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N O T E

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SENTIASA MAJU

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To promote the general interests of the planting profession.

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Editorial :

Henri Fauconnier

Henri Fauconnier was 24 years old when he first arrived in Malaya early in 1905 and went to live on Jalan Acob Estate at Kapar, 12 miles north of Klang. On Sundays the young Frenchman, accompanied by a few friends, would go prospecting in the nearby jungle looking for a suitable site to start a plantation. Their travels through the swamps of the Selangor coast eventually brought them to what is today Rantau Panjang Estate near Batang Berjuntai.

By the end of 1906, some 150 acres had been planted with rubber, and a further 350 acres cleared. At about this time Fauconnier and his partner, named Posth, were visited by Adrien Hallet, a Belgian pioneer. The three became friends, Hallet helping them to raise enough capital to start a small company which later was able to expand considerably during the rubber boom of 1910. Hallet extended his interests to Indochina and Sumatra and in 1911 invited Fauconnier to visit the latter with him. While in Sumatra he confided to Fauconnier the idea of planting oil palm in Malaya.

At this time there were only a few oil palms planted as ornamental trees near the bungalows of Dutch tobacco planters in Sumatra, and Hallet, who had been in charge of an oil palm factory in the Belgian Congo, was amazed at their vigour and productivity.

Despite the rubber boom Fauconnier brought back a few bags of oil palm seeds to Malaya and germinated them at Rantau Panjang. The palms were later planted to form an avenue at the entrance to the estate.

Fauconnier then obtained a concession to plant oil palm on a commercial basis near Batang Berjuntai (Tennamaram Estate) but soon after the outbreak of the first World War in 1914 the first planted acres were sold to another company. After the war however, in 1919, Fauconnier returned to Malaya and resumed the planting of oil palm.

He retired from Malaya in 1922 after finishing his famous and fascinating book *The Soul of Malaya.* This book won the Prix Goncourt, France's most coveted literary award, in 1930, and was translated into English in 1931.

Henri Fauconnier was chairman of Selangor Plantations until he relinquished the appointment on account of his age. He was last in Malaya in August 1957 and was honoured by the Incorporated Society of Planters with an Honorary Fellowship in 1968. He died three weeks ago in Paris, aged 92.

Modern Malaysia owes him much.

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Planter, Kuala Lumpur **49:** 146–151 (1973)

Steroidal sapogenins from *Dioscorea* in Malaysia

K. C. CHAN* & J. B. LOWRY†

SUMMARY

Dioscorea species play an important economic role as the main source of steroid drug precursors. Although the long term market is uncertain, there is considerable potential for developing new sources of these compounds.

The possibility of exploiting any of the twenty two West Malaysian species is considered, and results given for the steroid content of eight of these. Two contained sufficient diosgenin to warrant further investigation. Socio-economic aspects of the industry which could result provide cogent reasons for pursuing this research.

INTRODUCTION

Plant steroids as drug precursors. For a full account of this subject, see the review by Hardman (1969). The importance of various steroid hormones in human metabolism is well known, as is also the resulting pharmaceutical applications of this group of compounds. Steroid drugs may consist of the natural hormones, or of related synthetic compounds with differing effects to fit various medical requirements. They have several areas of application, of which the fertility control agents are the best known, but the largest single use is for the cortical steroids. The market value of finished drugs is very large (in the United Kingdom, in 1968, it amounted to £20 million) so that the manufacture and retail of these constitutes a major industry. Sources of steroid drugs have included animal organs for the 'natural hormones', but these are usually limited in quantity, expensive to isolate and often less desirable than chemically-modified analogues. Total synthesis (*i.e.* from simple, non-steroidal starting materials) is possible for the majority of compounds, but is expensive on a commercial scale. The alternative route, by which most steroid drugs are made today, is to utilise a readily available natural steroid with a chemical structure which can be suitably modified to yield the required compounds. Drug precursors used in this way include stigmasterol from soybean oil and the steroidal alkaloid solasodine from various *Solanum* species. However the compound which acts as a precursor for the majority of steroids (66% in 1968) marketed today is diosgenin, which combines availability and structural features, enabling all important groups of steroid drugs—the male hormones, the female hormones and the cortical steroids—to be obtained from it in high yield.

Diosgenin or equally acceptable related compounds are found in many species of the Liliaceae and allied families. They never occur free, but always in combination with two or more sugar molecules in glycosides having soap-like properties,

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and are known as saponins. In the plant the saponins probably function as defensive substances because they act as haemolytic poisons when taken internally by animals. We must note that the properties of the steroidal saponin bear no relation to those of the finished drug; rather, that part of the molecule provides a convenient starting point for partial synthesis of a desired compound—hence the term "drug precursor".

Diosgenin is at present obtained from a few species of the genus *Dioscorea** which occur as wild plants in India, China and Mexico. The latter country is the main source, and there the income from extraction of this compound amounted to about US$50 million in 1968. As this was virtually all obtained from wild plants occurring in secondary vegetation, gathered by rural people with few sources of cash income, and the resource shows no signs of disappearing, it is evident that the industry has several unique and attractive features for a developing country. The value of the trade in diosgenin has led to considerable efforts to develop saponin-bearing *Dioscoreas* as an agricultural crop (Martin, 1970) but these have been on the whole unsuccessful and present supplies still come largely from wild plants. However, recent discussions with representatives of one pharmaceutical firm indicate that significant quantities of cultivated *Dioscorea* are now being produced.

Market outlook for diosgenin. Reluctance of the larger drug companies to rely on overseas sources of a vital steroid, together with initial uncertainty about the total available supply led to efforts to devise alternative sources. Although there is a large and increasing demand for diosgenin, the long-term outlook is uncertain because of the possibility of total synthesis becoming a more practicable route to steroid drugs. However, at the existing price (approx. US$17.00 per kg) diosgenin is very cheap and probably not a major factor in the price of finished drugs. The change to total synthesis would probably appeal to those companies wishing to be independent of overseas suppliers. The general conclusion of Hardman (1969) is that a reliable supply at a stable price should be marketable for many years to come. Evidently also, the production from new countries would increase stability in the trade (the situation in the past has been highly unstable at times). Although some have taken a more pessimistic view (Manning, 1969), numerous references in the current literature show that considerable effort is being made to develop new sources of diosgenin and of solasodine. An additional factor is the possibility of increasing yield of diosgenin by treatment of the *Dioscorea* tubers (Hardman, 1968a).

The genus Dioscorea *in Malaysia.* As there are twenty-two species found wild in the Malay Peninsula, it is surprising, considering the current economic importance of the genus elsewhere, that there are apparently no published results of surveys for sapogenin content. In the results collected by Coursey (1967), the only Malaysian species mentioned is *D. hispida* because this was included in surveys carried out in the Philippines and in India. Both the introduced forms grown for edible starchy tubers, and the wild species, are the subject of a comprehensive account by Burkill

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* Commonly called 'yams' in Africa and the Americas but not to be confused with the 'yams' of Asia and the Pacific which are species of *Colocasia* and other Araceae.

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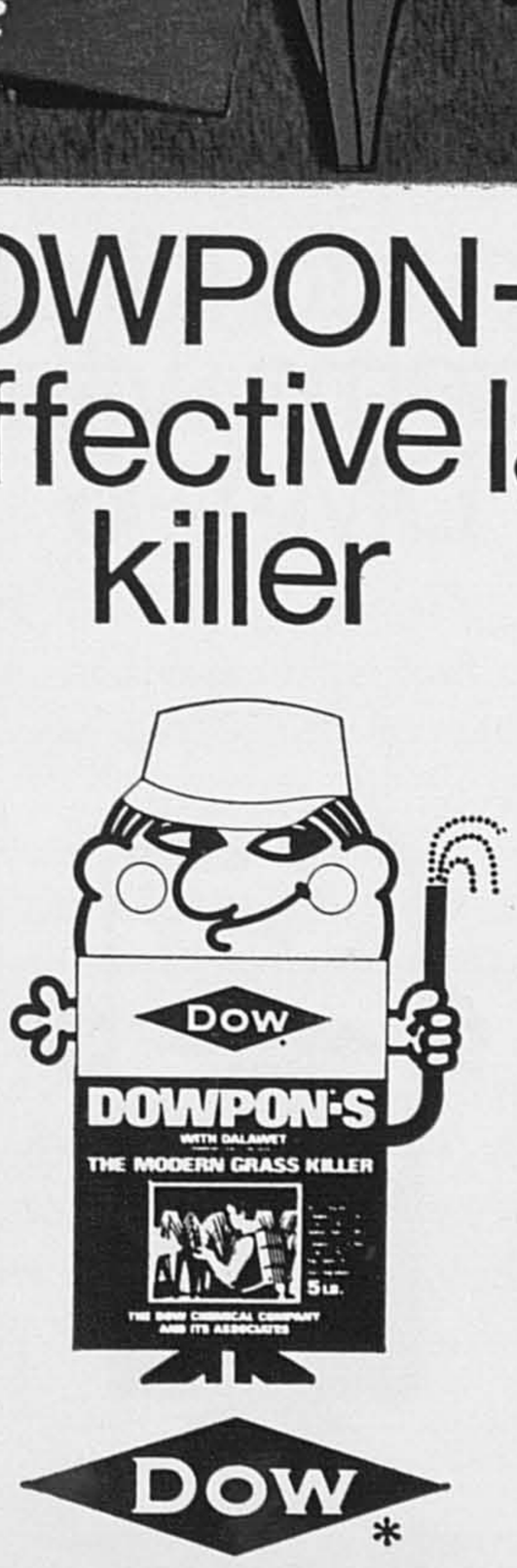

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(1935). Unfortunately the economic value of the sapogenins was not known at the time. Many of the wild species have been eaten, particularly by forest-dwelling people, and if any saponin was present elaborate treatment was necessary to remove it. For this reason the widespread introduction of tapioca has caused the food use to be largely forgotten, however any existing information on traditional names and practices regarding the various species should be a useful indication of the saponin-bearing ones.

Wild *Dioscorea* species occur in many habitats but in Malaysia they are essentially forest plants. Their use as food indicates that substantial quantities of tubers were in the past obtained from forest areas. Today the area of lowland forest has greatly decreased and would probably not supply significant quantities of those species restricted to this habitat. However the area of disturbed hill forest and *belukar* is probably much greater than in Burkill's time, and some species may be *more* common since they are light-seeking lianes, able to exploit breaks in the forest canopy. The collections on which these results are based were mostly made in disturbed forest and from general observation (JBL); they do not appear conspicuous in primary forest.

METHODS AND RESULTS

Collecting. Field collections of *Dioscorea* were made in several localities, but mostly on ridges bordering the Main Range near Kuala Lumpur. As the plants are not conspicuous and most collecting was done on cross-country walks, the coverage is anything but systematic, and should be regarded only as reconnaissance. Fertile material was rarely found, and the *Dioscorea* species are in any case difficult to distinguish. Therefore plants are being maintained as a living collection, propagated from tubers in the Botanic Garden of the Universiti Malaya. They are referred to here by the collector's number (JBL–); garden acquisition number (HB–); or Universiti Malaya Herbarium number (KLU–).

Qualitative Test. Initial indications of saponin can be obtained by a simple frothing test. The ground tuber was shaken vigorously with water, and a persistent froth showed the presence of saponin.

Hydrolysis. The saponin was hydrolysed *in situ* by heating the macerated tuber with 2N sulphuric acid at 100°C for 1 hour. After filtration the residue was washed with water and dilute ammonia, and then dried and extracted with light petroleum. The resulting extract was evaporated to dryness and dissolved in chloroform for estimation of diosgenin.

Analysis. Two techniques were available. Use of the characteristic infrared absorption of the spirostan system of diosgenin (Hardman *et al*, 1968 b) while a technique suitable for handling many samples, was found to be inconvenient for the sporadic nature of this work. Instead, we used thin-layer chromatography on silica gel plates developed with chloroform and visualised with (1) Iodine (2) sulphuric acid—acetic anhydride. The sample was applied in differing dilutions, together with measured volumes of a standard solution of diosgenin on the same

plate, and the estimation done by visual comparison of spot area and intensity. Results are in terms of dry weight of tuber.

RESULTS AND DISCUSSION

D. esculenta (JBL 594; HB 468). This is a cultivated yam from Kelantan which gave indications of saponin in the frothing test. The tubers must be roasted before eating; also an indication of small amounts of saponin. The diosgenin content was very low; approx. 0.4%.

D. hispida (JBL 592; HB 442). This species produces large succulent tubers which however are very poisonous in the untreated state because of the presence of the alkaloid dioscorine. As also reported by other workers, the diosgenin content was low, approx. 0.5%.

D. piscatorum (JBL 357; KLU 13186). The species name refers to use of the tubers as fish poison, an indication of high saponin content. This was indeed found to be so; the tubers yield about 5% diosgenin which is not accompanied by significant amounts of other steroids. As this is well above the lower limit for commercial exploitation (approx. 2.5%), and this is a hill forest species with reasonably large tubers, it would appear to be a very good prospect. Unfortunately we have obtained only one collection so far. *(Figures 1–3).*

D. pyrifolia (JBL 576; HB 504; KLU 17176). This species is common in lowland habitats including belukar and swamp. The plant has an extensive system of thin tubers which are deeply descending and difficult to dig up. Diosgenin was not present but there were substantial amounts of another unidentified steroid.

Dioscorea sp. (JBL 427; KLU 5724). A species found in belukar and forest fringes, with a small rather cylindrical tuber. It contained 1–2% diosgenin.

Dioscorea sp. (JBL 477; HB 213). This hill forest species had a highly branched tuber close to the surface of the ground but contained little or no diosgenin.

Dioscorea sp. (JBL 478, 544, 550; HB 216, 423). This hill forest species had a large tuber (4 kg), and is reasonably common. Although it contains saponin it has little or no diosgenin.

Dioscorea sp. (JBL 481; HB 214). This species contained approx. 4% diosgenin, but is probably not a good prospect because the tubers are very small and woody, and because the locality (coastal forest on Pulau Rumbia in the Sembilan Islands) suggests that the available habitat is very limited.

CONCLUSION

It would seem that there is a reasonable possibility of diosgenin becoming an economic product in Malaysia, with the development in the following stages.

(1) Energetic seeking out and screening of the other wild species; then survey of content and distribution in the promising ones. This would require very little

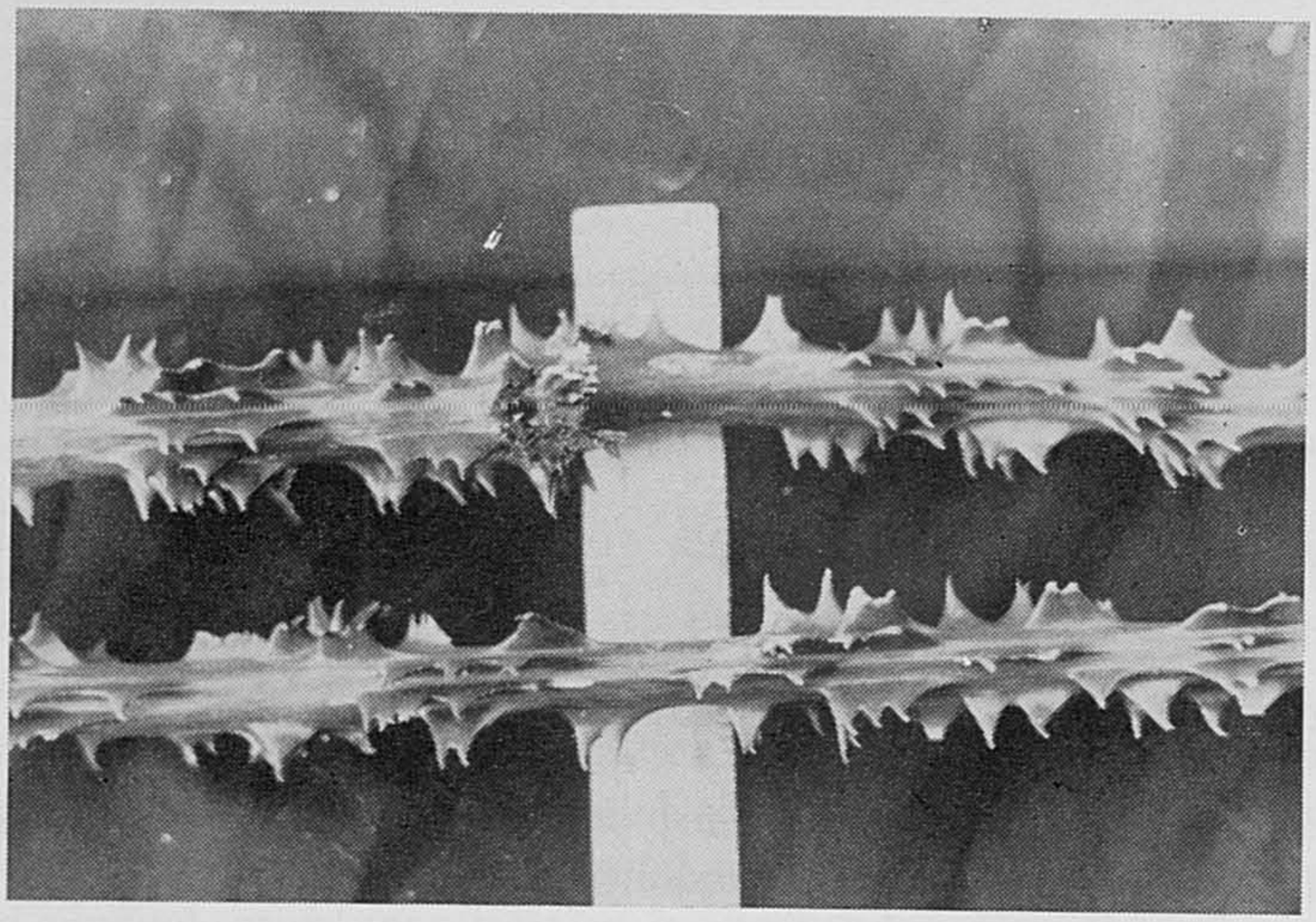

Fig. 1. D. piscatorum —*stem*

Fig. 2. D. piscatorum —*tubers*

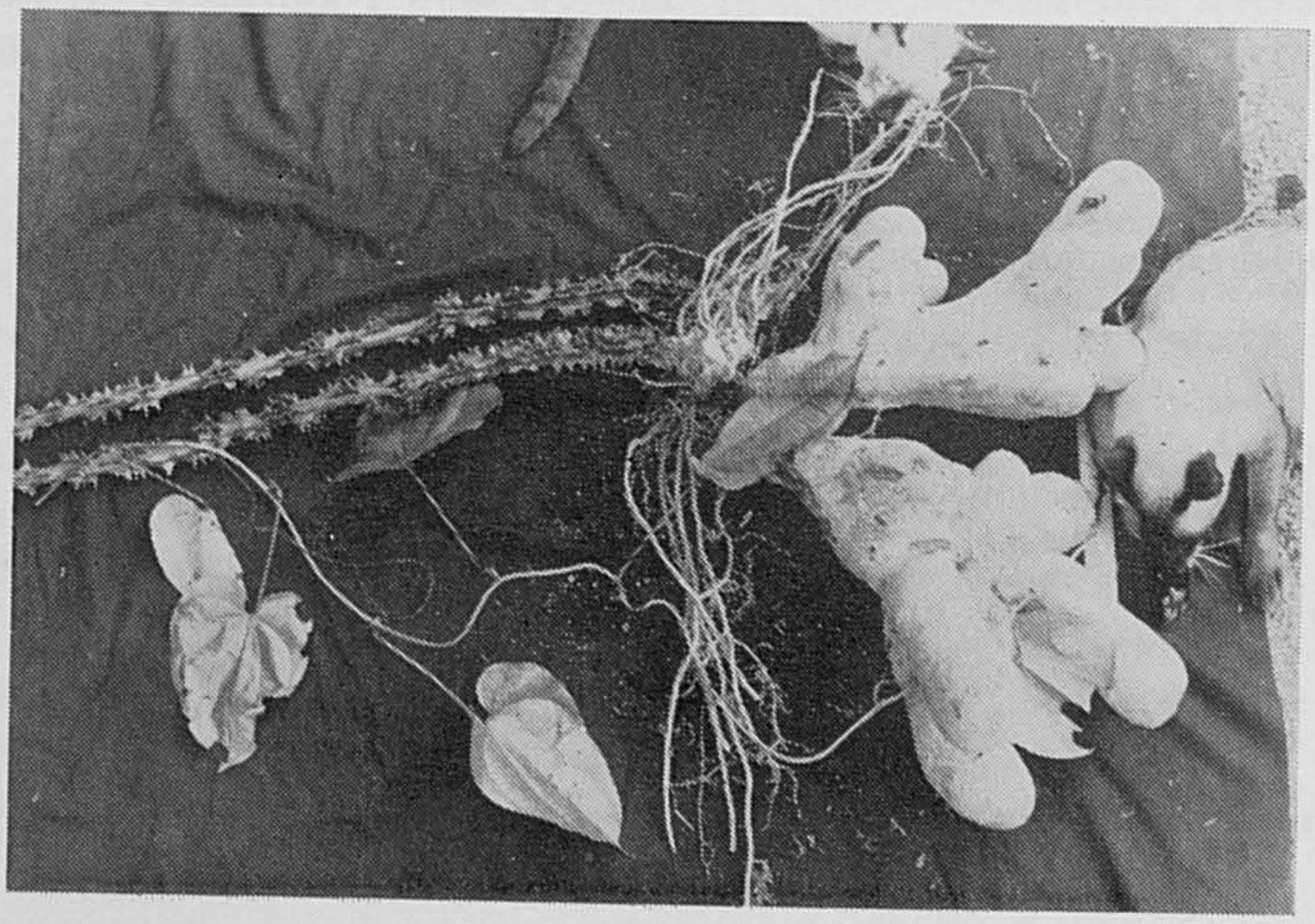

Fig. 3. D. piscatorum —*whole plant*

financial resources, but has not been possible for us in the University of Malaya, being essentially a field project.

(2) If favourable, to exploit supplies from wild plants.

(3) Development of these or introduced species for field cultivation.

An extraction industry based on wild plants would have such unique advantages that they are worth listing.

(1) It would conflict with no other land use.

(2) It would provide employment and cash income for those rural people living around the edges of forest or mountainous areas.

(3) Relatively little capital would be required to set up the extraction operation.

(4) Extraction of diosgenin could be carried out with local materials and largely with locally-trained people.

Other possibilities would follow, but they are too visionary to be considered here!

Acknowledgements. The first two *Dioscorea* spp. listed were collected by Encik Ismail bin Saidin of the Kebun Botani, Universiti Malaya.

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Conservation in Malaysia

P R WYCHERLEY

PART SEVEN — NATIONAL PARKS AND NATURE RESERVES

The idea of a National Park for the nation's recreation and to preserve the best of its scenic beauty is readily associated with that of a reserve to protect wildlife for the enjoyment of future generations. There are various immediate, practical reasons for maintaining a particular area undisturbed, for instance because it is a catchment important in the control of the water regime and the prevention of soil erosion and silting in a large river basin. Undisturbed areas are needed as controls in experiments and studies in forestry and hydrology and on the processes of soil formation and biological evolution. The preservation of the native fauna and flora for beneficial purposes such as animal and plant breeding, pest control and phytochemical investigation is another function of such reserves both now and in perpetuity. These areas become the natural centres for open-air recreation, the enjoyment of which is part of the heritage of all citizens and for which tourists and holidaymakers are willing to pay, so reversing the flow of money from the rural areas and the country. These parks and reserves can often be located on land which is unsuitable for other purposes, although combining several of the functions mentioned above and discussed at length in the earlier chapters.

In this chapter the planning, location, staffing, administration, management, legislation and public use of national parks, nature reserves and similar areas will be discussed rather than the need for such areas, because the various reasons for creating and maintaining them have already been detailed. National parks and the successful preservation of characteristic wildlife within them are a great source of national pride and satisfaction. Failure to assure adequate provision is a constant source of regret. All over the world this generation must assume its responsibilities in bequeathing the heritage it has received in a viable condition for the use and enjoyment of future generations. The greater pressures which threaten wildlife today are a measure of the sense of fulfilment which will be the reward of those who attempt and achieve these objects. In a new national and international, professional sense, none but the brave deserve the fair.

Past, present and proposed reserves differ in size, particular purpose and regulation. In general it is intended that the public should have access and should be able to follow those activities which do not harm the wildlife and other features protected in the reserve or which do not impair their enjoyment by other people. In certain circumstances, such as the breeding sites of rare birds, the exclusion of the general public is the only way to ensure that no harm or disturbance to the wildlife defeats the object of the conservation programme. Hopefully the status of the rarity will improve and later the restrictions may be relaxed for the benefit of an educated and appreciative public. Meanwhile certain strict sanctuaries will be required, which may be islands or similar isolated places, but more often will be an inner part of a larger park with normal access. Although undisturbed natural conditions are usually characteristic of national parks, there are cases where

management is necessary to allow a greater stocking to be carried or conditions for breeding to be improved. Therefore portions of nature reserves may be modified under the control of the wardens.

Some types of reserves, especially some existing bird sanctuaries, contain very little natural vegetation. In these areas birds and other wildlife are declared to be totally protected, this is to enable them to continue to use their favoured breeding grounds, examples include wet-podilands in Sabah, hill stations and a golf course in Malaya. In the case of fully protected birds (fully protected in the legal sense, not always alas in fact) which it is illegal to harm, kill or capture at any time of year in any part of the country, the whole country is in effect a reserve for them even if not very rigorously maintained. Therefore the legislation for the general protection of wildlife will be considered with that of the more definitive reserves.

Legislation

Wildlife is protected in Sabah and Sarawak under Ordinances passed in 1963 and 1958 respectively. The Malayan Ordinance of 1955 has been replaced by the Protection of Wildlife Act of 1972 in West Malaysia. Their provisions cannot be described in detail and are not exactly the same in all three territories. Broadly they provide for animals (mainly mammals and birds are specified) to be classified as Totally Protected, Licensed or Game Animals and the rest. Those totally protected cannot be harmed, shot, trapped or kept in captivity. The Licensed or Game animals may be hunted or taken as cage birds for example during certain seasons and in certain places as specified on purchase of a license. The rest are not protected, except that wanton cruelty to vertebrates is usually punishable. It is permissible to kill even totally protected animals in defence of human life, crops or property. The onus is on the person killing such an animal to prove the justification. This leaves an obvious loophole in the law, the animal might be enticed on to the owner's property with the intention of killing it and there are many cases in which the risk to human life has been greatly exaggerated. Often the animal could be driven away, but instead is driven into a corner and killed.

The correct enforcement and interpretation of the law must rely upon the sympathy of the court, whether with the animal victim or the hunter (who perhaps claims to be a starving farmer) and will ultimately depend upon public opinion.

The penalties also vary between States and in some cases are unrealistically small by comparison with the profit of poaching or the incalcuable value of a rare animal. These laws also control the trade in wild life and their products, alive and dead, by licensing taxidermists and dealers in game, skins, pets and cage birds. Lax enforcement of the law leads first to loss of revenue in licenses, this loss becomes permanent if the game animals are exterminated by illicit hunting and trapping. Thus lack of enforcement leads to loss of wildlife, which is lost to everyone including the hunter, the poacher, the game warden and the ordinary citizen. So neglect leads to another extinct species, which is shameful in an enlightened society. Therefore to conserve both the wildlife and the revenue it can raise, proper observance and enforcement of the law are essential. Therefore the

law must be amended to prevent abuses and the Game Department (or equivalent authorities) must be adequately staffed and trained, so that the law may be properly implemented with the support of the government and people.

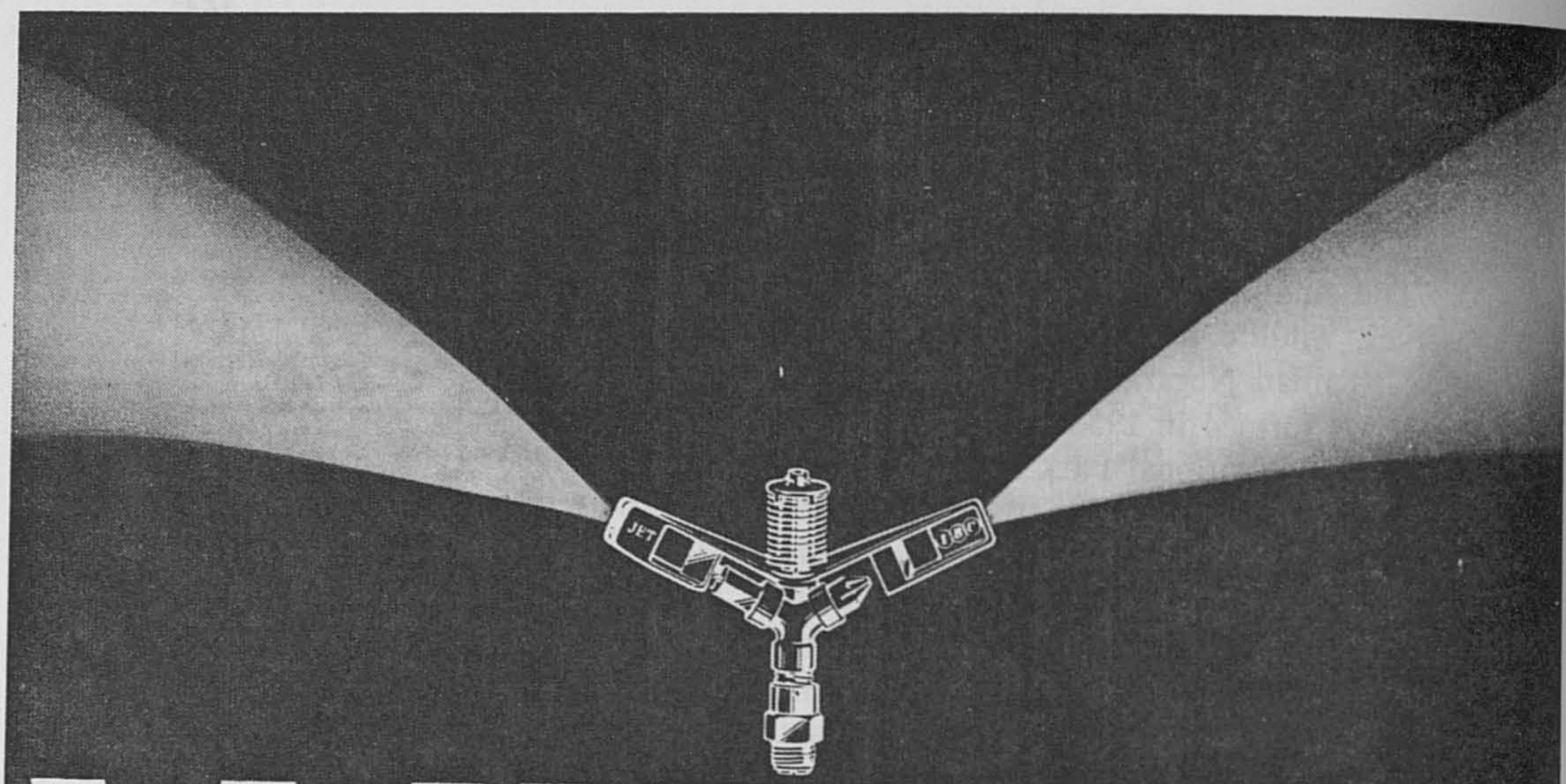
The first Game Reserve in Malaysia was gazetted in 1902, various game reserves, wildlife reserves, bird sanctuaries and national parks have been created since. Taman Negara, Malaya (formerly known as the King George V National Park) was formed in 1938. Bako National Park followed in Sarawak in 1957 and the Kinabalu National Park was constituted in Sabah in 1963. The three national parks were made under different ordinances. The various other reserves in Malaya were made as specific gazette notifications in most cases. Some have been rescinded and alienated for other purposes by further gazette notifications. In only the minority of cases have any staff been provided to patrol, watch and manage the reserves. The purpose of some of the reserves has been ill-defined and consequently they have been poorly managed for conservation. Some reserves have been to protect game animals for the hunt.

New enactments are in preparation for West Malaysia. It is desirable that general legislation covering all parks, reserves and sanctuaries be drawn up using the best examples from East and West Malaysia and other countries as models. The practice of separate ordinances and notifications for each reserve has led to unfortunate, inadvertent omissions from the regulations of some of them. In some cases the Game Department and serious students are prohibited from making necessary collections for identification. However, undoubtedly the weakest feature of the existing legislation in West Malaysia is the case with which reserves can be alienated by gazette notification and converted to other uses. It is essential that in future those reserves which are to be retained and the new reserves to be created should all be established by Acts of Parliament, so that their status would remain inviolate unless changed by another Act of the highest authority.

Location

In the attached tables and accompanying notes the names and extent of the National Parks and similar reserves in Malaysia are given. Those listed in the table are areas which are still almost entirely in their natural condition. The existing reserves cover about 6, 1.1 and 0.02 percent of the total land areas of Malaya, Sabah and Sarawak respectively. A few reserves or parts of them in Malaya have ceased to serve any useful purpose and should be or have been rescinded.

The respective authorities in East and West Malaysia (the Game Department in Malaya with the assistance of a Colombo Plan Adviser) have drawn up recommendations for adjustment of some existing reserves and proposals for new reserves. Some further amendments have been proposed in Regional Master Plans and by such bodies as the International Biological Programme, Terrestrial Conservation Section, West Malaysia and the Malayan Nature Society. These are also mentioned in the tables. If these recommendations were implemented in their entirety, the reserves and parks would cover 10.5, 4 and 0.7 percent of the land area in Malaya, Sabah and Sarawak. This proportion may seem large in the case



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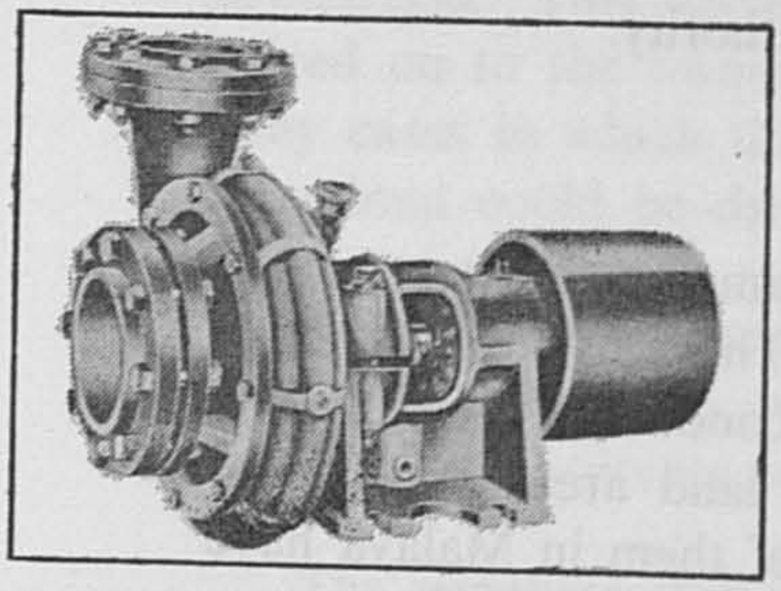

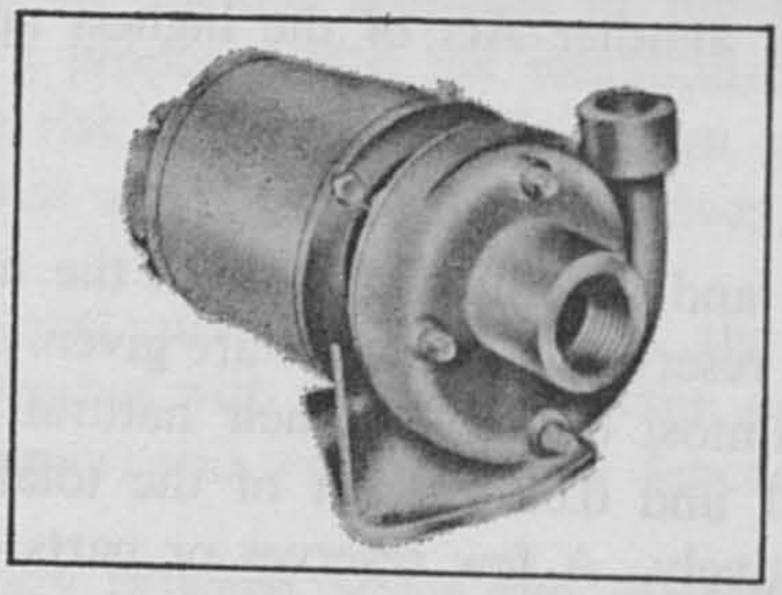

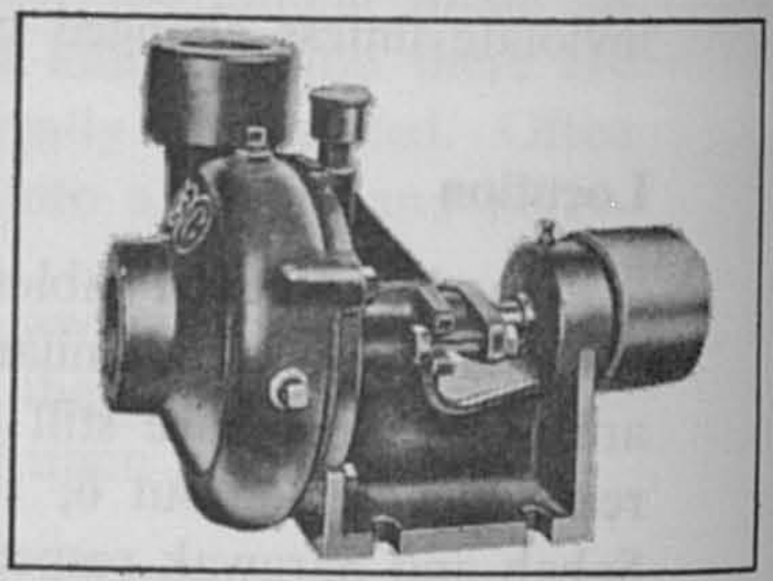

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of Malaya, but more than 20% of the country is more than 1000 ft (300 m) above sea level and the amount above the 'steep land line' is even more. The 10% in existing and proposed reserves has been selected to occupy mainly uncultivatable land, where wildlife reserves, catchment areas and national parks are the best land use and will provide employment for people where otherwise there would be none.

The smaller reserves and sanctuaries are mentioned in the notes. A new name of National Nature Monument is proposed for some of these in Malaya. This name has gained currency in many countries to mean small National Parks and Reserves which have been dedicated to preserve unique features or the best examples in the nation's characteristic wildlife and scenery. Batu Caves is an obvious choice for inclusion in this class, it has a rich flora on the limestone hill and an interesting cave fauna including some 'living fossils', it also has cultural significance, it is one of the few natural attractions in the environs of the capital city; much of the hill has been gazetted as a reserve for public recreation since 1930, but without any definition of the protection to be afforded to the wildlife, the caves or the public, because parts have been rescinded and are now being blasted.

When Malaysia has the system of National Parks and nature reserves which its people and wildlife deserve, their future development for the conservation of wildlife and the provision of recreational amenities for their visitors must be assured.

Amenities

The present National Parks all provide some amenities to visitors. At Bako, Sarawak, these consist mainly of paths or trials to enable the places of interest and natural beauty to be reached easily; there is a camping site and some accommodation. In the Kinabalu National Park, Sabah, there is a path leading right to the summit 13 455 ft (4104 m)— the highest between the Himalayas and New Guinea— with hut accommodation lower down and camping sites at suitable intervals all the way. Visitors may obtain pamphlets describing the more interesting wildlife likely to be seen. Taman Negara, Malaya, has several bungalows for visitors and a number of trails near the park headquarters. The path to the summit of Gunong Tahan 7186 ft (2193 m)—the highest peak in Malaya which is within the park—is difficult for the ordinary visitor to follow. Rod and line fishing is allowed, but hunting of birds and animals is not permitted. There are hides by salt-licks, where it is sometimes possible to see and photograph Seladang and other wildlife.

However, many visitors to Malaysia's national parks are disappointed to see very little wildlife, this is particularly so in the Taman Negara, Malaya, where they expect to see Seladang at least and perhaps Tapir, Elephant and Deer. This disappointment discourages others from visiting and suggests to some that the park is failing in its purpose. The main reason why wild cattle are not more regularly seen is that the few remaining herds have become very nervous. Their present grazing grounds are near villages on the boundary of the park where they are molested by poachers. Total protection is an essential for wildlife, especially cattle and deer, to become tame enough for visitors to get close to them taking only normal precautions not to scare them. Therefore the development of totally protected

Table 1. National Parks and Wildlife Reserves in West Malaysia

NAME	*Area sq. miles*	*NOTES*
Existing		
Taman Negara	1677	If a dam is built on the Tembeling, preservation of the catchment will be even more important. Any excisions should be compensated
Sungei Endau	291	Recommended reduction from 392 of old Endau —Kluang reserve. Proposed S. Emas sanctuary will be adjacent
Grik	262	Poor forest but many salt-licks and large mammals
Krau	252	Recommended increase from 213 to include Gunong Benom
Gunong Blumut	87½	Recommended reduction from 311 of old Endau —Kota Tinggi reserve
Mersing	72	
Sungei Dusun	17	Sanctuary for Rhinoceros
Sungkai	9½	Now isolated and encroached by agriculture
Bukit Kutu	7½	Steep forest near Federal capital
Templer Park	6	Recreational area disturbed by mining. Bukit Takun and Kanching ridge should be included
Proposed		
Belum	830	Catchment above Temengor Dam
Ulu Trengganu	450	Infertile area east of Taman Negara
Ulu Muda	445	Catchment above Muda Dam
Sungei Nenggiri	143	Poor forest north of Taman Negara
Gunong Semalayong, etc.	? 100	Extend from Gunong Blumut along watershed to Gunong Panti so protecting catchment of Johore River, rare and varied flora
Selama	86	Sanctuary for Rhinoceros
Tasek Bera	63	Unique freshwater swamp
Sungei Emas	61	Sanctuary for Rhinoceros
Other areas up to	500	These include areas already afforded some degree of protection, some of which are no longer under natural vegetation, *e.g.* bird sanctuaries at Royal Selangor Golf Club, hill stations, Bukit Fraser and Cameron Highlands. Fuller protection is needed for the following habitats and examples: limestone—Batu Caves and Gunong Tempurong, isolated mountains—Gunong Jerai (Kedah Peak), G. Bubu and G. Ledang (Mt. Ophir), islands—Pulau Tioman and P. Langkawi, submarine reserves—Sembilan and Perhentian islands, unique vegetation—Segari and Padang Mulud, important catchments — Batu Feringgi, established scientific study areas—Pasoh and virgin jungle reserves, and breeding grounds *e.g.* of leathery turtles at Dungun and of night herons at Kuala Gula. The existing sanctuary at Cameron Highlands accounts for 265 sq. miles of the total.
Total	5360	Approximately 10.5% of the total land area

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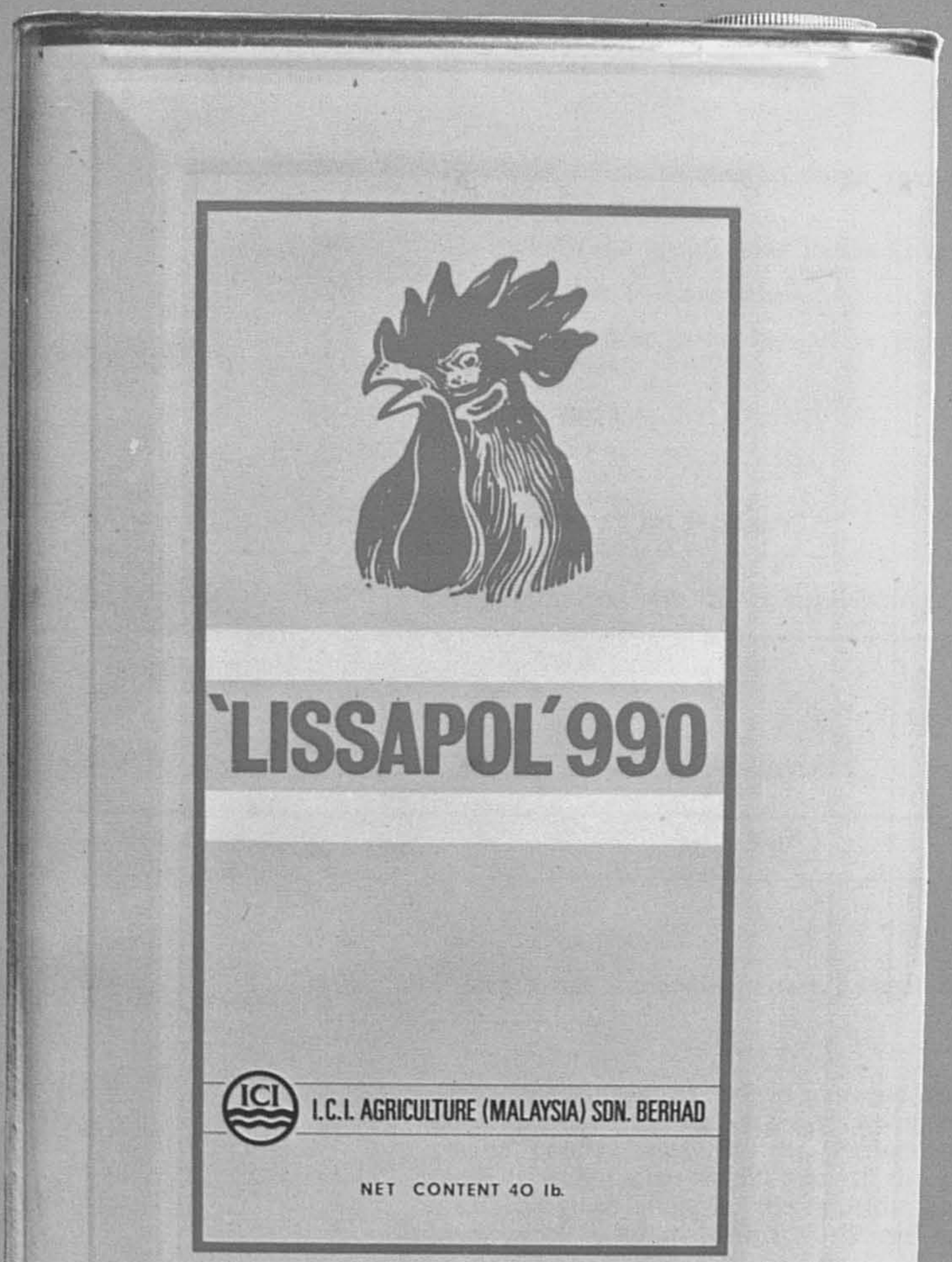

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Table 2. National Parks and Wildlife Reserves in West Malaysia

NAME	*Area sq. miles*	*NOTES*
Existing		
Kinabalu National Park	275	Includes Mount Kinabalu
Proposed		
Ulu Segama	700	Lowland forest to protect large mammals but licensed for logging
Crocker Range	88	To include the spectacular Padas Gorge
Mount Templer	36	An extension to Kinabalu
Pulau Gaya	12	For marine life; to be known as Tunku Abdul Rahman Park
Semporna	2	Mineral springs
Others		
Kota Belud	50	Bird sanctuary on farmland
Total	1163	Approximately 4% of the total land area

Table 3. National Parks and Wildlife Reserves in West Malaysia

NAME	*Area sq. miles*	*NOTES*
Existing		
Bako National Park	10½	Infertile but interesting coastal vegetation
Pending		
Gunong Mulu	204	The constitution of these national parks has been approved by the Sarawak Government and awaits confirmation by the Federal Government. Niah Caves form one of the principal archaeological sites in the world, which has been gazetted as an historical monument.
Lambir Hills	27	
Niah	12	
Pelagus Rapids	8	
Proposed		
Loagan Bunut	20	
Semilajau	15	
Gunong Gading*	13	*These two proposed national parks are also water catchments and no public access may be allowed, although the wildlife will be conserved.
Matang*	8½	
Sabal	5	
Sungei Dalam†	2	†A quarter is part of Miri airport and the rest will be a research reserve
Total	325	Approximately 0.7% of the total land area

areas deeper in the park, which can be managed to increase the amount of fodder and to provide artificial salt-licks, watering places and cover, will serve two main purposes: —the preservation of the wildlife, and the provision of a spectacle for visitors.

The future of Taman Negara has been threatened by a proposal for large scale logging, which seems to have been postponed at least. A more recent proposal is to construct a dam on the Tembling, which by flooding part of Taman Negara, will control some of the headwaters of the Pahang River and thereby help to reduce flooding in the lower reaches. Since this is but one of several tributaries of the Pahang River, it will not in itself solve all the problems of Pahang's perennial floods. More cogently, if the dam is to serve this purpose for a useful life, there must not be any logging or other developments which could lead to silting up behind the dam.

The dam, or rather the flooded area behind it, will deprive Taman Negara of a considerable proportion of its lowland forest, the biological community which is in most urgent need for preservation of an adequate representative sample undisturbed. Taman Negara should be compensated by inclusion of new lowland areas. Taman Negara is the largest National Park in South East Asia. Its future seems to be at the cross-roads and with it Malaysia's reputation for generations to come. The planners and policy makers have the opportunity to guarantee the National Park concept on a magnificent scale by truly coordinated provision for long-term needs.

Trails are necessary in every type of park, sign-posted as appropriate. Underwater trails for skindivers or vantage points for glass-bottomed boats should be indicated in submarine parks. Female turtles are very shy when they first come ashore to lay their eggs. Suitable shelters may be provided so that visitors may view in comfort without disturbing the turtles. Taman Negara already has some hides near salt-licks, this facility can be extended in various ways, for example in bird sanctuaries and similar areas. In swamps such as Tasek Bera, the hides must be approached either by boat or by raised pathways. A pioneer example of a platform 140 ft high up a tree in Malayan rain-forest at Ulu Gombak has revealed the fascinating world of the tree canopy, including various apes and many colourful birds, most of which are more active by day than by night in contrast to the fauna of the forest floor. Naturally tourists will want something more secure than a ladder to climb up to their observation perch. Towers with stairways or even lifts at suitable locations should prove rewarding, both aesthetically to the visitors and financially to the operators. Another approach used at Bukit Lanjan has been to build an aerial ropeway horizontally through the trees standing on a steep slope, so that the terminal observation platform is in the canopy of the tall trees lower down the slope.

Paths serve a dual function, they give access and also they guide and gently discipline the visitors. The casual tourist seldom strays far from the prepared route. As a result he is less likely to get lost and he is less likely to disturb features, plants and animals better left alone. One of the problems in Batu Caves for example was that there were no paths and all visitors to the Dark Cave got their footwear

muddy. Now there are dry paths which take them where they can see the spectacles without bringing them near to the feature themselves. The tendency of many visitors to damage the stalactites, mark the walls and to behave inconsiderately has been much reduced by the inconvenience of leaving the clean, safe and easy paths. Tourist development has aided conservation here.

Suitable notices along the routes through the parks can draw the attention of the visitors to points of interest. These will be part of a much larger system of instruction through various media to stimulate interest in wildlife, pride in the national parks, intelligent appreciation, responsible behaviour and general enjoyment. Illustrated notices, leaflets and guide books are well tried methods which will always find a place. Descriptions recorded on tape and films or filmstrips shown either at park headquarters or in schools or on television in advance preparation for a visit will play an increasing role. Portable tape-recorded guides are useful in caves for example. Museum displays at park headquarters help too. Finally the value of well trained guides versed in their subject among the park personnel, wardens and rangers who share enthusiastically their knowledge and so help others, can never be over-estimated. This intensifies the satisfaction of career staff as well as of visitors.

Other amenities, which are necessary in national parks or close to national nature monuments, include accomodation and refreshment facilities. There is need for a range from simple hostels, camp and picnic sites to hotels and restaurants suitable for the more elderly, comfort-loving tourists from overseas who can afford to pay more. The pride in their country developed among youth by spending holidays out of doors in national parks is a far better long-term investment than the immediate gains in tourists' money, attractive as the latter may be. Many other national characteristics may be displayed for tourists or encouraged among youth in association with national parks. For example typical local food and genuine national dishes, well prepared but served in a traditional manner prove an enjoyable experience which is frequently lacking in the more common types of tourist resort. Youth camps and hostels provide an agreeable background for the spontaneous enjoyment of national sports, songs and dances, so perhaps relieving racial tensions.

The provision of these amenities provides work for rural people. In many countries the local handicrafts—sometimes utilizing natural materials—sold in association with national parks are more pleasing artistically, more faithful to local designs and useful than the stereo-typed souvenirs sold in towns, at airports and hotels all over the world. These considerations should always be kept subsidiary to the main purposes of national parks which are to conserve wildlife, natural resources and beauty. Nevertheless, national parks can be developed as profitable enterprises and as centres for the revival of national pride, traditional crafts and pastimes.

Sport

Wherever there are suitable lakes or rivers, parts can usually be set aside for swimming or boating. Controlled fishing by rod and line can often be allowed as

an attraction without disturbing the wildlife as a whole. However, hunting, even licensed and strictly controlled, requires very careful consideration. Hunting by aborigines using their traditional primitive traps and weapons, such as bows and arrows, blow-pipes and darts, may be regarded as part of the natural complex and there is a case for protecting their ancestral rights to hunt game for food by such methods, which are not a serious threat to most endangered species. However, such concessions must be carefully supervised that potentially more destructive methods such as steel traps, luring with power lamps, and firearms are not substituted for the primitive, more skillful means of limited effect. Moreover new demands for wildlife taken by aborigines, such as captive animals for dealers or trophies for tourists, cannot be allowed to erode the purpose of nature protection. In other words, hunting by aborigines must forfeit any special concessions and become subject to the same universal controls if their hunting ceases to be aboriginal in either methods or purpose.

The concessions to aborigines must be carefully defined, both within and without national parks. Owing to the reduced area available to wildlife and aborigines due to modern land development, there can be no concessions at all for the hunting of totally protected animals which are endangered species, or for any hunting at all in the strictest wildlife sanctuaries for the preservation, breeding and rehabilitation of threatened animals, because freedom from all disturbance is essential in these areas. Often the aborigines who have lost their hunting rights may be found new employment as game wardens and park rangers.

Aborigines' hunting rights constitute a special case wherever practised. Conventional hunting and shooting must be prohibited in national parks and nature reserves. Normally animals should be taken only on other land, for example forest reserves or in agricultural areas, under licence and with proper respect to close seasons and the age and sex limitations placed on the number of animals which may be killed. If a national park or wildlife reserve is successful in raising and maintaining a heavy stocking of pig, deer or even wild cattle, these may well develop a situation where selective culling is necessary to maintain a desirable age and sex composition of the animal populations. This culling can provide much needed meat especially as protein is one of Malaysia's most important growing dietary deficiencies. Sale of meat will yield revenue.

This revenue may be further increased by licensing the culling to private hunters, however, this can be a dangerous procedure in national parks. There is a greater risk with private hunters that ordinary visitors may be injured or killed than is so when only game wardens are employed. Moreover, there is a risk of undermining the principles of administering reserves by allowing progressively greater disturbance of all the wildlife as well as the game and by hunting gradually obtaining greater significance than wildlife conservation. The emphasis may change to managing the park primarily to raise game for hunting instead of protecting wildlife for ordinary visitors to see and enjoy. Therefore, although the extra revenue may be attractive, it would be better to organize the park in the interest of the majority of visitors and to raise revenue by other means without undue reliance on hunting licences.

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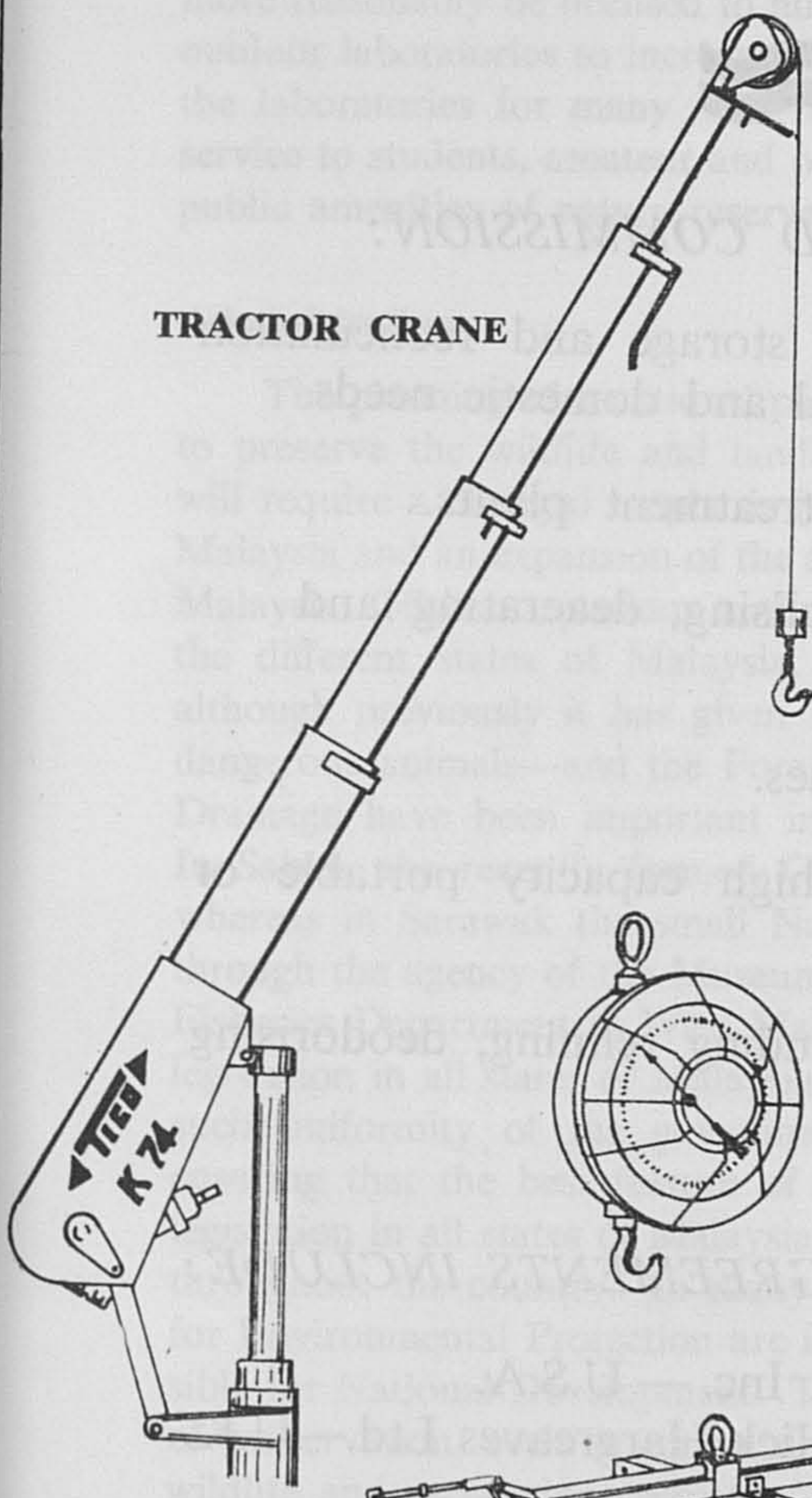

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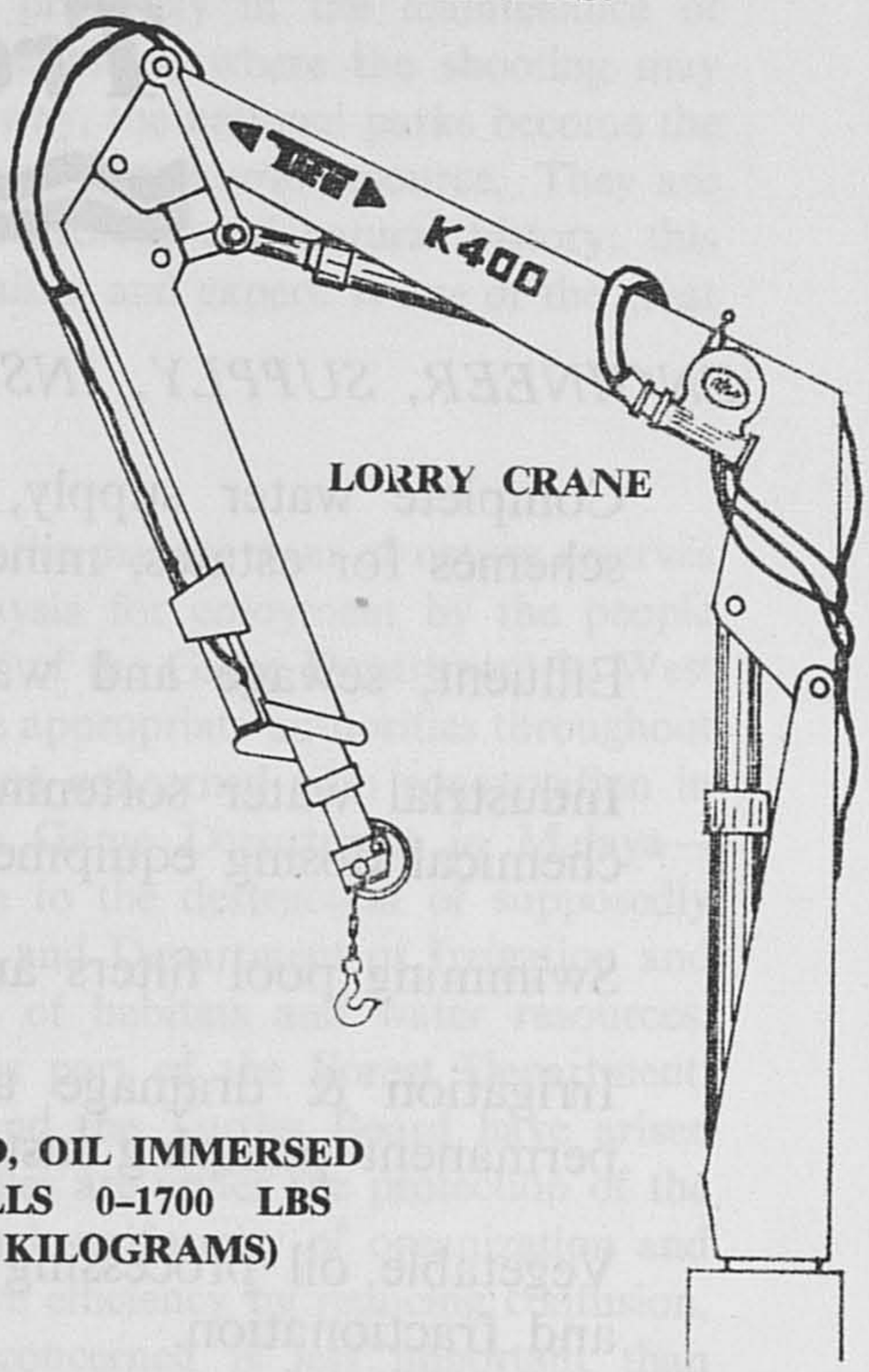

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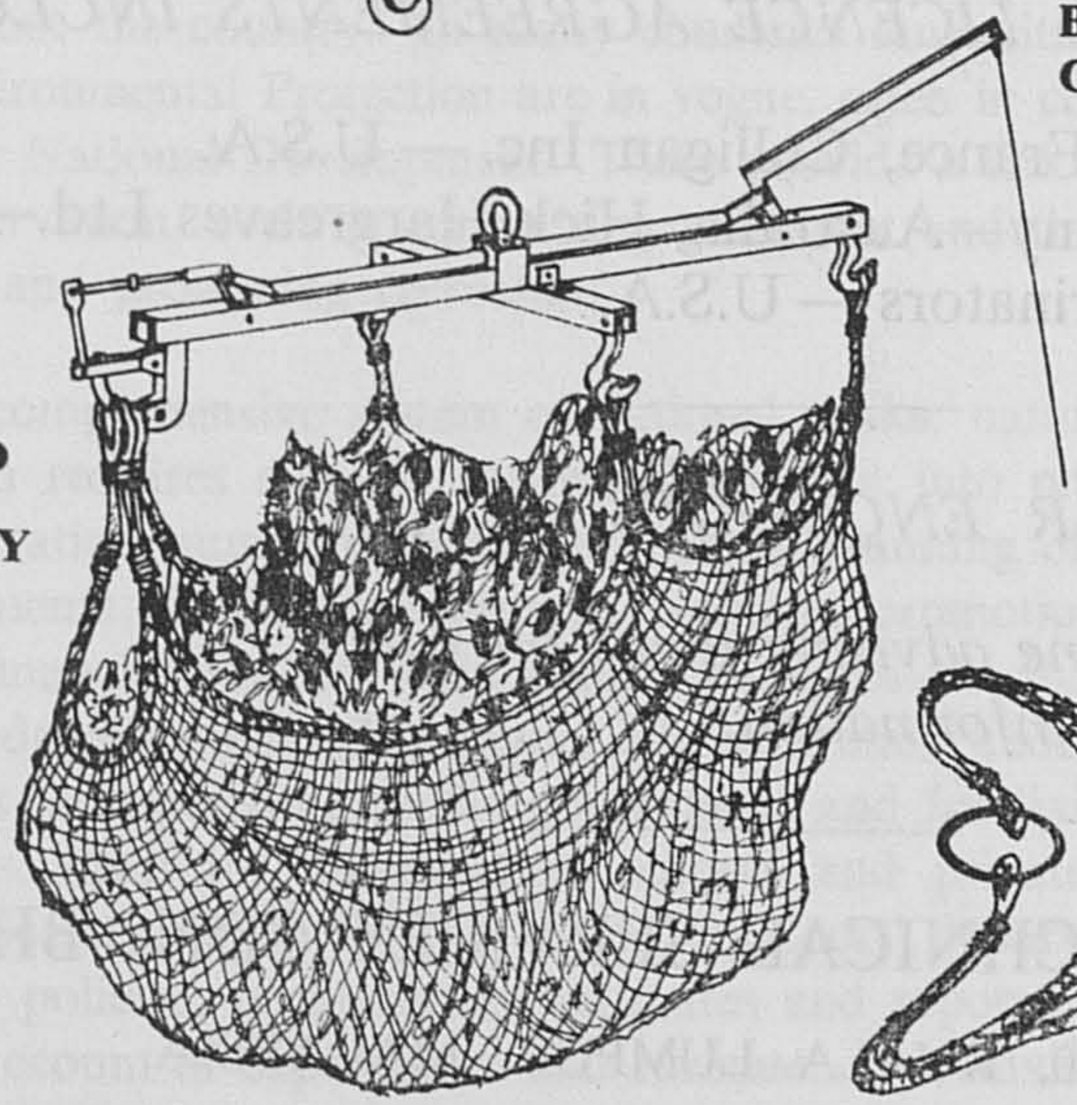

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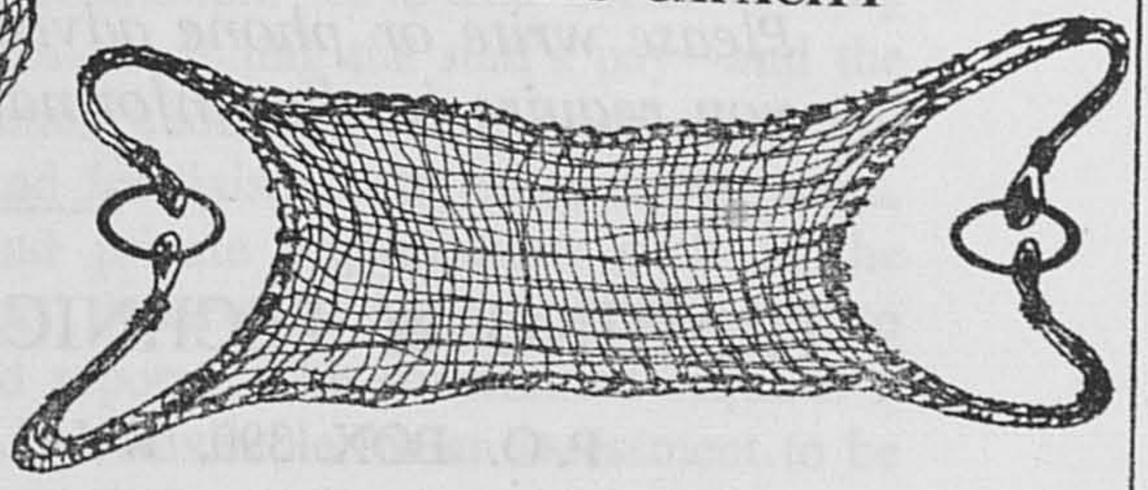

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Administration

The planning of a national park system and the management of nature reserves to preserve the wildlife and landscape of Malaysia for enjoyment by the people will require a changed emphasis in the functions of the Game Department in West Malaysia and an expansion of the activities of the appropriate authorities throughout Malaysia. Hitherto, various authorities have been concerned with conservation in the different states of Malaysia, primarily the Game Department in Malaya—although previously it has given more attention to the destruction of supposedly dangerous animals—and the Forest Department and Department of Irrigation and Drainage have been important in conservation of habitats and water resources. In Sabah, the recently formed Game Branch is part of the Forest Department, whereas in Sarawak the small National Park and the Turtles Board have arisen through the agency of the Museum. Marine turtles are under the protection of the Fisheries Department in West Malaysia. Although uniformity of organization and legislation in all states of Malaysia might improve efficiency by reducing confusion, such uniformity of the government agencies concerned is less important than ensuring that the best feature of previous experience, research, organization and legislation in all states of Malaysia and indeed elsewhere are combined and applied throughout the country. In many countries authorities, departments or ministries for Environmental Protection are in vogue, often in conjunction with those responsible for National Development. These provide a link between the negative aspects of conservation, such as combatting pollution, and the positive such as preserving wildlife and promoting recreation.

A comprehensive system of national parks, nature reserves and wildlife conservation requires staff of various kinds knit into one organization. The central administration must undertake the overall planning of the service and the routine arrangements of staff recruitment, training, promotion, leave and social security and of financial matters, both regular expenses—including the staff's pay—and the costs of development. The higher administration under the director and chief conservators is responsible to the government and for liaison with other departments, museums, institutes, universities, schools and private organizations such as the Nature Society. Inevitably, even an "outdoor" department requires office work to draw up policies, programmes, estimates and reports. The government requires a careful account of expenditure and revenue. It is advisable for an assessment to be made of indirect revenue from tourist accommodation, sales and services by local people to visitors. This helps to maintain a true perspective of the contribution of national parks to the country's economy.

The field staff, usually divided into senior staff called wardens and junior staff caller rangers, have several duties. Firstly, they are responsible for enforcing observance of the legislation concerning wild-life throughout the country as well as in the national parks. The parks, reserves and sanctuaries must be patrolled sufficiently frequently to exclude poachers. Where licensed shooting and fishing are allowed, there must be checks that the proper fees are paid and restrictions on the kill or catch in size or season are obeyed. Sometimes farms, animal dealers and ordinary residences must be visited, armed with a warrant if necessary, to recover animals which it is prohibited to keep in captivity or for sale. Taxidermists, dealers in trophies and souvenirs must be supervised too. Secondly, the field staff must maintain the parks and manage the wildlife. This includes clearing paths, erecting and repairing bridges, signposts and hides as far as the physical amenities are concerned. The management of wildlife will require censuses of their numbers, modification of the habitat for example by cutting shrubs, culling too large or over-aged populations, as well as the general protection of the wildlife. Occasionally, the field staff may be called upon in their traditional duty as the destroyers of crop-raiding, cattle-killing and other dangerous animals, alternatively a special control officer may be appointed to apply the best methods in each case. The field staff may also act as guides and instructors for visitors to the parks, or this role may be deputed to specially trained staff.

The field staff are professionals but not necessarily scientists. A scientific or research branch is necessary to investigate improved methods of conserving wildlife and raising its productivity where appropriate. The research branch must keep a constant watch on the stocking of important species as reported in the censuses by the field branch, in order to interpret the effect of management methods and to be alert to any threat due to either a dangerous decline in numbers, perhaps caused by disease, or to an excess which might exhaust the food supply. The research branch must be prepared to advise the field branch what to do in these circumstances or know how to design a suitable investigation if the problem is a new one.

The research staff will usually have had advanced training at university or institutional level in biology, ecology, wildlife management or veterinary science. Research is needed to save rare species, to increase stocking in parks, to enable visitors to enjoy wildlife without disturbance, to control wildlife humanely where they are pests of agriculture especially by deterring rather than by destroying them. Immobilization techniques need study so that rare animals can be moved safely, this might be applied to securing pest animals for zoos or moving them where they can do no harm, instead of killing them. The minimal areas for the survival of biological communities, plant and animal species, the movements of migrants, breeding seasons and many other ecological problems must be investigated, some of which have been mentioned elsewhere in this series of articles.

Central research stations are needed, at least one each in East and West Malaysia. The central research stations will require various laboratory and library facilities, but it may be necessary to supplement these by access to the more extensive facilities available in universities and other research institutes, for example

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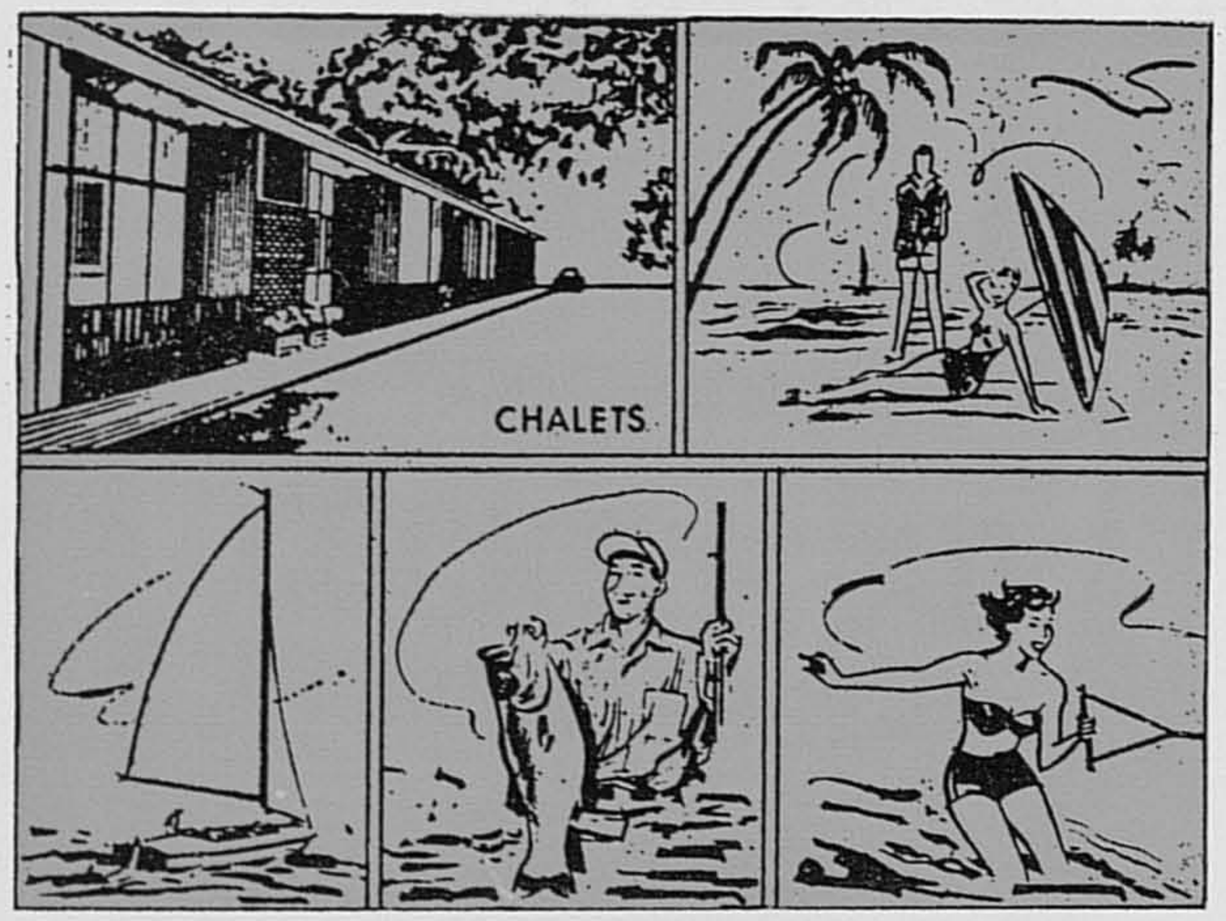

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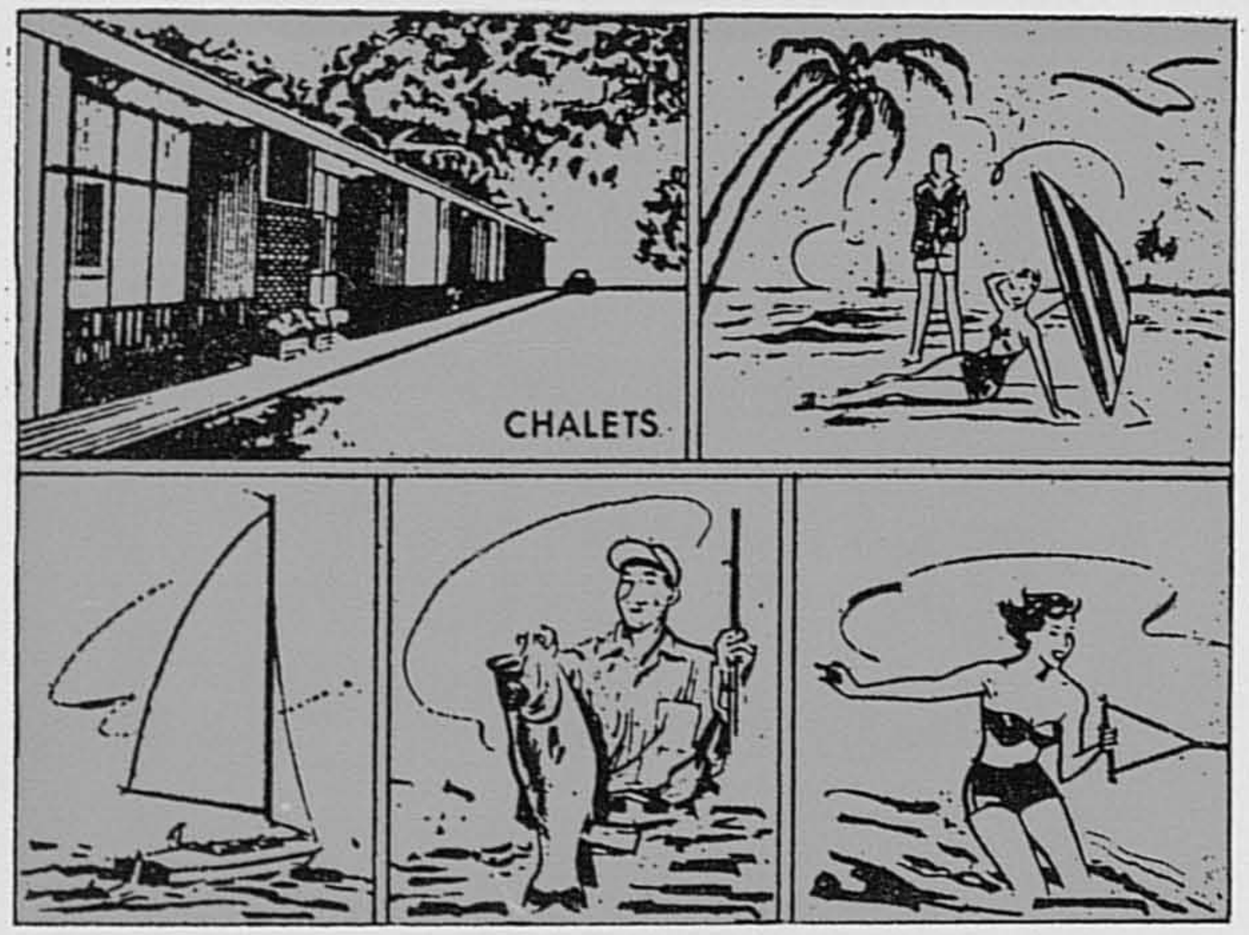

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in agriculture, forestry and medicine. Therefore, the central research stations must probably be located near state and federal capitals or other centres of learning. They should not be too far distant from the administrative headquarters, or better combined with them. However, many of the actual experiments must be carried out in the parks and reserves. Therefore, parts of the parks may be set aside for research and in any case appropriate accommodation for research work and staff must be provided in each park. Sometimes a room as an office in park headquarters and a room to sleep in at the hostel are all that is necessary if the investigations can be handled by occasional visits by the research officer. In other cases, one or more research officers in permanent residence with a branch laboratory attached may be necessary.

The national park service and wildlife conservation department should provide two types of instruction. Firstly to train their own personnel in particular the rangers, and secondly to educate the general public to understand wildlife and enjoy natural beauty, so leading to a greater appreciation and respect for their value. Departmental training should include both theory taught in a school set up in conjunction with the research station and practice demonstrated in the parks and reserves themselves. The education of the public is threefold. Firstly by visits to schools, universities, nature societies, rotary clubs and other groups where films and exhibits may be shown and talks given. Secondly by publications and providing material to mass media, radio, television and the press. Finally by assisting the public to learn about nature in the parks, either by static displays, signposts and descriptions which every casual visitor may use or by guided tours and courses more appropriate for larger groups especially of young people. Education in the enjoyment of wildlife and pride in the country, leading to an understanding of the need to conserve natural resources and to save the environment from pollution, is vital for the future of the national park service, the nation itself and all mankind. Therefore, an education and public relations officer, who has specialized in these subjects, is needed. In time an education branch, independent under the director or in conjunction with the research branch, will probably prove essential.

The national parks and wildlife conservation service will eventually offer careers to a wide range of staff with different backgrounds and levels of education. Aborigines, the traditional dwellers in the forests and hills where most of the parks will be situated, will find more congenial work than perhaps the towns afford. There will be need for guides, boatmen, cooks, rangers, wardens, scientists and many others. Eventually, the departments concerned may rise from their relatively minor status at present to take pride of place in service to the nation.

(Next month: CONCLUSIONS)

Planter, Kuala Lumpur **49:** 164–169 (1973)

Screening clones of Hevea brasiliensis for disease resistance — a review

R. L. Wastie, K. H. Chee & T. M. Lim*

INTRODUCTION

Several diseases of *Hevea brasiliensis* in Malaysia are of economic importance on certain susceptible cultivars, particularly in regions of the country where the local climate is favourable for their development. The leaf disease complex known as secondary leaf fall, which is caused by *Oidium heveae* Steinm. and *Colletotrichum gloeosporioides* Penz., is widespread throughout the country; the severe outbreaks that occur in certain districts result in extensive defoliation of the new leaves produced after the annual wintering, with a consequent loss of yield. The leaf disease caused by *Phytophthora botryosa* Chee is of relatively recent occurrence in Malaysia; it causes defoliation of mature leaves during the monsoon period, but only very limited areas of the country are currently affected. Pink disease, caused by *Corticium salmonicolor* Berk. et Br., attacks the bark of the main stem and branches and causes the death of the canopy above the point of infection. *Phytophthora palmivora* (Butl.) Butl. (black stripe) invades the tapping panel *via* the tapping cut, resulting in large open wounds and uneven bark formation which make subsequent tapping difficult or impossible.

The incidence of these diseases has increased in the last two decades as more emphasis has been placed on planting cultivars of higher potential yield: yield has been improved thereby but with some loss of secondary characteristics such as disease resistance and wind-fastness. Although measures to control these diseases are available, their use is not always economically justified. Fortunately, there is a wide range of host reaction to the different diseases in the planting material currently available, and by screening parental material and progeny for disease resistance those of unacceptably high susceptibility can be eliminated. Further, areas of the country where particular disease risks are high can be planted with clones of an appropriate degree of resistance or tolerance.

Screening techniques for three leaf diseases and two stem diseases are described, and the preliminary results discussed. Root diseases have been omitted from this account since the use of unselected seedling rootstocks precludes the possibility of disease screening.

SCREENING TECHNIQUES AND RESULTS

The ideal screening technique would allow the identification and elimination of disease-susceptible progeny at an early stage in the breeding programme. In practice this is not possible or necessary. A certain low level of disease susceptibility is generally acceptable, and even moderately susceptible clones may be suitable for

* All of Pathology Division, Rubber Research Institute of Malaya

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areas where disease levels are low, or in situations where mechanisms of disease escape (*e.g.* by early wintering) exist. In the absence of simple laboratory methods of disease screening, the degree of replication necessary under field conditions in order to ensure a reliable assessment precludes the use of progeny at any early stage in their selection history, and requires that a considerable amount of budwood be available. A preliminary selection made on vigour, growth habit and even yield is thus followed by observations on disease resistance.

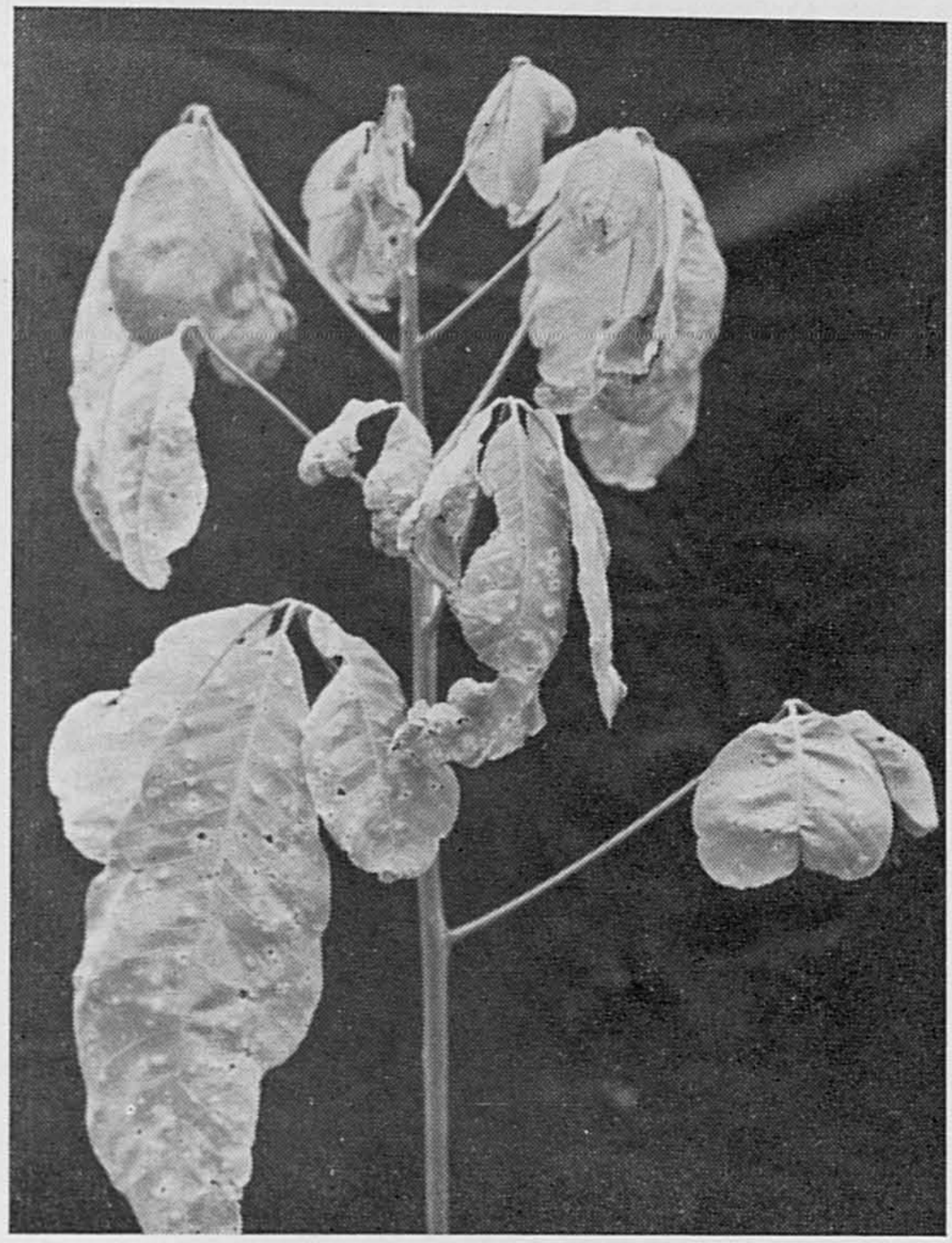

Fig. 1. Terminal flush of nursery plant of PB 86 severely affected by Gloeosporium (Colletotrichum gloeosporioides).

Colletotrichum gloeosporioides (Gloeosporium secondary leaf fall)

As well as causing secondary leaf fall, *C. gloeosporioides* persists throughout the year, affecting the young leaves of plants of all ages. In view of its ubiquity and difficulty of control, Gloeosporium was the first leaf disease to be considered for screening, and 102 clones had been tested by 1970. More recently, a further fifty-three clones have been screened, forty more are in the process of being tested, and another forty-six are planned for assessment in 1973.

Fig. 2. Leaf whorl from a plant attacked by Oidium (Oidium heveae).

Screening is carried out in nurseries planted for this purpose in central Johore, in the south of the country, where the disease is habitually severe. One hundred plants of each clone are budded, and at intervals of 2–3 months, beginning about 6 months from budding, plants are cut back to 1 m height; 6–8 weeks later the

Fig. 3. Method of inoculating the tapping panel with black stripe (Phytophthora palmivora) *The foam pad contains a culture of the fungus.*

Fig. 4. Portion of bark removed from the tapping panel of clone RRIM 605 to show the black stripes caused by Phytophthora palmivora.

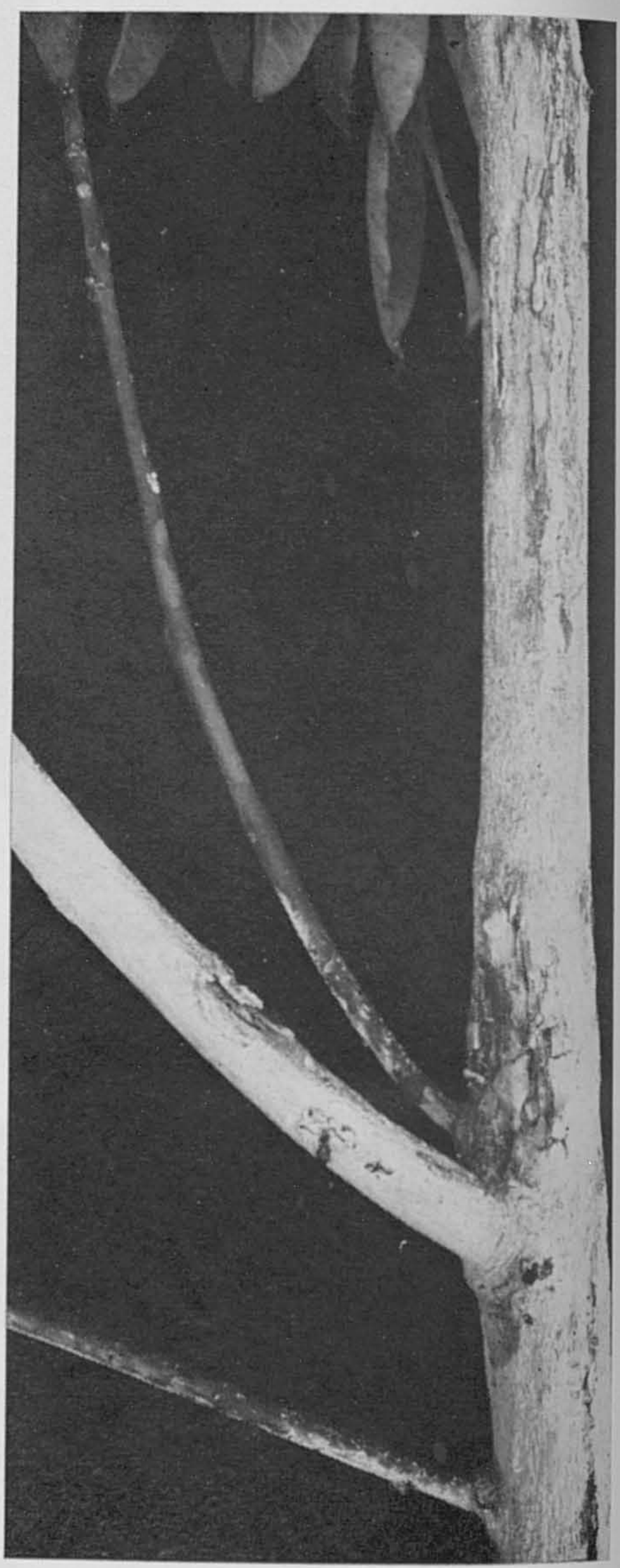

Fig. 5. Main stem of a young tree infected with pink disease (Corticium salmonicolor).

resulting flush of new leaf is scored for the intensity of infection (*Figure 1*) with a standard method whereby randomly-selected leaflets are compared with a chart showing different patterns of disease intensity. Three separate assessments are made, and the results expressed as a fraction of the mean disease score of five standard marker clones selected to cover the whole range of disease reaction and common to each nursery. Results so far obtained confirm that all the newer material currently recommended for large- and moderate-scale planting within Malaysia is of only fair or moderate susceptibility.

Oidium heveae (Oidium secondary leaf fall)

Oidium secondary leaf fall, although widespread in Malaysia, is ephemeral in nature and is readily prevented by sulphur dusting. The stimulus to screen for disease resistance has therefore been somewhat less than for Gloeosporium secondary leaf fall. However, using a similar nursery technique to that employed for the latter disease, but siting the nursery in coastal Negri Sembilan (where the weather is more suitable for *O. heveae*) has enabled fifty clones to be assessed. In order to ensure a sufficient inoculum level the nursery was situated adjacent to a field of the susceptible clone PB 5/51, being shaded from all except midday sun by the height of the nearby trees. A heavy, infection resulted (*Figure 2*), enabling three disease assessments to be made over a period of 3 weeks.

A general agreement between nursery scores and what is known of the field behaviour of the clones has been observed, but further progress in nursery screening is likely to be slow because the disease is of short annual duration. A recently-developed technique of *in vitro* screening is therefore of great interest: detached leaves in the laboratory are dusted with spores, and the intensity of sporulation of the fungus, which is positively correlated with the degree of susceptibility of the host, is observed. A high degree of correlation between the laboratory and field methods of assessment has been observed.

Phytophtora botryosa (Phytophthora leaf fall)

Although a laboratory method has also been developed for assessing clonal susceptibility to *P. botryosa* its value is somewhat limited at present by a lack of confirmation from field observations. The disease is restricted in distribution in Malaysia to the extreme north-east and north-west regions, which suffer unusually heavy monsoon rains in November/December and June/July respectively. Opportunities for observing the disease in the field are therefore restricted. The situation is further complicated by the fact that only trees more than about 6 years old are affected to any appreciable extent, making screening of young plants inappropriate. However, it is possible that the nursery screening technique could be adapted to Phytophthora leaf fall; close planting with a degree of lateral shade in an area where the disease is endemic might encourage it to occur. Such a method is currently being used in South Thailand, where the disease is more widespread than in West Malaysia.

Phytophthora palmivora (black stripe)

A method of assessing clonal susceptibility to black stripe has recently been developed, in which the tapping panel is artificially inoculated with the fungus and the severity of the resulting infection subsequently assessed. The fungus is grown in a polyurethene foam pad, which is inserted into a polythene sleeve with an opening cut in the centre on one side to expose the fungus. The polythene cover is then stapled at each end just above the upper end of the tapping cut (*Figure 3*). Infection of the entire panel by zoo-spores released from the inoculum takes place within 3–4 weeks. The susceptibility of the test clone to the disease is assessed by counting the number of fissures and/or measuring the necrotic areas on the panel (*Figure 4*). Eighty-seven clones have been tested so far.

Large-scale clone trials provide the most suitable materials for disease screening, as all the trees are of the same age. Usually twenty trees of each clone are inoculated during wet weather, the test being repeated once on a separate occasion. Screening can also be conducted in commercial plantings if marker clones are close by, thus eliminating any differences in disease severity due to site effects. Newly opened panels and panels near to ground level are more susceptible to infection, and all clones in the same test should have panels at a similar height.

Corticium salmonicolor (pink disease)

Polyurethene foam pads have also been successfully used for inoculating trees with *C. salmonicolor*. A nursery of thirty clones has been specially established for the purpose in Kedah state, in an area of high incidence of the disease. One year after budding the stems were inoculated about 1 m above ground level, and the extent of necrosis assessed after 2 months by measuring the vertical extent to which the fungus had travelled within the bark. Fifty trees of each clone were inoculated. The inoculations were repeated, on a different part of the stem, on two subsequent occasions. The preliminary results obtained, although indicating wide differences within clones in the extent to which infection developed, nevertheless allow the identification of clones of above- or below-average susceptibility. However, there appears in general to be inherently smaller differences in infection between clones resistant to and susceptible to pink disease, for field observation suggests that most clones can be severely affected where weather and other conditions are locally suitable (*Figure 5*).

DISCUSSION AND CONCLUSIONS

The availability of clones with a low susceptibility to each of the above diseases is encouraging, for by breeding or by crown budding a more general measure of disease resistance may be acquired. Unfortunately, clonal resistance to each disease is shown independently, and no general leaf or stem characteristic conveying resistance to disease appears to exist. This is to be expected from the nature of the diseases under consideration: *P. botryosa* affects veinal tissue, particularly the petiole, of mature leaves; *C. gloeosporioides* and *O. heveae* attack immature leaves, the former internally, the latter mainly externally. Development of the cuticle imparts resistance

to both diseases, but there is no correlation between final cuticle thickness and disease resistance. *P. palmivora* is a wound parasite in as far as black stripe is concerned, and *C. salmonicolor* attacks intact bark; there is no feature in common to these two diseases except their greater severity during wet weather.

Little is known of the mechanisms of resistance to leaf and stem diseases. If the biochemical basis of resistance were better understood the search for an easily-measured parameter of resistance or susceptibility would be easier. Similarly, no data are available on the basis of inheritance of resistance characters. Crosses which produce progeny with unacceptably high disease susceptibility will continue to be made, and assiduous, and of necessity somewhat laborious screening will be needed to improve the production of planting material of all-round suitability.

The bark diseases of *Hevea* are more easily treated by chemical means than diseases of the leaf or even of the root. Nevertheless, an inbuilt measure of resistance to bark-infecting fungi increases the usefulness of a particular clone and renders it more suitable for wide-scale planting, particularly in districts which suffer heavy monsoon rainfall. By their nature, bark diseases cannot easily be tested in young plants, which have a limited amount of brown bark; screening by *in vitro* methods would therefore be attractive if a suitable method could be developed.

Clone screening in *Hevea* is seen as a long-term means of reducing the importance of above-ground diseases to an economically insignificant level. Though the time-scale of operations is essentially a long one, the results will, in the long run, justify the efforts currently being made.

SUMMARY

Methods employed for assessing the degree of resistance or susceptibility of clones of *Hevea brasiliensis* to the three main leaf diseases and two bark diseases in Malaysia are described. Nursery screening against *Colletotrichum gloeosporioides* and *Oidium heveae* has given results which are in good agreement with the field behaviour of the test clones. Since *Phytophthora botryosa* is limited to mature leaves on trees more than 6 years old, little opportunity has occurred for confirming the validity of the *in vitro* disease screening hitherto carried out. Nursery screening against *O. heveae* can only be done during short periods annually, but a recently-developed laboratory screening method can now replace it.

Clonal differences in susceptibility to the bark diseases caused by *Phytophthora palmivora* and *Corticium salmonicolor* have been established by artificial inoculation in the field, and with the former disease in particular these differences correlate well with field behaviour.

Acknowledgement. We are grateful to the Director of the Rubber Research Institute of Malaya for permission to publish this article.

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Book review:

Cocoa and Coconuts in Malaysia

Proceedings of the ISP Cocoa and Coconuts Conference, November 1971. Edited by R. L. Wastie & D. A. Earp. 1972, Kuala Lumpur: Incorporated Society of Panters. pp. 464. M$25.00. (M$19.50 to members).

Conferences attended by both scientists and planters are to be welcomed for many reasons. Probably the most important is the development of a dialogue between the two; a close second must be as a method of getting down on paper and in one place the information available from a particular geographical area for particular crops (or facets of the crops). Knowing many agricultural scientists and planters in Malaysia, I am sure that the first, the dialogue, was highly successful. The overall effect of the publication shows that it is a valuable regional contribution in terms of knowledge, information and ideas which will be extremely useful not only in Malaysia but elsewhere. It is especially successful because, through the Conference Committee, the geographical area has identified its priority problems and weaknesses over the whole spectrum of production and marketing, and has concentrated on plugging the information gap with invited speakers and papers from outside. As the Hon. Minister of Agriculture and Lands pointed out in his opening address, of the forty-two papers, twenty-one were from overseas, twelve from the public sector and nine from the private sector in Malaysia; a good mix.

The information on cocoa breeding must be relevant to work being done in many other areas and is certainly of value to the efforts being made here in Fiji. Cocoa and bananas seem to be the tropical crops which have more than their fair share of pests and diseases, and this aspect was well and competently covered. I was glad to see a paper on cocoa canker; planters in Malaysia should be aware of the risk that they are running in using their present planting material, most of which is likely to be highly susceptible, at least to vicious strains of *Phytophthora palmivora.*

The shade and cover section is extremely interesting, as is the section on processing, which represents a valuable contribution to the literature on the subject.

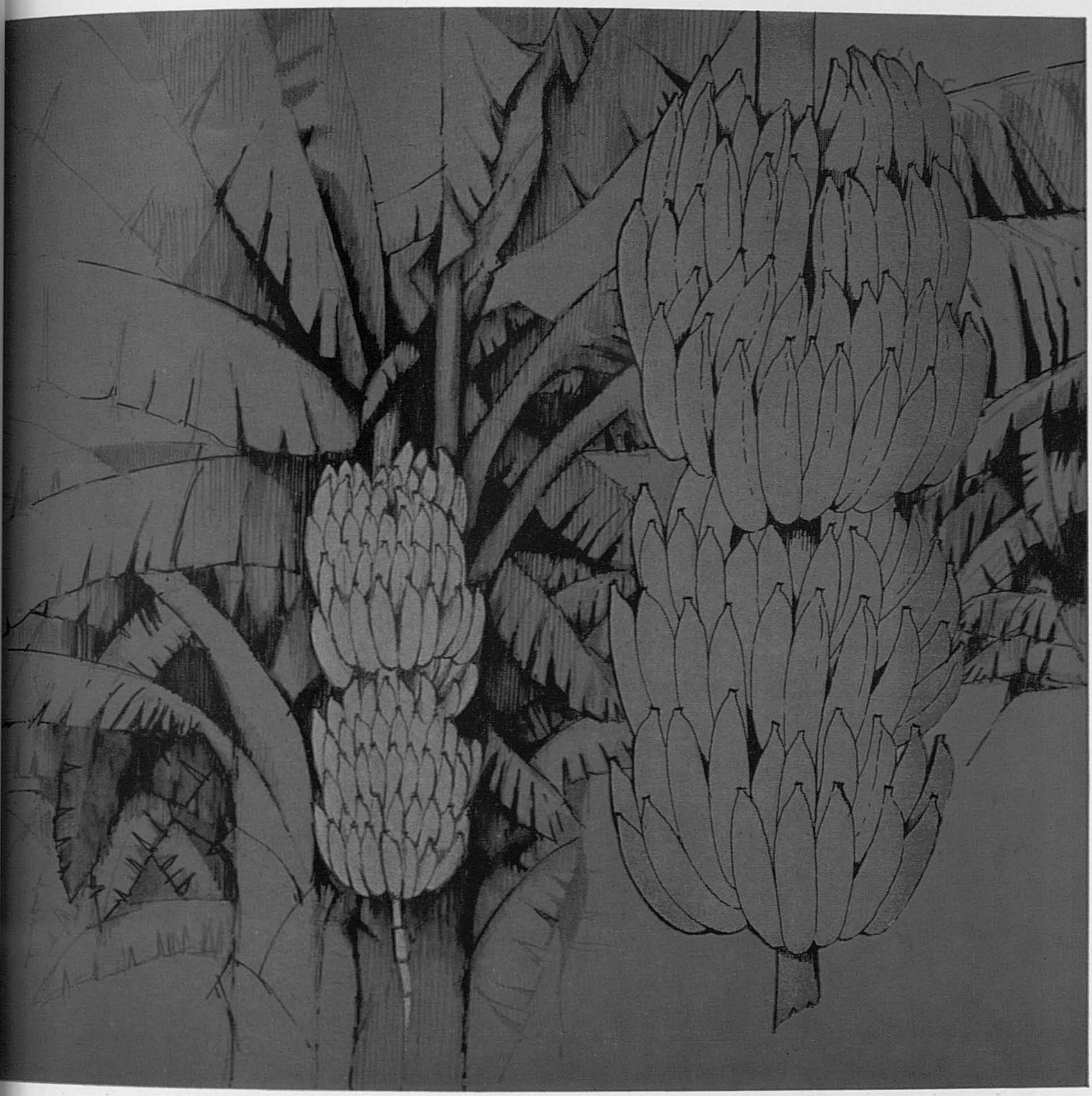
Interest in intercropping the major tropical plantation crops waxes and wanes as the price of the commodities falls and rises, but it has been felt for many years that coconuts would be unlikely ever to be planted again as a monocrop. In view of the age of many coconut plantations, not only in Malaysia but throughout the world, the information on intercropping is important. Cocoa planted with coconuts as light shade would seem to be a good proposition for large estates, but for small-holders emphasis should perhaps be on programmed planting of cocoa with or without coconuts, and with annual or shorter-term crops to give earlier returns. The profit will of course hinge on management levels and capability.

Two papers which seemed to me to be of outstanding interest were those of Frémond and de Lamothe (p. 309) and Smith (p. 429). The implication is that in the East and the Pacific we must get rid of the wide heterozygosity in our coconuts before we can obtain the spectacular and constant increases in yield attained in the Ivory Coast and Jamaica, produced presumably by hybrid vigour. It is pleasing to see another confirmation of the value and application of foliar analysis in Guha's paper (p. 357). What a pity that foliar analysis is so much more difficult with dicotyledons than with monocotyledons!

The Conference must have been a highly successful one which it would have been a pleasure to attend.

E. J. H. BERWICK.

Fiji School of Agriculture
Koronivia, Fiji.



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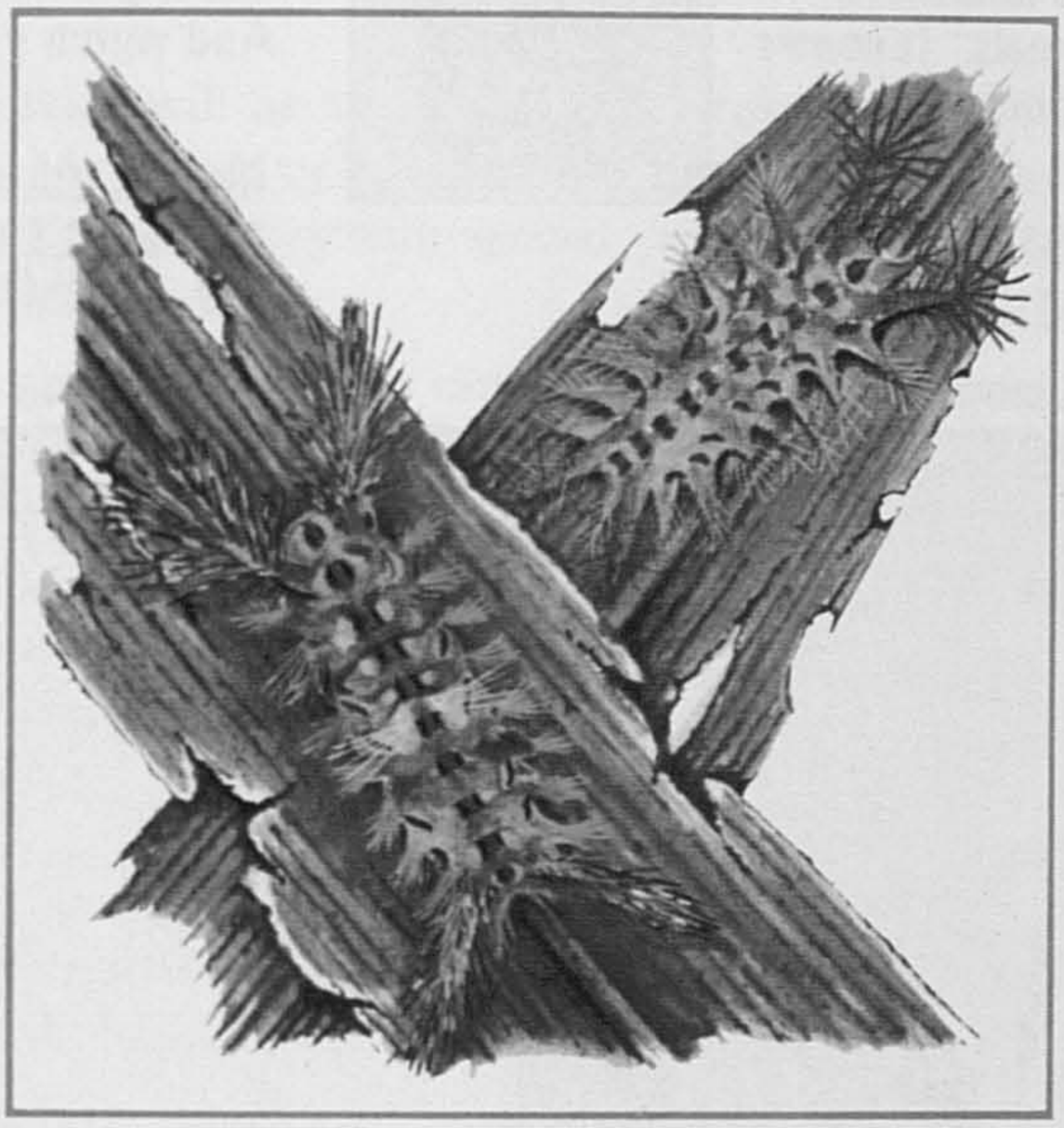

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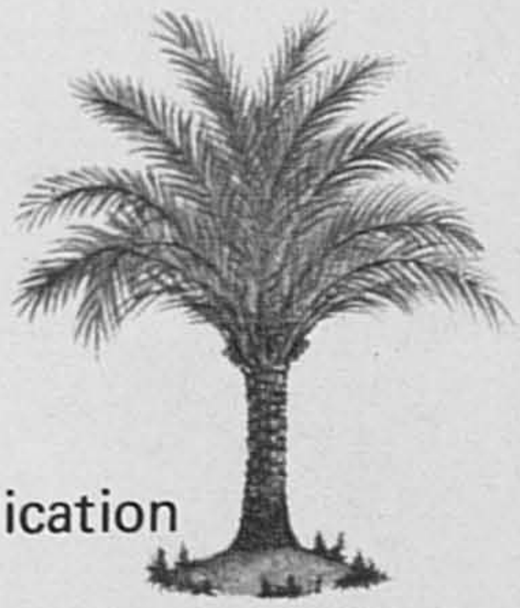

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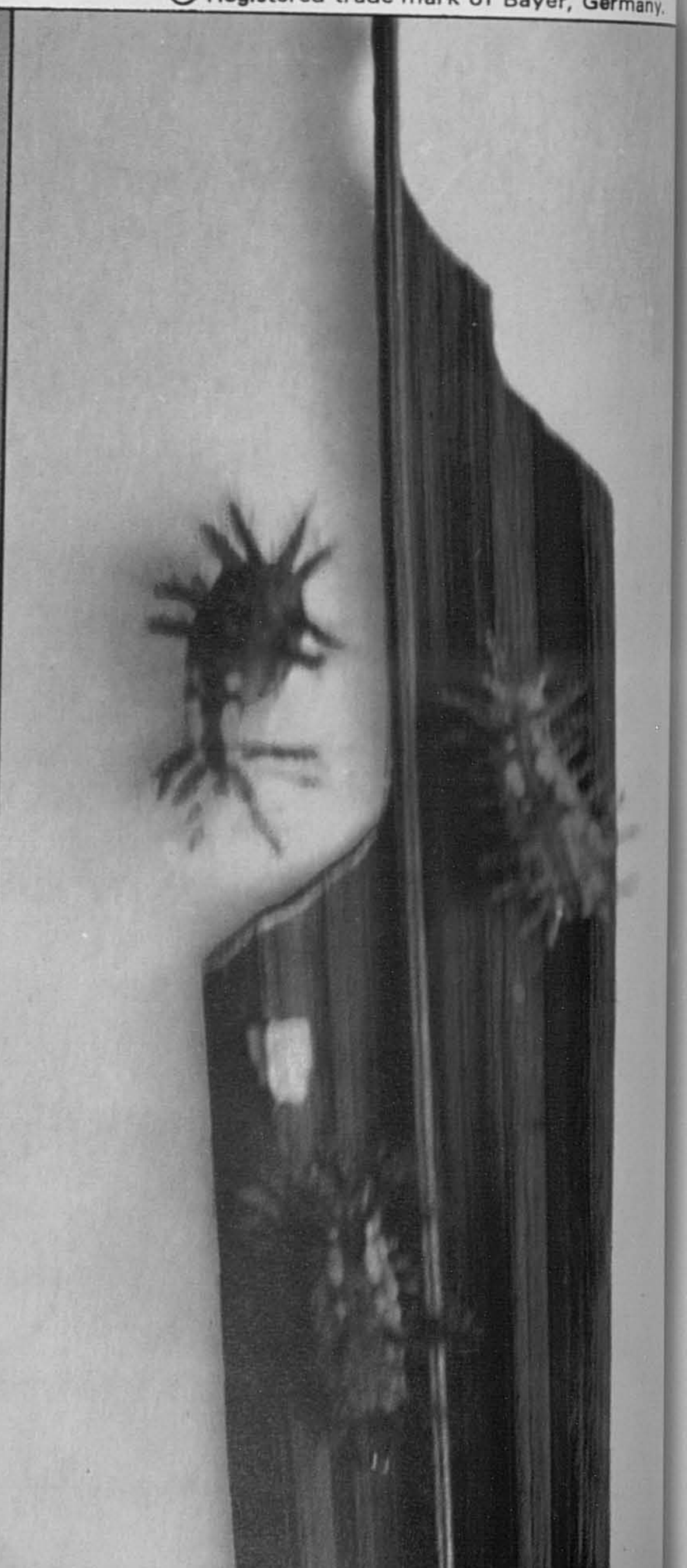

The monthly crop

Congratulations to Encik Tan See Yeok AISP on being elected Chairman of the Society for 1973/74 and to Encik Khoo Kay Tuan AISP who is the new Vice-Chairman.

The Executive Secretary will be away on a few weeks overseas leave from 14 May. During his absence Mr Moses or Miss Lee will deal with routine enquiries, or will know to whom to refer members with special problems.

13 months' jail for pop-singing pimp ran a headline in *The Straits Times* (5 April). It reported that a British-born pop-singer was sentenced 'for transporting two California girls to a Nevada brother for purposes of prostitution'.

That would be a *lay* brother of course.

A shade smaller please. A letter to the same newspaper (18 April) states: 'it is noted with deep regret that the holes along Jalan Tebrau are too big for motorists.'

Which is not much of a harvest from the month's national dailies; so, with acknowledgements to *Punch*, we go further afield.

In a West Sussex weekly they found: 'Two people were treated for monkey bites during the past season. This is one more than last year.'

And from a Durban paper: 'Neighbour Rosemary Rose heard a voice crying: "Don't do it, Billy, please." Said Mrs Rose: "What he was doing I can't imagine. I was so upset I got up and made a cup of tea."

Quite a few members have asked for copies of the MPOPA Technical Bulletin No 1 mentioned in these notes last month, and we still have some left. Will the member who wrote over an illegible signature and gave no address, please write again.

The next President of the United States could well be Mr John Connally; if he satisfies two conditions. One is that he'd have to leave the Democratic and go over to the Republican party. The other is that Mr Connally, already a very rich man, will have to spend less time on his current preoccupation; which is, to use his own phrase: "making megabucks".

It may seem a little early to be talking of Christmas and New Year greeting cards but we admit to having been a bit late off the mark in the notices of these during the past two years. This year we are bending our efforts to helping the Society for the Prevention of Cruelty to Animals, and they have made available to us a

delightful card of a hilarious scene painted by that much-loved *Punch* artist Thelwell. The scene is entirely Christmasy and will amuse young and old alike. Entitled 'The Ambush', it wouldn't be genuine Thelwell if it didn't feature plenty of those perfectly round little ponies. And it does.

It is hard to reconcile the government's declared antipathy to excessive blood-letting and other forms of mayhem on the nation's television and cinema screens with the film chosen for the Kuala Lumpur première in aid of the National Heroes Welfare Trust Fund. The occasion, graced by Malaysian Royalty and Cabinet Ministers was the screening of a film portraying the most sickening violence, and made the more objectionable because the murdering 'hero' appears to get away with it. Perhaps that is the real point of the film's title*.

---

* Getaway

DATELINE KUALA LUMPUR

The Malayan Traveller

A correspondent who is frequently 'on the road' around Malaya (now called Peninsular Malaysia by the broadcasters) has passed on to us a few criticisms about accommodation around the country which he thinks might help the Tourist Board. He obviously also thinks that someone in the Tourist Board reads *The Planter*, which we couldn't be sure of. Anyway, here goes.

It seems that in the newer small hotels in the provincial towns there are single lifts and unit air-conditioners which frequently go wrong; our correspondent, a very understanding fellow, does not complain about this but he *does* complain that if they are not working, or not properly, no rebate is given on the bill. He reports that during a four day stay at one such hotel he had to climb three flights of stairs every time he went to his room on all four days and that on three of the nights the air-conditioning was faulty and the other night it wasn't working at all. As the room charges are naturally higher than in hotels without lifts and air-conditioning, our hero asked for a rebate on his bill; his request met with no response other than raised eyebrows.

A feature of these smaller unit air-conditioners not met with in the larger hotels is that, according to our reporter, conversations from other rooms come quite clearly through the inlet duct, together with cooking smells!

Further points met with in resthouses and smaller hotels which could be a source of irritation, particularly to tourists are:

ICE: Why is this so often made from unboiled, muddy, or heavily over-chlorinated water?

SODA WATER: Why is this the one mineral water not found in even the largest refrigerators? Why do so many of our inexperienced barmen think that ICE CREAM SODA goes well with whisky?

ICE CREAM: Why, if ice cream is ordered, unspecified, is Strawberry or Chocolate always delivered and never the most popular variety, Vanilla?

MALAYSIAN FRUITS: Why is it so difficult to get *Papaya* and *buah limau nipis* in so many provincial catering establishments? Fresh orange, more expensive and probably less nutritious, is always obtainable.

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Not related to the foregoing, but an important tourist point, is the view from Johore Bahru to Singapore; along the 'front' the municipality have gone to some pains to make an attractive verge with trees, both natural and artificial (with coloured lights) but the water viewed through the trees has what seems to be a permanent overlay of refuse; presumably effluent from Johore Bahru, as the rubbish is not visible on the Singapore side of the strait.

Talking of trees, this is 'Plant a tree Year' in Britain but seems to be 'Fell a tree Year' in Kuala Lumpur, especially along Jalan Pekeliling. A number of grand old trees have disappeared and others have been heavily pollarded; let us hope that this is all in a good cause and that they will be replaced with younger trees as soon as possible. Good roadside shade trees not only appeal to the eye, they help to keep down the air temperature in urban areas as the road surface never gets really heated.

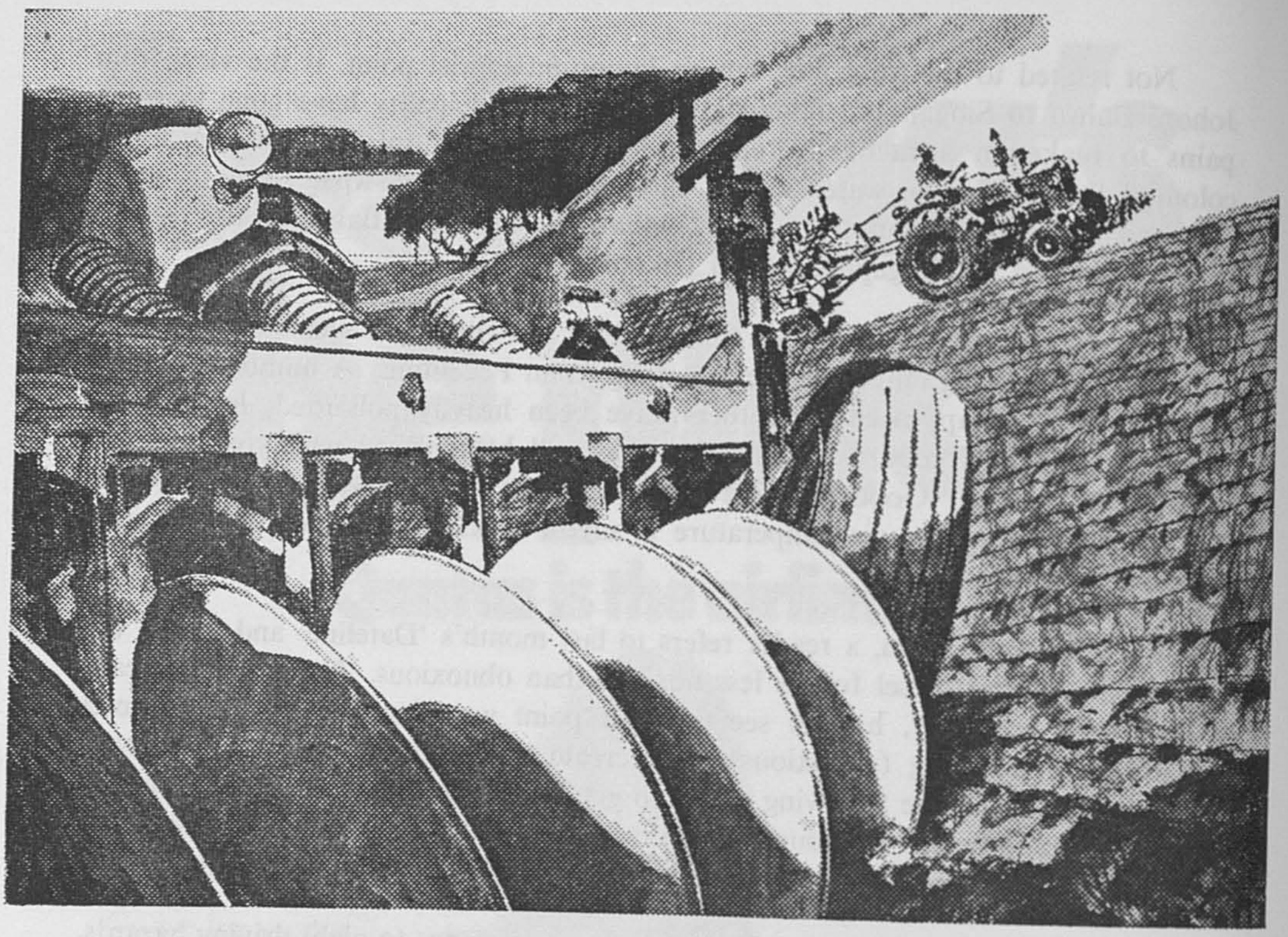
Back to roads again, a reader refers to last month's 'Dateline' and makes the point that unburnt diesel fuel is less noxious than obnoxious. If our reader reads a little more carefully, he will see that our point was that because these diesel exhausts are irritating (obnoxious), they create a danger by inducing the overwhelming desire by the following driver to get out of the slipstream. Whether they are damaging to health (noxious) was not relevant to our argument: that the fumes induce impatience in the driver behind and this leads to irresponsible overtaking.

The same reader points out that we made no reference to night-driving hazards, and comes up with the following:

... Perhaps the most dangerous offence under the Inconsiderate Driving heading is failure to dip headlamps when this is demanded. The drivers of heavy vehicles are for the most part punctilious about this; but it would probably be safer if this were not so as, their headlamps being situated considerably higher than those of the average private car, they can often be dipped blindingly right into the eyes of the lower-seated driver. Why can't there be an international agreement that all vehicle headlamps are at the same height from the ground? It is unbelievable that this is beyond the wit of man to devise, as they say.

And could not more publicity be given to the necessity of placing those reflective triangles which warn of a breakdown ahead at such a distance from the broken-down vehicle that approaching drivers get sufficient warning? There has been one fatal accident (the KL/Seremban road again) because the warning triangle was too near the broken-down vehicle. And couldn't those triangles be larger?

If it starts to rain when driving at night and you have recently had your windscreen 'cleaned' at the petrol station with that stuff they squirt on, you put on your wipers. All visibility is immediately cut off—with highly dangerous potentialities. What is this stuff they use? It must be oily; whatever it is it ought to be banned. Personally I always refuse this 'service' if they will not use soap and water.



For bigger harvests look to rugged, dependable Australian farm equipment

Over 1,200,000,000 acres of Australia are farmed to make Australia one of the world's leading food producers. Yet less than 8% of the total work force is engaged in farm production. The secret of this high productivity is the efficiency of farm equipment manufactured in Australia.

Australian farm equipment operates on irrigated land, tropical forest, and in semi-desert heat conditions. Rugged equipment built for dependability.

More and more countries are reaping bigger and better harvests with Australian tractors, ploughs, cultivators and harvesters; the range includes pumps, windmills, irrigation sprays, pre-fabricated silos; and specialised equipment, in such fields as dairying and sugar farming.

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what's in Australia for you?

Find out today. All you have to do is contact the Australian Trade Commissioner who will put you in touch with suppliers of Australian products: MALAYSIA, 117 Jalan Ampang, Kuala Lumpur. Tel: 290381-2. SINGAPORE, Australian High Commission, 201 Clemenceau Avenue, Singapore 9, Tel: 379311.

Australian Department of Overseas Trade

Safety Helmets : Since last month's 'Dateline' we learn that the rarity of safety helmets on the heads of motor-cyclists and their pillion-riders is because demand is far outstripping the supply of those conforming to the requirements of the Standards Institute of Malaysia and therefore the 'period of grace' is extended until the situation is remedied. Incidentally, the press is still calling them 'crash' helmets.

Footnote to the bit about resthouses, etc.

Our correspondent also seems to think that someone in the Automobile Association of Malaysia reads 'Dateline', since he went on to make a suggestion that the AAM's handbook should 'grade' the resthouses and hotels perhaps with a 'star' system and warnings about beds being uncomfortable, lack of hot water, rotten cooking, etc.

We feel that it would probably be better if a member of the Tourist Board toured the entire country, staying at every resthouse and small hotel and putting the minor irritations to rights on the spot. And what about his being accompanied by a representative of the S.I.M.?

JMN

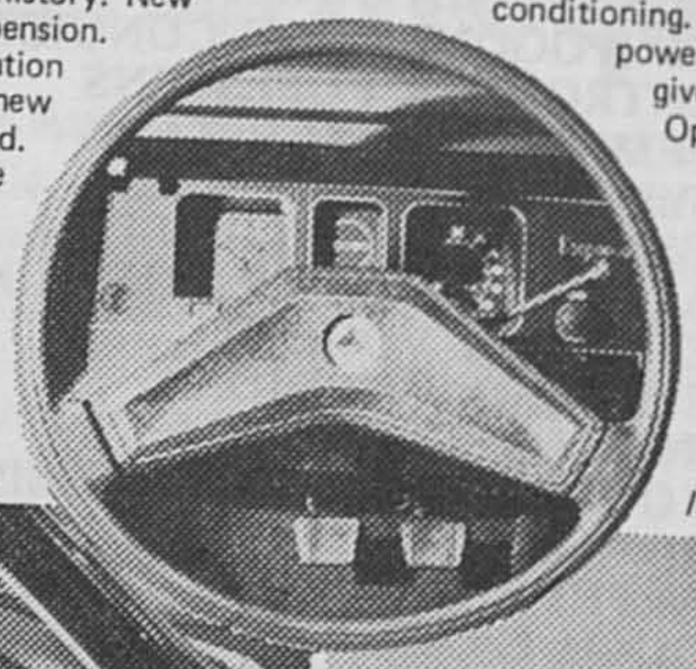
Holden The Great Way to Move

"Sydney Sun" Road Test reports on fuel consumption

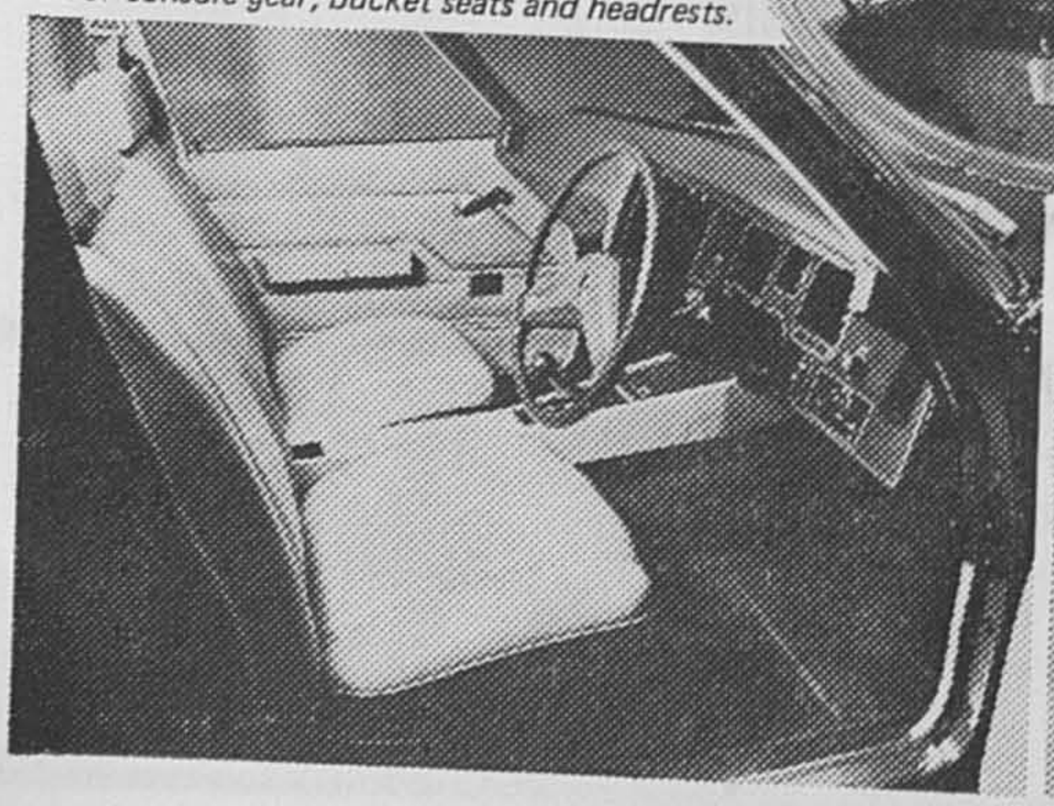
Highway driving 28 m.p.g.
Economy driving (50 m.p.h.) 30 m.p.g.

See it at:
LYONS MOTORS, K.L., Petaling Jaya, Klang and Ipoh or
WEARNES, Penang, Butterworth, Kuantan, Seremban, Malacca, Johore Bahru.

The new Holdens have already changed Australia's ideas about how a good car should look. Drive one . . . and you'll change your ideas about how a great car should ride. A five foot wide track and new big coil springs over each wheel see to that . . . but these are only two changes in the most changed Holdens in history. New styling. New front chassis design. New suspension. New seating comfort. New flow-thru ventilation system. New steering. New brakes. Exciting, new Kingswood, built with your family in mind. Luxurious new Monaro LS model for prestige two-door motoring. Australia's first long-wheelbase wagons. You've got to drive new Holden to believe it . . . and we've got them ready waiting for you to do just that. Do it today. The superb Premier range offers luxurious fold-flat bucket seats with folding arm rests front and rear, and superb fully instrumented walnut facia, with built-in, forced-flow ventilation and concealed air conditioning. A smooth six-cylinder engine provides ample power in silky silence, while power disc brakes give fade-free, safe stopping from high speeds. Optional power steering completes your comfort and safety. And finally a choice of a 3-speed column gearchange, full automatic transmission, or the sporty, 4-speed console shift, with new manual gear-box that allows optimum gear ratios, maximum reliability.



The superb new Kingswood with 4-speed floor console gear, bucket seats and headrests.



The big new Kingswood station wagon with long wheel base – an exclusive chassis design.

Social and Personal

Awards

Fellowship ISP

Dr R L Wastie

Mr B J Wood

Mr D A M Bloom (Honorary)

On leave

3665 Anderson, J, AISP, 9 The Street, Hindringham, Fakenham, Norfolk, England.

5258 Crawford, M B, SDA, AISP, Malcolm's Mount, Stonehaven, Kincardineshire, Scotland.

5121 Garner, H, 'Agarth', Rectory Close, Ashill, Nr Ilminster, Somerset, England.

5727 Hoare, D R, 92 Lewis Road, Istead Rise, Gravesend, Kent, England.

3241 Stewart, J, BSC, OBE, Town Lodge, 134 Mill Point Road, South Point, Western Australia 6151.

4257 Thompson, J A, c/o Wilson, "Tree Tops", The Loan, West Linton, Peeblesshire, Scotland.

Returned from leave

5015 Clifton-Brown, N, BSc (Agri), AISP, Sungei Samak Estate, Ulu Bernam, Perak.

4246 Fair, E M, AISP, c/o P N Perkebunan X, P O Box 74, Tanjung Karang, Indonesia.

Change of address

5781 Ahmad bin Samah, Pejabat Ladang MARDI, Serdang, Selangor.

5820 Azman bin Abdul Molok, Lembaga Perusahaan Nenas Tanah Melayu, Yunit Tanam Semula Nenas, 102 Jalan Johor, Pontian Kecil, Johore.

5712 Arikiah, A, Bukit Benut Estate, Kluang, Johore.

4976 Boult, P M de W, Perhentian Tinggi Estate, Sungei Gadut, Negri Sembilan.

4881 Chew Fook Khuan, Sungei Tiram Rubber Estate, Ulu Tiram P O Box 102, Ulu Tiram, Johore.

5455 Chin Kwoon Kok, Michael, Bukit Rajah Palm Oil Mill, Klang, Selangor.

5461 Chua Hock Guan, 1A Jalan Paoh, off Jalan Loke Yew, Kuala Lumpur 08–08.

5937 Eapen, Joseph, Ulu Bernam Estate, Ulu Bernam, Perak.

2856 Earle, T, Department of Agriculture, Stock & Fisheries, Passam, via Wewak, East Sepik, Papua New Guinea.

4459 Hertslet, L R, AISP, Kekayaan Estate, P O Box 103, Paloh, Johore.

4473 Jones, J B Owen, Cranlyn, 8 Benarth Road, Penrhyn Bay, N Wales.

4307 Koshy, P J, AISP, Tanah Merah Estate, Port Dickson, Negri Sembilan.

5270 Krishnan, B, Norseman Estate, Ulu Sepatang, Taiping, Perak.

5029 Lim Cho Yam, AISP, Kuala Gris Estate, Kuala Krai, Kelantan.

4698 Matupang, L P, Melville Estate, Labis, Johore.

5659 Muniandy, V, RRI Estates Advisory Service, 2nd Floor Malayan Bank Chambers, Butterworth, Province Wellesley.

4732 Muirhead, P R S, Bukit Cheraka Estate, Jeram, Selangor.

5678 Subramaniam, L, AISP, Kelan Estate, Kulai, Johore.

5725 Saffree Sulong, Resident's Office, Kota Kinabalu, Sabah.

5350 Tseu Chi Fui, Stephen, AISP, Giram Estate, P O Box 19, Kunak, via Tawau, Sabah.

5309 Visuvanathan, R K S, Kuala Pertang Estate, Kuala Krai, Kelantan.

4267 Yee Teck Hsing, Bukit Badak Estate, Layang Layang, Johore.

5956 Zainal Anuar b Hj Zainal Ariffin, Sungei Buloh Estate, Bukit Rotan, Selangor.

5826 Daud b Md Amin, Tingkat 2, 80 Jalan Banggol, Kuala Trengganu, Trengganu.

4865 Lee Kim Tin, Cheng Estate, Alor Gajah, Malacca.

5237 Mohd Yunos b Mohd Aris, Braunston Estate, Jeram, Selangor.

4997 Montgomerie, J, NDA, MRAC, AISP, New Rompin Estate, Rompin via Gemas, Negri Sembilan.

4969 Ong Tat Lien, Bertam Estate, Kepala Batas, Province Wellesley.

Deaths

FAUCONNIER: Henri, FISP in Paris on 14 April 1973. Aged 92. (see *Editorial*)

NIAS: S J Nias died on 12 February 1973. After the war he became Manager of Voules Estate, Tenang, and in the early 1950's was General Manager of Kepong (Malaya) Rubber Estates Ltd, until he retired to U K around 1960. He was a Life Member, number 1706.

BOOTH: Douglas Duncan on 8 March 1973 in Devon, England, beloved husband of Nancy (dec) and loved father of Ian, Patricia and Shirley. Formerly of Victoria Estate, Kedah, and *ex* Sixth Gordon Highlanders.

LEWIS: Sheila Mary, wife of Kenneth Lewis, on 29 March 1973, suddenly and very peacefully at home at 98, Brookmans Avenue, Brookmans Park, Herts; formerly of Golconda Estate, Kapar, Selangor. Aged 56 years.

MORTON: Reggie J, JP, FISP, on 24 April at Teluk Anson after a short illness. (Life member 2042)

Kurmah: a rich and aromatic curry

Ingredients

1 chicken
2 ripe tomatoes
1 cup small onions
5 fresh green chillies
2 sprigs curry leaves
1½ ozs evaporated milk
½ cup curds or use plain yoghurt
juice of ½ lime
2 sticks of 3 in. long cinnamon
salt to taste
4 ozs ghee
1 teasp turmeric powder
5 skinned almonds
1 tabsp cus cus or poppy seeds
3 pips garlic
2 inch piece ginger
1 tabsp coriander seeds
3 cloves
5 skinned cardamons

Method

Spices to be ground to a fine paste

Cut the chicken into large pieces at the joints.

Slice onions, cut chillies lengthwise into two and cut tomatoes into four.

In a thick bottom saucepan, mix the chicken with all the ground spices except for the ground almonds and cus cus.

Add the chillies, onions, salt, cinnamon, turmeric powder and stir. Leave aside for about 1 hour.

Add the ghee and ½ cup hot water and cook.

Meanwhile, mix in a bowl the curds, milk, lime juice, cus cus and almonds.

When the meat is nearly cooked add the curd mixture and tomatoes.

Stir well and cook on a low fire till it comes to the boil.

Take off the fire and leave open for a few minutes stirring occasionally.

For a very aromatic Kurmah leave aside after cooking for 3 hours.

If you like it hot you may heat the Kurmah, but do not boil.

ADVERTISEMENT INDEX

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Printed by Yau Seng Press, 26 Jalan Silang, Kuala Lumpur 01-21, Selangor.

Hit it where it lives and breeds: Underground. We have the chemicals to search and destroy it down there.

Shellapon - on sheet lalang at 15 lbs. to the acre in dry weather, preferably before flowering. It's absorbed into the sapstream. The lalang turns brown from the tips of the leaves, and is destroyed to the tips of its roots.

Shell Lalang Oil-the most effective and economical treatment for any lalang regrowths. Wiped onto the leaves by hand, they brown in half an hour-so you can tell at a glance whether all have been wiped. Then you can leave the oil to be absorbed into the sapstream and complete the eradication.

But talk it over with your Shell Chemicals man. He can tell you all the procedures-and about the other products that you can use in combination with these at other times, for other weeds.

Lalang is an underground network

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Systemic control gives you total control

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This powerful insecticide spreads to every leaf, every root, every part of the plant an insect may attack.

One application of AZODRIN is effective for two to three weeks.

Then the chemical breaks down. Completely. It leaves no detectable residue.

This systemic action makes AZODRIN very efficient. And very economical!

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