."

Malaysian Members who have yet to visit the United Kingdom had better get a move on. BOAC recently took a page in *The New Yorker* which announced: LONDON BRIDGE IS IN ARIZONA! . THE QUEEN MARY IS IN CALIFORNIA! . The page was headed: COME TO BRITAIN WHILE IT LASTS.

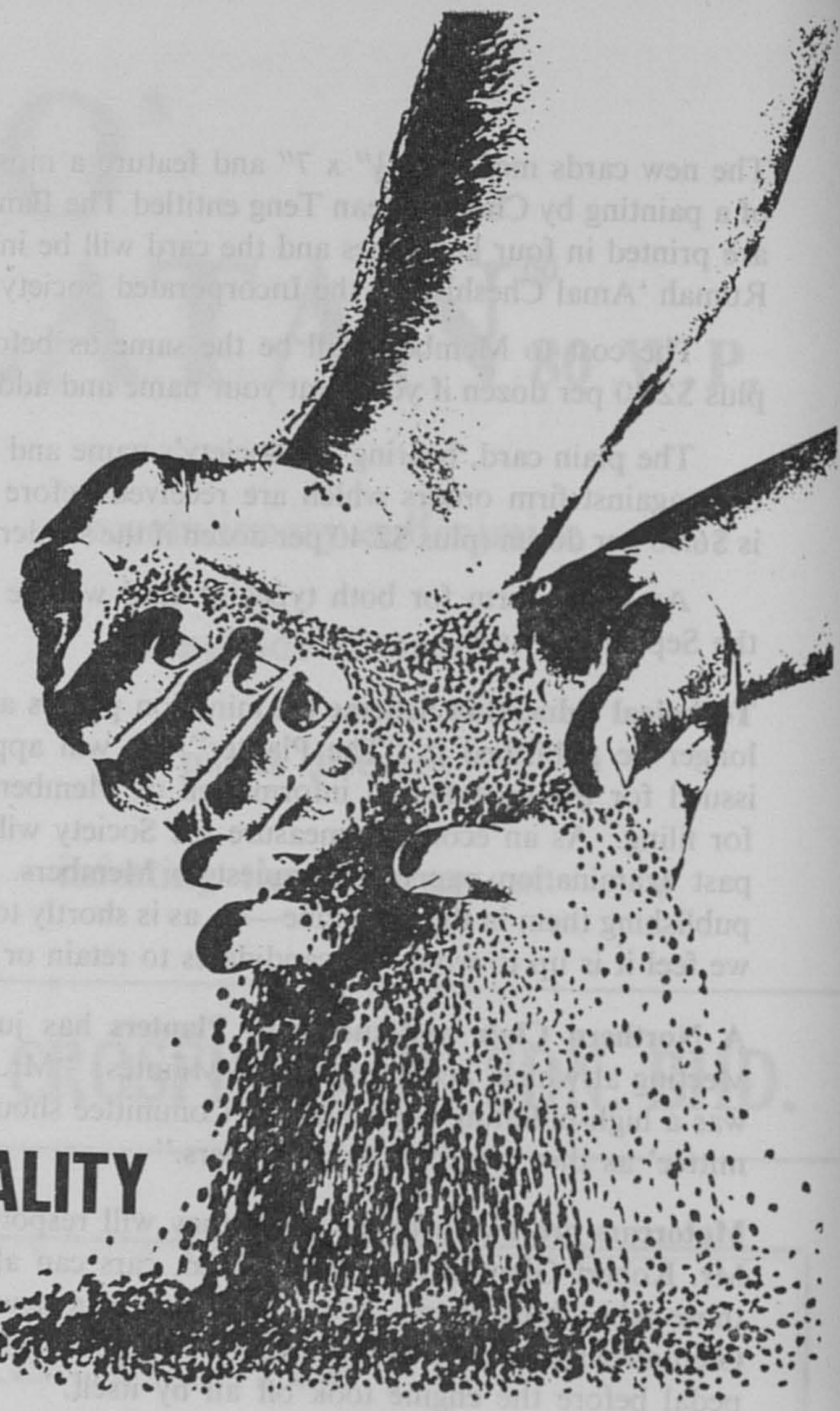
Amchem Products whose name has by now become synonymous with Ethrel, have opened a new office in Kuala Lumpur. It is at 14a Pesiaran Ampang, which is a turn off to the right at the 4 milestone Jalan Ampang, coming from Kuala Lumpur. The telephone number is 647653.

A small gathering of friends and associates, among whom your Secretary was kindly included, were most pleasantly entertained at a reception to celebrate the opening of the new premises on 14 August.

Another rubber anyone? Things have reached a pretty pass in Pahang. The headline to a letter in *The Straits Times* (16 July) reads: TIME FOR BRIDGE AT JERANTUT FERRY.

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Review:

SAVING MALAYSIA FOR MAN

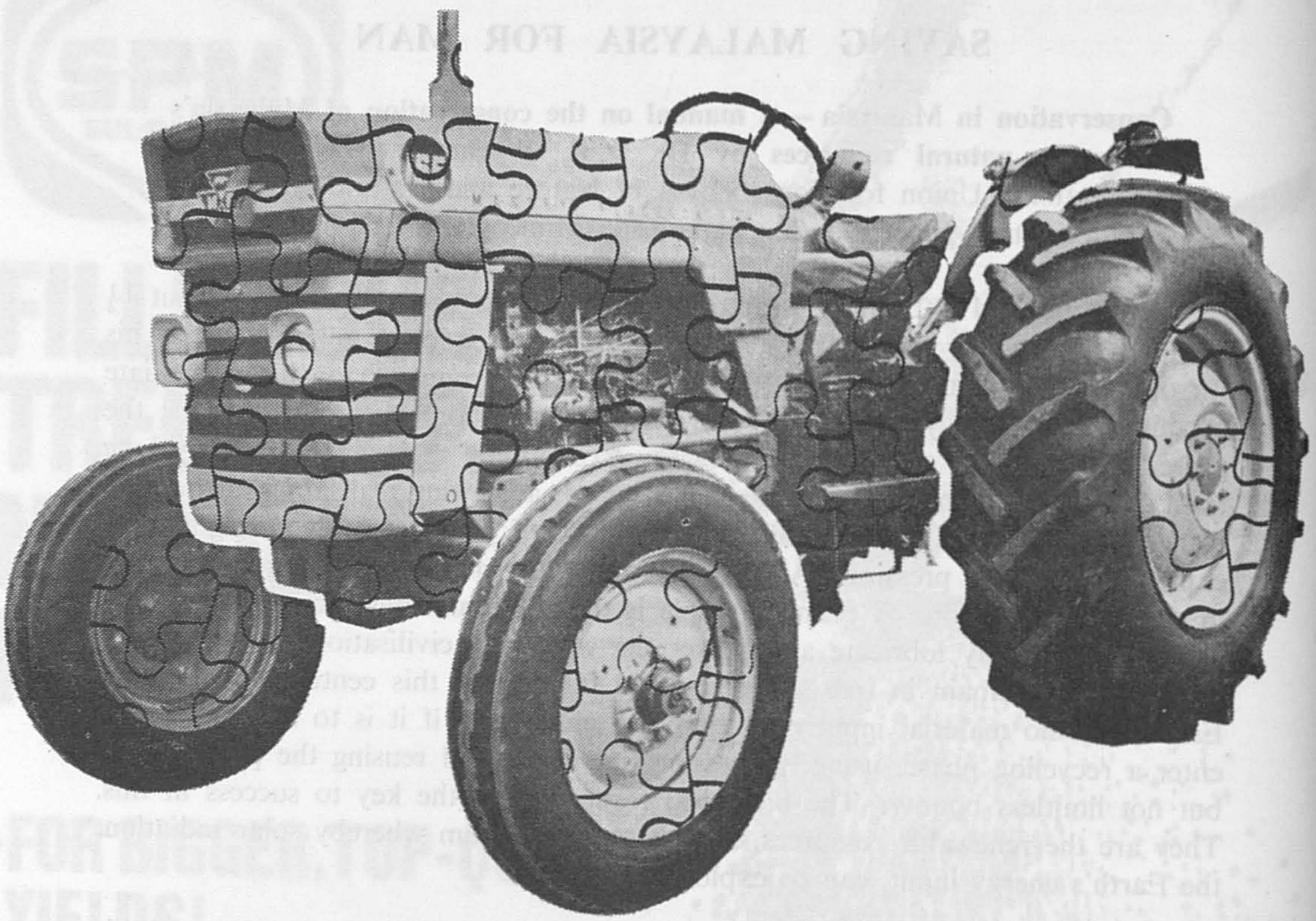
Conservation in Malaysia — a manual on the conservation of Malaysia's renewable natural resources by Dr. P. R. Wycherley. Published by International Union for Conservation of Nature and Natural Resources. Supplementary paper No. 22. Paperback, Mimeograph.

The earth is 4 000 million years old, and man has been present for about $1\frac{1}{2}$ million of them, for most of that time living in reasonable equilibrium with his surroundings. His unique ability to modify the environment for his immediate benefit has only really blossomed forth in the last one or two hundred years; the present environment crisis results from this exploitation racing ahead of any long term consideration for the consequences. There is a growing realisation of the need to control population growth and halt the spread of poisons, and control of over-exploitation is also pressing. Already several of the major physical resources are in sight of exhaustion. A prime example is the petroleum deposits which literally and metaphorically lubricate and power the wheels of civilisation. Few consider that they can remain in free supply beyond the end of this century. "Spaceship Earth" has no material input or output and civilisation if it is to survive, has to enter a recycling phase, using, processing, retrieving and reusing the planet's rich but not limitless bounty. The biological resources are the key to success in this. They are the renewable resources, and the main medium whereby solar radiation, the Earth's energy input, can be exploited.

How important then to develop a full understanding of the mechanisms of this biological activity, and to take precautions to avoid totally destroying those biological communities wherein lies the hope of future generations. Dr. Wycherley looks into these questions, as they affect Malaysia, in some depth. The tropical areas have the potential for high biological turnover, and as the author remarks in his introduction, Malaysia has been chosen as a representative because it is well known, and because of the need to look in some detail at one place rather than extend to a wider area more superficially.

Malaysia is blessed with a climate and physical environment that has nurtured a rich biological variety. This climate is itself a major resource. Fortunately, as Dr. Wycherley says, man cannot yet control it, for if he could, undoubtedly he would amend it for immediate selfish ends, quite likely to be contrary to the long-term good. The soils, too, are a major asset and most can support abundant plant life; but soil is extremely slow to form and is easily lost. A more delicate resource then might be immediately supposed. Water is an indispensible physical requirement of life, and it is a common error to suppose that Malaysia, with its heavy tropical rainfall, has an optimum amount. In fact, in some circumstances it can have too little whilst in others there is too much. Rainfall, unimpeded, is a harsh remover of top soil—even brief periods without vegetation can lead to denudation. Once this occurs, restoration to the original state is unlikely within any foreseeable future.

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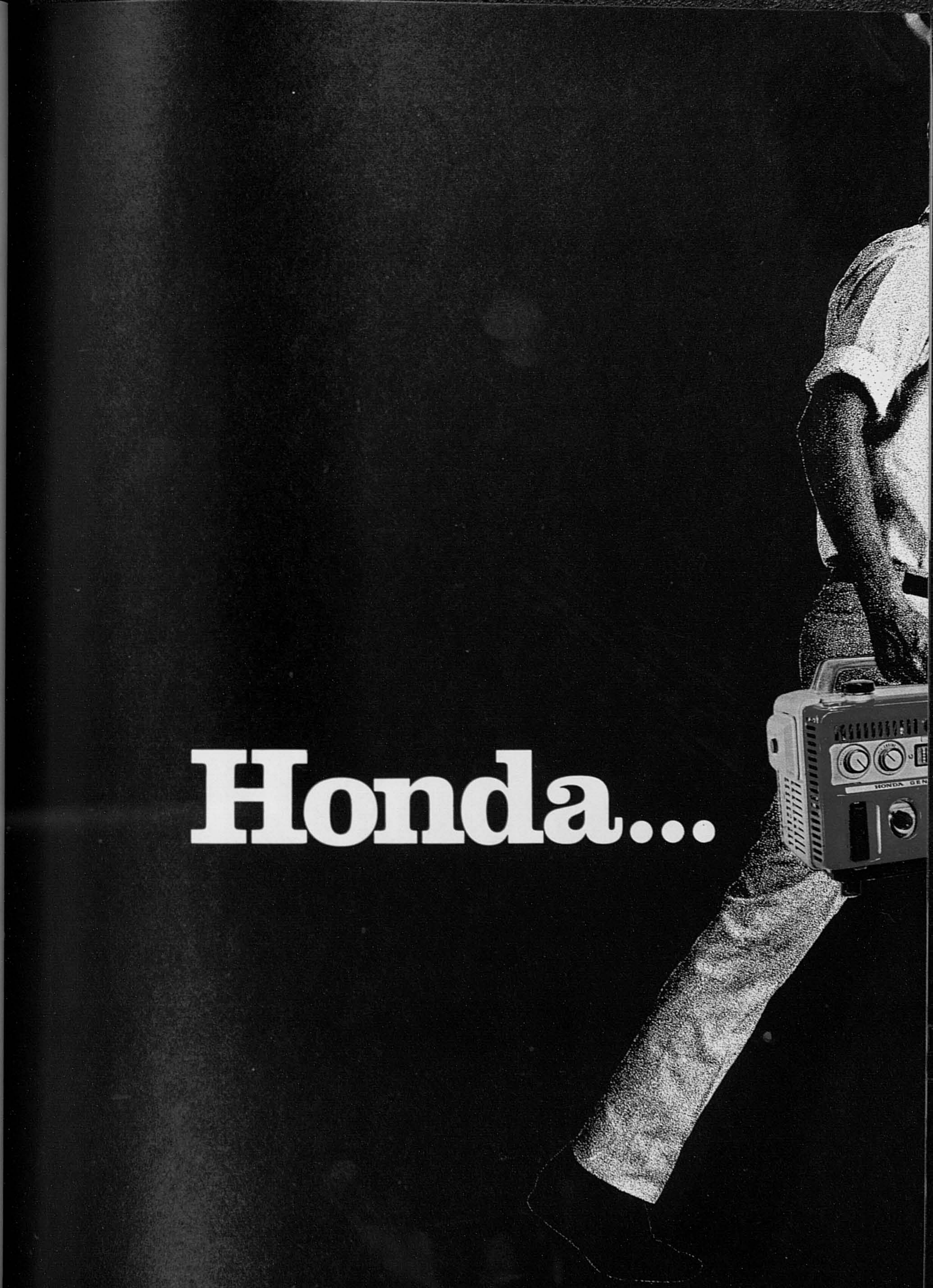
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Erosion has consequences beyond loss of soil at the site. It also silts rivers and streams, thus greatly adding to the likelihood of flooding, with its various adverse short and long term affects. Vegetation is the all-important factor in soil preservation, and by giving a sponge-like quality to the land surface, it permits an orderly flow of water from areas of excessive rainfall to areas of need, or harmlessly to the sea. Forest is the climax vegetation of Malaysia, and large reserves must be set aside for catchment.

Plantations, properly husbanded, can serve some of the protective functions of a forest cover. The planting community has been quite conservation minded, providing physical aids like silt pits, and managing the ground vegetation to the benefit of the soil. Plantations cannot supply all the advantages however; primarily they lack diversity, and must not be considered an appropriate substitute for forest *throughout* the range of any specific type, in particular not for all of the lowland forest.

In Malaysia, ancient tribes still pursue shifting agriculture, exploiting an area of forest, moving on and allowing the forest to regenerate. With small populations in a big area, this is possible but our present civilisation is dependent on intensive agriculture. The rate of change from almost total forest cover over the past few decades has been rapid, but we still have a lot to learn about the wise use and long-term conservation of land. The land we are uncovering for agriculture has got to last a long time! Many past civilisations destroyed their environment by over-exploitation and decayed; remnant populations then moved elsewhere to form a new civilisation. Our own is world-wide and if we fail we have nowhere else to go.

Discussing the role of biocides (insecticides, fungicides, herbicides etc.) in agriculture, the author emphasises the need to find intelligent compromise between potential benefits and the adverse side-effects which can occur from careless use. Problems of unprecedented severity may be set off through upset biological balance by the very chemicals that appear capable of killing the pests. Poisons can reaccumulate after dispersal, posing problems at sites and on life remote from the point of application. Man the applier and man the consumer is at risk from acute and chronic effects. Knowledge is the key to rational use of biocides, which should only play a part in an overall strategy of crop protection.

Dr. Wycherley goes on to consider the preservation of wildlife as such, both plant communities and their animals. Several are in danger of extinction through man's unthinking or cynically selfish activities. Many types of vegetation, unique to Malaysia, occur only on soils of restricted extent. They are thus exceedingly vulnerable. Natural biological communities provide resilience. They contain the genetic variability to enhance known crops and provide new ones, to supply raw materials, foods, lubricants, fuels and medicines. They can aid our survival and comfort in many ways. Beach vegetation, heath forest, swamp forest, river bank flora, as well as the major lowland and hill dipterocarp forest, and the montane flora above that, contain material resources, serve a vital function in soil preservation and formation, and have as yet undiscovered potential in many directions.

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Large forest reserves are essential for a number of reasons. Their value in erosion control and catchment has been touched upon. Logged reserves provide a means for retention of forest with some exploitation of resources, but the need for knowledgeable management and responsible caution cannot be over-emphasised. Once the forest is cut-out beyond a certain point it does not easily regenerate. Selective logging may, in some cases, be followed by land-slips or top soil erosion. Only large reserves will enable our descendants to compare what regenerates on exploited areas with the original. The educational, scenic and recreational values of forest reserves speak for themselves, and whilst perhaps such factors would not score many points where financial or material expediency is at stake, add to the weight of necessity for preservation. Once established, forest reserves should be inviolable—not merely exist until it suits someone's convenience or pocket to exploit them. Dr. Wycherley raises the interesting point that several of the plants which colonise a felled area and prevent forest regeneration may be biologically more successful species, and that man could be symbiotic in assisting their evolution. This is not to say that man is necessarily the beneficiary by this process, and indeed a prime example is lallang, the arch-enemy!

Animals become extinct or severely reduced mainly by either environment destruction or over-hunting. The turtles of the East Coast are well known; *too* well known as producers of tasty eggs, literally laid into the hands of waiting marauders, but too *little* known biologically. Legislation to protect them is failing because it is not properly enforced, and even if it could be, it is far from certain how best to make it work. A protein source, as well as a most interesting life form, is in danger of being lost. Crocodiles are hounded for a quick profit from their skins, and these formerly common animals have become rare, dramatically declining in the Klang river, for example, only in the last ten years, from abundance to almost total extinction. River fish provide protein, but pollution puts them in danger. The sea, contrary to common supposition, is not likely to prove the earth-saviour, for it too is a sensitive environment, already heavily shocked. The recent story here also is of declining abundance. Sea-mammals, fish, corals, molluscs, all are under pressure from a variety of causes from pollution to collector-mania. Birds are at grave risk from excessive capture for caging and display. A cheering exception to a generally depressing picture is the careful harvest of swifts' nests from caves in East Malaysia, in such a way that the population is maintained.

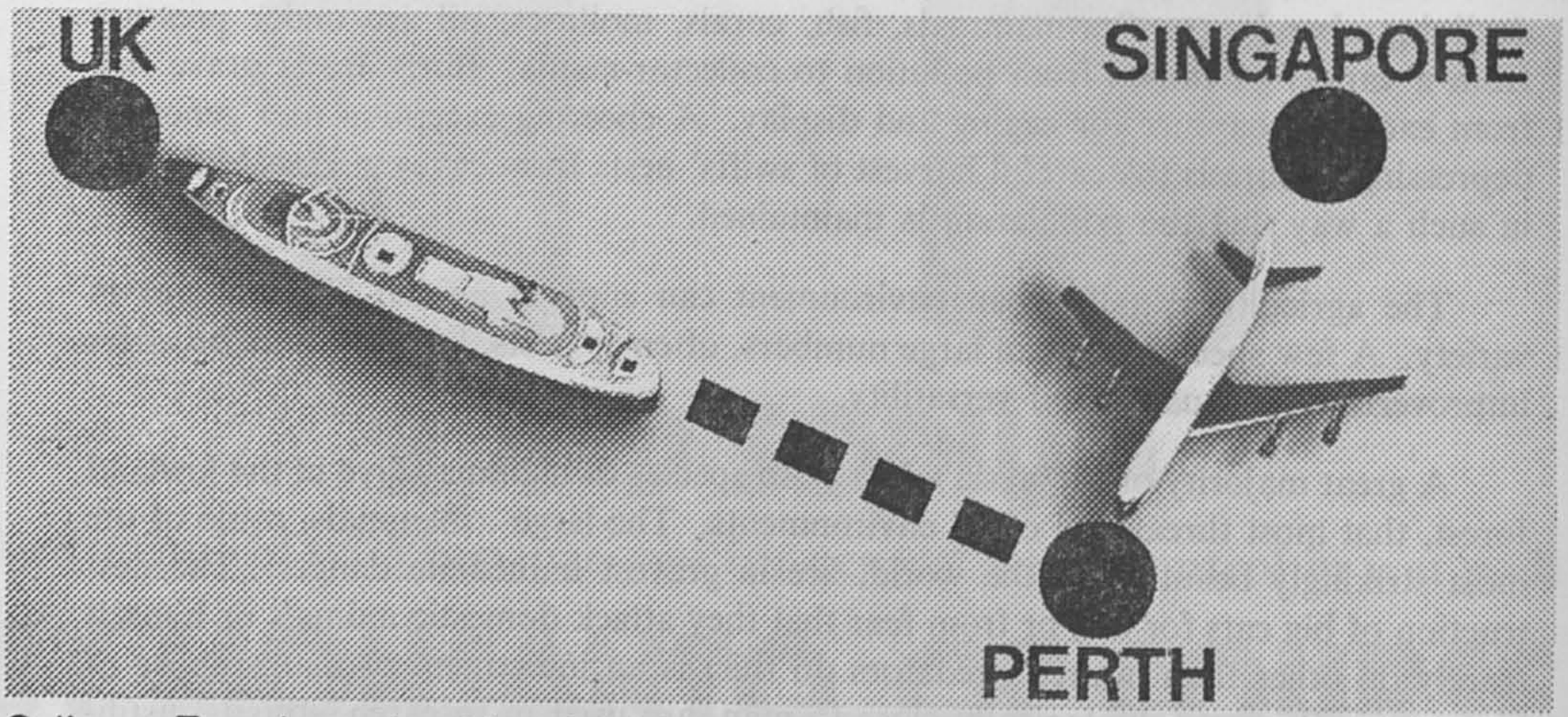
The agricultural and urban environment can support animal life, but not in variety. A few species occur in large numbers, often as pests, but the fauna becomes improverished in quality and versatility.

A great majority of Malaysia's 200 or so species of mammals live in the lowland forest, that most threatened of all environments. The large mammals, some of the most strikingly beautiful in the world, are in gravest immediate danger. The destruction of big cats for fur, or from fear that they attack domestic animals or himself (rarely do other than injured predators do this) is an indictment of man's abuse of his power. Primates, biologically close to man, are used in research—this is justifiable, and, when they are allowed to breed in a natural environment and intelligently harvested, is hard to censure. Instead, too often, they are rounded up by crude

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methods, and only a few survive to their intended destination; breeding stocks may or may not be left. Elephant and seladang are almost gone, and saddest of all, the rhinoceros is on the verge of elimination from the Earth on account of an imaginary stimulus. Several of the unique medium sized mammals are also at risk.

On the credit side, there are a number of National Parks and nature reserves in Malaysia. Some are in an undisturbed state, others far from the original vegetation, albeit still capable of supporting some kind of living community. They are open to the public and could greatly boost the tourist industry. In comparison with African savannah, a tropical forest can disappoint the tourist. The more dramatic animals are shy and cover is abundant, but when a degree of peace from hunters descends, animals often become tamer, so that with proper management, sighting of game on a "jungle safari" could be virtually assured.

Progress to a better life for the people cannot be halted, even were this the intention, but as the author makes clear, he is no sentimental conservationist seeking to preserve nature simply for its own sake. As he remarks himself "among the objectives of conservation is the preservation of the environment fit for Man to live in and retain his sanity. In this sense, the whole of this book is about the conservation of that one primate." In the final analysis man will continue to use his ingenuity for modification to the last, and the hope is that, through a growing realisation of the dangers, effort can be redirected to a conservation civilisation, not a gross and crudely exploitive one.

Official recognition of the problem of conservation in Malaysia exists. Legislation goes some way, but not far enough. It is difficult to enforce, with punishment too lenient and exceptions too many. This is exemplified by the game situation, where potential profit to the poacher usually far outweighs any risks. Too often, reserves are eroded on quite minor economic pretexts, and a variety of abuses occur. Malaysia is among the most efficient, prosperous, and dynamic of developing nations. Is it too much to hope that it may emulate some developed areas, and set an example to other developing nations, by bringing environmental problems under one major ministerial roof? This to produce a coherent policy for establishing an abundant life for man, without destroying the basis of its long continuance.

Dr. Wycherley is uniquely qualified to write this book. By profession, a botanist in agriculture, with 18 years at the Rubber Research Institute—by inclination a naturalist, member and frequently office-bearer in the Malayan Nature Society, he has a full awareness of the need to reconcile agriculture with conservation, and of the ways in which this can be done. His style is lucid, unemotional, technically satisfying but comprehensible to the layman without being condescending. For a roneograph production, it contains surprisingly few misprints or other errors. There are few points of fact on which one would argue. Whilst burying of the breeding materials of *Oryctes* could control that pest, it might well lead to *Ganoderma* disease of palms. Sulphur definitely does not have an adverse effect on natural balance. Such quibbles are the exceptions that emphasize the general reliability of the work.

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We may hope that a future printed edition will be made available (with a Bahasa Malaysia version) including photographs. The author and the supporting organisation, International Union for the Conservation of Nature (with aid from UNESCO) have done Malaysia splendid service in making available what is a clear account of the state of nature here, and a blue-print for the future. For political groups, executive organisations and the concerned layman alike, the book will provide a guide-line. Nor does its value end at conservation, for in setting the scene with its description of the physical environment, the diagrams describing the principles of erosion control, of managing game populations, and other working aspects, it serves as a source of much practical information to all concerned in applied biology—planters, rangers, researchers, fish farmers and others.

The reader will finish wiser about Malaysia's natural resources and their rational exploitation, and will never feel quite the same again when he sees forests being felled; biocides disseminated with gay abandon; the land-slips that disfigure our hillsides; the colour of the rivers; the robbing of the turtle eggs; the devastating scars of tin mines; lands left totally bare of vegetation from several causes; and the whole variety of unnatural shocks to which we subject our life support. If he becomes another recruit to the environment bandwagon, then mankind has that bit more chance of survival.

SOEPECA.

(*Editor's Note:* Details of price and availability of this publication are unknown to us at the time of going to press. However the Society will be pleased to make enquiries from the publishers about a bulk order if a reasonable number of Members would like to purchase copies. In its present format the Manual is unlikely to be costly.)

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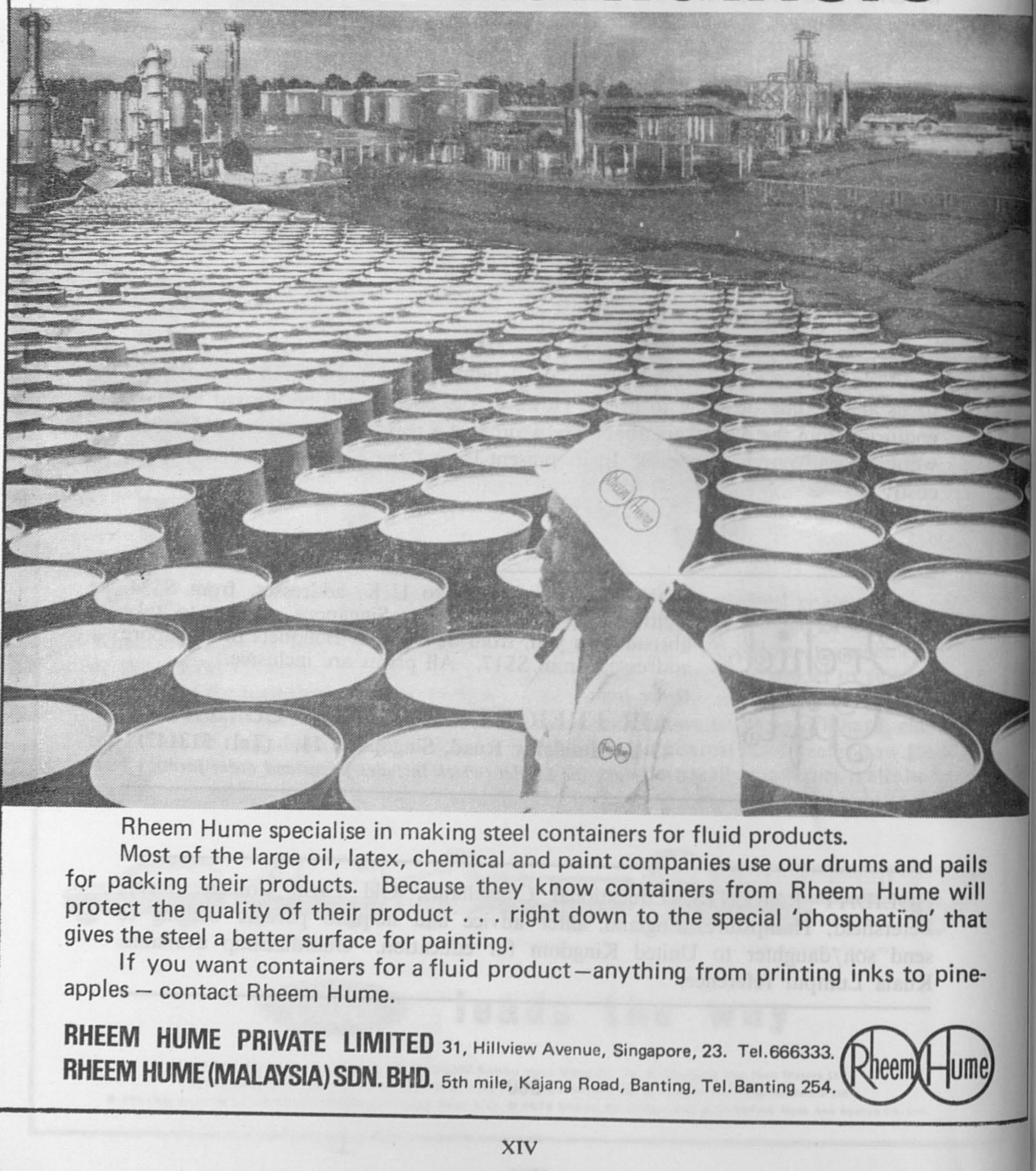
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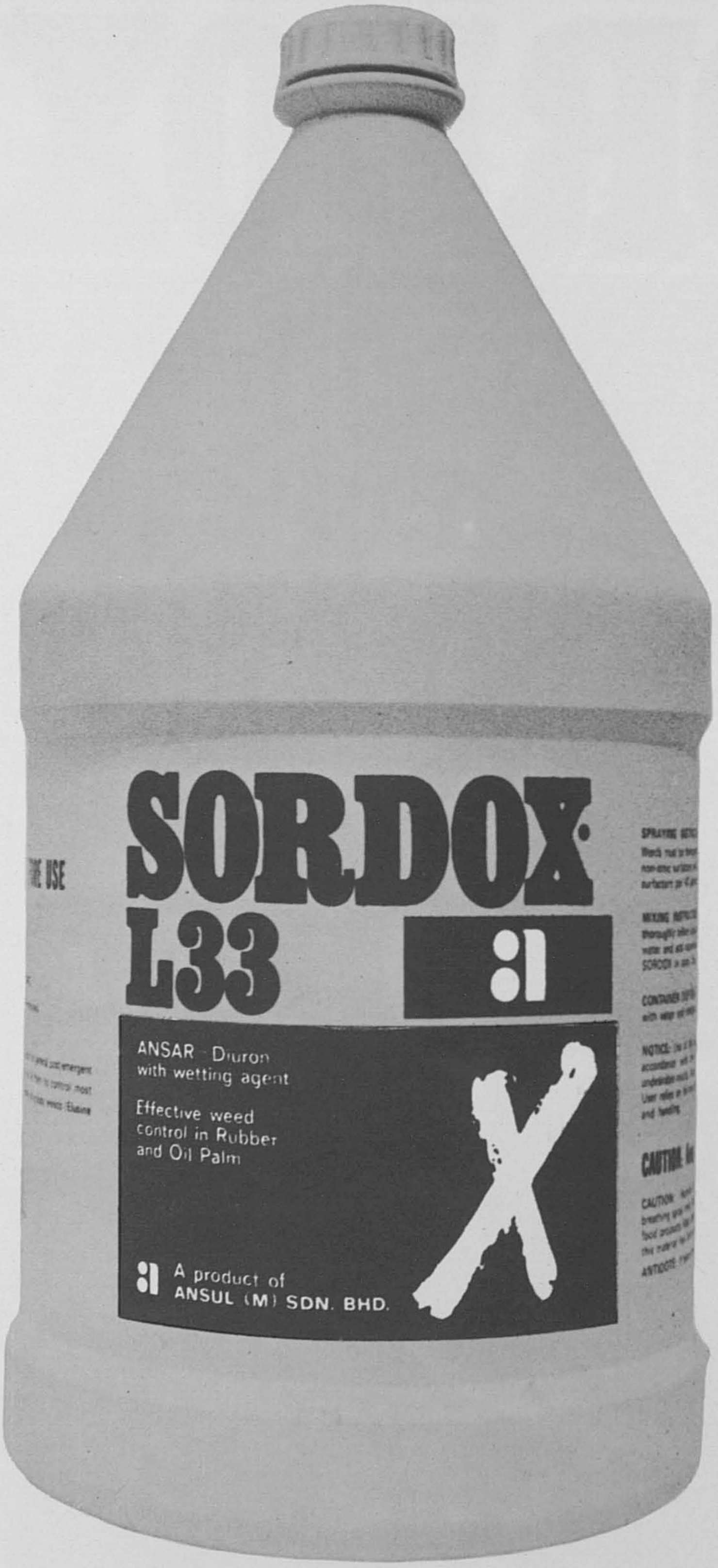
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Letters:

Sir,

A NOTE ON THE REVIEW OF "OIL PALM CULTIVATION IN MALAYA"

I am aware that it is not customary to reply to book reviews, but in view of a number of serious misrepresentations in the review of the above book I feel that it is necessary to correct these. For example, it is stated that 2: 4-D is recommended for weed control in oil palms but in actual fact a specific warning against the use of 2: 4-D appears in the book, which is reproduced here:

> "Systemic herbicides such as 2: 4-D are easily translocated and persist for a variable period—they are not generally recommended for oil palm....."

What is, in fact, recommended is a mixture of sodium chlorate and 2: 4-D. Furthermore, it is also stated in the book that .... "great care must be taken to see that 2: 4-D mixtures do not come in contact with palm foliage or other living parts of the tree, as the species is very sensitive .... etc."

It may be that the reviewer is not aware that there is a difference between 2: 4-D and sodium chlorate/2: 4-D and I would like to assure him that there is a great deal of difference, about as much, in fact, as there is between brandy and soda and soda water alone.

The reviewer has also observed a photograph of the planting of seedlings which he suspiciously regards as rubber seedlings. In fact they are rubber seedlings; but it would not have mattered if they were even roses because the important aspect of the illustration is the apparatus used for transplanting and not the objects being transplanted.

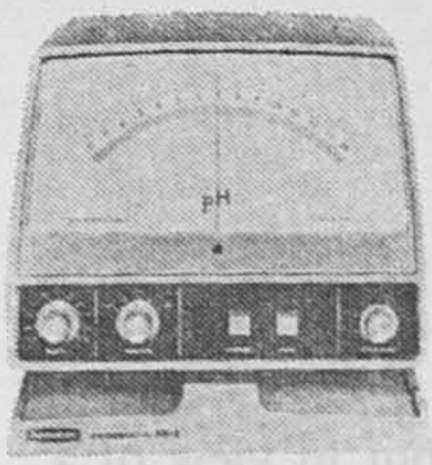
Attention has also been drawn to other "omissions, superfluities and inaccuracies . . ." but the examples given do not appear to conform accurately to this description. How, for example can the account of the in-field collection of fruits by a wheeled vehicle become the object of attack when the demerits of the system, if any, are so ephemeral? (In particular, the reviewer seems to object to the "dump truck" but what there is about this admirable vehicle that is displeasing is difficult to imagine; apart from the fact that carefully conducted trials indicate that it is suitable for collecting fruit in flat areas).

Similarly, the merit of aluminium bands for rat control, is not a question for the opinions of either the reviewer or the authors, but is simply a function of the quantity of fruit lost to these pests.

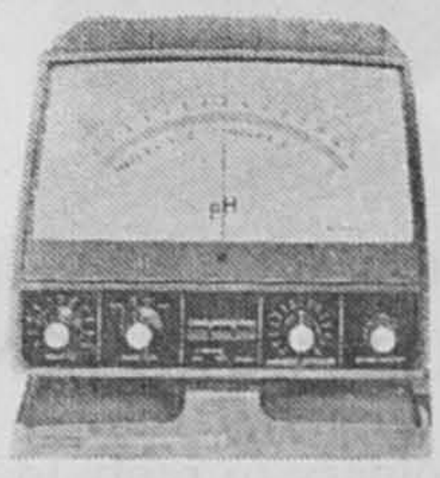
In regard to "omissions" I should like to point out that it is the prerogative of the author to select material of significance and to exclude that of only marginal or restricted interest.

I do not propose to discuss the more trivial of the reviewer's comments because they represent, at the best, only the reviewer's opinion. However there are two which illustrate the bias of the review. The first is the allusion to the out-of-dateness of the book in which the inclusion of the "sand bed" method of germination is attacked. It should be obvious to the intelligent reader that any description of

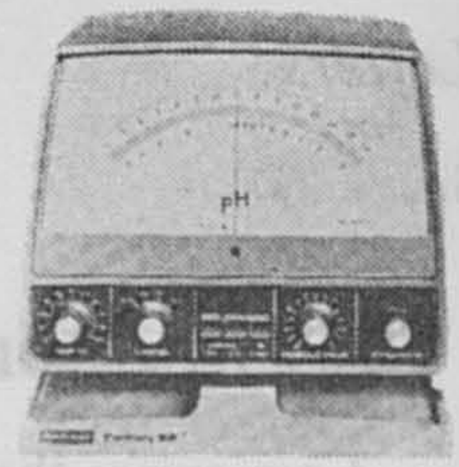
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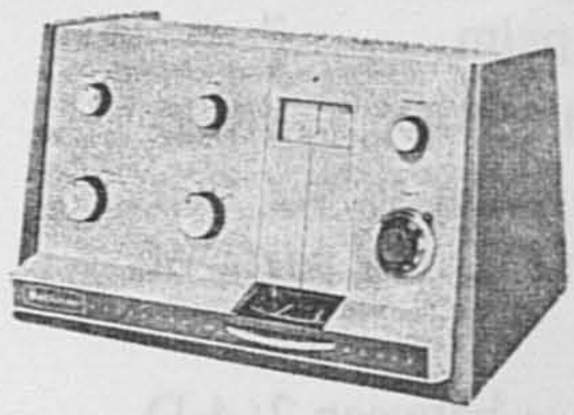
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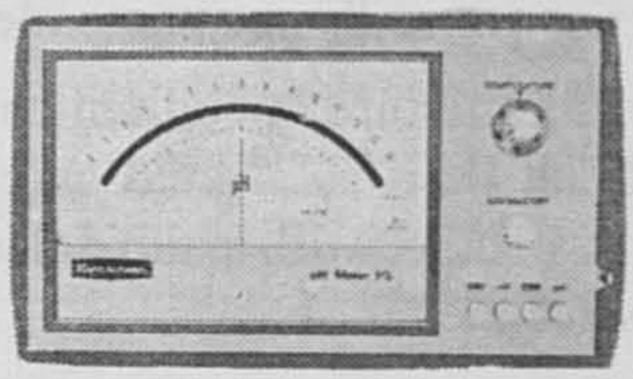
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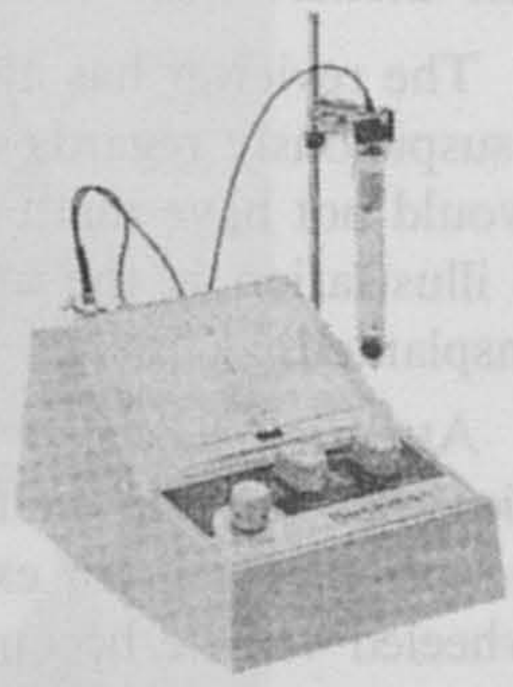
DIGITAL
pH METER



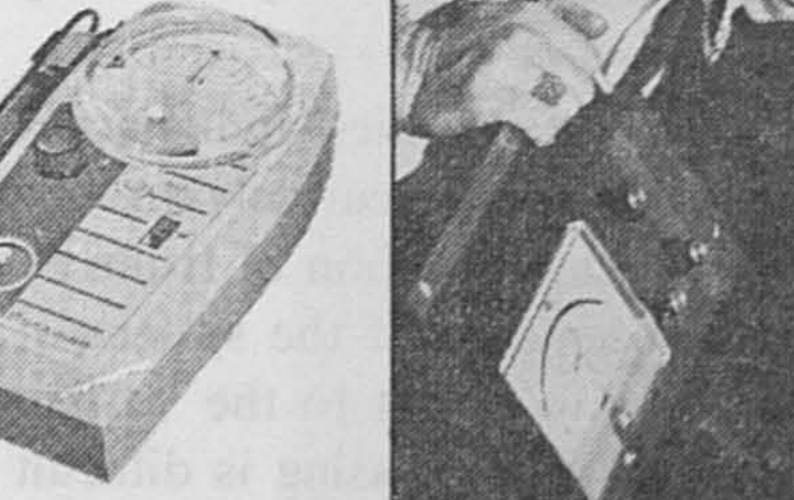
POCKET
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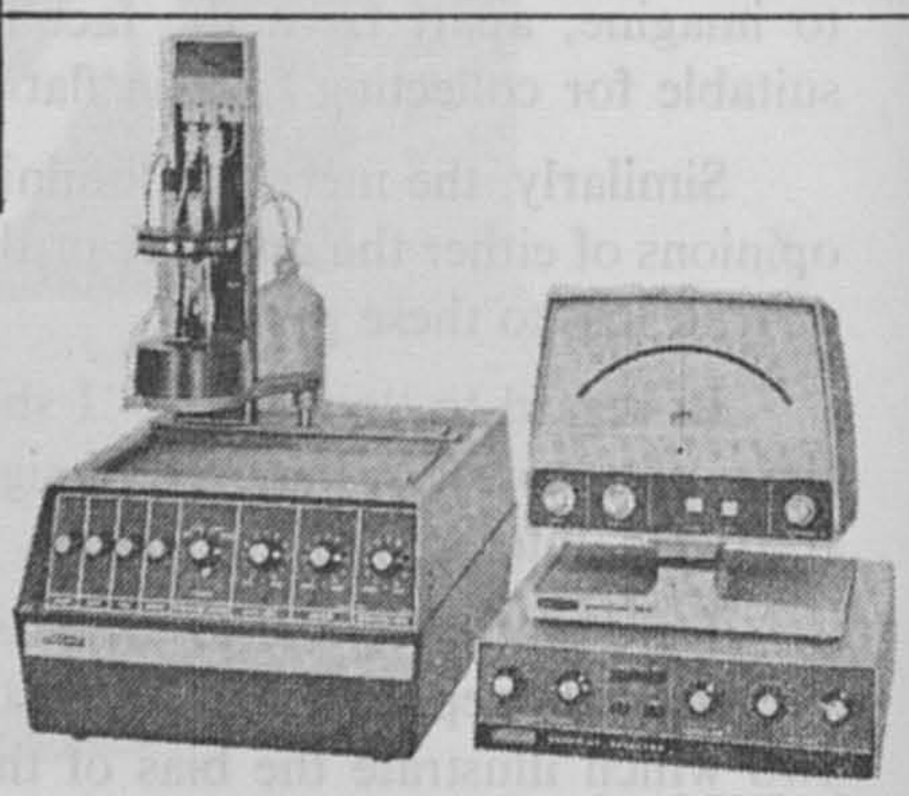
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germination would be incomplete without mentioning the sand bed method, but even so, the reviewer has pointedly failed to notice that the introductory sentence of this section states. . . "This method has largely been replaced by methods of controlled heating. . ." and pretends to be the great revealer of the fact that the sand bed is not longer widely used.

The second is the statement that . . "it is not certain . . . that pollen is spread to receptive flowers by percolating rain water." Now, while I believe that nothing in the universe is certain in the absolute sense I feel confident that the law of gravity is one of the more securely established laws of nature, and I would like to reassure all readers that pollen is carried in percolating rain water and that some of it will almost certainly reach the receptive surfaces of flowers.

It is not my intention to embark on a continuing fruitless dialogue as I feel that both my, as well as the reviewer's, time could be much more profitably spent in attempting to advance the state of agricultural knowledge in this country.

(*Sgd.*) C. N. WILLIAMS.

The Editor,

26th July, 1971.

Dear Sir,

At present there may be a number of British planters who are about to or who have recently returned to the U.K. on premature retirement from planting.

My firm of life assurance brokers is always on the lookout for suitable people who will, after training, be able to take up positions as life assurance brokers with the job of advising people on life assurance and unit trust investment.

People are becoming much more savings and investment conscious, and with new and continually changing plans being offered by the insurance/unit trust industry there is a growing need for the impartial consultant services of qualified life assurance brokers.

Many planters would be ideally suited to this job (I myself am an ex-Ceylon planter). It is essentially a job for someone who can work on their own initiative and organise their own day. It is not a 9–5 job bound to an office desk.

The essentials are for a person to be a good mixer who can meet and talk to hundreds of people a year about their family finances. It is an extremely interesting job if a person likes meeting people, literally from army officers to acrobats. There is a considerable challenge in the job since not everyone immediately recognises that they require our services and need to be persuaded of the advantages.

The rewards in the job are extremely good and after a year a trained man will be earning about as much as he was when planting.

If anyone would like to know more I would be pleased to hear from them. We are presently operating in the South of England and in Scotland.

Yours sincerely,
(*Sgd.*) PIERS PARMENTER.

Letters will be forwarded.—Ed.

SAVE THE LIFE OF YOUR RUBBER AND OIL PALM



It's dangerous time for rubber trees and oil palms just after you spray with life-saving weedkiller. Rain may wash the spray off the leaves before they can drink it in. So time is vital.

Mega wetting agents make it much easier for the weed to absorb weedkiller. Time is saved. And that could easily mean the life of your plantation is saved.

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20th July, 1971.

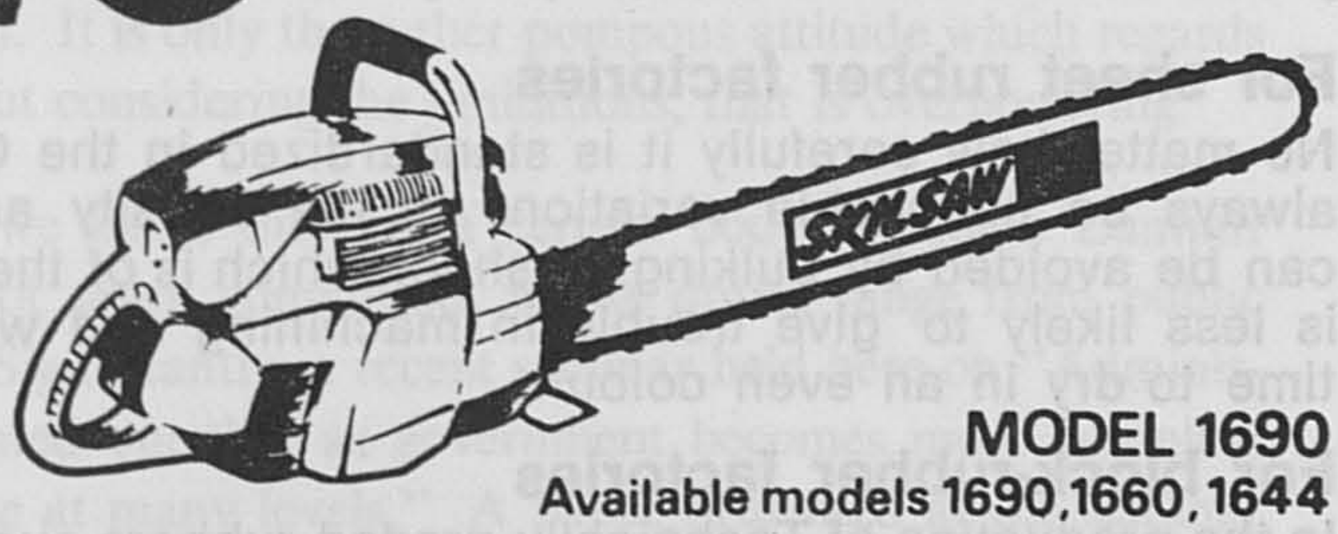
Sir,

The discussion in your "Headquarters Affairs" Column in June concerning modes of address correctly pointed out that "Esquire" was an anachronism. However you failed to go into the term "Mister" which was originally the masculine of Mistress, and someone with property-owning rights. As everyone is entitled to be called Mister in the same way that everyone is entitled to be called Enche, surely the former is also an anachronism while both are superfluous. We are given names; surely that is sufficient?

I have addressed you as "Sir" which is probably as anachronistic as "Esquire". How do you wish to be addressed?

Yours faithfully,
(*Sgd.*) M. N. COLLINS.

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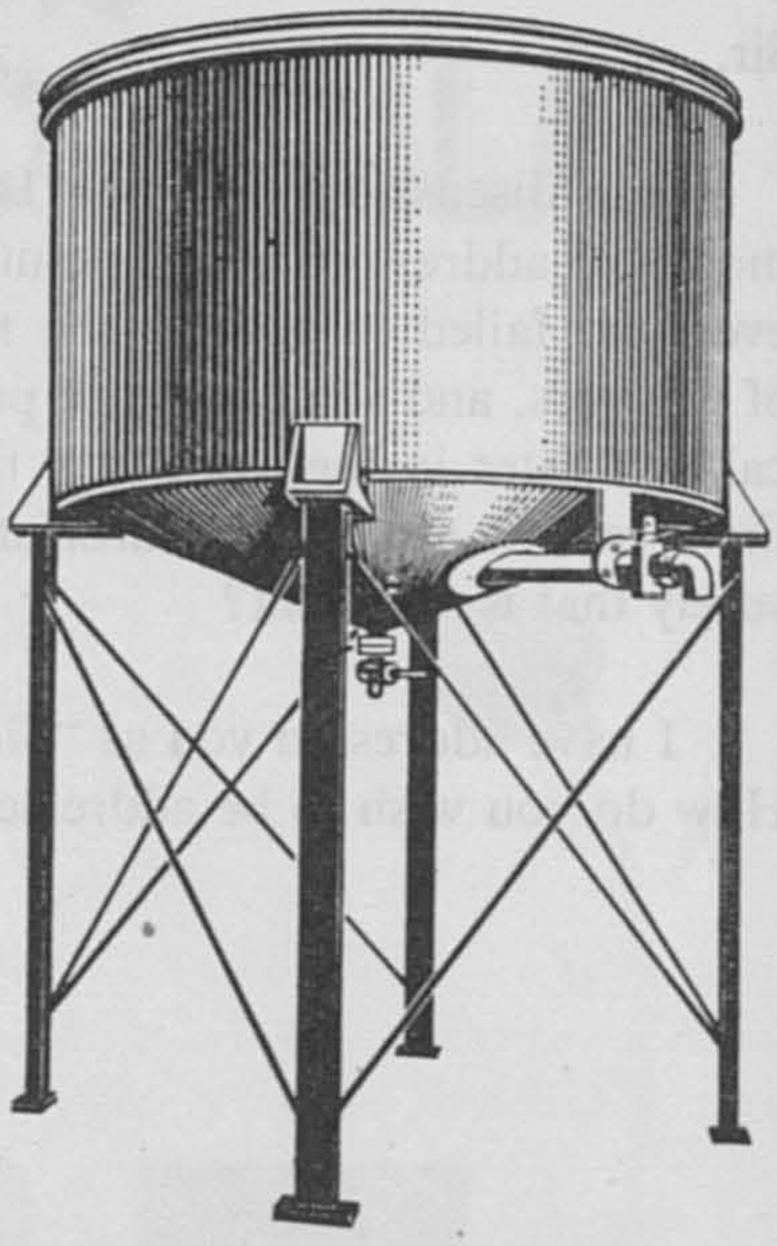
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In the production of Technically graded rubbers, such as Heveacrumb, Comminuted Rubber, etc., it is most essential that the properties of the rubber are uniform. The laboratory testing of rubbers detect variation in important properties which are not apparent in the visual grading system. Blending and bulk additions of chemicals will reduce these variations and reduce labour costs.

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DATELINE KUALA LUMPUR

Do you know how Heracles really put an end to the Hydra? After failing to persuade the Hydra to give up the ghost, our hero ended up in one of the jaws of the monster's nine heads. But having nine heads can be a problem. None of them could agree whether Heracles should be fried, broiled or roasted. In the quarrel which ensued Heracles made good his escape. After the mud had settled and the Hydra exhausted itself, Heracles cautiously approached the monster and cut off its immortal head. Exit one Hydra; and now who says nine heads are better than one?

Of course a myth proves nothing, and who wants to believe a myth anyway? So today committees, councils, commissions, and other bodies where sundry heads can get together, continue to thrive.

If there is any problem, any hitch or glitch, the call for a committee rings out loud and clear. Apparently there is nothing in the world that cannot be solved by setting up a committee.

The public nevertheless remains very much in the dark about the aims and work of most of these committees. What does a committee do? Does it look at, over or into a problem? When does a committee become a mother-hen and sit on a problem? Whatever happens, the public ends up happy and impressed with committees.

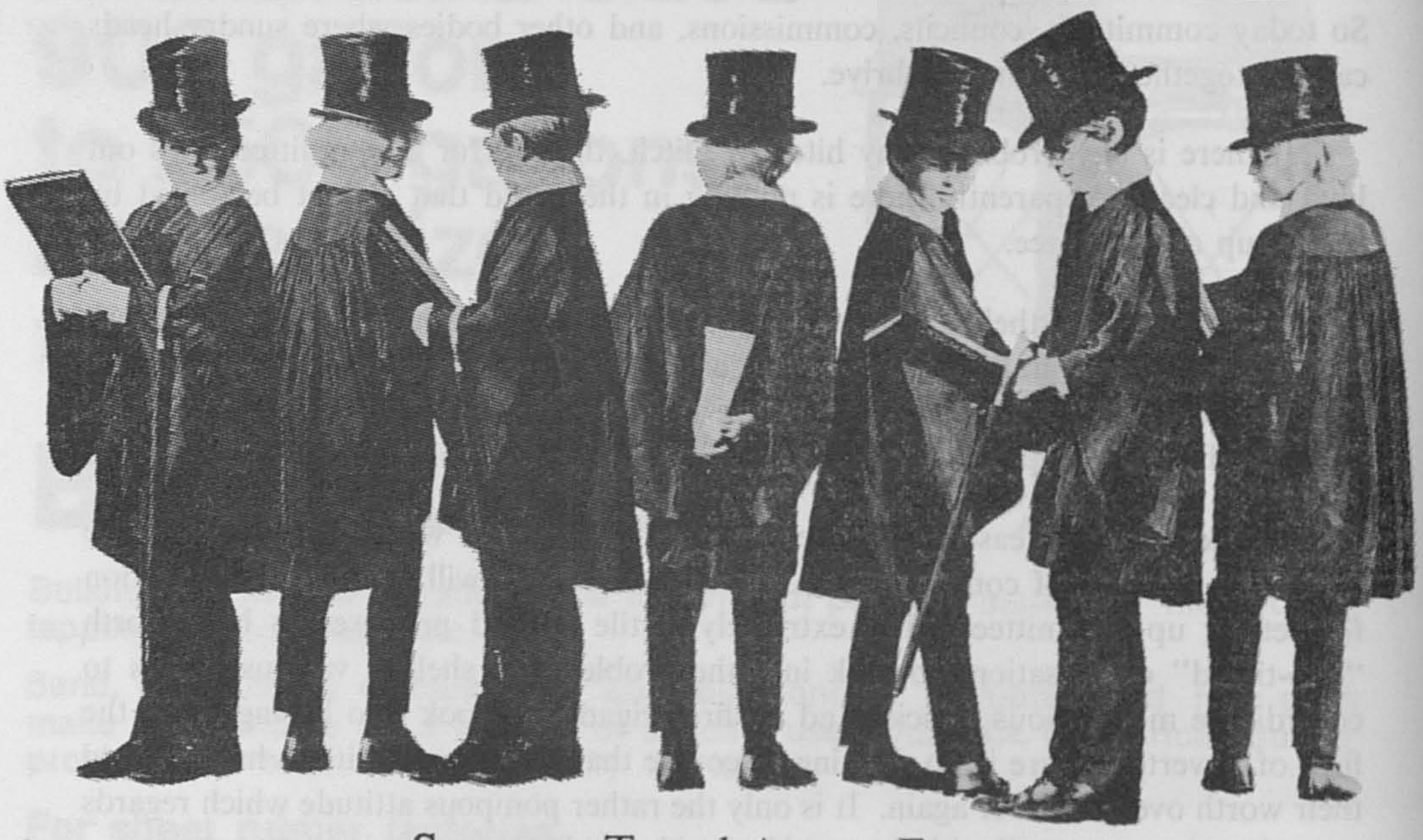
A brief tally will easily convince anyone that whatever we may be short of, we will never be short of committees. And fear not that we will run out of inspiration for setting up committees. The extremely fertile ground promises to bring forth "two-tiered" organisations to look into the problems of shelter, various bodies to co-ordinate multifarious policies and a "fire-brigade" to look into hosing down the fires of poverty. There is no denying of course that certain committees have proved their worth over and over again. It is only the rather pompous attitude which regards committees as a cure-all without considering the limitations, that is overpowering.

As an example of what we have, there is a certain body in Kuala Lumpur which operates with the help of seven committees whose duties range from public relations to drawing up rules. Significantly, a recent seminar held here on "Administrative Decision Making" pointed out that as government becomes more complex, "committees tend to proliferate at many levels." A paper presented at the seminar explained that the committee system was originally planned for speedy decision-making and for consensus formation.

However, if most of the time of top management is spent in attending meetings, leaving little for attention to substantive policy and programme areas, a serious study of the committee system must be made.

"The more committees a top administrator attends, the less time he has for substantive work in his department. And when he is pressed to make a decision which involves his department, and for which he has little time to study (because

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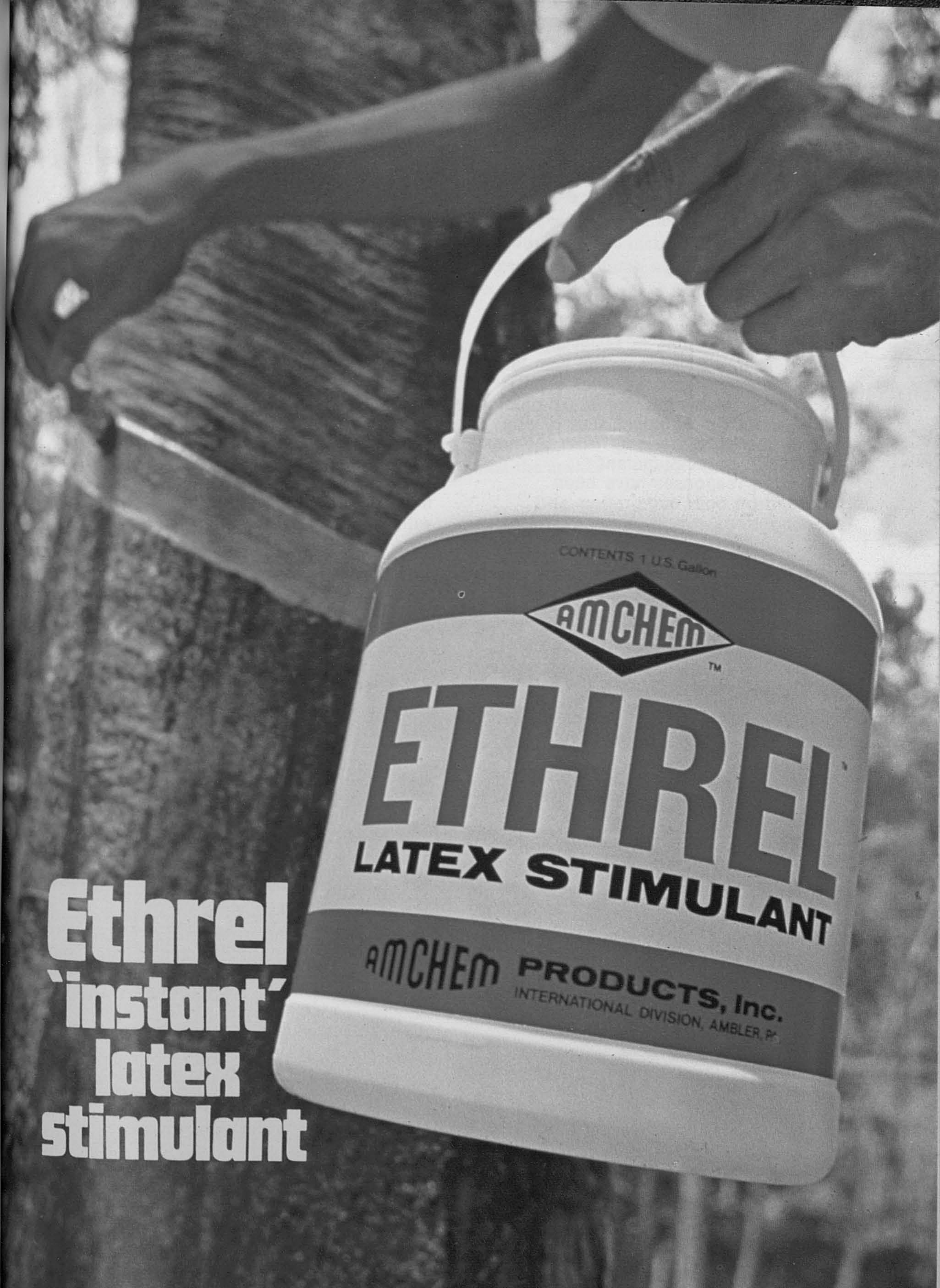
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Very good responses have been recorded on both bud-grafted and seedling trees.

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Sustained yield increases of 50% to 140% have been obtained from such clones as PB 86, Tjir. 1, PR 107, RRIM 600 and all clonal seedlings. Trees less than 15 years old should not be treated with ETHREL Latex Stimulant.

Easy to apply:

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Equivalent to 2 months' bark consumption.



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Apply ETHREL Latex Stimulant evenly onto the scraped bark with a flat 1½" paint brush.

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he attends too many meetings), he is obliged to call a further meeting of his own and obtain a consensus. It is less risky than if he were to make decisions on his own. Thus the committee system proliferates itself."

The paper added that even the editing of reports, where only marginal alterations were required, was sometimes done by committees. It continued: "Groups or committees are usually considered to be conservative decision makers. The committee for example, is often accused of recommending solutions which represent 'the lowest common denominator'. This implies the *status quo* or at best, moving incrementally not very far from some current practice.

On the other hand a committee may comprise members of widely divergent opinions, making decisions difficult unless the chairman is effective. The most likely decision from such a group is a decision not to decide."

The country already has its full share of committees. There are even committees to look after committees. Have they at last found the answer to Nero's "Who will guard the guards?".

And iron shall bear fruit!

The scars of iron mines in Sri Medan near Batu Pahat will give way to soft green fields of maize by 1974. After a run of 53 years the iron mines at Sri Medan and Sri Jagong will cease production. But this does not mean that Sri Medan will become a ghost town.

A 55-year-old director of the mine Mr. M. V. Phillips has already drawn up plans to turn 6 000 acres of unused land around the area into lush fields of maize. "Initially 1 000 acres will be planted." said Mr. Phillips, "and the rest in 1 000 acre stages."

This will be the first time that such an ambitious maize-growing project has been planned for the country and Mr. Phillips pointed out that the climate and soil were very suitable for the crop. A ready market, locally and in Japan was also available and he was confident of success.

The entire project will eventually cost $1.8 million and include a factory for grinding the cereal. An interesting feature of the factory will be a special machine for grinding the maize leaves which, Mr. Phillips claimed, would make excellent fodder for cattle.

The blueprint for the project also contains provisions for the growing of asparagus as a subsidiary crop on more than 1 000 acres. "The crop can be exported to Japan where the demand is great", said Mr. Phillips "and the disused mining pools put to good use too as fishponds". Mr. Phillips has been experimenting with Chinese carp and other fresh-water fish.

J. N. M.

Ever thought of yourself as a missing person?



Heart disease can happen to anyone. One minute a man is apparently healthy and full of life — the next he's an empty place at the table.

You see, the trouble with heart disease is that people don't like to think about it. And the symptoms are so easily confused with those of less serious ailments. Such symptoms as breathlessness, inexplicable pains, unaccountable dizzy spells. Are they significant? Perhaps not. You cannot tell. But your doctor can.

If you think things are not as they should be, see your doctor at once. If only to put your mind at rest. If, however, his diagnosis disturbs you, there is something he can prescribe that will help you.

ICI have developed one of the most up-to-date drugs for the treatment of certain kinds of heart trouble. It's called Atromid-S. Doctors all over the world are prescribing Atromid-S because tests have proved that heart sufferers can benefit immensely from it.

Atromid-S designed to help heart sufferers the world over.

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MALAYSIAN RUBBER RESEARCH UNIT ANNOUNCES BREAKTHROUGH IN TYRE TECHNOLOGY

Use of a new chemical additive for natural rubber will give longer-lasting tyres, according to an announcement from London. The chemical has been developed in the laboratories of the Natural Rubber Producers' Research Association (NRPRA), sister institute to the Rubber Research Institute of Malaya and operated by the Malayan Rubber Fund Board. The Association has granted the first license rights in the chemical to an American company, Hughson Chemical, and is now negotiating further licenses with leading international chemical companies in Asia, Europe and America.

The main use for the new chemical will be in truck, bus and off-the-road giant tyres. These are a major market for natural rubber. NRPRA has long recognized the importance of this market for Malaysian rubber and believes that the new chemical will help strengthen natural rubber's competitive edge over synthetics.

The chemical is an 'urethane crosslinker', designed to replace conventional sulphur vulcanizing chemicals of the type that have been used for over a century. Sulphur vulcanization has two drawbacks identified by NRPRA: tendency to 'revert' during fabrication and inadequate resistance to high temperatures. Both are greatly improved by use of the urethane crosslinkers: tyres are easier to make and the better heat resistance means less 'heat build-up' and hence longer tyre lives.

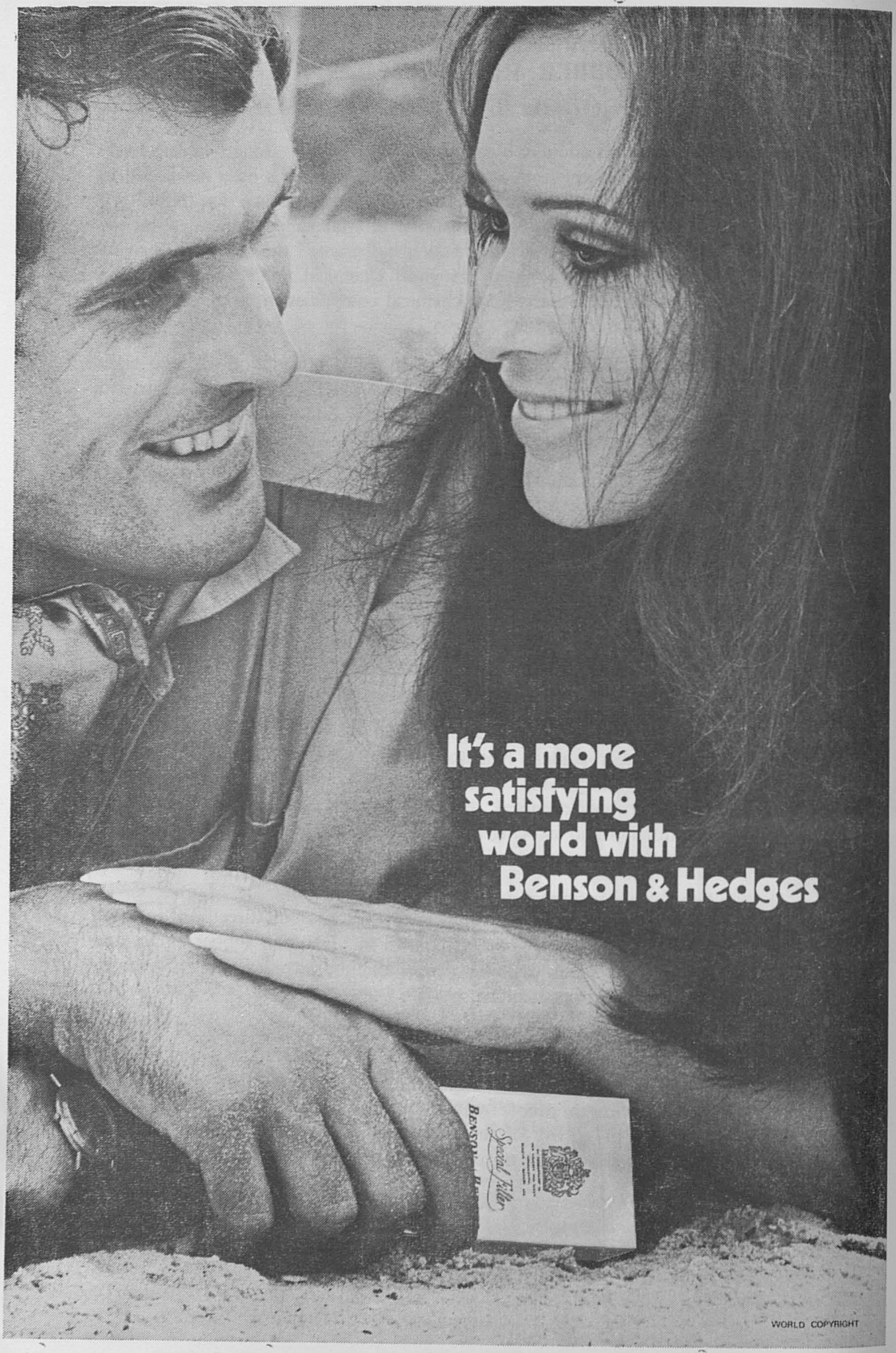
Tyres are not the only products that will benefit from use of urethane cross-linkers; application to other high-quality products is envisaged.

Manufacture of the urethane crosslinker requires advanced chemical technology and it is for this reason—and to ensure widespread use—that NRPRA is licensing international chemical companies. Hughson, in fact, (it is a division of the Lord Corporation of Erie, Pennsylvania) together with ICI, recently acquired NRPRA know-how in another rubber chemical; the 'rubber-bound antioxidant'. This chemical is now in production and is being sampled to rubber users. Hughson hope to start production of the urethane crosslinker this summer.

The urethane chemistry was devised by NRPRA chemists, Dr. Maurice Porter and Dr. Cris Baker, under the supervision of NRPRA's assistant director of research Dr. Douglas Barnard. Dr. Barnard is well-known in Malaysian rubber circles and was last in the country in March when he spent some time with the Rubber Research Institute and other rubber organizations.

The urethane crosslinker breakthrough forms part of the wide range of NRPRA activity on the rubber-consumption front. Apart from research and development NRPRA is the focal point of the Malayan Rubber Fund Board's wide-ranging technical advisory service to rubber manufacturers the world over. Its strategic position in the centre of gravity of the rubber using countries helps it keep the Malaysian producers well informed as to the needs of rubber users.

Released 15 July 1971 by RRIM on behalf of
The National Rubber Producers' Research Association.


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WILL YOU HAVE CHINA TEA?

How do you like your tea? Do you prefer Indian or Ceylon? More recently the question has been will you have African tea?

There cannot be so many people in the UK who remember being asked whether they would prefer China tea. Whether or not they remember the China tea taste, it should not be long now before that distinctive taste is recalled.

Tea figures high in the export trade of China and the recent liberating of contacts with the Western World presage an outflow of China tea. Supplies that have been coming to the UK over the past two decades have been mainly rerouted from Eastern bloc countries or some other indirect ways. The price has been high, but that is not unusual with a commodity whose supplies are limited, and difficult to obtain.

While the re-emergence from China of tea to the Western World is welcomed it is unfortunate that it should arrive at a time when tea from the other exporting countries should be limited by the action of their delegates to the FAO Conference on Tea. The current balance between world supply and world demand is not measurably bogged down by either side of the equation, but a surge of China tea exports on the world could weaken the balance.

The current time could hardly be considered propitious for an approach to be made to the Chinese to limit their exports. Once upon a time China was the only source of supply. That monopoly was upset when indigenous tea was found to be growing in North-East India, just over a hundred years ago. India has usurped China as the world's largest grower and new sources of supply have sprung up in other hemispheres, particularly in Africa. Their impact on the tea position has been momentous.

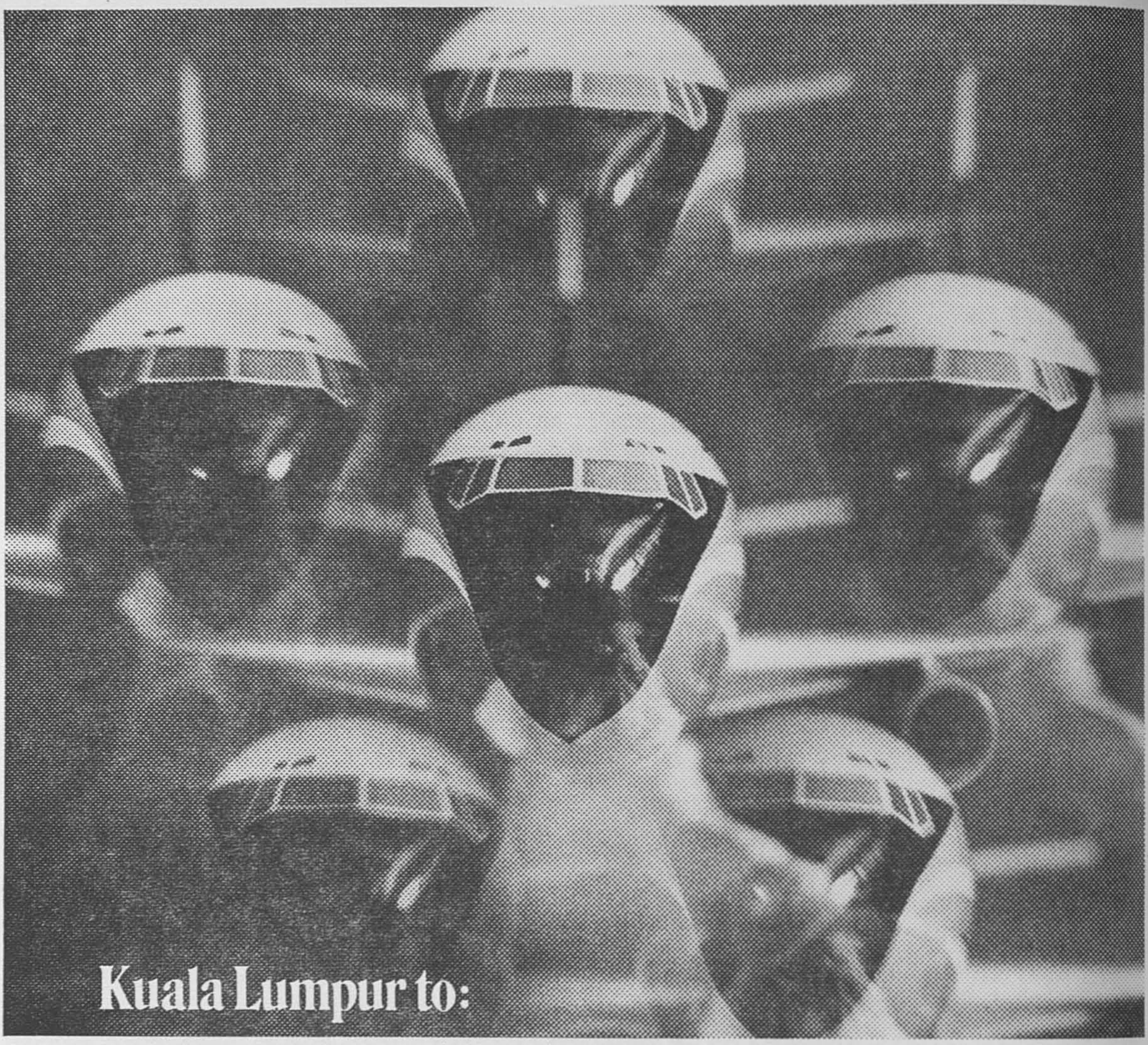
The Word Pekoe

China tea's fall from popularity may be ascribed to the style of manufacture in the tea countries controlled by the Europeans, and their inability to progress with the modern ways of cultivation both in the field and the factory. Black teas have ousted green teas, in which the Chinese excelled and to which they appelled the names of Gunpowder, Young Hyson, Hyson and Imperial, names which are used to describe the green teas made in East Pakistan.

It was the Chinese who gave the names Pekoe, Orange Pekoe and Flowery Pekoe to their teas and these have been immortalised in the modern tea language. The term Pekoe is derived from the Chinese *pek-ho*, denoting white hair or down, and refers to the fine hair seen on the buds and younger leaves.

The tea industry owes a great deal to the Chinese for their knowledge of growing and manufacturing tea, and if their industry has progressed to the point where their teas resemble very closely those made further west then they could present a real source of competition and materially upset that desirable balance between supply and demand.

(continued on page 389)



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'NATURAL RUBBER IS PLANK IN SPRINGBOARD FOR ECONOMIC DEVELOPMENT', STATES MALAYSIAN RUBBER RESEARCH CONTROLLER

'We have indeed the case of an industry in a developing country pulling itself up by its bootstraps', stated Dr. L. Bateman, Controller of Malaysian Rubber Research in his Jubilee Year Foundation lecture, given in London on 30 June 1971 at the Institution of the Rubber Industry. 'The natural rubber industry in Malaysia and South-East Asia is a key wealth generating industry for millions of people. The £300 million which natural rubber is earning annually for the region is a major plank in the springboard for wider economic development and the growth of new industries.'

'In the past 25 years the rubber industry in Malaysia has grappled with multiple challenges simultaneously. In hand with large-scale scientifically geared modernization of production and processing has gone greater technical input into marketing. New potentials for tree productivity have been uncovered by advanced research.'

Dealing with the role of the small rubber producers in Malaysia, who have doubled both the acreage they cultivate and their productivity, Dr. Bateman said, 'the Smallholders Advisory Service of the Rubber Research Institute of Malaya has grown to be the largest division of the institute. With other government agencies, its primary purpose is to advise and gain the confidence of the smallholder and to persuade him to follow improved practices. Such work has changed the face of the smallholder within a dozen years or so. The figures tell of a massive rejuvenation of the small man's side of the industry akin to a national blood transfusion.

Concerning tree breeding, Dr. Bateman said, 'the achievement of raising tree yield levels from 400 to 3000 lb. per acre per annum in some 50 years registers fully only when one remembers that the performance of the new selections has to be followed over two decades.'

He referred to new yield stimulants which in effect are transforming moderate-yielding trees into high yielding specimens; 'with yield stimulation high yields are obtainable at reduced tapping frequency, say every fourth or even sixth day.'

Concerning these and other dramatic improvements in production techniques, Dr. Bateman pointed out, 'benefits will only accrue when movements occur over the whole front of tapping, collection and processing. Basically one is looking to making the most efficient use of that skilled operative the tapper, to dealing separately with collection and to marrying crop input from the field to factory processing and market demand for the product.'

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uniformity generally. The target is to have a basic framework of specifications which producers can provide and users intelligently employ for simple control of their varied processing and performance requirements.'

Dr. Bateman stressed the extreme importance of projecting all such developments in depth to the smallholder and described how this is happening in Malaysia by setting up Group Processing Centres (GPC) and central factories, 'The progression in GPCs from 61 in 1960 to 419 in 1965 and to 846 in 1970, with 122 coming into service last year, tells of a growing and worthwhile impact. Five central factories are now being operated by the Malaysian Rubber Development Corporation. The larger units have capacities of some 30 tons a day and potentially can serve some 5000 smallholders.'

Released 2 July 1971 by RRIM on behalf of
The National Rubber Producers' Research Association.

Will you have China Tea?

(continued from page 387)

At the height of China's monopoly at the beginning of the nineteenth century, keen competition to bring the first season's teas to London gave rise to many adventure stories of races between the tea clippers, such as that between *Taiping* and the *Ariel* from Foochow to London in 1866. The first teas to arrive commanded the highest prices, irrespective of their quality, and their captains were well rewarded for winning the race. Vantage high points in South Devon brought the first news of their arrival in the Channel and it is reported that at this point bargaining began for the cargoes. One of these clippers has been preserved and may be seen at Greenwich. It is the *Cutty Sark*, which figured prominently in the races, and it is a tribute to the British merchant sailing vessel, the finest and fastest in the world.

China's Tea Output

In a closed and impregnable economy, any statistics relating to China's planted acreage, production and exports are a matter of conjecture. The International Tea Committee, whose task is to collect and compile all statistics relating to the tea industry, has only conjectural figures relating to China, and are only able to supply estimates. For instance, a figure of 68 000 lb. is designated to China's world tea exports in 1967, while production was estimated in 1959 at 337.3m. lb. These estimates belie the true position, but it is considered that if China tea were permitted uninterrupted outflow, the supply pipe, joined by the exports of the other exporting countries, would be choked. The prospect of China regaining her former place in the supply situation must not be regarded with indifference. Her potential is there and can be expanded, and it would seem that this prospect must be taken into account when assessing the supply horizon.

(Investors' Guardian April 23, 1971)

SOCIAL AND PERSONAL

ON LEAVE

4229 Brindley, K., 36 Stafford Road, Caterham, Surrey CR-3-6JA, England. (Malacca/Muar)—9/8/71

4685 Bamford, B.P., Crodara, Kells, Co. Meath, Ireland. (Selangor)—August '71

5073 Dale-Rudwick, P.H., P.O. Box 95, Dalgate, Srinagar, Kashmir. (S. Johore)—September '71

5573 Hay, D.W.E., c/o 17 Queen Street, Woodside, Aberdeen, Scotland. (Selangor)—1/8/71

5029 Lim Cho Yam, A.I.S.P., No. 38, Jalan 22/60, University Gardens, Sungei Way, Selangor. (Kedah/Penang)—26/8/71

4917 Ritchie, A.J., A.I.S.P., Freemasons' Hotel, Strichen, Aberdeenshire AB4 4SQ, Scotland. (Sabah–N. East)—1/8/71

4047 Sergeant, C.J., N.D.A., A.I.S.P., 5 Copse Close, Liss, Hants, England. (Selangor)—28/7/71

3289 Kidd, D. Duncan, "Brigend", 15 Shanwell Road, Tayport, Fife, Scotland. (Selangor)—3/9/71

5466 Dunk, P.H., The Cottage, Bassetts, Mark Cross, Crowbrough, Sussex, England. (North Perak)—21/8/71

RETURNED FROM LEAVE

4653 Allcorn, R., S.E.S. Rubber Plantations Ltd., P.O. Box 184, Calabar, S.E.S. Nigeria. (Overseas)—mid-August '71

5334 Huskisson, L.A., Tebong Estate, Tebong, Malacca. (Kelantan/Trengganu/Malacca/Muar)—July '71

4949 Sargeant, H.J., Sungei Raya Estate, Pulau Langkawi, Kedah. (Kedah/Penang)—13/8/71

5454 Wastie, R.L. (Dr.), Rubber Research Institute of Malaya, Pathology Division, P.O. Box 150, Kuala Lumpur. (Selangor)—3/8/71

3886 Webb, M.I.T., Tong Hing Estate, P.O. Box 103, Masai, Johore. (S. Johore)—August '71

4059 Hilston, W.B., Chersonese Estate, Kuala Kurau, Perak. (N. Perak)—10/8/71

CHANGE OF ADDRESS

5549 Chan Chow Kong, Riverside Estate, Kuala Selangor. (Selangor)—30/7/71

4950 Garland, G.R., Chamek Estate, P.O. Box 505, Kluang, Johore. (Selangor/C. Johore)—19/7/71

5689 Hansen, J.N., c/o P.O. Box 73, C.D.C., Honiara, British Solomon Islands. (Sabah–Tawau/Overseas)—August '71

3649 Harris, F.W., 6 Lowanna Way, City Beach, Western Australia 6015. (Life member)—29/7/71

1091 Kjar, E., A.I.S.P., Hϕjsdal 3, Hareskov 2890, Denmark. (Life member)—28/7/71

2671 Lloyd, Wm., Via dei Bonacolsi 5, 00163—Roma, Italy. (Life member)—26/7/71

5017 Leong Heng Khoon, Kulai Besar Estate, Kulai, Johore. (S. Johore)—2/8/71

4750 Lee Lye Huat, Robert, Cheng Estate, Alor Gajah, Malacca. (Malacca/Muar)—3/8/71

5111 Mulkiaman bin Sherzeman, ADK., M.L.A., c/o P.O. Box 143, Papar, Sabah. (Sabah–N. East)—10/8/71

5557 Muniandy, G., Sungei Krian Estate, Bagan Serai, Perak. (N. Perak)—4/8/71

5439 Ng Chee Lin, Joseph, Tamang Settlement Scheme, P.O. Box 359, Tawau, Sabah. (Sabah–Tawau)—20/7/71

4979 Ong Beng Kee, A.I.S.P., Tanah Merah Estate, Tangkak, Johore. (Negri Sembilan/North Johore)—18/7/71

5729 Peters, E.W., Sabah Land Development Board, Apas Balung Mill, P.O. Box 359, Tawau, Sabah. (Sabah–N. East/Tawau)—1/7/71

4412 Reid, W.M., Sungei Sedu Estate, Banting, Selangor. (N. Johore/Selangor)—20/7/71

4874 Radhakrishnan, K., D.T.A., A.I.S.P., Kerling Estate, Kerling, Selangor. (C. Johore/Selangor)—1/8/71

5722 Varughese, K.T., Sabah Land Dev. Board, Ulu Dusun Scheme, P.O. Box 1253, Sandakan, Sabah. (Sabah–N. East)—5/7/71

5433 Wycherley, P.R. (Dr.), F.I.S.P., 52 Beadon Road, Bromley, Kent BR 2 9AT England. (Selangor/Overseas)—1/8/71

3577 Walker, G.F., 70 Polwarth Gardens, Edinburgh EH11 1LL, Scotland. (Life member)—26/7/71

5162 Yeoh Ewe Teik, Philip, Shell Malaysia Ltd., P.O. Box 128, Ipoh, Perak. (Selangor/C. Perak)—5/8/71

4663 MacKenzie, R., A.I.S.P., Giram Estate, P.O. Box 5, Tawau, Sabah. (Sabah–Tawau)—7/8/71

4742 Kwan Yin Nein, Pegoh Estate, Alor Gajah, Malacca. (W. Pahang/Malacca/Muar)—12/8/71

4789 Yap Thean Seng, Allagar Estate, Trong, Perak. (L. Perak/N. Perak)—13/8/71

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5777 Cheong Kam Swee, Tuan Mee Estate Group, P.O. Box 202, Sungei Buloh, Selangor. (Selangor)

5779 Chang Kuan Sin, Teong Lee Estate, U.P. Selambau Division, Sungei Patani, Kedah. (Kedah/Penang)

5780 Mayakrishnan, P., Botany Division, Rubber Research Institute of Malaya, P.O. Box 150, Kuala Lumpur. (Selangor)

5781 Ahmad bin Samah, Bagan Sena Estate, Kulim, Kedah. (Kedah/Penang)

5782 Bridge, C.J.R., O.B.E., c/o S.D.F.C., Electra House, P.O. Box 400, Kuching, Sarawak. (Sarawak)

5783 Bridgland, L.A., P.O. Box 232, Rabaul, New Guinea. (Overseas)

5784 Pawanteh bin Din, Jugra Group Estate, c/o Gadong Oil Mill, Tanjong Sepat, Selangor. (Selangor)

5785 Oung Cheng Hai, Socoil Corpn. Sdn. Bhd., P.O. Box 107, Port Swettenham, Selangor. (Selangor)

5786 Chik Lwi Siang, Chan Wing Estate, Jagoh, Kluang, Johore. (C. Johore)

5787 Leong Ah Chye, Torkington Estate, Sabak Bernam, Selangor.

5788 Grose, W.J., P.O. Box 46, Kavieng, Papua, New Guinea. (Overseas)

REJOINED

4873 Lim Ming Hong, Glendale Estate, Bahau, Negri Sembilan. (Negri Sembilan)

RESIGNED

5556 Anuar bin Haji Abdul Rahman (West Pahang)

3579 Anderson, J.H.B. (South Johore)

4283 Macpherson, I.M. (Overseas)

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