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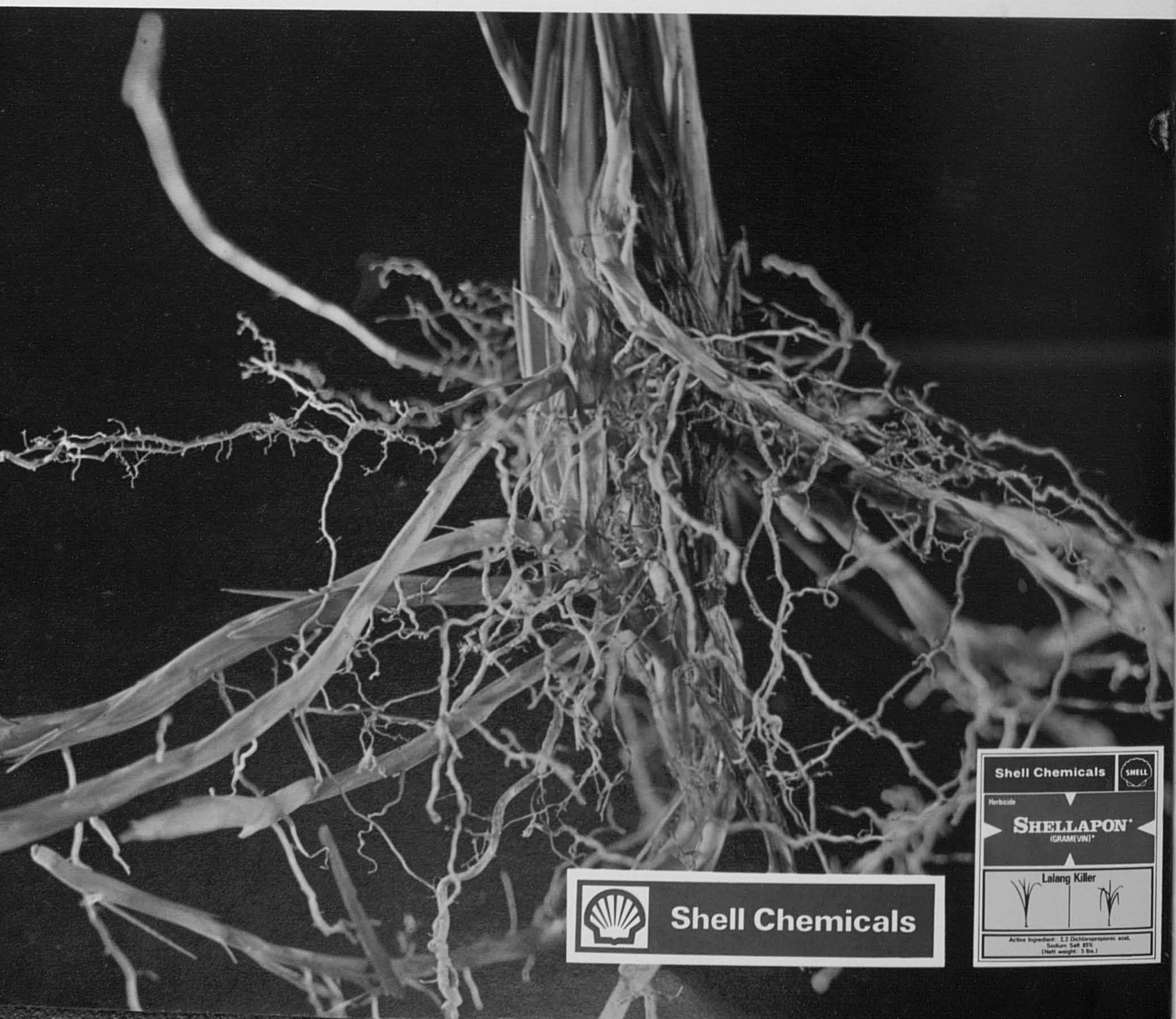
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MAGAZINE OF THE INCORPORATED SOCIETY OF PLANTERS

VOL. 48 AUGUST 1972 No. 557

Publishing Office :

1 Pesiaran Lidcol
P O Box 262
Kuala Lumpur
MALAYSIA

Telephone : 86396

Telegrams : ISPLA

Price : M$2.50

Annual Subscription : M$30.00

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The Planter assumes no responsibility for the statements and opinions expressed by contributors.

SENTIASA MAJU

The Incorporated Society of Planters

Founded 1919

THE SOCIETY REPRESENTS the Planters of Malaysia and other territories, whose personal and professional interests it is bound to endeavour to secure and promote.

OBJECTS foremost in the Society's Memorandum of Association are:

To promote the general interests of the planting profession.

To promote the advancement and facilitate the acquisition of that knowledge which constitutes the professional qualification of planter.

To watch over, promote and protect the mutual and individual interests of its members in respect of matters pertaining to or arising from their employment in the planting profession.

To promote and maintain good feeling, co-operation and understanding between members and their employers.

ACHIEVEMENTS of the Society are a technical education scheme, the publication of authoritative works on tropical agriculture, a monthly magazine featuring original technical articles, the sponsorship of conferences and symposia on tropical crops, and the organisation of joint consultation with employers.

MEMBERSHIP of the Society is open to: —

A Those directly employed in plantation management such as estate managers, assistant managers, superintendents, supervisors and cadets, and

B Executive engineers, estate medical officers, and qualified scientific or administrative staff of estates or organisations mainly concerned with the planting industry.

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Category B		
Ordinary Members employed as Executive Engineers, Estate Medical Officers, Research Staff etc., wherever resident	$ 48	$ 48
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Editorial:

The Society's 1972 Conference

In September 1967 a small group of ISP members, both planters and research scientists, got together in Kuala Lumpur to discuss 'Cocoa and Coconuts in Malaya'. It is doubtful if they realised that they were setting the pattern for a series of annual conferences organised by the Incorporated Society of Planters, which have achieved wide recognition and importance in tropical agriculture.

Six full-scale conferences followed this small symposium. The first two, in 1967 and 1968 were on 'Oil Palm'. The following year saw two conferences: on 'Crop Diversification' and on 'Palm Oil Quality and Marketing'. In 1970 it was the turn of 'Crop Protection', and last year, a mammoth affair on 'Cocoa and Coconuts in Malaysia', featuring twice the usual number of papers, more than half of which were from overseas.

There was little doubt that after an interval of 4 years, Oil Palm would again be chosen as the subject of this year's Conference, which is to be held in Kuala Lumpur from 16–18 November. Malaysia is the world's leading producer of palm oil; the commodity is vital to her economy, and there probably is now in this country a fund of knowledge and experience of oil palm unsurpassed anywhere. The Society is particularly pleased that Tuan Haji Taib bin Mahmud, the Minister for Primary Industries, is to open the Conference.

When the Society begins to plan a conference the hope is always expressed that planters themselves will contribute a significant number of the papers required, and it is unfortunate that this hope is never realised. Again, the organisers do their best to ensure that the papers, from whatever source, are of a style and content acceptable to planters who, while they may not all possess the technical qualifications of the authors, lack nothing when it comes to practical experience in the field.

In the event, it is the very popularity of I.S.P. conferences, and the fact that they are unique in south-east Asia, which bedevils the situation. In the case of oil palm especially, many experts of national and international standing are attracted to the forum which the I.S.P. provides, and as a consequence most planters have grown shy of too personal an involvement, whether from the platform or the floor, in such conferences, being content to 'leave it to the experts' and to hope they will learn at least something from the $2\frac{1}{2}$ days of discussion.

There seems little that can be done about this situation if the Society is to maintain the technical quality of its conferences. Much depends on the chairmen of sessions and their ability to get discussions going, especially those of the practical and 'cut and thrust' kind. It is probably true to say that of all the questions asked and points raised from the floor, those from planters are the most welcome and the most likely to appeal generally to the audience.

Registration for the 1972 Conference is now open, and already there are indications that overseas participants will be especially numerous. Some of them will be scientists and research workers, but they will include planters too; the Indonesian contingent usually having a strong 'planter' component. We would emphasise that, no matter how it looks on paper*, this is a conference organised *by* Planters *for* Planters, and we look forward to seeing large numbers of them there.

1972 ISP Oil Palm Conference

16-18 November

Federal Hotel Kuala Lumpur

---

* A provisional programme is contained with this issue.
A Registration Form may be found opposite.

I.S.P. OIL PALM CONFERENCE 1972

Federal Hotel, Kuala Lumpur, 16 - 18 November

REGISTRATION FORM

Intending participants are requested to complete and return this form not later than 30 September 1972 to:

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(b) I wish to receive an invitation to the Conference Cocktail Party (16 November) for myself/and my wife.*

(* *delete* where inapplicable)

Date: *Signature:*

Planter, Kuala Lumpur **48:** 201–206 (1972)

Some notes on the fractionation of palm oil

T. D. TJANG* AND J. J. OLIE*

SUMMARY

Some properties of palm oil having a bearing on its fractionation are discussed. A brief description is given of three possible methods of palm oil fractionation, *viz.* simple winterization, solvent fractionation, and fractionation by separation of crystallised fat after addition of detergent solution.

Production methods should be geared to the required quality of the fractionated liquid palm oil and solid palm fat, and the marketing of these end products should be carefully studied with the object of creating new markets. The various factors which need be considered in a feasibility study of a palm oil fractionating plant are set out.

INTRODUCTION

Palm oil is now being produced in quantities that are of significant volume in the world market in relation to the edible oils and fats from other sources. Furthermore, the strong upward trend of palm oil production is still gathering momentum. By 1975 Malaysia alone is expected to produce one million tons of palm oil per annum, while by 1980 Malaysian production of palm oil could well reach a level of two million tons per annum.

In order to maintain the profitability level of palm oil production, sales must keep pace with production and thus ways must be found of increasing the consumption of palm oil. In this context the fractionation of palm oil into liquid oil and solid fat is one of the processes that has aroused considerable interest. The liquid oil is designated for cooking oil, or for blending with other liquid vegetable oils, while the solid fraction can be used as a component of the harder frying fats, for the production of margarine, as vanaspati component or further processed into cocoa-butter substitute.

Depending on the required properties of the end products, palm oil, can be fractionated into 70–80% liquid oil and 20–30% solid fat. This article deals with some of the theoretical aspects of palm oil fractionation.

SOME PROPERTIES OF PALM OIL

Composition

Palm oil consists largely of triglycerides. A triglyceride is a compound in which three fatty acid molecules are attached to one molecule of glycerol. As there are several different constituent fatty acids in varying proportions, and many different combinations of these fatty acids can be attached to the glycerol molecules, it will be realised that the triglyceride composition of palm oil is complex. Further increasing this complexity are the various possibilities of spatial arrangements of the attachment of the fatty acid chains to the glycerol molecules.

---

* Stork Apparatenbouw N.V., Amsterdam.

The component fatty acids of Malaysian and Indonesian palm oil are shown in *Table 1.*

Table 1. Fatty acid constituents (%) of palm oil

Fatty acid	*Molecular formula*	*Saturated or unsaturated*	*Percentage of total fatty acids*
Myristic	$C_{14}H_{28}O_2$	Saturated	1–2
Palmistic	$C_{16}H_{32}O_2$	Saturated	42–48
Stearic	$C_{18}H_{36}O_2$	Saturated	3–6
Oleic	$C_{18}H_{34}O_2$	Mono-unsaturated	36–42
Linoleic	$C_{18}H_{32}O_2$	Di-unsaturated	8–12
Linolenic	$C_{18}H_{30}O_2$	Tri-unsaturated	0.2–0.6
Arachidic	$C_{20}H_{40}O_2$	Saturated	0.2–0.6

Palm oil is a semi-solid fat at ordinary room temperatures. The word 'fat' is normally used to refer to triglycerides that are solid or semi-solid at ordinary temperatures, whereas the word 'oil' is used for triglycerides that are liquid at room temperature. The melting point of triglycerides increases with increasing length of the fatty acid chain, and decreases with increasing unsaturation.

The semi-solid nature of palm oil at ordinary room temperatures is due to the presence of the solid fully-saturated triglycerides and the higher melting mono-oleo-glycerides and monolinoleo-glycerides dispersed through the liquid diolein-glycerides and other more unsaturated triglycerides.

Triglycerides exhibit the phenomenon of poly-morphism, that is they can exist in more than one crystal form. These different forms are often sufficiently stable to exhibit distinctive melting points, densities, X-ray diffraction patterns, etc. The major component triglycerides of vegetable oils usually have three crystal forms. In the order of increasing stability these are the alpha, beta-prime and beta-forms. The most stable crystal form (the β-form) has the highest melting point.

FRACTIONATION OF PALM OIL

Simple winterization

The fractionation of palm oil can be carried out by simply cooling the oil and keeping it at low temperature for some time. The triglycerides with a high melting point will precipitate in one of their crystal forms, and can be separated from the liquid oil by filtration. However, due to the very poor filterability of the softish precipitate this filtration operation is very difficult to perform satisfactorily. Even if the cooling is done gradually and the palm oil is kept for several days at a low temperature in order to develop the stable and harder β-crystal form, filtration is still most difficult.

This method of fractionation is also known as *winterization*, in analogy to the fractionation of cottonseed oil in former times. The winterization process of palm oil does not yield products of definite specifications because of (i) the solubility of the triglycerides in each other, (ii) the eutectic formation of glycerides, and (iii) the occlusion of liquid oil in the filter cake. Furthermore, the yield of liquid end-product is low.

Solvent fractionation

In recent years processes have been introduced for affecting the fractionation of palm oil in organic solvents. Although methyl-ethylketone has also been used as solvent, at present the most widely used solvent is commercial n-hexane.

The advantages of solvent fractionation are as follows:

(i) Crystallization in a solvent is much more rapid. Furthermore, the crystals are immediately developed in the stable β-form, the contrast to the above-mentioned winterization process where crystallization takes place *via* the unstable forms, and takes several days to reach the stable β-form.

(ii) By applying the solvent crystallization procedure developed by Stork a very rapid precipitate of fat crystals is obtained that is relatively easy to filter from the liquid solution. A high filtration rate can be achieved.

(iii) Within certain limits the end products can have more sharply defined specifications as regards their solidifying/melting properties.

(iv) By varying the conditions of crystallization, a yield of 70–80% of liquid oil and 20–30% of solid palm fat can be obtained, depending on the required properties of the end products.

The main disadvantage of solvent fractionation is that the inflammable nature of the solvent necessitates the use of flame-proof equipment.

Separation of crystallised fat after addition of detergent solution

An alternative procedure for the fractionation of palm oil involves the addition of a cold aqueous solution of detergent or wetting agent plus electrolyte to the cooled and partially crystallised oil. The cooling and crystallisation time of this undiluted palm oil is relatively long—about 9–12 h. The fat crystals and the aqueous detergent solution form a suspension which is separated from the liquid oil in a centrifugal separator. After heating the suspension, the melted fat crystals are separated in a second stage from the aqueous solution by centrifugation. The advantage of this process is the exclusion of the solvent, but according to Andersen and Williams (1965) this method may not yield end-products with such exacting specifications as can be obtained by the solvent fractionation process.

THE PRODUCTION, QUALITY AND MARKETING OF FRACTIONATED LIQUID PALM OIL AND SOLID PALM FAT

In Malaysia and Indonesia the main objective of fractionating and refining palm oil is to obtain the maximum quantity of liquid light-coloured edible oil to be marketed



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PRICES ON APPLICATION

as cooking oil. If the domestic market for the liquid fraction is favourable, then of decisive importance for the feasibility of a fractionation plant is the question of whether the solid fraction can be marketed at economically attractive prices.

If the liquid oil is to be exported, then a factor which must be taken into consideration is its keeping quality. During the refining and fractionation process the natural anti-oxidants are removed; thus due to its higher degree of unsaturation the refined liquid oil is much more liable to oxidation than raw palm oil, especially if the refined oil is transported in bulk for a relatively long time—*e.g.* from Malaysia or Indonesia to Europe.

For exporting the solid palm fat, facilities must be provided for liquefying the fat in its storage tanks, both at the estate, at the port, on board the vessel and at the consumer's factory. Thus, before establishing a palm oil fractionating plant with the purpose of exporting its end products, the marketing and shipping problems should be carefully studied and a satisfactory solution found.

However, if the refining and fractionation plant is to be set up mainly for the domestic market, the following processes are recommended for obtaining the best results: (i) bleaching cum de-gumming; (ii) simultaneous de-acidification and de-odorization by vacuum distillation; (iii) solvent fractionation.

In the second operation (distillative de-acidification and deodorization) the free fatty acids and odoriferous substances are removed from the palm oil by vacuum distillation. This procedure is better than the conventional method of neutralizing the free fatty acids by caustic soda and deodorising afterwards.

As already mentioned, in the solvent fractionation plant the solid fraction of the palm oil is separated from the liquid portion by crystallization from a solution of the palm oil in hexane. Apart from the provision of steam, water and electricity, the main equipment in a solvent fractionation plant is crystallizing equipment, a refrigerating unit, vacuum filters, hexane strippers and vacuum equipment. All this equipment should be designed in such a way that as far as possible the process variables can be adapted to suit the required specifications of the end products. For example, with regard to liquid refined palm oil the following questions need to be considered: (i) the required solidifying, melting and clouding properties of the liquid oil; (ii) whether the refined oil is sold as such or is mixed with coconut oil, palm kernel oil or other liquid vegetable oils.

If the refined oil is to be sold as such in the tropic lowlands, it would probably suffice if it passes a 'cold test' of staying clear for 30 days at 22°C. If it is to be mixed with coconut oil, a much less stringent requirement (*e.g.* clear at 24°C, depending on the mixing ratio) could be sufficient, due to the intersolubility of the triglycerides of both oils. If very exacting specifications are required for the end products of fractionation, then fractionation into three fractions (liquid oil, semi-solid fat and very hard fat) or repeat fractionation can be considered.

CONCLUSIONS

Several factors should be taken into consideration for a feasibility study of a palm oil fractionation plant:

(i) In an unprotected market the price of the liquid palm oil should be competitive with the cheapest of any of the other liquid vegetable oils of comparable quality, *e.g.* for the hypothetical case of the current situation in Western Europe, the liquid palm oil would have to complete with soyabean oil.

(ii) Operating costs for the fractionation plant, including depreciation, interest, overhead, insurance, *etc.*, as well as marketing and transport costs and likely (or attainable) c.i.f. prices, should be assessed carefully.

(iii) The yield of liquid oil and solid fat depends not only on the quality of the raw palm oil and the fractionation method used, but also on the required properties of these end products.

(iv) Finally, a factor that is most difficult to assess is the marketing value of the solid fat.

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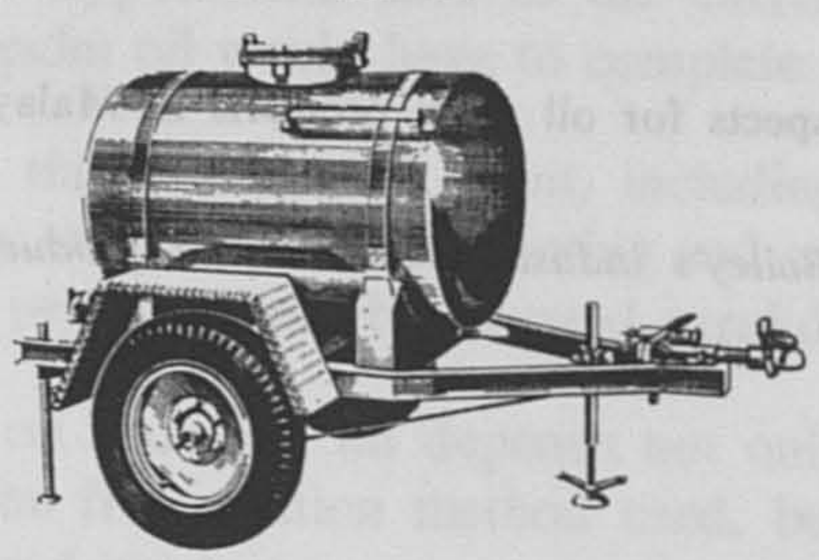
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Conservation in Malaysia

P. R. WYCHERLEY

PART TWO — SOIL

Solar energy becomes human food energy by two main pathways, and in following these the energy carriers in our food become associated with the other essentials such as amino-acids, vitamins and mineral salts. One pathway is by water in ponds, rivers, lakes or the sea. Water-plants, often microscopic in size, trap solar energy and become the food of fish, which in turn are eaten by mankind. There are variants of this foodchain, for example invertebrate animals including shellfish may form an alternative or additional link as carrion feeders, or in different parts of the world whales or wildfowl may form the last link before man. Important as this water pathway is, especially to provide protein, by far the greatest proportion of human food is obtained by the soil pathway.

Plants root in the soil and obtain water and nutrients from this medium while assimilating carbon dioxide from the air and energy from the sun. Whether we consume these plants directly or animals form an intermediate link in the foodchain, the soil is as essential as our crops which grow in it or our grazing stock. The water pathway may be blocked for such reasons as low nutrient content or excessive salinity or drying out, yet it is a simple medium compared with the soil and research may find relatively easy ways of removing such blockages as occur. The soil is slow to form and is not replaced as rapidly as it can be lost by erosion, misuse or neglect. Its composition and the balance of nutrients are relatively delicate and dependent on living processes.

Soil Function

Plants obtain most of their water from the soil, which as described previously they require to transpire when tissues are exposed to the air in order to assimilate carbon dioxide for photosynthesis. The movement of water from the soil into the plant carries with it dissolved substances which are also essential nutrients for the plants and the animals which feed on them. The nutrient required in greatest quantity is nitrogen, a constituent of aminoacids, and the derived proteins and nucleic acids the substances most characteristic of living organisms. The fertility of the soil, that is its capacity to bear crops, is often dependent on the availability of nitrogen. Phosphorus, potassium, magnesium and calcium are also needed in fairly large quantities; sulphur and iron are used to a lesser degree and others such as boron, manganese, molybdenum, zinc and copper are required in much smaller amounts. It is also possible for some substances, especially common salt from the sea, to be present in too great a quantity and so prevent the growth of crop plants. Other toxic substances such as mine wastes containing arsenic cause local problems in Malaya; manganese toxicity is suspected in some Malaysian soils.

Plants can only take up nutrients from the soil in solution. The solubility of salts and hence their availability in the correct proportions is greatly influenced by the degree of acidity or alkalinity of the soil, which is measured on the pH scale

(pH 7.0 indicates neutrality, lower values acidity, higher alkalinity). Most Malaysian soils are rather acid. The uptake of salts from the soil is not an entirely passive process, oxygen is needed for respiration to generate the necessary energy to take up some ions against the electrical potentials and concentration gradients. Some plants which live in swamps have developed root tissues with many air spaces which can allow exchange of gases between cells in the plant roots and the air. Most common crop plants do not have such extensive development of internal air spaces and as a result cannot stand stagnant water-logged conditions. Air spaces in the soil are necessary for these plants. Respiration by plant is not the only demand for air in the soil. Many processes in the circulation and release of plant nutrients, especially nitrogen, also require air for respiration by soil micro-organisms. The fixation of atmospheric nitrogen by bacteria, either free living in the soil or in association with the roots of plants, especially many legumes, requires penetration into the soil of both nitrogen and oxygen. The legume-bacteria association is most important in agriculture. Thus a fertile soil is not a solid mass, but has a structure permeated by fine air and water passages.

The development of a good soil structure takes time. Mineral particles are obtained by the breakdown of the parent materials. The channels between the particles are made by plant roots and soil animals, and by the formation of aggregates. The mineral particles are stuck together by colloidal material, sometimes clay colloids and often organic colloids derived from humus, leaving pores between these aggregates. These colloids or jelly like substances in the soil have other important properties in water and nutrient storage. The nutrient ions or salts would easily be leached away from the soil and lost through the constant washing by the high rate of rainfall in the region, were it not for the clay and the organic content of the soil. A fertile soil is a complicated product of physical, chemical and living processes.

Soil Formation

Soils can be grouped into two main classes, the *sedentary* soils formed on site from the underlying rocks and the *alluvial* soils formed from the materials transported from elsewhere by water and deposited on the site from rivers, lakes or the sea. The *colluvial* soils are an intermediate group, which form on the lower slopes of hills from material washed down by the surface run off of rain water from the upper slopes. There is another intermediate group of old alluvia, whose material was transported so long ago that they have continued to develop at their new locations during a period of geological time similar to that taken for some sedentary soils to form. Soils are classified into series, each of which is characterised by its parent material and profile, that is the relative thickness, colour, texture and structure of each layer or horizon in a vertical section. The series are grouped in families, great soil groups and orders in a similar manner to the classification of living species. Soil formation starts with the breakdown of the parent rock into particles, their subsequent weathering and/or transport. It continues with further physical and chemical changes occasioned mainly by the climate including the availability of water, but affected also by the vegetation it can support at each successive stage.

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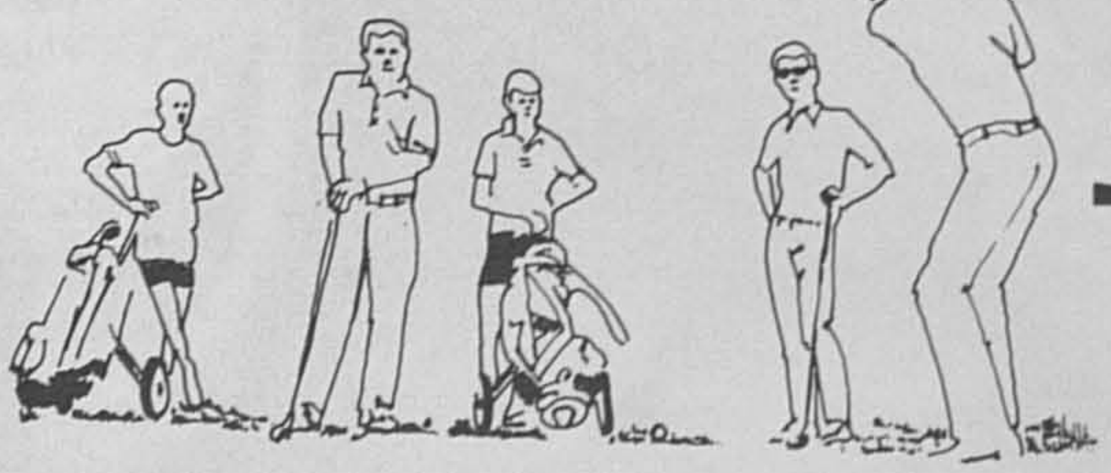


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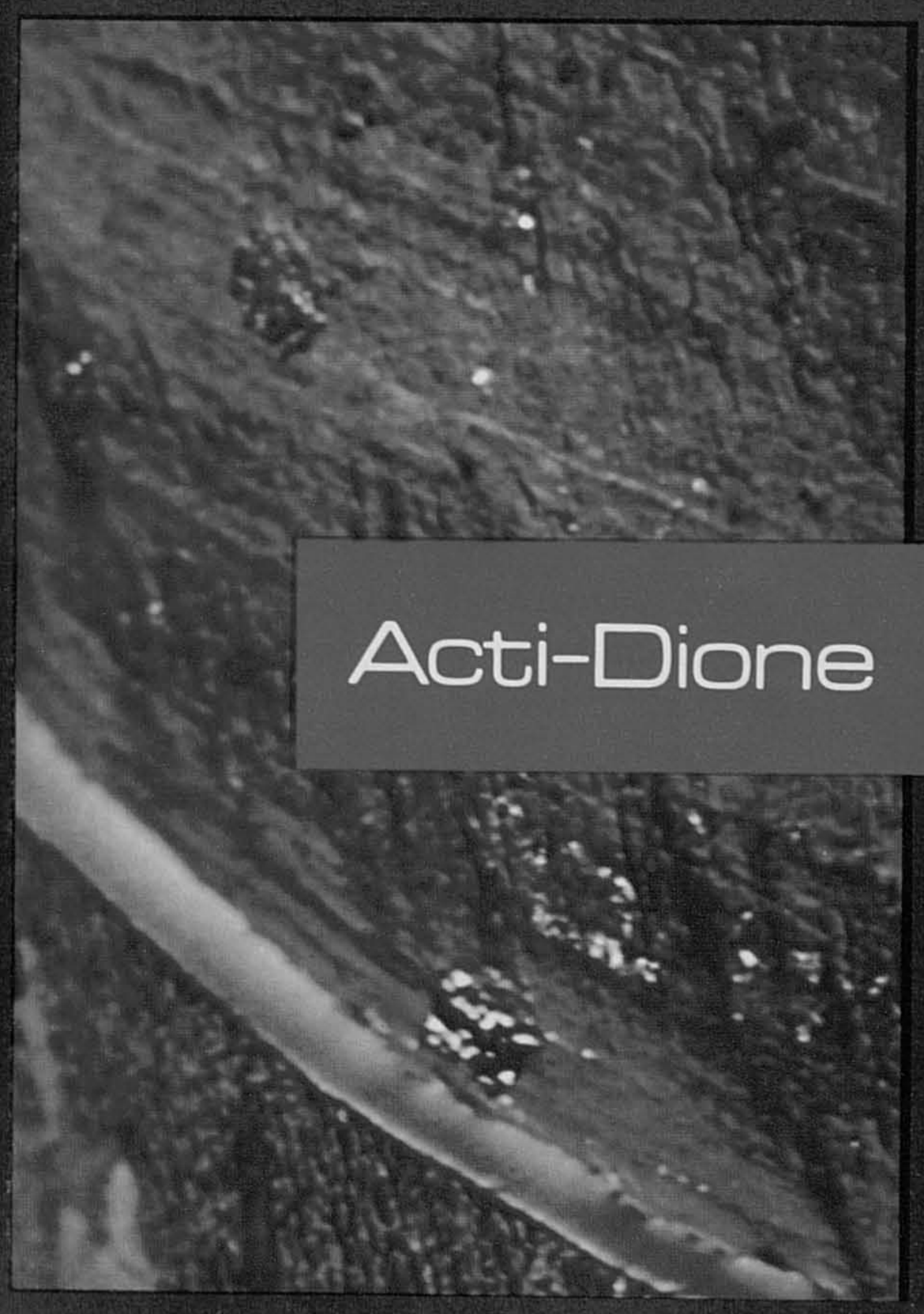
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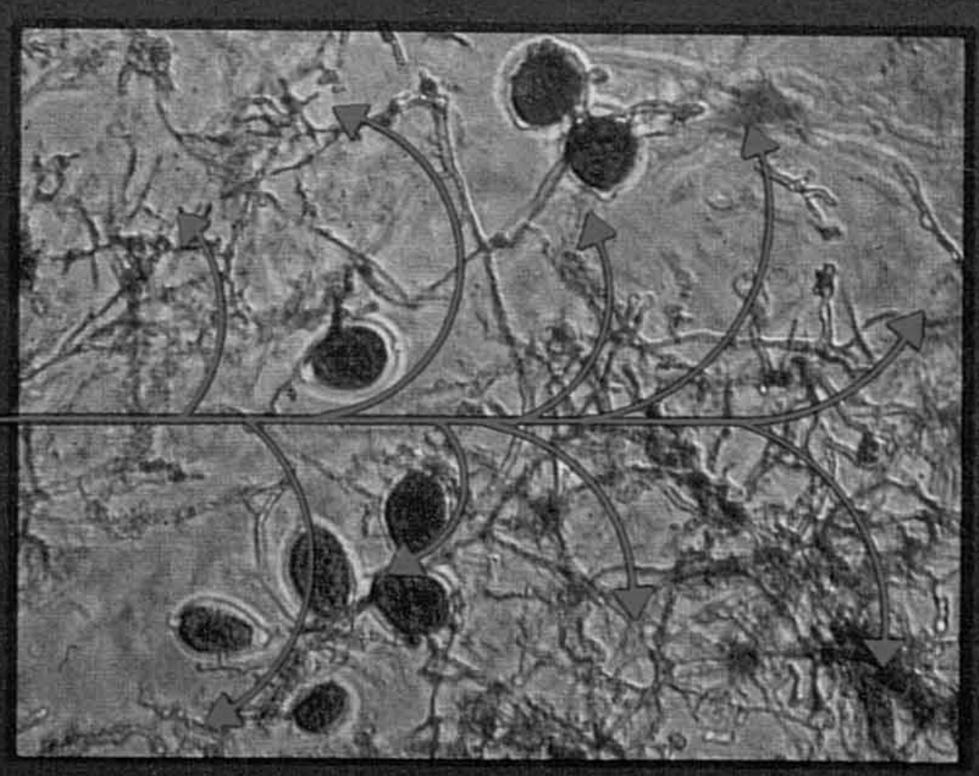
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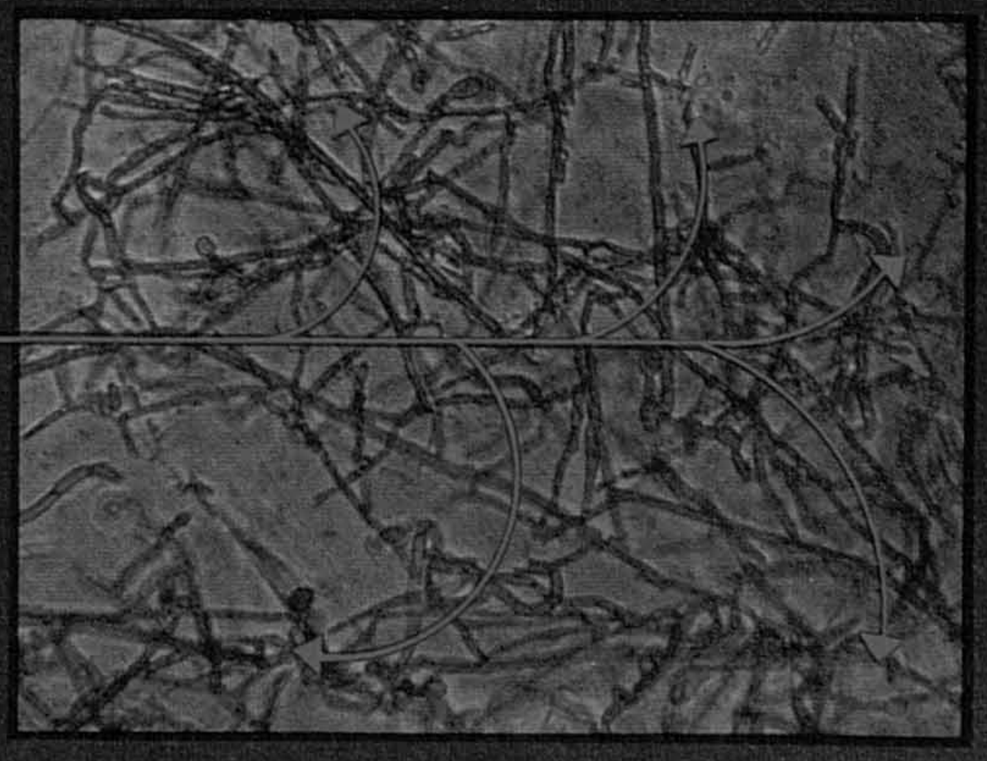
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In the regions where there is a very wide diurnal or seasonal temperature range, in particular if freezing and thawing are common, physical forces play a major role in weathering the parent material. In Malaysia's equitable, warm humid climate physical action is less important compared with chemical effects, in particular solution in and deposition from tepid water. Water percolating through the soil continues weathering to a great depth. Substances are dissolved in the water from the top soil and carried downward and either leached away completely and lost in waters draining from the area, or deposited again lower down the profile. The substances available in the topsoil and the chemical properties of the soil water are affected by the presence and nature of vegetation and its litter. Roots penetrate the soil and alter its physical structure, also deep roots bring up nutrients from lower levels and reverse the downward leaching process. Natural vegetation aids soil formation, so do agricultural crops provided there is compensation for the nutrients lost from the site at harvest and reduction of the risk of soil erosion by exposure. These losses and risks are much greater with short term crops like cereals or tapioca than with tree and palm crops.

Topography and Time

Topography and parent material are other important factors in soil formation on which the climate (warm water) and vegetation act. The length of time they can operate depends much on the topography. Steep slopes are always losing materials so that deep profiles are unable to develop. Indeed it is only their cover of vegetation which saves the soils on the steeper land from being lost altogether. The material lost from the steep slopes is deposited in the flatter or low-lying areas. Deep profiles may develop on gently undulating land if they remain undisturbed for long periods. Peat formation may occur in the wetter low-lying areas of high acidity, the depth reflecting the period of accumulation.

Parent Materials

The parent materials, rocks or geological formations are classified primarily by the way they were formed, namely sedimentary, igneous and metamorphic rocks, and by their age, which are reflected in their chemical and crystalline composition. The *sedimentary* rocks were deposited as alluvia, sand and gravel (sandstones and conglomerates), clay silt (shale), coral, shell (limestone) from water and subsequently compressed. The *igneous* rocks solidified from molten lava in the heart of the earth, granite being the most common example throughout Malaysia. The pressure and heat of the intrusion of the igneous rocks have changed some sedimentary rocks, examples of such *metamorphic* rocks are quartzite from sandstone or schist from shale, much of the limestone in Malaya has been metamorphosed to marble. Igneous rocks may be metamorphosed by a subsequent intrusion, for example the formation of gneiss from granite.

There are some tracts of basic volcanic material, andersite and basalt mainly in parts of Pahang and Sabah, which yield deep fertile clay-loam soils with a good crumb structure. The shales usually yield clay, clay loam or silty soils with a wide range of fertility. Quartzite yields rather sandy loams, which are shallow and of poor fertility on steep slopes, but fair soils are derived in undulating lowland terrain.



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Granite weathers deeply producing a well drained soil with a good balance of clay and sand, which stores water and nutrients in depth. The distant parent material contributes to the properties of alluvial soils and the nature of the body of water from which they are deposited exerts an influence too. Sandy river alluvia are often infertile, but marine or coastal clay alluvia are usually richly fertile.

Soil Fertility

Different crops are adapted to different types of soil. Their performance on a suitable soil depends on other environmental factors and husbandry methods such as application of fertilisers. The principles of conservation require that land should be utilised with respect to these soil and other factors in the best way to provide food, materials for clothing, shelter and fuel for mankind, and also recreational amenities. Reserves of wild plant and animal life contribute to man's aesthetic needs and may be considered to be recreational amenities. However, wild plants and animals impinge on agriculture not only as weeds and pests, but as genetic reserves for breeding improved crop plants and as reservoirs of the natural agents which control pests. Timber production under the managed natural regeneration system so well developed in and adapted to this country is an obvious contribution of wild plants to rural economy. The major soil types in Malaysia are reviewed below with respect to their fertility, suitability for conventional agriculture or conservation under more natural conditions.

Recent Coastal Alluvia

The more sheltered coasts of West Malaya and of Sarawak have extensive mangrove forests still tidal and in process of being won from the sea by the advance of the mangrove. Conventional agriculture is impossible here. Very extensive dykes or bunds would be necessary to keep the salt water out, drainage would also present many problems. The rate of natural advance seems quite rapid. Shell fisheries have been developed in places and the burrowing prawns aid in the aeration and colonisation process. Eventually the land furthest from the sea becomes sufficiently elevated for fuller utilisation and reclamation, meanwhile very profitable crops of poles and wood for conversion to charcoal can be obtained on a rotational system. This seems the best use of these young soils, which also provide a protective coastal fringe.

Coastal Alluvia

These are the geologically recent soils deposited along the coasts during the last 25 000 years. In general those on the more sheltered coasts contain finer clay and are more fertile. Many of the finer particles were probably first suspended in sea water, where they absorbed various nutrients and were then precipitated when the sea water met less dense fresher water draining from the land. On the exposed coasts coarser sandy material is thrown up by the rough seas, except where erosion rather than acretion is in progress. Other river borne material is dropped when the force of the stream is slowed by running into the sea, either on the banks of the estuaries or in sand bars. The debris of sea and river life, shells and plant material, is also found scattered or in discrete deposits in the alluvium.

Thus the coastal alluvia are very variable in their physical and chemical properties, and the degree to which they become built up and elevated to be drained naturally, or that they may be drained artificially. Harmful sea salt is leached out by rain and carried away where drainage is successful and subsequent inundations are prevented. The drainage and aeration must be adequate to prevent water-logging and the formation of harmful sulphides. The coastal clays are among the most fertile soils if these conditions can be satisfied, although irrigation with water of low salt content is often necessary for padi cultivation throughout the year to balance the high rate of evaporation. It is dangerous however to keep some of these soils water-logged by excessive irrigation throughout the year, when sulphides may accumulate. In these cases a crop with a lesser water demand should be included in the rotation between rice crops, so that there is opportunity for air to penetrate and oxidise the sulphides. In turn it may be necessary to leach out or neutralise sulphuric acid. These soils should be reserved for the most productive agriculture. However, large areas have been lost or their management by drainage and irrigation made much more difficult and costly owing to flooding, which has its origin in erosion upstream as described earlier.

Swamps

Where lagoons have become isolated behind the various coastal alluvial deposits, and sometimes in flat river valleys, a permanent water logged swamp forms. The litter of the plants does not decay rapidly owing to the lack of aeration in the wet soil and plant debris accumulates as peat. At first the swamp receives most of its water from rivers and occasional tidal inundations from the sea, both these may bring some mineral detritus, even if the general conditions are brackish. In areas where the precipitation does not greatly exceed the evaporation, the peat does not become raised much above the water table determined by the sea and rivers. In regions where the rainfall is very heavy, peat continues to accumulate until the swamp surface is raised above the level of other sources of water. Rain-water contains few dissolved plant nutrients compared with those brought in by other sources of water. Any nutrients released by the decay of the peat tend to be leached away by the rain water as it drains off, but much of the peat continues to accumulate.

There are large areas of swamp forest in south east Malaya and even more extensive areas in Sarawak. Their soils are very low in fertility, because all the nutrients are locked up in the organic matter and applied fertilisers are easily leached away. Artificial drainage causes some drying and shrinkage of the peat, but reclamation by such means is a long and costly process. If the peat was removed or destroyed, the clays beneath might prove fertile. However, drainage would remain an important and difficult factor, because the land level would have been reduced to the normal water table or lower, and not only would bunds be needed to keep flood waters out, but pumping might be necessary to get rid of the excessive rain water. Until such massive engineering works can be afforded or pressure on lands is so severe, it would seem the most profitable land use to discover means of managing the extensive tracts of swamp forest to yield the maximum forest products and to retain some as game reserves. Vegetables may be grown by intensive methods, but the market available within the range of economic transport is often

limited so that this land use is local only in most cases. The market for pineapples, also grown on these soils, is saturated at present. Thus forestry remains the most promising large scale usage.

Valley Alluvia

Weathering occurs naturally in the hills and where the rivers are slowed down on entering the coastal plain, part of the burden carried by the streams is deposited as river valley alluvium, since the coarsest material is usually deposited first, rather sandy strongly leached soils of low fertility often result. The finer material giving rise to clay and loam alluvial soils is usually carried into the lower reaches, the estuaries and flood plains, where fertile soils may be deposited over a period of time, the risks involved where this process gets out of control due to excessive soil getting into the rivers have already been described.

Older Alluvia

During earlier geological periods river, flood plain and coastal alluvia were deposited in terraces ranging from 20–270 ft (6–80 m) above the present level of the sea. These terraces are interesting indicators of the geological history of South East Asia, whether they correspond to the then levels of the sea as supposed by some, or to extensive lakes. Prolonged leaching of these soils has reduced their fertility. The forest on these impoverished soils is not very valuable in preferred timber species. Fertilisation and cultivation of the less demanding tree crops such as rubber is often difficult owing to multiple deficiencies of both major and trace nutrients, although there are a few isolated cases of very good yields from oil palms on these soils. If abandoned after unsuccessful cultivation, waste lands of lallang and poor scrub are likely to predominate. It would seem wise to expand the cultivated area cautiously taking careful note of past experience.

Shallow Soils of Steep Land

On steep hill and mountain slopes erosion of parent material, especially of sedimentary rocks, is most rapid and the situation is the reverse of that which obtains where alluvium is being deposited. These young soils are shallow and easily lost if their vegetational cover is removed. Twenty times as much soil is lost from the tea and vegetable gardens as that from forest in the Cameron Highlands of Malaya, although the gardens are terraced and the forest is not. These are soils which from their situation should remain for the greater part under protective forest.

Lateritic Soils

In the humid tropics the constant washing of the soil by rain can have various effects. Laterisation occurs when the silicates are washed out, but the remaining sesquioxides of aluminium and iron accumulate and impart a deep red colour to the soil. The formation of hard concretions is the most typical aspect of this process. There is usually a rather shallow soil covering the hard layers of laterite nodules, which are easily exposed by erosion. These soils are difficult to work, the fertility is moderate at best but often low. The main problem is poor root penetration and thus limited utilisation of the nutrients. The hardier tree and palm crops are

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perhaps the most suitable usage, although shallow rooted crops can sometimes be grown if the lateritic layer is not too near the surface.

Podzols

Podzolisation is sometimes considered to be the reverse of laterisation. In a podzol a shallow peaty topsoil covers a depth of bleached sandy material extending downward and beneath it is a dark stained layer. The sand is almost pure silica except for a few plant remains on or near the surface. The iron and other materials washed down are concentrated in the dark usually red layer, which may be a hard impenetrable pan. In Malaysia some of these heavily leached podzol profiles are deep (3 ft or 1 m. or more), they form on old raised beach terraces, as for instance on the East Coast of Malaya or in parts of Sarawak where at least some of the kerangas areas are of this nature.

In parts of Sabah there are red-yellow soils classified as podzolic by some soil scientists and as latosols by others; these are fair agricultural land if fertilised adequately. The typical grey podzols require heavy manuring, preferably with organic matter, and possibly irrigation to produce agricultural crops of value; if abandoned these heavily leached podzols revert to poor scrub. The natural vegetation is poor, in places careful management can give crops of poles and firewood; the deep roots of these trees bring up nutrients from the lower depths and counteract the leaching process to a limited extent. Part of the Bako National Park in Sarawak includes podzols. Owing to the infertile soil, many interesting insectivorous and other peculiar plants are found, and even if the stocking with wild animals is not high, it is adequate to justify preservation as totally protected nature reserve and to provide recreational amenities. Shallow rooted coconut palms occupy much of the podzols of East Malaya, the crops are poor and do not repay the heavy fertilisation necessary to effect any improvement; this mistaken land use should not be repeated.

Pure silica sand for making high quality optical glass has been obtained by dragline (opencast) mining from podzols of raised beaches in Penggerang Peninsula of Johore. This is not a renewable resource until geological time elapses. Extraction is justifiable, where the forest has been cleared and the subsequent cultivation abandoned to lallang. The few relics of forest on these soils as at Padang Mulud are worthy of conservation.

Latosols

These are yellow, red or brown soils of usually deep profile, which have been subject to prolonged weathering and intensive leaching by rain water on site; they are primarily sedentary soils, although some of the colluvial and older alluvium soils also may be regarded as latosols which have developed since their ancient deposition. With the exception of disturbed soils, some older alluvia and the young shallow examples in the mountains, the latosols as a group are of suitable physical structure for most crops, but their nutrient content is variable. Some of the widespread latosols derived from granite owe their fertility more to their friable structure enhancing drainage and water storage than to the amount of available nutrients,

the latter being low. These soils allow the roots of tree and palm crops to penetrate deep and tap the nutrients from a large volume of soil, also the free percolation of water enables weathering and release of bound nutrients, especially potash, to continue deep in the profile.

In some latosols nodules of laterite occur. The most fertile latosols are those rich in nutrients, well weathered and yet retaining a good crumb structure to a great depth, the best known of these are derived from effusive volcanic rocks. In Malaya, these are known near Kuantan and Temerloh in Pahang and also in Johore. In Sabah they occur in the South East near Tawau and Darvel Bay. Owing to their richness and the easy infiltration of water through the crumb structure, it is sometimes thought that these soils need no management. In fact they respond better than any other soils to good husbandry. Since they are so valuable an asset, it is most important to use these soils for the most beneficial food production and to protect them by careful treatment.

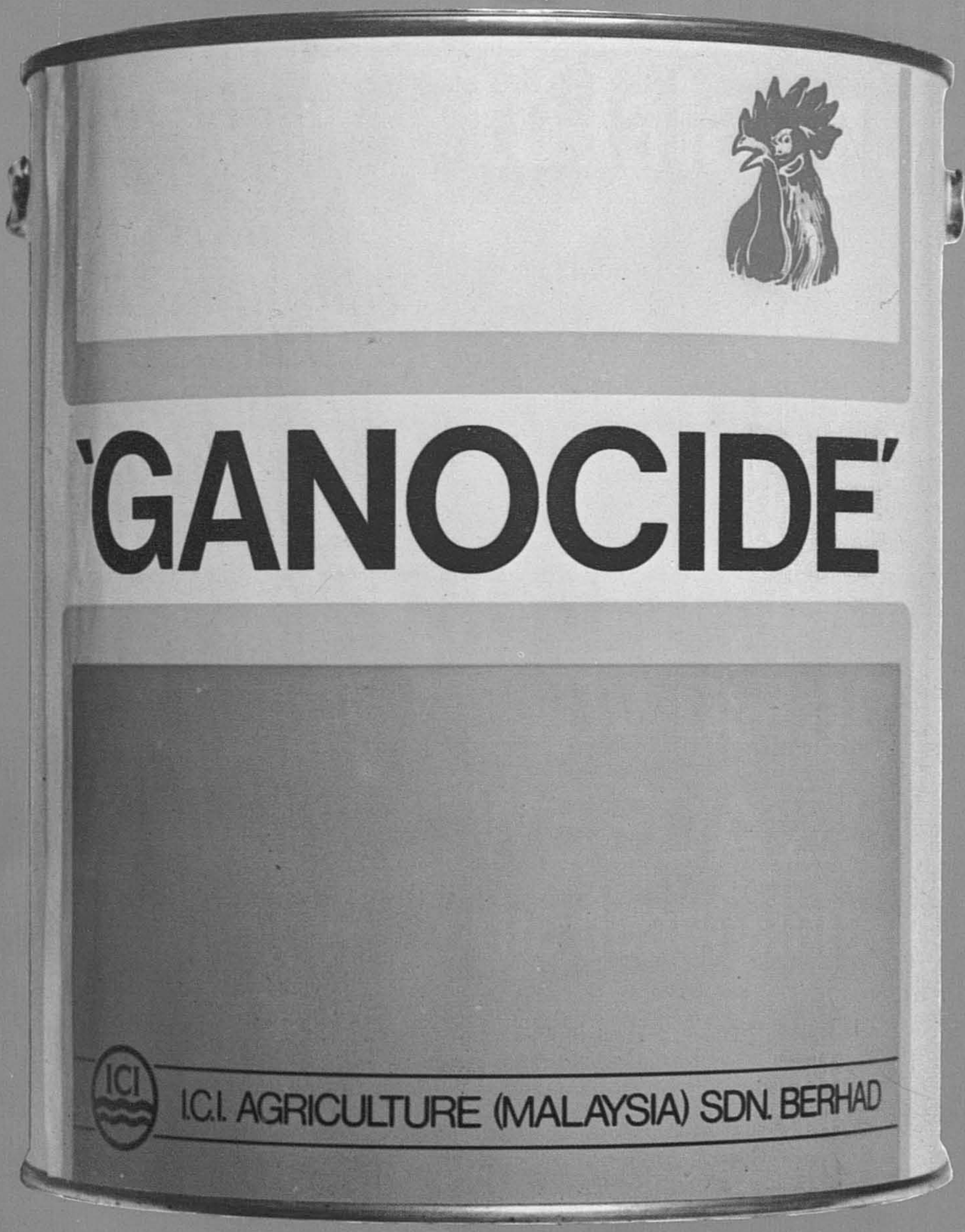
The latosols, with their wide range in fertility and structure, provide much of the agricultural land and the poorer amongst them support good forest. They are the product of weathering on site for a long period. The soil is still in place in a more or less natural profile, even if the degree of humic penetration in the topsoil has altered under cultivation, unless eroded by exposure and bad management. It does not follow that because latosols are widespread that these soils are sufficiently robust to withstand all abuse. Whenever in nature there is opportunity for contrasting processes to operate, such as where soil formation by weathering on site may pass over into erosion from the site, then it is a warning that careful management is necessary to preserve the balance or to control the rate of soil loss.

Disturbed Soils

Dredging and hydraulic mining for tin is widespread in Malaya. In the process of extracting the tin ore, the soil is washed and loses most of the soluble nutrients. The soil profile is drastically altered, top soil is buried, deep layers of infertile, free draining sand cover vast tracts. In the slimed areas the clay which has been saved cakes and cracks, so that it is easily drained through the cracks but the hard surface between is not readily penetrated by roots and colonised by plants in these locally arid conditions. Natural colonisation is slow; there are many areas fifty or more years old with but a scanty fire prone regeneration of scrub. Rehabilitation by planting trees, such as pines for pulp production, has met with only limited success owing to the low fertility and fire hazards. As for agriculture only intensive methods using large amounts of organic manure are possible on a strictly limited local scale.

This is all the more sad because the 200 000 acres (80 000 ha.) of badly degraded tin tailings represent much which was originally among the best agricultural land in Malaya. The profits of tin mining when prices are high and the revenue earned by government through taxation make it unlikely that alienation for mining would ever cease, apart from the large number of prospecting and mining leases already given. The following measures might help to ameliorate the worst effects and make rehabilitation easier.

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Areas are worked piecemeal at present, rich deposits when the price is low, the poorer only when there is a premium. Old fashioned methods could not reach all the tin in some fields, which are now accessible to modern workings and will be mined again. Several different companies may hold adjacent leases and each works at its own rate according to its own methods and resources. If complete and co-ordinated working of a particular area could be introduced, resettled soil need not be disturbed afresh by re-mining or flooding or changes in drainage by adjacent activities at a later date. Sliming in bunded pools with the clay spread on top is a promising method. Coordinated planning to remove limestone and dolomite, which are exposed by hydraulic mining for tin, would make rock available for constructional purposes and for magnesium fertiliser preparation, as is already done on a limited scale to obtain marble and for cement and lime manufacture. This would do no more harm to the landscape than tin mining already inflicts and would make additional spoil areas available, although at the cost of some pumping. The main object would be to relieve the pressure on the rare limestone outcrops for these materials by overall conservation planning.

Limestone

Nearly all the limestone exposed above ground level in Malaysia is in the form of precipitously rising hills or karst towers. The limestone hills are isolated islands, survivors of much more extensive formations in the past. Limestone consists of calcium carbonate, there may be various proportions of magnesium carbonate from nil to equal amounts of calcium and magnesium in the double carbonate or dolomite. These carbonates dissolve in water containing carbon dioxide, a little of which is taken up by rain passing through the atmosphere, as well as in other acids produced by the decomposition of debris from plants growing on the surface. Many drainage channels are formed through the rock. The strong drainage is one of the factors determining the vegetation able to grow on limestone.

The limestone hills present a mosaic of different habitats. There are the steep dry cliffs and pinnacles with hardly any soil except in a few crevices. The top is broken into ridges and valleys, damp hollows alternate with dry ridges. The soil is shallow in most places, because the limestone leaves few residues after dissolving away, occasionally iron oxides accumulate (sometimes as valuable haematite ore), or a peat of fibrous plant remains may form because the dry conditions and low nitrogen status does not encourage rotting. Spontaneous fires sometimes break out, quite frequently on Gunong Api (Fire Mountain) in Sarawak. Their topography alone makes them unsuitable for agriculture. There is no agricultural pressure for these limestone hills, but their specialised vegetation and the rare fauna of cliff and caves are threatened by quarrying. Often the dry vegetation is burnt off by fires started accidentally or purposefully by mineral prospectors.

Because of their value to science, interest for tourists and unique contribution to characteristic landscapes, the best use of the limestone hills is to conserve them.

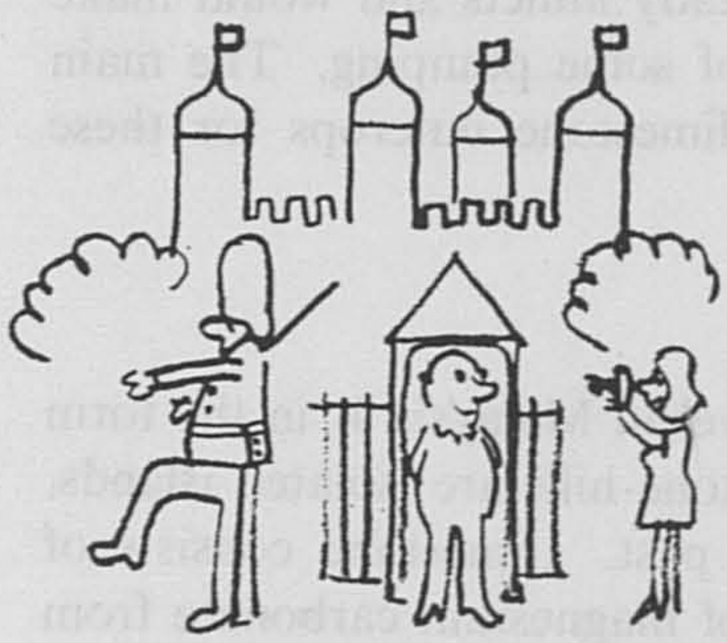
Soil Survey

Soils in Malaysia were first described by examination of profiles in agricultural land, where the penetration of humic substances was often deeper than under

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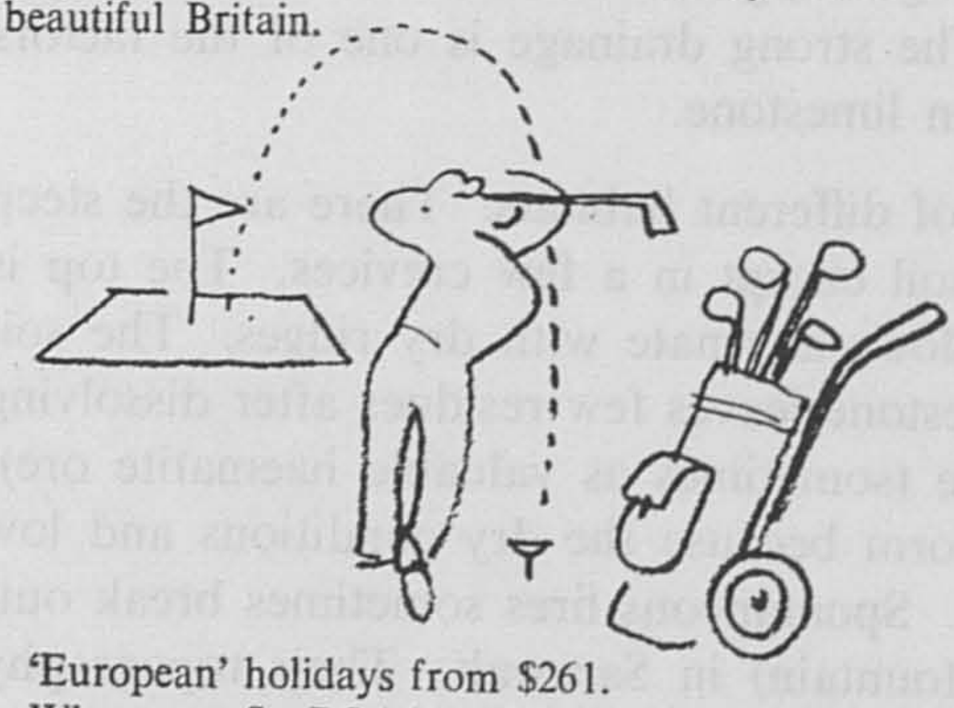
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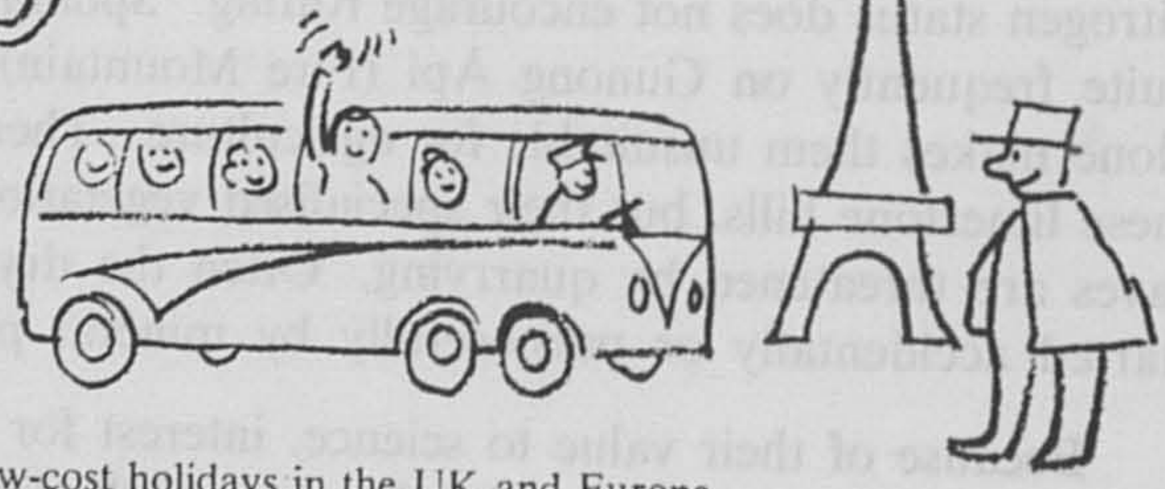


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undisturbed natural forest. Even so the period of cultivation in Malaysia has hardly ever been so long that the relationship is obscured between soils recognised in agriculture at the series level and the soil developed from the same parent material under similar climatic and topographical conditions but still covered by forest. Therefore soil surveys are conducted by visual, physical and chemical examination of soil profiles or of samples from pits dug at selected points in both cultivated and undisturbed land. The soil series or broader units of classification are identified and plotted on maps. The experience with these soil types in agricultural practice enables their inherent suitability for certain crops with or without artificial aids such as drainage or manuring to be assessed. A soil survey throughout the country is one of the steps towards classifying the suitability of different areas for various crops or indicating those parts more wisely left under forest.

Land Capability Classification

Although soil fertility is one of the important factors in deciding the most suitable use for a piece of land in the nation's economy, others must be taken into account. Climate and topography influence the soil, but they have independent effects also. Some crops thrive in a markedly seasonal climate, whereas others are adapted to equitable conditions throughout the year. Erosion control measures on very steep land or drainage of low lying areas may be impracticable or too expensive. The position of the water economy must be determined, whether the area is catchment which should be protected, or in need of irrigation and, if so, whether adequate water is available. Abundantly rich mineral deposits take priority in exploitation.

Reconnaissance soil surveys had covered more than 20% of Sarawak, 30% of Sabah and all of West Malaysia by 1968. The climatic conditions are known in broad outline throughout the lowlands at least, although more detail is needed concerning radiation and hydrology. Topography and current land use are mapped by aerial photographic survey supported by ground investigation. Geological surveys and mineral prospecting locate these resources. All this information is entered on maps and collated for Land Capability Classification as it is called in Malaya; surveys similar in method and object are conducted under other names elsewhere. The purpose is to recommend the best land use for any area.

Such surveys grew first from the need to be able to alienate the land of most promise for success in agricultural development to the landless settlers, who otherwise would try to satisfy their hunger for land by squatting on land more suited to other uses or by shifting cultivation in protected forests or catchments and so damage the national economy. It has always been appreciated that some non-agricultural uses such as working rich mineral deposits must take high priority for the capital they attract, the employment created and the foreign exchange earned. Water power is also a valuable asset, water supply is necessary for irrigation, urban and industrial development. Since exploitation of these non-agricultural resources depends on good conservation practice in the catchments and channels of safe water movement, the outcome of a well organised comprehensive survey and the wise implementation of its recommendations is not antagonistic to appropriate nature protection projects. The surveyors and planners not only mark some areas as unsuitable for agriculture and recommend retention as forest, game reserve or

recreational amenity, but indicate further where misused land should be converted back to these purposes.

Soil Erosion

The Land Capability Classification attaches great importance to the topography of the land, that is the steepness of any slope, because this is a major factor in predisposing the soil to erosion. It is not intended to cultivate land with a steeper slope than 20° (about 1 in 3). The 'steep land line' is detected on topographic maps of Malaya as the level where the contours change from widely to closely spaced and indicates the boundary between the lower slopes less than 20–25° and steeper above. Most of the land of 500 ft (170 m) elevation or more is above the steep land line in Malaya, that is about 40% of the surface of the peninsula. These upper steep slopes should be retained under protective forest.

In the arid and semi-arid regions of the world the scouring action of wind blown particles is a major couse of soil erosion, but this is of minor consequences in Malaysia, where water is the principal agent. Coastal erosion may occur after interference with the protective mangrove swamps, sandy foreshores and coral reefs; these are special cases of water erosion by the sea and the concurrent inundation of agricultural land by salt water does equally serious damage. Most soil erosion in Malaysia arises from the action of rain falling on sloping land and the subsequent movements of the water. The amount of erosion depends on the degree and length of slope, the quantity and force of the rain, the presence or absence of vegetation, the properties of the soil and any artificial measures taken such as terracing or silt pitting to reduce the length of uninterupted slope.

Splash Erosion

The energy of a falling raindrop, or of repeated raindrop blows, may detach a soil particle from the soil surface. When this or other detached particles are struck by further rain, they are flung up into the air and—if the surface slopes—on the average each particle will fall back a little further downhill. The effect of heavy rain on exposed soil is often insiduous, thousands of tiny particles each move a short distance downward during every storm. The cumulative result is that a whole sheet of top soil moves down the slope. The value of vegetation in breaking the force of the rain is evident. The litter serves this purpose also and is often too big to be as easily dislodged as mineral particles, moreover the organic matter helps to stick the soil particles together and modify the soil surface so that the rain water is rapidly absorbed instead of bouncing back. The encouragement of infiltration instead of run-off is important in preventing the next type of erosion too.

Channel Erosion

Rill, gulley, stream and river erosion are varying degrees of channel erosion from the first incipient stages in the field. All arise from water which runs off over the soil surface and gathers together into progressively larger channels following the path of least resistance, which at first may be any slight depression avoiding rocks and other obstructions. As the quantity of water and speed of flow increase so the

channel is scoured deeper and wider until adjoining gulleys coalesce and the original surface is lost.

The severity of channel erosion depends on the intensity of rainfall, the proportion which runs off, and the steepness and length of the slope. These factors determine the amount of water and the speed it attains. Vegetation and its litter affect the surface soil and hence the balance between infiltration and run-off, although this is less important in channel erosion most common during intense rainfall than in splash erosion equally serious during prolonged light rain. Plough furrows and planting rows are agricultural artifacts which provide primary channels for run off; if they run up and down hill, they will concentrate water movement in streams of the maximum velocity. Contour ploughing and terraced planting rows interrupt the rush of water downhill.

Landslips and Slides

Landslips are small landslides; both are most common where clay soils overlie impervious rock strata on steep slopes. Clay is colloidal and can hold great quantities of water, which increase its weight and lubricate the interface between the soil and underlying rock, so that the soil eventually slips and slides downhill. The risk of landslide is increased by undercutting, either deliberately in road construction or accidentally by stream erosion at the foot of the slope. The role of vegetation appears at first to be uncertain, whether beneficial or otherwise, if it increases infiltration and the water loading of the soil. However, the vegetation also transpires water so that the clay is partially dried out and tree roots improve drainage. Plants differ in their effects and the balance between these processes. Artificial drainage may assist. Early detection of areas liable to landslip enables roads and dwellings to be sited safely elsewhere, or where that is impossible for the banks to be sculptured to reduce the hazard.

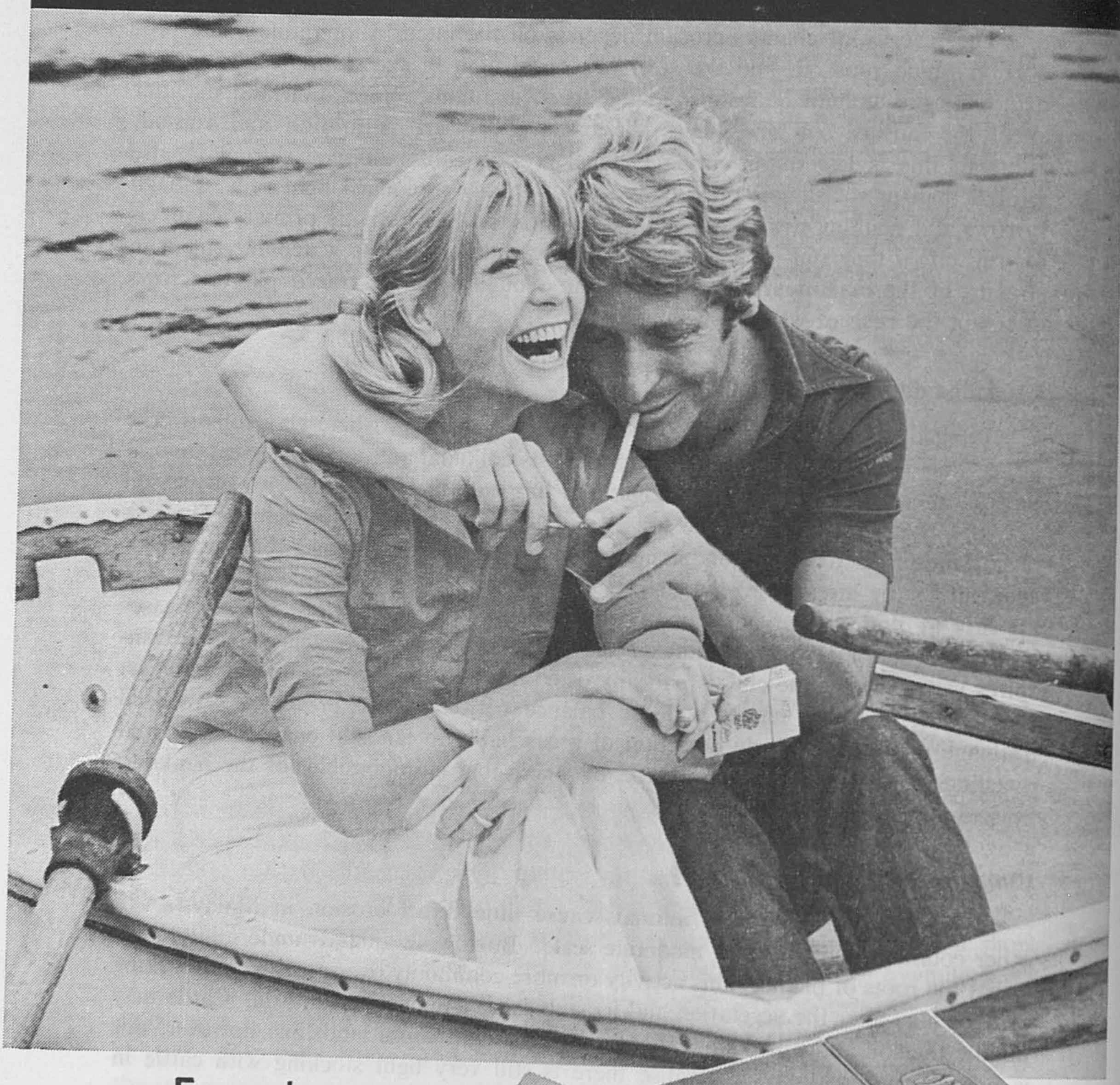
Biotic Erosion

Except for man himself, animals cause little direct erosion in Malaysia. In other countries they do on a moderate scale. Burrowing animals undermine banks or eat the roots of plants. This activity or more commonly over-grazing and barking of trees may alter the vegetation and its stabilising influence on the soil. Cattle may puddle the soil and upset infiltration, or their weight cause landslips; however, this is not serious in Malaysia because there is still very light stocking with cattle in most places.

Erosion Control

The old proverbs 'Prevention is better than cure' or 'It is no good shutting the stable door after the horse has bolted' are most appropriate in discussions of erosion control. It is sometimes possible to restore land, if erosion has not gone too far, but this is an expensive procedure relative to the value of the crops which can be taken from such impoverished and rehabilitated soil. Good conservation agriculture is practised in many cases throughout Malaysia, especially in the old established and well capitalised plantations which learnt their mistakes during the early days

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of clean weeding. However, erosion control should be universal, not just observed by a majority only, otherwise the spoilers of the soil will constantly look for new land elsewhere and erode away the nation's capital resources. Many of the principles and practices of erosion control have been indicated already in explaining how erosion comes about.

The first golden rule is to have an adequate cover of vegetation to prevent exposure of the soil to sun and rain. Where the spontaneous growth or agricultural crop provides incomplete protection, cover plants should be established in the bare spaces. Legumes are favoured in agriculture, because they can improve the nitrogen status of the soil as well. Roadsides and urban open spaces are usually put to grass. A common mistake is to try to get plants to grow on the infertile newly exposed subsoil of recently mechanically cleared sites. This can be overcome by preparing a seed bed and manuring. Another mistake is to mow grass too low or to let it be overgrazed. This restricts the root growth too, so that the grass is susceptible to drought and the short tops wither away to unsightly wisps insufficient to protect the soil when the rains return. Run-off may be rapid if the soil is baked and puddled. Fertilisation and moderate cutting give quicker establishment, add more organic matter to the soil and so increase its water retaining and soil binding power, as well as giving a more pleasant appearance. Crop residues should be returned to the soil as far as possible, instead of being burnt as is often the case at present. Crop residues are sometimes grazed by animals or fed to them, in which case the farmyard manure should be returned to the soil.

The next important rule is to follow the contours whether this be ploughing or preparing planting rows along terraces. Contour bunds and silt pits provide an alternative where the land is not so steep as to justify terraces or form an additional measure on very steep land or under mature rubber which has shaded out the ground covers. Sometimes in estates whose field plantings are well laid out, these bunds and pits are forgotten in nurseries because a nursery is regarded as only temporary; nevertheless the need for soil and especially water conservation is all the more in nurseries because they are intensive agriculture, even if it is of short duration. Terraces should slope back into the hill to assist soil water accumulation. Even so provision must be made to carry off any large excess of water safely by gently graded drains with sodded banks. It is often desirable to leave the larger streams surrounded with the original vegetation. Concrete lined drains and silt traps are useful permanent installations in places where occasional flash floods are inevitable. Sometimes a drain or silt pit to protect the upper boundary of a plantation is forgotten and water pours in from behind breaching the upper terraces.

Soil Conservation

True soil conservation as the best use of the land and water resources goes beyond erosion prevention and control. Firstly land mapping and planning can ensure that the right sort of development is undertaken on the land which can sustain it, and that wrong developments are corrected by reforestation. There are social aspects too. Squatters, who have no legal title to the land they occupy, are careless in its use. Cultivators, who are given only short term tenures such as

annual leases or who have uneconomically small holdings, will not bother or cannot afford to invest their small capital in effecting improvements to preserve its fertility. Alienation and alignment of holdings must be planned in units for soil and water use. The Malaysian government is taking steps to prevent illegal occupation, fragmentation of holdings and short insecure tenures in future schemes, but there is still much misuse of land attributable to inherited problems of customs, ownership titles or the lack of them.

Although soil conservation is largely a problem of land use planning, agricultural and forestry, public works such as roads and open spaces are important too. The engineer's first problem is to prevent flooding, subsidence and blockage by landslips of the highways and airfields. However, the effects of rapid run-off and surface erosion over tarmac and short grass on the areas receiving this water and its overburden may be neglected. Sediment traps in the major outlets are often a useful intermediary barrier to break stream flow and deposit soil particles where they can do no harm. Indeed sand caught in these traps can usually be sold as building material.

The Malay expression *tanah ayer kita*, literally 'soil and water of ours', to describe the land of the country has a deeper meaning. Soil and water are among the most significant natural resources. Water enables solar energy to be used to the full, it must be safely channelled, it can be stored in reservoirs and improved soils, it is replenished. The soil is the basis of the greater proportion of food production, it can be protected and improved, it can be neglected and eroded, but if lost it cannot be replenished in a commensurate period.

(Next month: AGRICULTURE)

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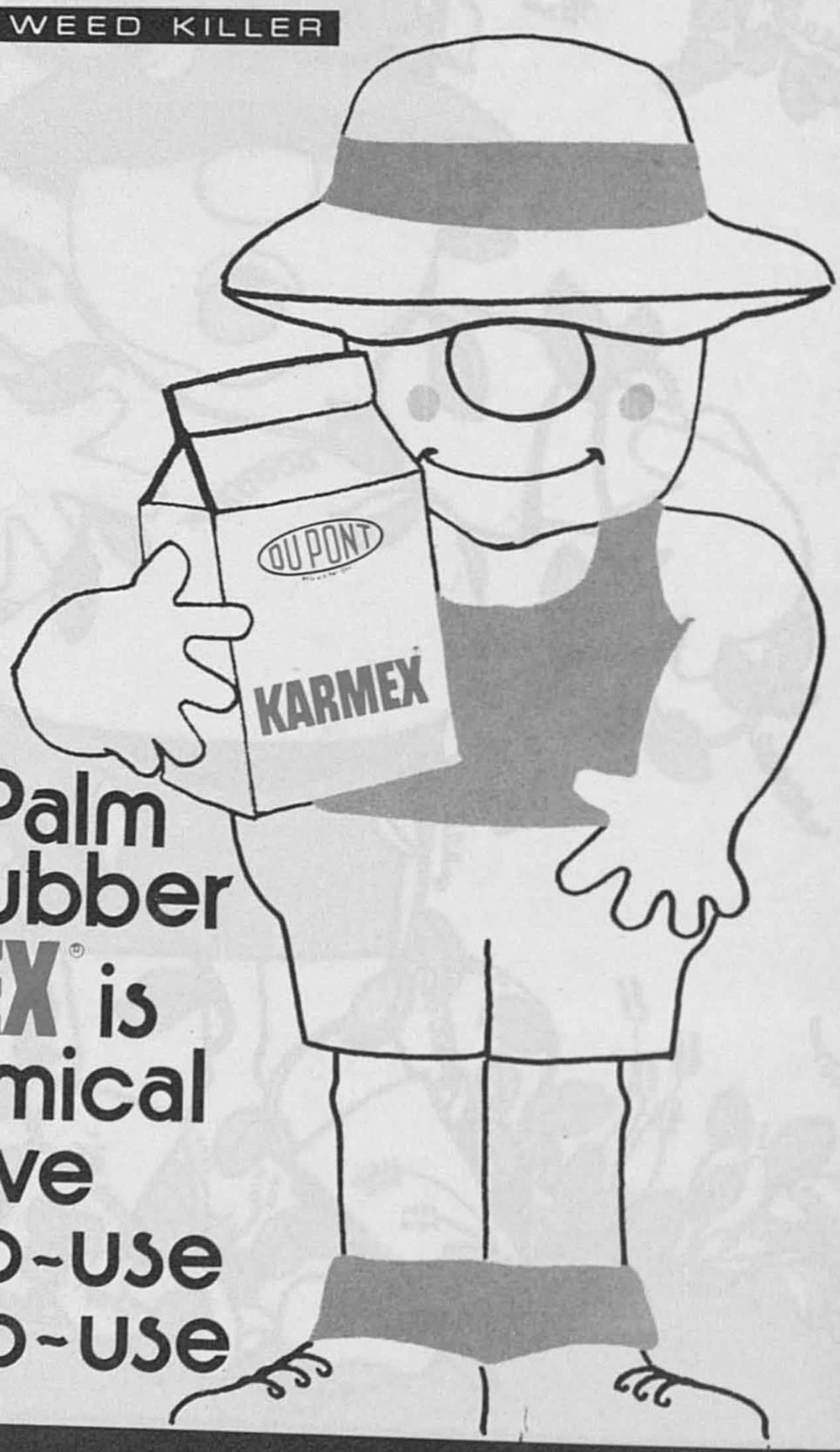


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GUTHRIE WAU

A mid-year look at NR

by

W. NEWALL

The digestive period following the annual RRIM Planters' Conference offers the opportunity for a little stock-taking in the position of natural rubber. The dominant aspects at this time are (i) the selling price; (ii) the future for both planting and equity investment; (iii) the outlook for smallholders.

The consensus of opinion is that if (i) can be improved then items (ii) and (iii) are also favourable.

PRICE

The reasons for the weak price, as emanating from the RRIM's marketing forum, are to this writer at least, (i) disproportionate quantity of production in non-SMR grades; (ii) RSS 1 being used as a datum for price; (iii) the interposition of the marketing sector (middlemen) between producer and consumer.

Presumably, if the total NR production was in tailor-made grades, the price would improve. A step in this direction is the introduction of EQ (extra quality) and tyre rubber; the latter holds great promise as it is able to utilize smallholders' unsmoked sheet. Another very important step is the programme for the construction of more regional factories for processing smallholders' rubber into more sophisticated forms. The smallholders' sector accounts for more than half the acreage under rubber in West Malaysia, and is the sector where the greatest growth can be expected in the future.

MARKETING

Members of the RRIM forum on this subject agreed that the present marketing system, like democratic government, had its imperfections, but was the best available at the moment. They were not without hope however, that when the majority of smallholders' output was in SMR forms, a parallel marketing system might be set up by the Malaysian Rubber Development Corporation (MRDC) who operate the regional factories.

It is also not impossible that these sophisticated end-products of latex, classifiable as manufactured articles, could have a fixed price attached to them as do other manufactured items which go through a number of highly-supervised and sometimes critical stages of production. Esemar can hardly be called a raw material. The processes are at least as involved, for instance, as those necessary to produce aspirin tablets. The possibility of a fixed price deserves more thought by all concerned; (the ANRPC?).

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THE FUTURE

Whether from direct investment in replanting, or in the equity of natural rubber-producing companies, one is hard put to find a pessimistic view of the future. The advances in chemical, botanical, pathological and managerial aspects of NR production keep optimism constantly alive, as they lead to ever-decreasing costs of production; in fact, it is hard to believe that synthetic rubber can continue to compete indefinitely!

To take full advantage of these advances, the estate sector must reduce labour intensiveness at the greatest speed compatible with avoiding hardship or socio-economic upsets. It is urgently necessary to provide better educational facilities for estate-born children, and gradually to evolve better-paid tapping forces of about half the present-day strength, whose (planned) children are equipped to undertake urban employment. Trade Unions should not be worried about such development, as the better-paid tappers will be able to pay increased dues and Union income can be maintained. It is important that the gradual decrease in tapper-intensiveness should not be impeded by emotional or outmoded Union opposition. The NUPW is Malaya has in fact fostered such progress with its scholarship scheme and has been able, from the higher pay won for its members, to double its subscription rate.

SMALLHOLDERS

The owner or lessee smallholder normally benefits, even if in the long run, from all progress in natural rubber production techniques, but yield per tapping, *per se*, is not of such vital interest to him as it is to the estate sector. He is concerned with the total annual income from his holding, and there is general agreement that holdings of less than 6 acres (2.4 hectares) cannot support a family. Unfortunately there are many such holdings, and many without additional land for other crops. In such circumstances the holder is more or less compelled to tap daily as long as the weather is fine, and this makes good husbandry impossible. The short-term answer here would seem to be more government-controlled smallholder schemes on a basis of 6 acres of rubber, 2 acres of fruit and 2 acres of padi. If such schemes could attract half the families in a kampong, and their land could be amalgamated with that of those remaining (and the holdings thus doubled), this would go a long way to alleviating one of the biggest problems in this sector. The provision of space for padi, fruit, tobacco, etc. enables the rubber to be managed on a proper basis so that the benefits are manifold. Where the land available is suitable for rubber cultivation but not for other crops, then 9–10 acres of rubber, one third of which (*i.e.* about 600 trees) is tapped daily, can with modern cultivars and good husbandry, yield about 80 lb per tapping day. Assuming 24 tapping days per month, this means an average monthly income from 1920 lb which, even at to-day's price (27 cts/lb) for kampong sun-dried sheet, gives a monthly income of $518.40. There are of course the immature years to be considered, and the years of early maturity when the yield is building up to 80 lb, but on present evidence, this yield can thereafter be held for 20 years with correct manuring and judicious use of yield stimulants.

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FUNGICIDE



(extracts from a crop protection paper.)

" Black stripe: — effective fungicides were captafol (2% Difolatan), —. Complete control of the disease seldom occurred and a maximum 65% reduction in severity was the best that could be achieved with severe infection.

The " flowable " formulation of Difolatan gave better control than the wettable powder at the same dilution, although containing about half the amount of active ingredient. The liquid formulation is probably a better bark penetrant.

Mouldy rot: of the fungicides tested against mouldy rot, — 2% Difolatan — gave better control — with 2 applications at weekly intervals.

Since — Difolatan — control(s) mouldy rot as well as black stripe, they are therefore suitable for use in areas where both diseases occur.

It is now possible to achieve good control of mouldy rot with weekly applications of newer fungicides such as — and Difolatan, but with black stripe application after every tapping is necessary."

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The big problem with all-rubber smallholdings is how the owner is to live during the period of immaturity. Fractional replanting, say one-third at a time, should take care of subsequent immature periods. The first 2 years after planting can provide some income from inter-cropping but generally speaking, the smallholder would have to be subsidized until the trees are mature.

THE IMMATURE PERIOD

Methods of shortening the immature period have been studied for over 50 years, and the RRIM has recently revived a technique first tried in 1919, that of cleft-grafting. A good success rate has been achieved with seedlings only 3-weeks-old, and if the technique can be adapted to large-scale practice, then this could reduce immaturity by 8–12 months.

Another revival is that of commencing tapping at a girth of 18 in. (45 cm). This practice has long been economically justified, but is now recommended for wind-fast clones as being not only physiologically harmless but beneficial in terms of girthing, especially if tapping is done on alternate panels.

Again, taking the smallholder's point of view, he may not be able to take advantage, as can the estate sector, of this latter development, in that his higher planting density for economic viability necessarily involves a longer immature period. Although there is general agreement that equidistant triangular (or quincunx) planting is the best, there is no economic optimum planting density recommendation for smallholders which strikes a mean between time to maturity and eventual yield per acre. The present RRIM recommendation for smallholdings where unpaid family labour is used, is '200 or more trees' per acre. The writer knows of no empirical work on the establishment of this mean between a high number of small trees and a low number of big trees, but feels that it could possibly be lower than 200. The lower the number of trees per acre, the cheaper it is to bring them to maturity, particularly in respect of manuring, and the shorter the immature period.

It seems a pity that no use has been made of Gough Garden seedlings in the smallholder sector. With good management these come to maturity in $4\frac{1}{2}$–5 years and rise to yields (unstimulated) of around 1 800 lb per acre at estate planting densities, sometimes as early as the 4th year of tapping. Gough Garden seeds are more expensive than other planting material, but a little subsidy here might be more than compensated by reduction of subsidies under other headings.

Planting recommendations

The RRIM has now related planting recommendations to soil character and climate, and so we now have official backing for the policy which many Visiting Agents have tried to put into practice for some years.

MANURING

The manuring of mature rubber is rapidly moving away from being an imperfect art to being a controlled science. The new RRIM recommendations are

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related to the tree's physiological characteristics, the soil, the climate and the yield. Incremental manuring recommendations for stimulation programmes now comprise N and K only, provided always that correct basic manuring has been carried out.

STIMULATION

The latest recommendations from the distributors and producers of Ethrel emphasise its use predominantly in the yield-per-tapping role, with less frequent tappings. This means that production costs are lowered by attacking the highest cost in an estate's accounts: tapping. In one example of the use of Ethrel the yield per tapping was doubled whilst the yield per acre rose by only 27%. This result is very encouraging in that economic gains are high, whilst total nutrient drain is contained within reasonable bounds. Fears expressed in the recent past that the widespread use of Ethrel would lead to flooding the world market with natural rubber, particularly from the smallholder sector, thus depressing the price still further, would now seem to be unfounded.

Nevertheless, it is not easy to see how the smallholder who owns less than 5 acres can benefit from Ethrel. If he is willing to adopt a 3rd-daily tapping system and, with Ethrel, achieve the same or slightly greater yield, he could devote two-thirds of his working days to other projects. But if he has no other land, he is probably best advised to eschew stimulation; and even the estate sector can only proceed at the pace dictated by the ability to scale-down the tapping force.

All this not withstanding, the advent of Ethrel enables us to look to the future of natural rubber with greatly enhanced optimism; this is because of the control it gives over yield and bark consumption such as will eventually enable us to receive better than today's yields with half the present tapping force and at a lower cost. This naturally supposes that we shall move towards 4th-daily tapping systems, which Ethrel makes more economic, rather than today's alternate daily systems.

To sum up, there is still much research to be done in maximising yields per tapping, that is, in finding the system best suited to the planting material. To the all-important smallholder sector, the benefits of Ethrel are (i) prolonged tapping life through bark economy; and (ii) time to devote to other crops or livestock by achieving the same, or better yields with less frequent tapping. If the holding is too small however, to benefit from the extra time made available, then, to quote the Minister for Primary Industries, planning 'must be based on a size of holding which can be considered to be price-insensitive in terms of income'. He also added that 'a greater sense of discipline is called for from our smallholders' in that they must abandon once and for all their impulse to tap every day as long as the weather is fine, and to "save" money by limiting the use of fertilisers and herbicides.

WHY YOUR CROPS NEED SUL-PO-MAG

NUTRIENT REMOVAL CHART
Pounds of nutrient per acre used by various crops

	Nitrogen	Phos-phate	Potash	Mg.	Sulphur
Banana plants/ acre (1200)	400	400	1500	156	*
Coffee lbs/acre (1784)	27	4	43	61	16
Oil Palm lbs/acre (13382)	80	18	120	18	*
Pineapple plants/acre (15000)	134	170	535	53	*
Corn bu/acre (100)	150	60	125	33	22
Tobacco lbs/acre (2000)	75	15	120	18	14
Grain Sorghum lbs/acre (8000)	260	110	220	36	38
Rice lbs/acre (6500)	135	51	18	15	18

*No information

The Sul-Po-Mag nutrients

(nature's natural combination of magnesium, potash and sulphur)

While most farmers are familiar with the needs for nitrogen, phosphate and potash, they are sometimes surprised to learn how important other nutrients can be in the diet of a growing plant.

Magnesium and sulphur often deserve special consideration. As the chart above shows, some crops need *more* sulphur than phosphate and some crops need more magnesium than nitrogen. All crops need both sulphur and magnesium and if these needs cannot be provided by your soil, crop yields and quality can be seriously reduced. Here's why:

Stimulates Growth

Proper magnesium balance stimulates growth. If a plant is deprived of magnesium, all growth processes will be slowed, and the plant will be unable to produce high yields.

Improves Quality

The addition of sulphur can improve the quality of crops. Without sulphur, proteins cannot be formed, thus, crop quality can suffer.

Deficiencies are Widespread

Magnesium and sulphur deficiencies have been observed in every major crop and in most crop-production sections of the world. And in many cases Sul-Po-Mag has been used to help correct these deficiencies.

Use Sul-Po-Mag

Sul-Po-Mag is a natural combination of available magnesium, sulphur and potassium, and it is essentially chlorine free. Although it is 100% soluble, Sul-Po-Mag does not leach out even in sandy soil. This means the nutrients are available for plants throughout the growing season. It can be mixed with your regular fertilizer or it can be applied directly to the soil. Sul-Po-Mag will not affect the soil pH.

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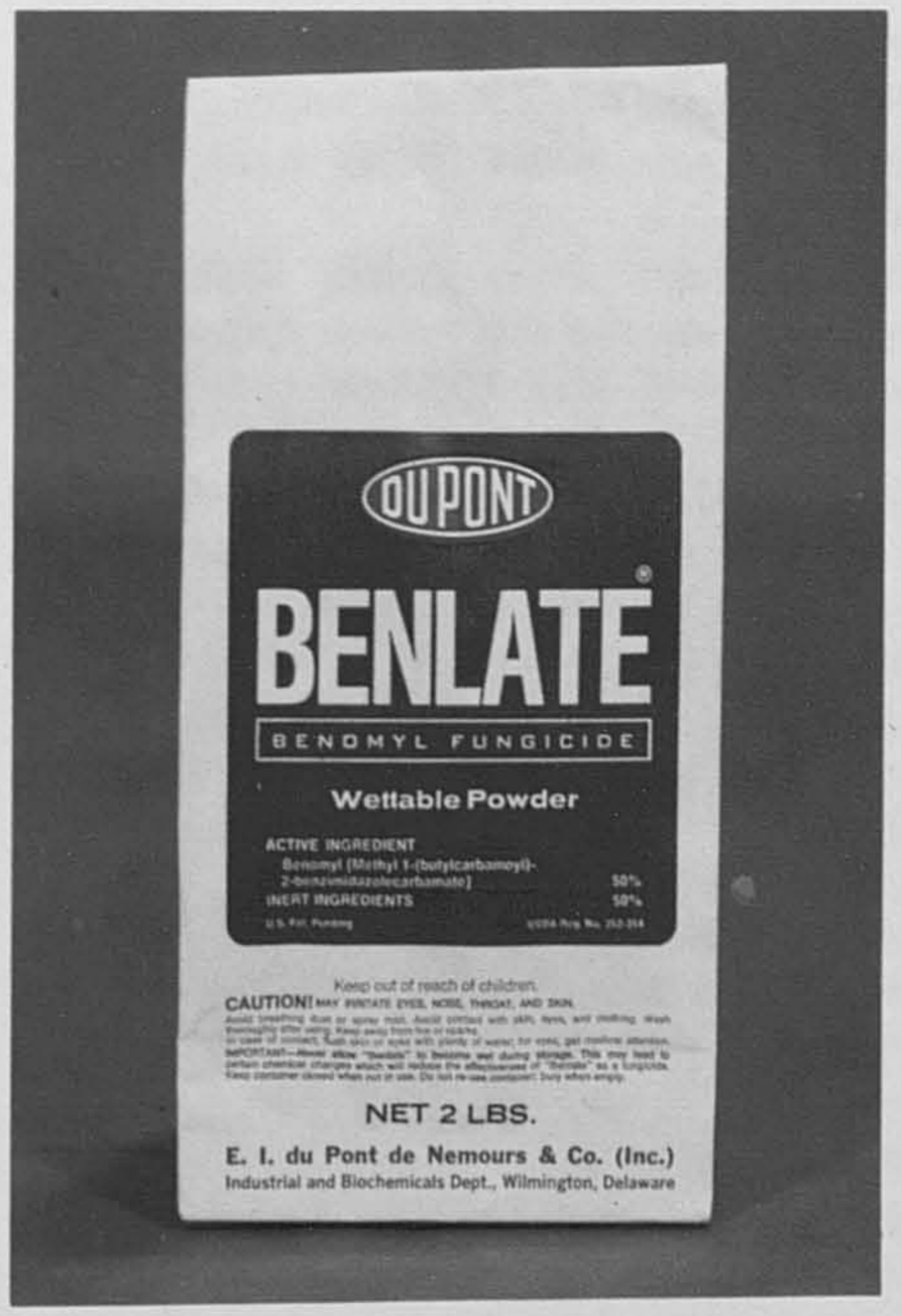
Du Pont Benlate® Benomyl Fungicide is recommended for the control of Mouldy Rot (Ceratocystis fimbriata) on rubber tree tapping panels.

HOW TO APPLY:

Apply Benlate® at 8 oz. per 80 Imperial gallons of water (6 grams in 2 gallons) either as a spray with a flat fan nozzle or with a brush at 4" above and 2" below the tapping panel.

WHEN TO APPLY:

Begin application when disease first appears on the tapping panel and repeat treatment at 7 day intervals as long as needed. Spot treatment may be necessary in case of re-infection.



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Wizards of the Rose

MAURICE MOYAL*

It takes true poets, endowed with vision and intuition, to present the world with worthwhile novel varieties of plants, whose flowers or fruit show vast improvements over the ones yielded by earlier strains. And speak of dogged perseverance!

Of course, since the good Austrian monk Johann Gregor Mendel discovered some 95 years ago the genetics law that bears his name, the work of the hybridist has been rendered somewhat easier. But, despite all genetics and chromosome tables, he has to pray for Lady Luck to take a big hand.

His main difficulties stem from the fact that he seeks to influence things so tiny that nobody has ever been able to examine them closely: the inheritance-shaping genes. It would take a microscope four times as powerful as the most powerful one in existence today to see these genes. For all their invisibility, we know that they do exist, for we are confronted with their effects. This also holds true for the, as yet, invisible ultra-viruses. To genes can be ascribed the fact that the main traits of man, animals and plants are transmitted from generation to generation.

Every living organism is made up of cells. Each cell has a nucleus and, inside this nucleus, are minute thread-like structures, the chromosomes. These chromosomes are matched in pairs, the number of which may vary between varieties belonging to the same species. The important genes the hybridist is out to pin down stretch like beads on a string in the chromosome. We know that each of these genes influences a particular trait in the next generation—but which shapes what?

Plants breed true, but the parental strains brought together in a new strain must be near blood relatives, so as to pass readily to their offspring the favourable traits the hybridist is out to enhance.

Let us take a concrete example: the Meillands, a grandfather-father-son team (breeders also breed true!) have been endeavouring for the past 30 years to develop the true-blue rose, which has been haunting the dreams of hybridists ever since the turn of the 19th century. Starting from certain bi-colour roses such as 'Ampère' and 'Fantasque', at once yellow and deep violet red, grandfather Antoine succeeded in building into 'Prélude' (their progeny) a deep Parma violet. After him, son Francis, and now grandson Allain, have been trying to turn that violet into blue through an oxidising process.

A very gradual change in colour has been obtained through crossing parent-strains of the same colours; whereas the mother-variety transmits to its progeny the shape and size of its blooms, the male-parent, the pollen-giver, controls the colour scheme.

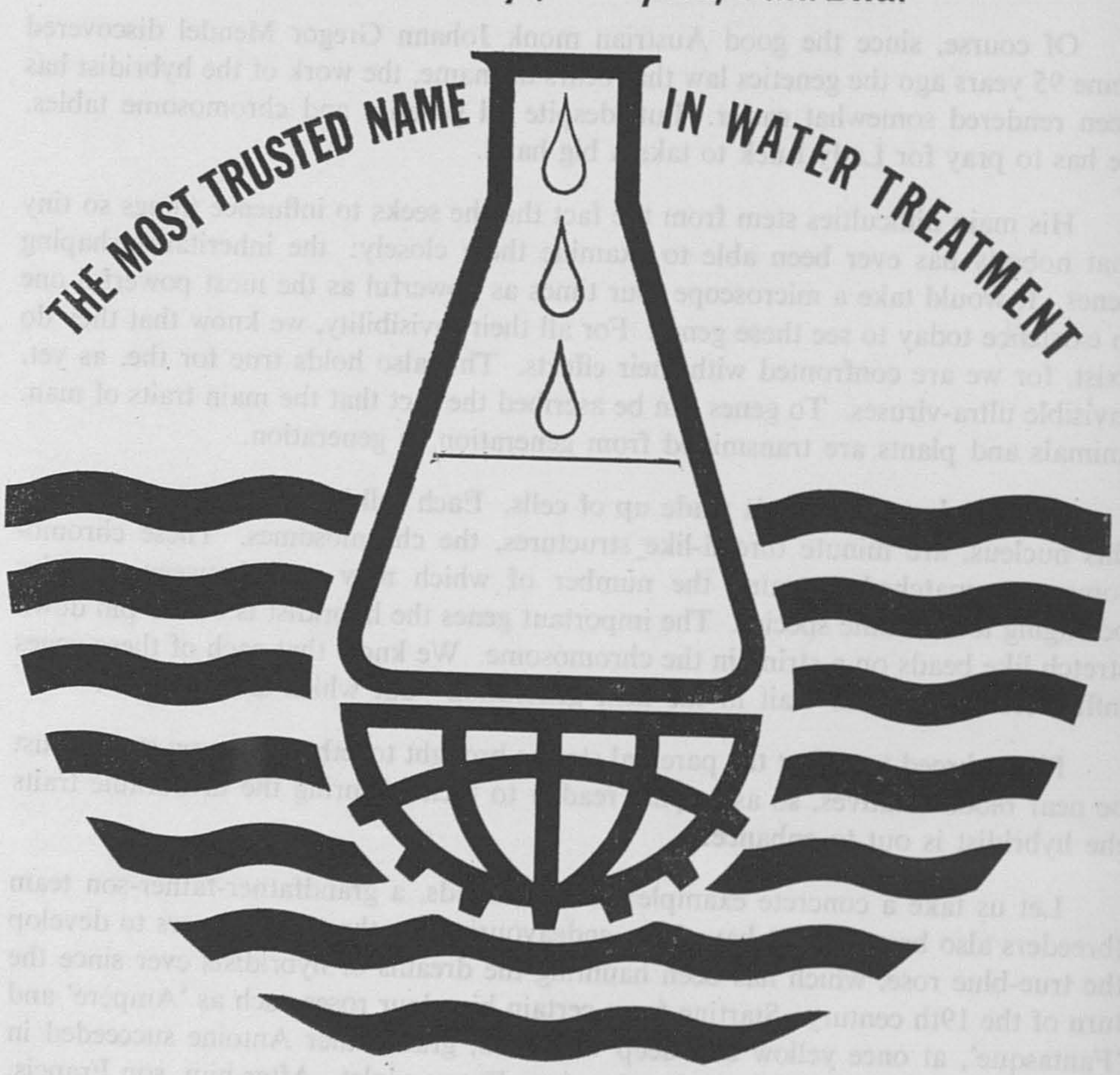
Besides the above traits, many genes influence floriferousness, hardihood, weather-resistance, freedom from diseases and pests, scent, etc; but not all such desirable traits can be transmitted as the result of a single cross. To overcome that

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* *See* THE MONTHLY CROP, page 227.

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hurdle, the Meillands have been resorting to a system known as 'back-crossing'. After picking up the more violet progeny, they cross it many times over to the parent selected earlier for its violet colour. They simultaneously cultivate a back-cross to the early parent with the better-shaped blooms. After securing the maximum of genes controlling colour on the one hand, and shape on the other, Allain will eventually mix the genes of both parental strains so as to get into the end-product as many genes as possible governing both features.

Although beautifully simple in theory, Allain reckons that it will actually take him years to develop the true-blue rose. Many stumbling blocks exist along his path; chief ones stem from the fact that genes have a way of clinging together in peculiar clusters.

A cluster may well include genes favourable from the colour view-point, but also some undesirable character, responsible, for example, for misshapen flowers. This particular gene-linkage must be broken down to eliminate this adverse factor. It will take hundreds, perhaps thousands, of further cross-pollinations to achieve this. But these perverse genes may well have recombined in the process in another linkage, impairing floriferousness, or weather-resistance, or mildew-hardihood, and so on. Lady Luck takes a big hand in eliminating adverse inheritance-shaping genes in these clusters and, at each very gradual change in hue, the whole show must have a repeat performance!

It is thus no wonder that a novel variety of rose showing definite improvements over its predecessors should, on average, come in a ratio of only 1: 16,666. Thus, the hybridists' is a labour of love and dogged perseverance, often spanning several generations.

Right now, experiments in the U.S.A., Britain, France and Sweden are seeking to reduce the large role played by Lady Luck through the application of X-rays under various temperatures and pressures. It has also been found that pre-treatment with different concentrations of oxygen may well influence the response to irradiations. It has also turned out that the effects of these irradiations are not essentially different from those produced by an atomic bomb, already responsible for the emergence of freaks among the progeny of affected people in Hiroshima and Nagasaki in Japan. In fact, the use of X-rays has already produced some choice plant monsters through doubling, trebling or quadrupling the number of their chromosomes.

Through bombarding tulips with gamma-rays, British nuclear physicists have brought them back to the original wild state of their forebears one thousand years ago. On the credit side, the Swedes have developed through the application of X-rays a novel strain of much hardier barley, yielding three times as much as the most prolific variety previously in existence.

Some measures of control could perhaps be devised over the nowadays unpredictable effects of X-ray applications and gamma-ray bombardment. It seems as though we may probe the secrets of nature, but not beyond certain limits. Have these limits already been reached?

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The monthly crop

Dr Maurice Moyal who writes on page 225 about the never-ending search for the truly blue rose, lives in Marseilles and is a veteran French-born writer on natural history and farming. He is reputed to own one of the most extensive farming and horticultural libraries in southern France, and is the author of an award-winning book *On the road to pastures new**.

Advances with Natural Rubber for Engineering and Transport is to be the subject of a two-day conference organised by the Natural Rubber Producers' Research Association. This is the third conference for experts from all over the world to be staged by the NRPRA and will be held at the Imperial College of Science and Technology in South Kensington—part of London University—on 29th–30th March next year. The latest developments in the compounding, testing and performance of NR in civil and mechanical engineering and in tyres will be described and discussed. Papers will be given by international experts, including several of the NRPRA staff.

Eleven million motorcars have been recalled by U.S. manufacturers in the past 12 months for what are described as "repairs". Ever since Mr Ralph Nader damned General Motors' Corvair in 1960, car makers have lived in dread of his censures—it was Volkswagen's turn last year. Now however, a report by the U.S. Department of Transportation claims that the Corvair was at least as stable as other cars of the same period, and as a further sweetener for the industry there is an unconfirmed rumour that Mr Nader's own time may have come, and that he is to be returned to his mother for essential modifications.

The world's endangered plant species are being listed in a data book jointly prepared by the International Union for Conservation of Nature, the World Wildlife Fund and Britain's Royal Society. The urgency is created by the threat to about one in every ten known plant species, which means that about 20 000 species face extinction. The reasons given include population explosion, bad land management, technological development and new uses of plants as the source of medicines or chemicals. The data book is being edited by Dr Ronald Melville, formerly a senior scientific officer at the Royal Botanic Gardens at Kew.

How would you like your rain? With the present pre-occupation with the lack of it in these parts, it is interesting to read last month, in Dr Wycherley's paper on Climate, that Kuala Lumpur once had 2 inches of rain in 15 minutes, the most intense rainstorm ever recorded in Malaya. A more "leisurely" precipitation of 24 inches in 24 hours has been recorded near Kuantan. Even so it is difficult for Malaysians to appreciate the total misery recently inflicted on the island of Luzon

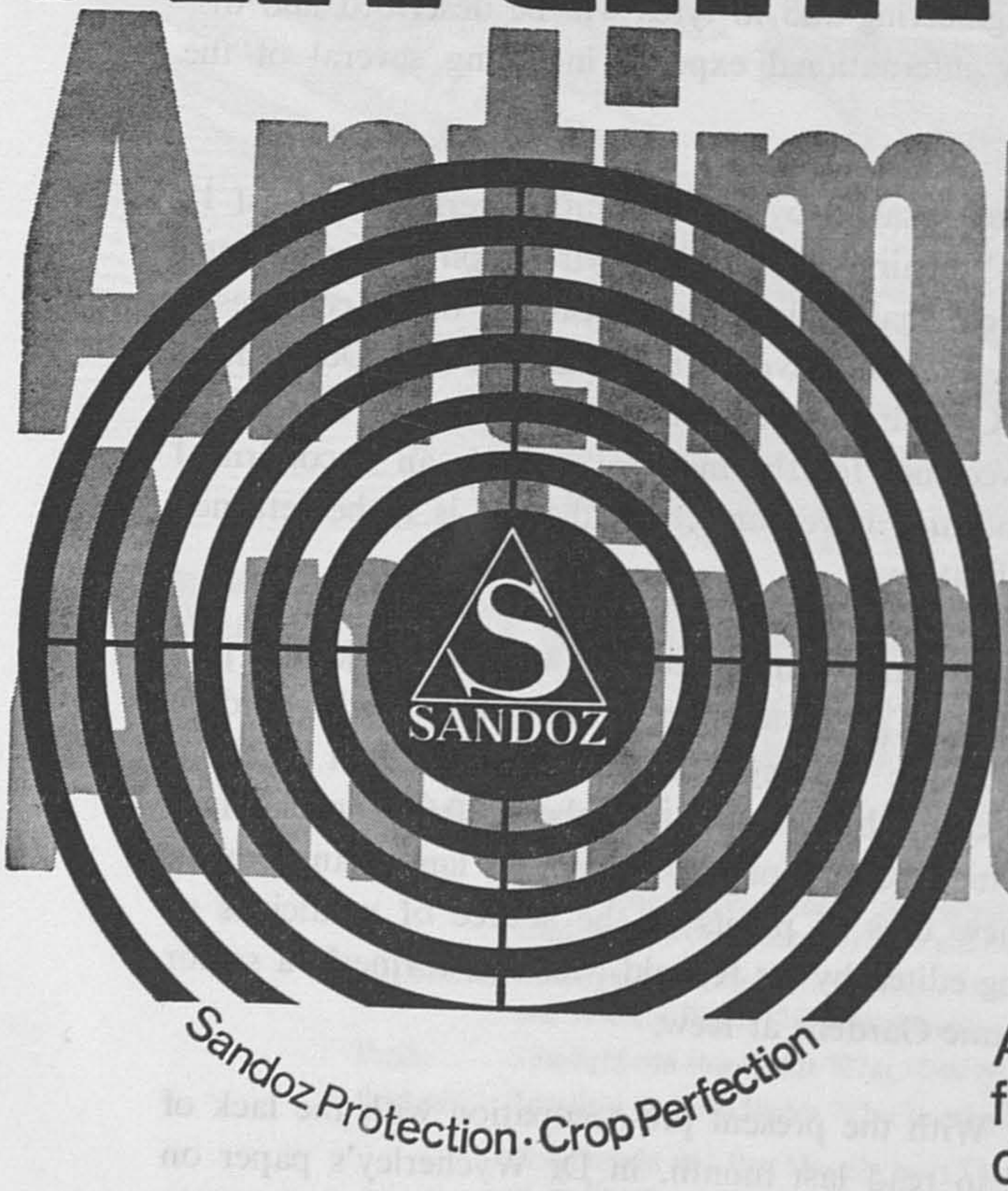
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* Phoenix Press, London. £1.25.

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in the Philippines, where much of the country's development is concentrated and where the capital is located. A deluge of 176 inches of water fell on the island in 30 days. One million acres of rice have been destroyed, and 30% of the sugar crop.

Breakfasts on British Railways are described by Lord Mancroft, writing in *Punch*, as "excellent", "though they do" he says, "occasionally serve up the piece of cod that passeth all understanding."

The President and Council of the Royal Society have bestowed the Royal Society Mullard Award for 1972 on Dr W. R. Boon, joint managing director of Plant Protection Ltd, Fernhurst, Haslemere, Surrey, in recognition of the outstanding role he has played in the discovery and development of the dipyridyl herbicides (diquat and paraquat) the introduction of which is having important consequences for agriculture throughout the world. By their use some of the traditional steps in cultivation, for example, ploughing, can often be eliminated. They also permit weed control without disturbance to the roots of the crop plant, and the establishment of crops where geographical conditions would not permit this by normal methods. On a smaller scale, they have markedly lessened the task of weed control for the ordinary domestic gardener. Both herbicides are rendered inactive virtually instantaneously in soil and are then degraded, thus avoiding any build up in the soil or transmission to forms of life for which they are not intended.

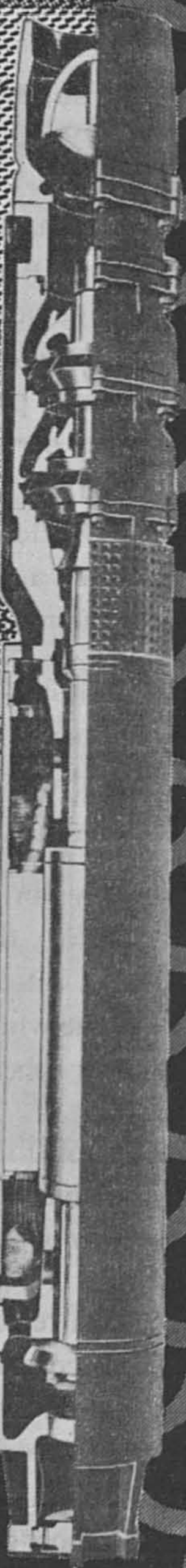
The Award which was instituted in 1967 will be presented by the President at the Anniversary Meeting of the Royal Society on 30 November 1972. The Award consists of a gold medal and a prize of £1000 provided by a gift being made by the board of directors of Mullard Ltd.

The Award is to be made annually for an outstanding contribution to the advance of science, engineering or technology that in the preceding ten years has led directly to national prosperity in the United Kingdom; with emphasis on the application of science and technology to the whole range of manufacturing industries, including those based on agricultural and other biological processes of production.

And now you know. "Speaking for myself first, then the Treasury, I do not think any public revelations of what we did or did not do would not hurt us." (Malaysia's Minister of Finance reported in *The Straits Times*, 12 August.)

Are these animals really protected? asks a recent news letter of the Selangor Branch of the Malayan Nature Society. Their correspondent reports that visitors to the Industrial Expo '72 at Petaling Jaya will be dismayed to see, among other mounted and stuffed species, a clouded leopard (*Neofelis nebulosa*), several sea eagles, and many other birds of prey for sale. Although the shooting of sea eagles and clouded leopards is prohibited, their sale and import are apparently not. Law enforcement would greatly be simplified if both the import and sale of protected species were banned.

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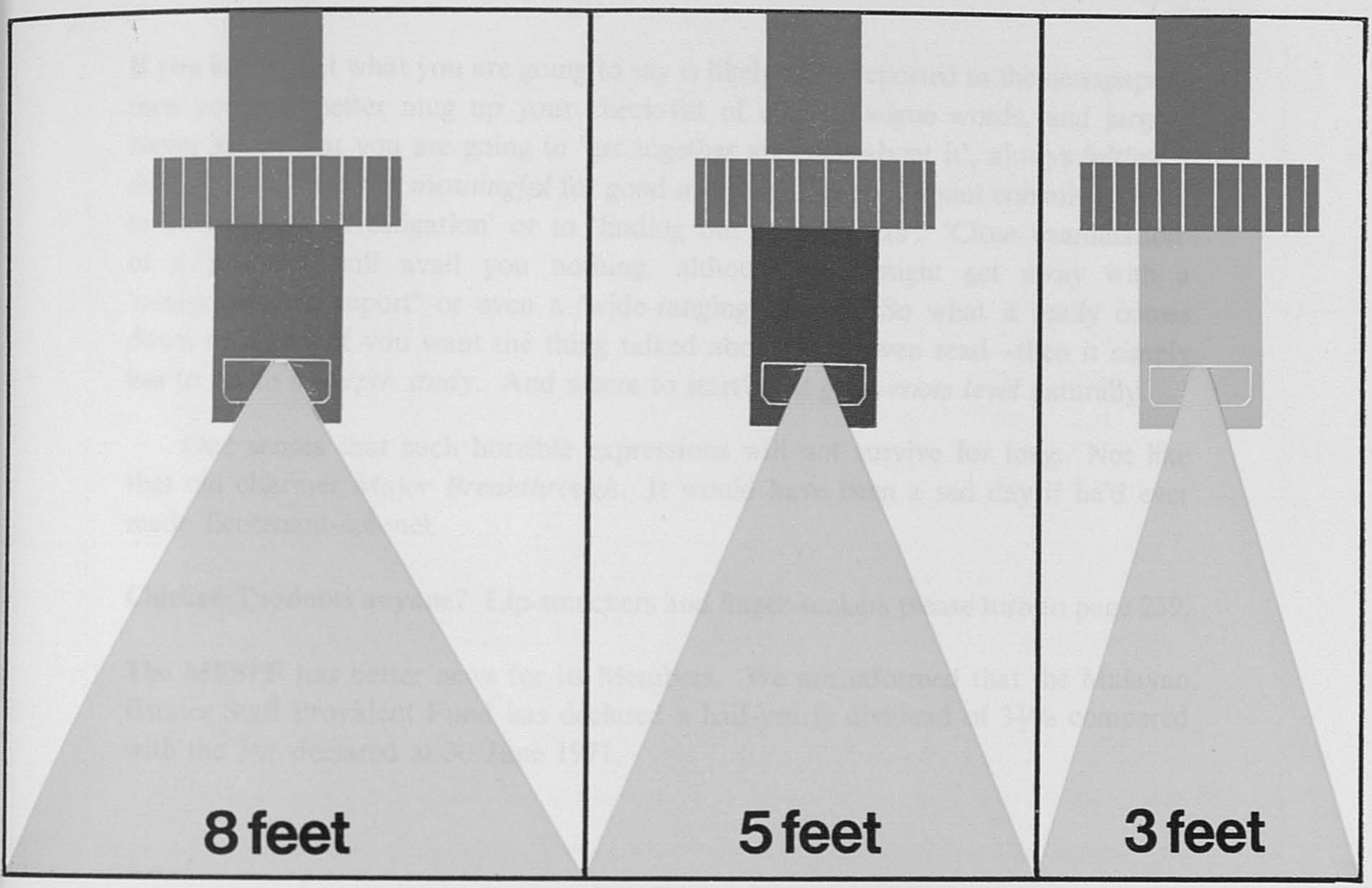
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If you know that what you are going to say is likely to be reported in the newspapers, then you had better mug up your check-list of clichés, vogue words, and jargon. Never assert that you are going to 'get together and talk about it', always *initiate* a *dialogue* and throw in *meaningful* for good measure. On no account commit yourself to a 'thorough investigation' or to 'finding out all the facts'. 'Close examination' of a problem will avail you nothing, although you might get away with a 'comprehensive report' or even a 'wide-ranging survey'. So what it really comes down to is that if you want the thing talked about—and even read—then it simply has to be an *in-depth study*. And where to start?—at *grass-roots level* naturally.

One senses that such horrible expressions will not survive for long. Not like that old charmer *Major Breakthrough*. It would have been a sad day if he'd ever made lieutenant-colonel.

Chicken Tandoori anyone? Lip-smackers and finger-suckers please turn to page 239.

The MESPF has better news for its Members. We are informed that the Malayan Estates Staff Provident Fund has declared a half-yearly dividend of 3½% compared with the 3% declared at 30 June 1971.

APPOINTMENTS VACANT

The Government of Indonesia is looking for three Executive Assistants for appointment to their Perusahaan Negara Perkebunan 10 (PNP X).

Appointments are for a minimum of 3 years and may be extended as deemed necessary by the PNP X and IDA. The Executive Assistants would be in charge of their particular departments and be directly and solely responsible to the First Director.

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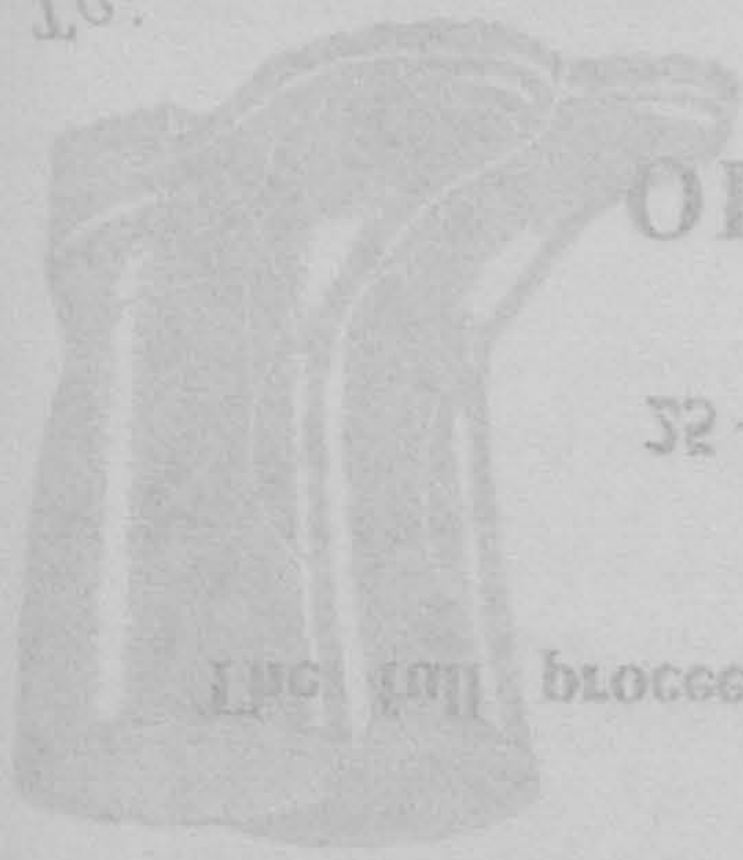
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Making conferences successful

The title is that of an article which appeared in *Nature*, to which journal we are indebted, in March of this year. Written by Mr John Wright, of the Directorate of Overseas Surveys, United Kingdom, the article was inspired by the most recent 4-yearly Commonwealth Survey Officers' Conference. Mr Wright discussed the many features which contributed to the success of this conference and which could with advantage be adopted by others. He has kindly agreed to our quoting at length from his article.

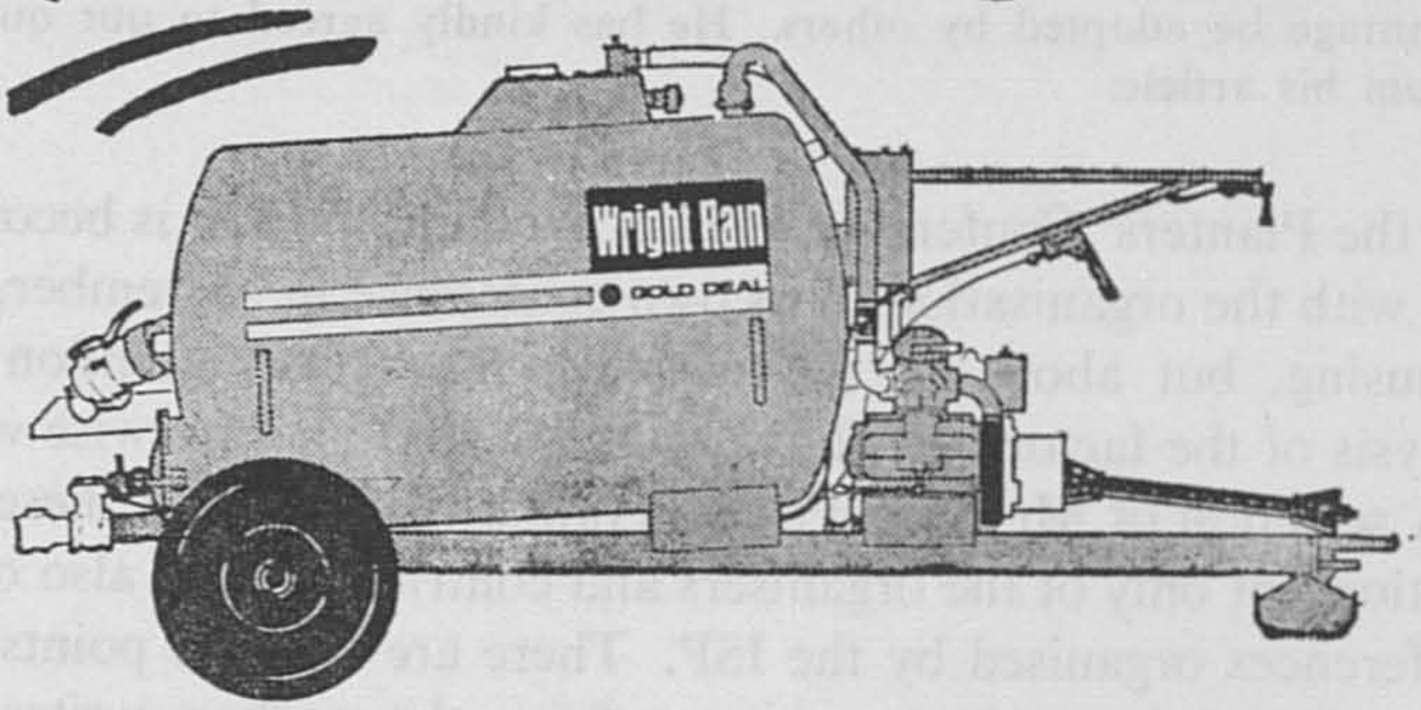
Now that the Planters' Conference 1972 is over and the ISP is becoming increasingly involved with the organisation of its own conference in November, it is interesting, often amusing, but above all instructive to pay close attention to this very thorough analysis of the factors which can make or mar an otherwise well-conceived conference. A selection of Mr Wright's observations follows, and these are intended for the edification not only of the organisers and contributors but also of participants attending conferences organised by the ISP. There are obvious points of difference between our conferences and the super affairs the author writes about, (*e.g.* participants being selected by invitation with no payment of registration fees!) but to maintain the flow of narrative we have not excised these.

"At a recent United Nations Cartographic Conference in Tehran a number of measures, like limiting speakers' time, were introduced and a resolution proposing somewhat similar procedures for submitting papers was proposed and carried unanimously."

"The Commonwealth Survey Officers' Conference (to give it its full title) has three advantages over many international and even some other Commonwealth conferences. The first is that only one language is used, which cuts out microphones and interpreters. The second is that there has been continuity of organization, in that the conference has so far always been held in Britain and has not been peripatetic with all that this involves for a new team taking the task on every time and having to learn all the lessons afresh. The third is that because no registration fee is charged there can be some selection in the invitations and the size of the conference can be kept down—again cutting out microphones. The Greeks had a point when they insisted on limiting their assemblies to those which could be addressed by one man."

"Because the most important members—those from Commonwealth departments—are normally the directors or assistant directors, they are interested in all the subjects discussed, and so there is never any splitting up into specialized commissions which is bad for any conference and fatal to a small one. Not only does it prevent something very real—the growth of the conference's own identity (and every body of people develops this) but it starves each specialized session of most of those gifted people in any conference who are able to make a contribution on any branch of the subject. There are usually only a score or so of these and they tend to carry the bulk of all the discussion between them. Split them up and the discussions are diluted."

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"The most important components of any conference are the members. We seem to get a good mix of the practical, both government and commercial, and the academic; and although the host country is bound to provide most of the membership, the various British organizations try to send a nucleus of people who will stay long enough to provide continuity and not to send too many different representatives each day just because they are the experts on the subjects being discussed on that day. The chances are then that these are either too junior or too inexperienced to open their mouths and so become simply part of the audience—and this should not be overdone because all members are invited for what they can contribute and not what they will get out of it; nor should the discussions be too abstruse or specialized. Fortunately the hard core and full-time attenders of the conference are fairly senior members of home and overseas organizations who will give short shrift to inaudible or incomprehensible talk."

"One of the most essential procedures of the conference is to get almost all the papers in, print them, and circulate them to all conference members before the conference starts. This means not only that the members can be taken to have read them (and are soon silenced in the conference if they obviously have not) but that heads of departments have had time to consult their specialists and get their views on the more abstruse papers."

"Then comes the actual discussion procedure. *No author at this conference has ever had the temerity to read his paper in full since the Second World War; he would soon be shouted down by the other members if he did.** The authors of the three to five papers being discussed at any one session form a panel with a separate chairman (chosen for his personality and knowledge of the subject much more than for international or political reasons) and in general their introductions (an outline of the chief points or an updating of the information) are limited to ten minutes each, which takes the session up to a tea or coffee break, giving the whole of the second half of a morning or afternoon session for discussion.

With one exception since 1955 the conference has been held in a big lecture theatre holding about 200 people. The exception—in the Leys School theatre in Cambridge in 1967 with the panel on the stage—was a less successful event than usual. It seems probable that authors of papers easily get too big for their boots and it is much better for them to look up to their audience rather than down. Also, because a crick in the neck is very tiring, the audience are less likely to go to sleep if they are looking down; but few authors of papers go to sleep while actually presenting them. Sitting on the sort of high altar flanked by masses of flowers and national flags favoured by international congresses, together with the discreet attendance of beautiful acolytes, gives speakers and chairmen altogether too great a feeling of their own importance. Moreover the bowl effect of a lecture theatre and the fact that everyone can be heard without using microphones speeds up the procedure (and encourages the occasional wisecrack) because it means that in discussion speakers do not have to come up to the front. The wise conference

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* Emphasis ours.—*Ed.*

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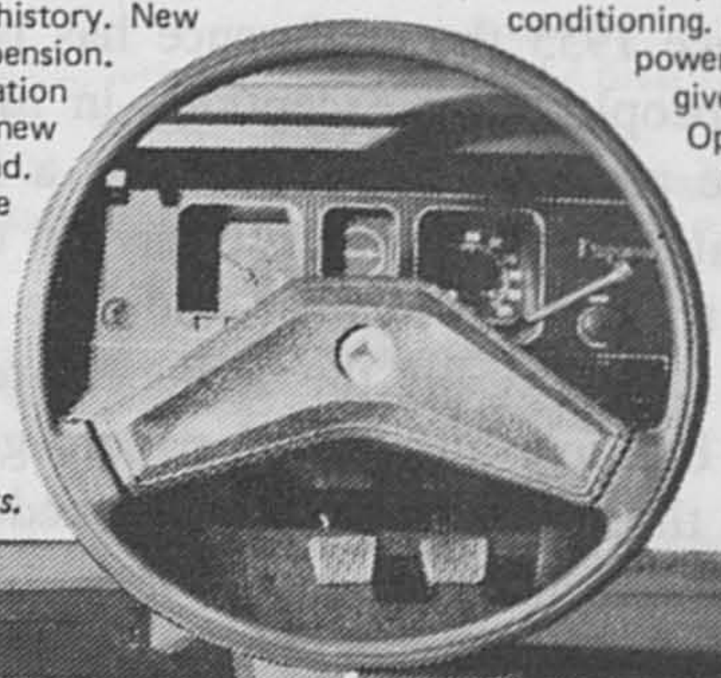


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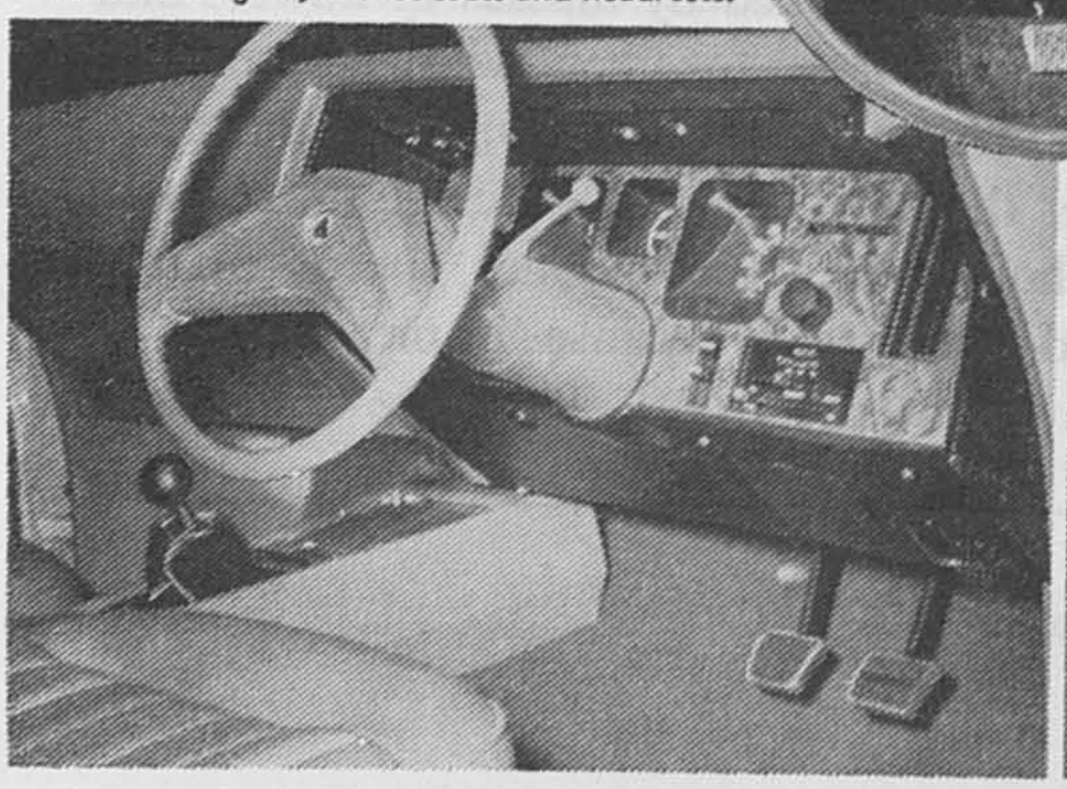
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member who is going to join in the discussion secures a seat at the side of the hall so that at least he has his back to the wall!

The record of the discussions is just as important as the papers themselves (if not more so), and it seems a pity that many excellent conferences should be content to publish proceedings which consist of the papers and a series of pictures of delegates in funny hats but no record of the discussions. In the Commonwealth Survey Conference the discussion is taken down almost verbatim but immediate editing by the speakers concerned is allowed and a final distillation is done by the rapporteurs and editors; this process reduces the discussion by a third or more without eliminating the important points or losing the atmosphere of cut and thrust which is an essential part of a good debate.

Those responsible for organizing the first post-war conference in 1947 still remember with horror the attempt to record the discussion by tape recorder and leave the transcription until after the end of the conference. By the time the transcript had been made all the members had dispersed—all over the world. They were sent the record of what they had said and with one accord so modified this that it made nonsense of comments made by speakers later in the discussion. So the technical secretary was involved in an immense, lengthy and acrimonious correspondence with surveyors all over the Commonwealth before he finally got an agreed version some three years later which could then be printed, only just in time for the next conference.

There can only be two procedures—either tape record, edit and publish and damn the consequences, or get a draft out within a few hours, pass each speaker his section and insist on getting it back within twenty-four hours. The Commonwealth Survey Conference prefers the last of these procedures and uses a tape recorder and a team of stenographers and rapporteurs (selected conference members) whose job it is to achieve this; it works on the whole. If speaker A makes an error that he would rather forget and speaker B makes capital out of it, they are put together and asked to iron it out so that the record reads consistently. What a man says is often less important than what he meant to say, and certainly less readable than what he would have said with more time to prepare it; so in this way one gets the best of both worlds in an accurate, readable, and reasonable concise record of the interchange of ideas which is after all what a discussion is meant to be.

Your correspondent rightly criticizes the normal kind of conference label, which is usually typed and can therefore only be read by another delegate looking at it so obviously that he might as well ask the name outright and have done with it. Such labels are quite useless for finding someone whose name one knows but not his or her appearance. Of course typed labels are the easiest but this conference went over to stencilled ones—with letters about 6 mm high—in 1963 and are now using 'Dymotape' (in the larger size). Two benefits were expected, but only one was evident in practice. In cases in which a delegate in the heat of the discussion forgot to give his name (and the chairman forgot to remind him), the rapporteur could read it with the aid of binoculars. The other benefit hoped for was that, using a low power microscope, the secretary would be able to read the names of an enlargement of the

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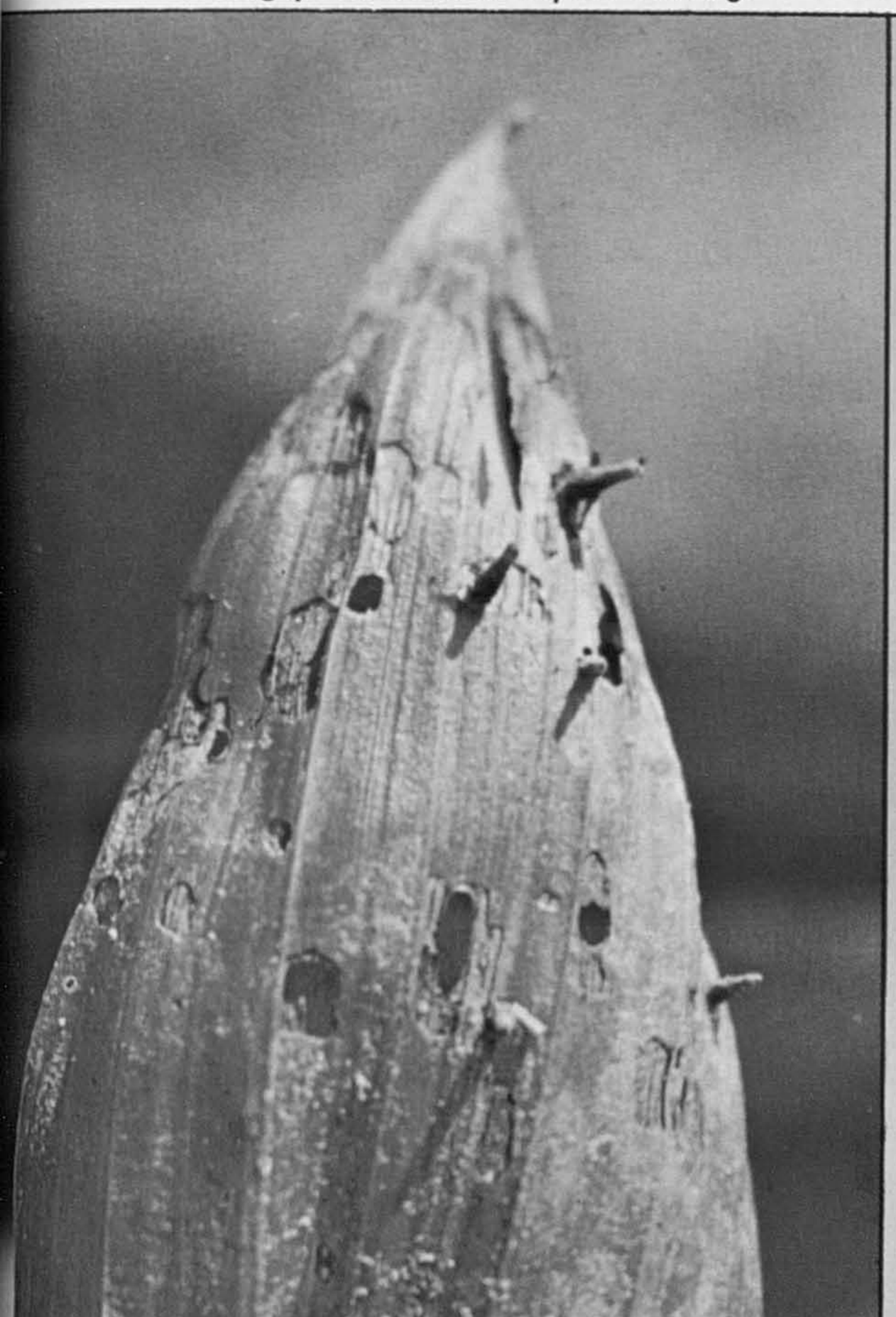
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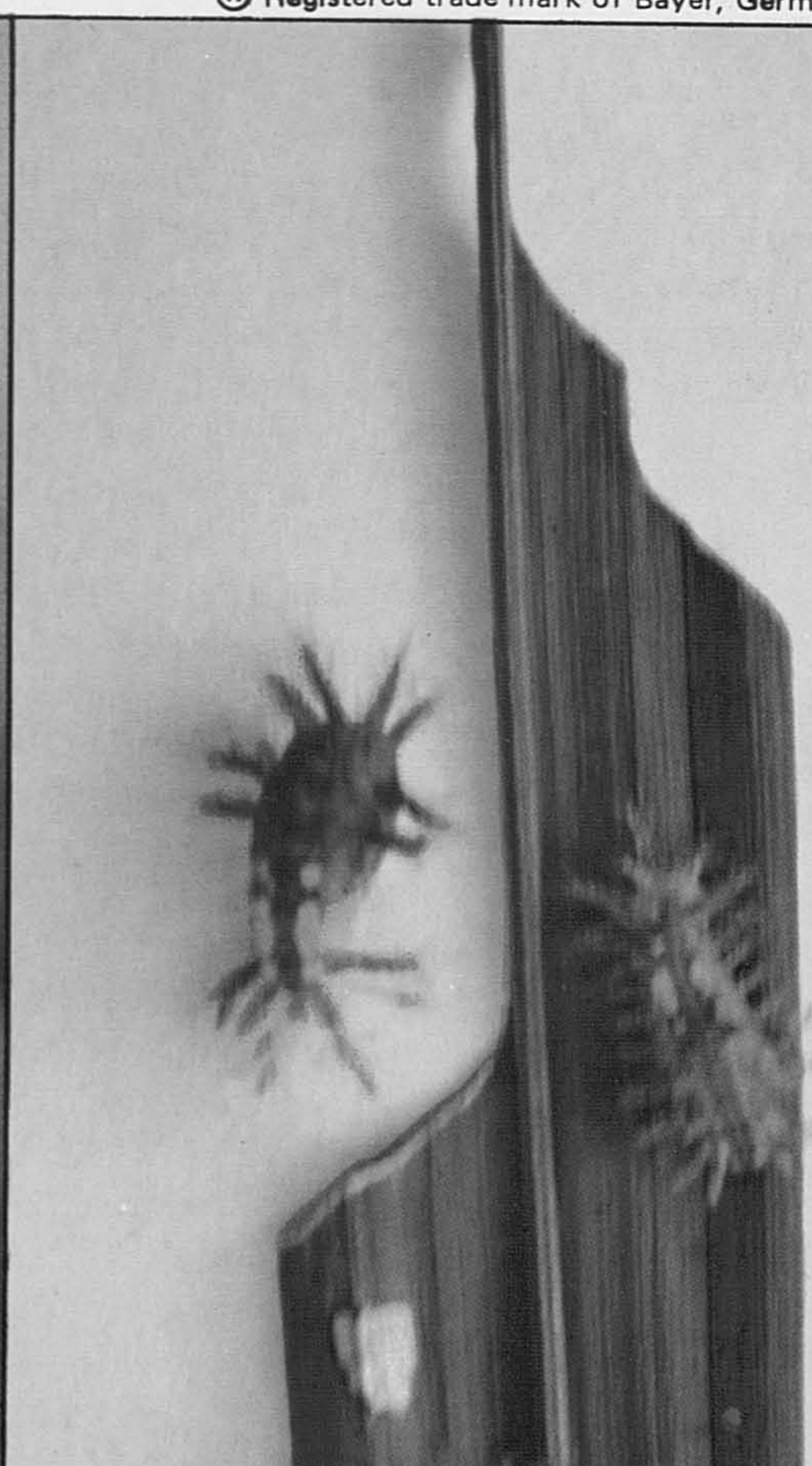


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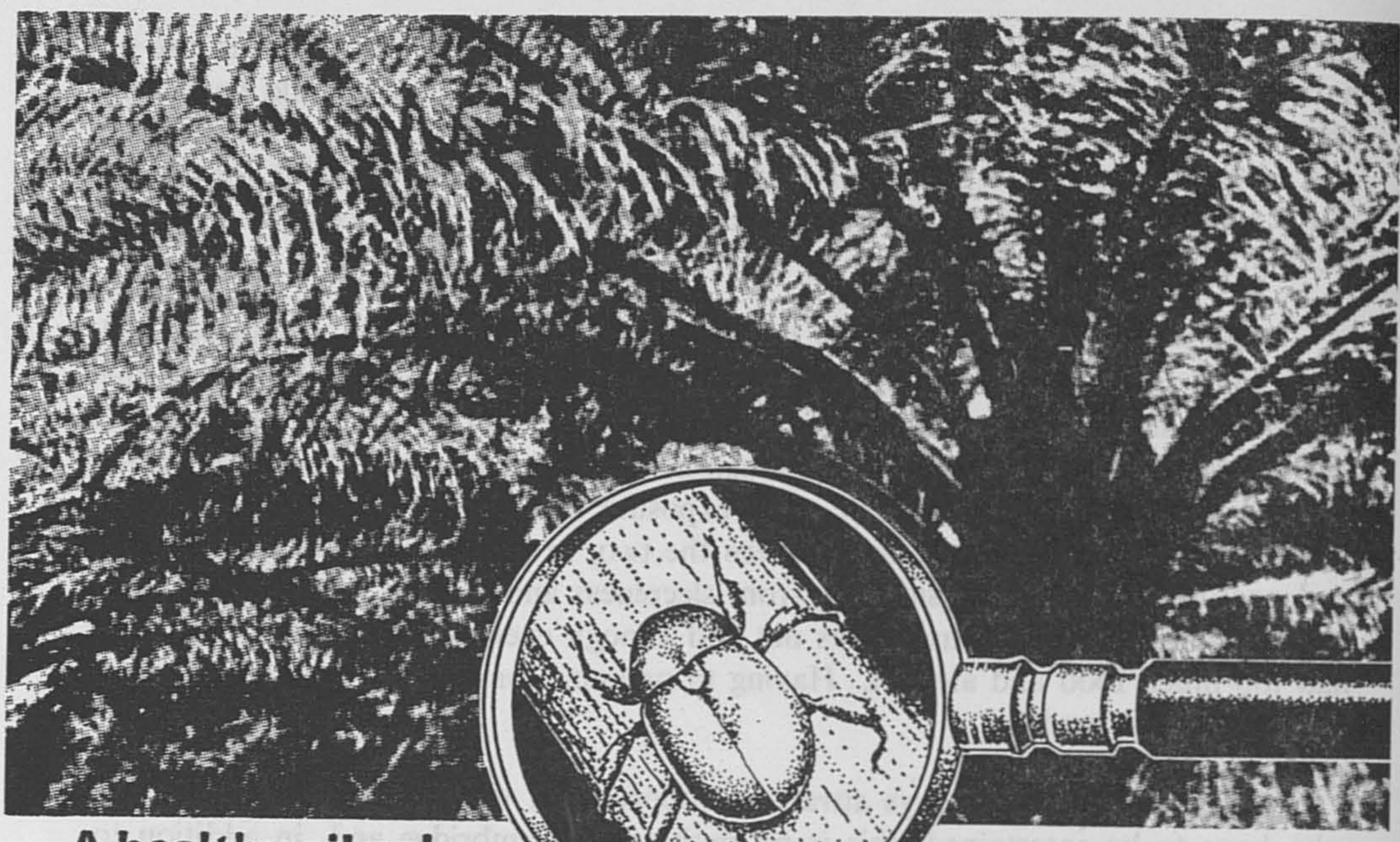


conference photograph and thus compile a key to it. This did not work because of halation by the white label background into the lettering; the labels could be clearly seen but the lettering had completely disappeared. The secretary had therefore to rely on a combination of personal knowledge, chasing up and and asking the names of (or reading the labels of) the few people he did not recognize; once again a simple technique worked best."

"Many symposia have realized the value of using universities or colleges and hold their meetings in similar surroundings, but there are dangers in having the conference hall and the accomodation all under one roof or organizing buses to move delegates between the two. Although in theory this is more efficient and saves the delegates the time and trouble—and exposure to rain and wind—of organizing for themselves four moves a day between the two, in fact it makes things too easy and one gets a conference suffering from sleepiness and—in the later stages—from indigestion and liver because it has not had enough exercise and fresh air and has had too much food and alcohol. Having to organize some things themselves keeps delegates awake and fit.

All conferences nowadays attract a proportion of wives and other dependents who have to be entertained; this is no problem in Cambridge and, in addition to short tours of colleges, one or two all day visits or tours are organized for them together with a popular evening lecture or two on subjects allied to the conference—polar and space travel, building big dams, oil exploration and the like. The RICS and the Government organize receptions before and after the conference, and the instrument makers exhibiting their products give a formal party and several informal (but much more deadly) affairs to selected potential customers. But even with all this it seems unlikely that many of the Commonwealth Survey Conference members would repeat that remark often heard after other conferences: "Of course the sessions were hopeless but one made a lot of useful contacts outside". If a conference cannot do better than that it should not be held.

It would seem that the elements of a successful conference or symposium in order of importance are selection and pre-circulation of papers, one language (if possible), limited numbers (and some selection of members), well planned accommodation outside the capital, sensible recording arrangements, good chairmen and enough, but not too much, opportunity for informal discussion. Given the will and a good lead by its secretary and by a few of the more experienced members, even an international conference could achieve these if it wanted to, and there are signs that this is beginning to happen."



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Thirty-fourth Annual Report of the NRPRA

The two excerpts which follow are taken, with acknowledgements to the Natural Rubber Producers' Research Association, from the Report of their Director of Research for 1971.

"The low price of rubber has inevitably had a major influence on the Association's activities during the year. We have taken a long hard look to see which of them seem most likely, in the short term, to produce results of practical value to the Malaysian industry. This has had a number of outcomes. Outside the laboratories there has been considerable intensification of all those kinds of activity which involved *direct* dialogue with consumers. Thus, for example, all aspects of Technical Advisory Service have received extra priority; additionally we have increased our already-established practice of sending out laboratory-based staff to talk with consumers about newer developments which are ready to impact on the industrial scene. Within the laboratories there has been deliberate concentration on those development projects which seem most likely to bring more immediate returns in terms of tonnage consumption, especially those which involve 'new' consumption. Later pages of this Report will give details of some of these efforts.

The low price of natural rubber is but one aspect of what is, to put it bluntly, an international slump for *all* polymers, involving the world-wide chemical industry. Synthetic rubber producers have had to endure a savagely cold wind: there have been plant closures, production cut-backs, price discounts, and loss of profitability to the point of near disaster for some companies. Fibres have fared no better, with vast over-capacities for nylon and polyester in particular. A similar situation exists for plastics, while in the chemical industry overall there is said to be over £1 000 million-worth of plant now idle in Europe alone.

The causes of this world polymer/petrochemicals slump are many and varied, but they can be summed up simply as—miscalculation of the balance of supply and demand. It is a sobering thought that the world's largest and most prestigious companies have been unable to assess future demand with sufficient accuracy to adjust capacity growth, despite their armies of market researchers and professional soothsayers. It is an even more sobering thought that the consequences of such miscalculations bear most heavily on those people—rubber smallholders especially—who have no alternative forms of livelihood to fall back on when times are hard.

Against this background the Association is doing all it can to stimulate the consumption and to find 'new' customers and 'new' applications and is carrying out developmental work which appears necessary to seize any opportunity likely to result in direct uptake of reasonable tonnage.

In this it can claim a degree of success: we know of many situations where Malaysian natural rubber has been sold as a result of our actions and where we can be reasonably sure it would not otherwise have been. Admittedly much of the benefits that might reasonably have been expected from this activity have this year been swept away by the economic winds, but some still remain and the pay-off is steadily building up.



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PRICES ON APPLICATION

In a more optimistic vein, the long-term potential of Malaysian rubber is outstanding. Production cost decreases resulting from better trees, new production methods and features such as yield stimulation; growth in technically-specified types (the millionth ton of Standard Malaysian Rubber will be sold in July 1972); all of this plus the 'consumption research' advances accruing from the Association's longer-term work adds up to growth, not decline. It is heartening to see implicit recognition of this in the Second Malaysia Plan and in the continued determination of Malaysian producers, smallholders and estates, to enlarge and to strengthen their industry."

Yield stimulation

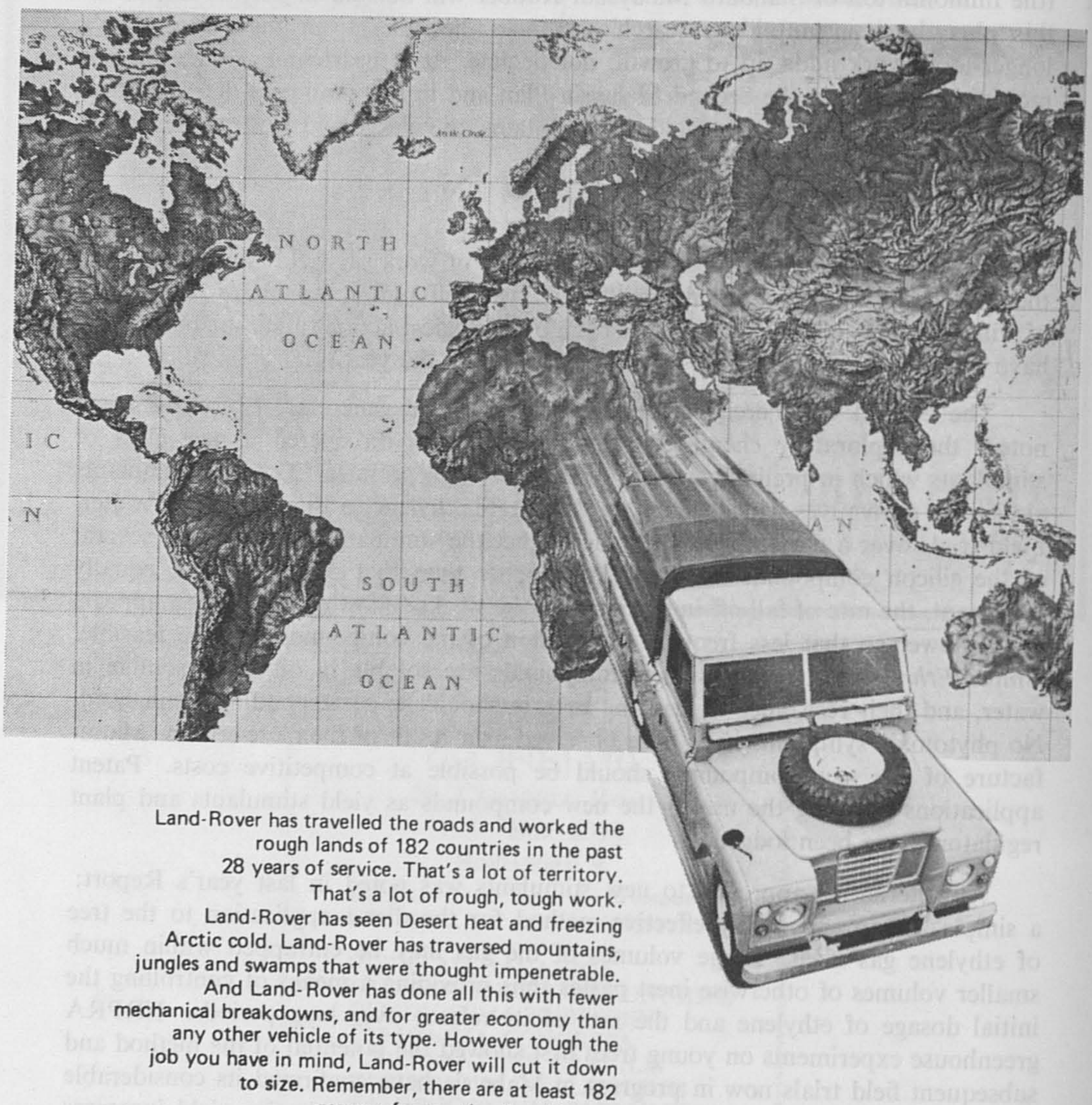
"The Association's co-operative programme of work on yield stimulation with the RRIM is now operating on three fronts: two different approaches to new types of stimulant plus continued probing of the physiological action of stimulants. There have been important advances with all three during the year.

The current commercial stimulant is an ethylene generator, *Ethrel*. As just noted, the exploratory chemistry team have recently discovered a new class of stimulants which in preliminary field trials show high promise. The new stimulants are silicon derivatives which, like *Ethrel*, liberate ethylene in the presence of water. Field trials over a 6-month period indicate that the stimulation efficiency of several of the silicon compounds is significantly higher than that of *Ethrel* and, equally important, the rate of fall-off in efficiency in the weeks following application appears to be slower so that less frequent application of the compounds may be feasible. Unlike *Ethrel*, most of the silicon compounds are soluble in oil but insoluble in water, and their resistance to leaching by rain should be correspondingly enhanced. No phytotoxic symptoms have been observed as a result of their use so far. Manufacture of the new compounds should be possible at competitive costs. Patent applications covering the use of the new compounds as yield stimulants and plant regulators have been lodged.

An alternative approach to new stimulants was noted in last year's Report: a simple, cheap and highly effective method for the direct application to the tree of ethylene gas itself. Large volumes of the gas may be entrapped within much smaller volumes of otherwise inert pastes thus providing a means of controlling the initial dosage of ethylene and the rate of its release over long periods. NRPRA greenhouse experiments on young trees first showed the potential of the method and subsequent field trials now in progress in Malaysia have confirmed its considerable promise. In these trials, the new materials have produced superior yield increases in a direct comparison with *Ethrel*. Continuing studies indicate means by which these materials may be further improved by the inclusion of very small amounts of certain cheap and innocuous additives designed to aid bark penetration, thus obviating the need for the conventional labour-intensive procedure of bark scraping.

Both these approaches to development of new stimulants call for continued investigation of the physiological action of yield stimulants generally. Studies are being conducted of the absorption of radio-labelled *Ethrel* into the stems of seedlings, its translocation from the region of application and its rate of decomposition into ethylene within the plant tissues."

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A Tharmalingam	,,	,,
S Pathmanathan	,,	,,
Mohd Zain bin Haji Idris	(South Johore)	,,
Au Yong Siew Fah	(South Johore)	,,
R Gopala Krishnan	(Kedah/Penang)	,,

Agricultural Science Examination

Soil Section — 14 July 1972

Lim Hua Son	(Kedah/Penang)	Passed

Donations to Hostel Fund

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On leave

5409 Bolland, J F, Cairnie Hill, Goodwick, S Wales.

3491 Macpherson, D A, AISP, Glen-An, Barrhill Rd, Dalbeattie, Kirkcudbrightshire, Scotland.

4661 Reid, E D, 7 Pittodrie Place, Aberdeen, Scotland.

4551 Richmond, K A B, 2 Brockington Drive, Tupsley, Hereford, U.K.

4853 Somasundram, K R, (Senator), AMN, JP, c/o 60 Jalan Raya, Kulim, Kedah.

Returned from leave

4508 Dreyer, J, Lanchang Estate, Lanchang, Pahang.

4174 Hanson, P W, Merlimau Estate, Merlimau, Malacca.

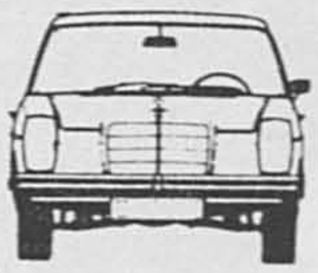
4660 McEwen, J F, BSc, (For), AISP, RRIM Station, P O Box 503, Kota Tinggi, Johore.

3809 McIntosh, W D, PJK, Kuala Ketil Estate, Kuala Ketil, Kedah.

4540 Morrison, W H, Sungei Mai Estate, P O Box 206, Mentakab, Pahang.

4587 Nielsen, C B, Jendarata Estate, Teluk Anson, Perak.

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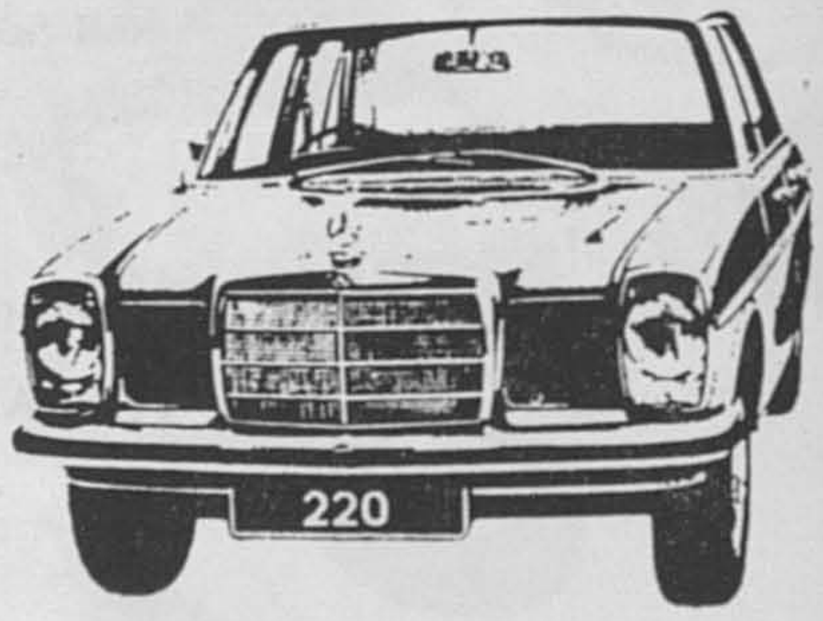
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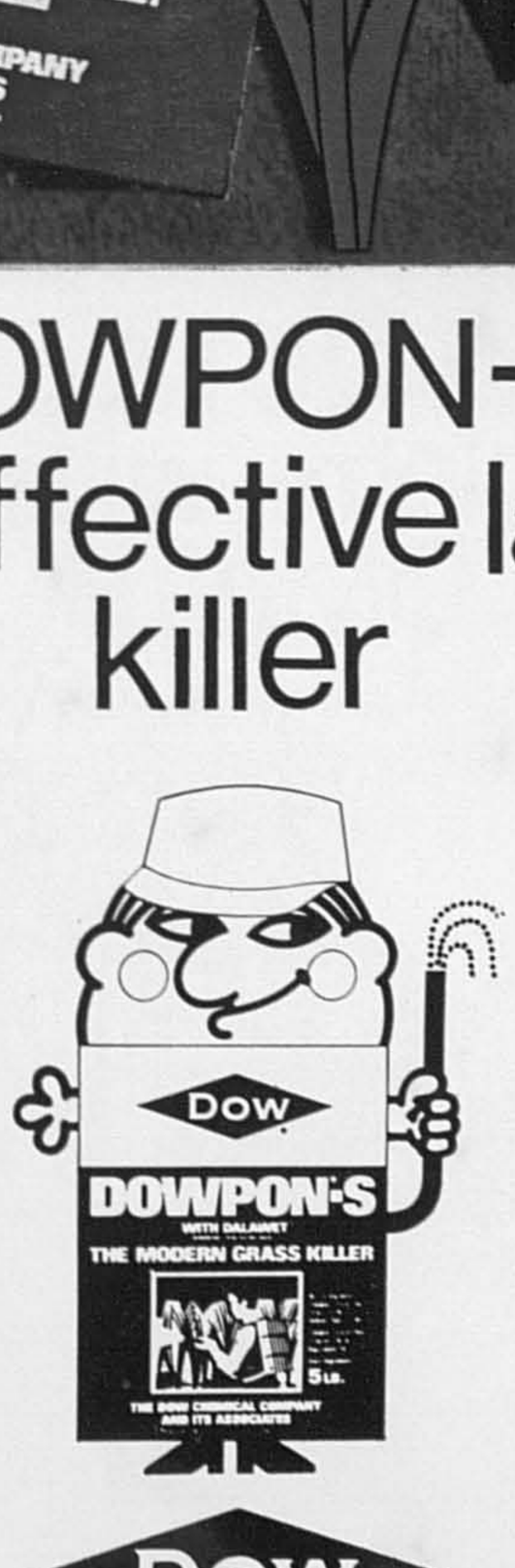
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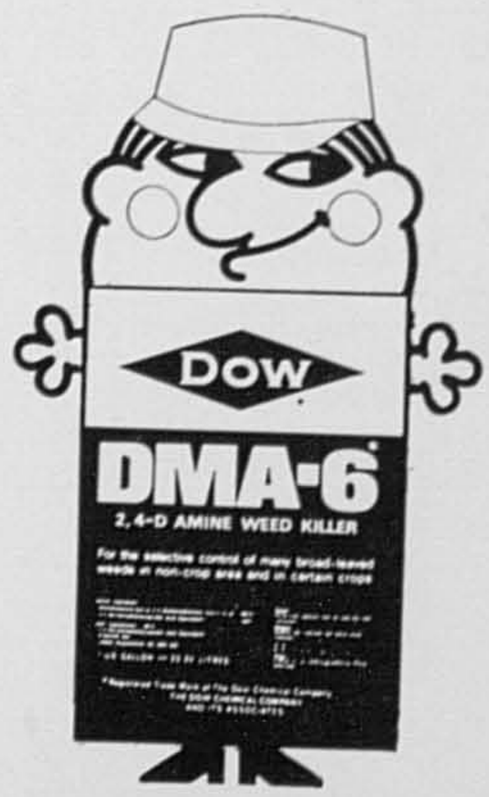


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3975 Barker, P W, 14 Ullswater, 53 Putney Hill, Putney, London SW 15, England.

5777 Cheong Kam Swee, Tanjong Malim Estate Group, Tanjong Malim, Perak.

4529 Duraimaniam, K, Ban Heng Estate, Pagoh, Muar, Johore.

5837 Goh See Hong, Pusat Latehan Tekam, P O Box 30, Temerloh, Pahang.

3623 Glennie, D A I, Wingfield House, Elborough Nurseries, Hutton, Weston-Super-Mare, Somerset, England.

5055 Ismayuddin bin Abdul Manan, Scarboro Estate, Sungei Patani, Kedah.

4742 Kwan Yin Nein, Ayer Manis Estate, Bakri, Muar, Johore.

4997 Montgomerie, J, NDA, MRAC, AISP, Diamond Jubilee Estate, Jasin, Malacca.

5490 Nair, P V, 77 Jalan Buloh Kasap, Segamat, Johore.

4543 Retnam, F, 20 Jalan Suleiman, Kajang, Selangor.

4771 Santheran, K, AISP, c/o Kumpulan Guthrie Sdn Bhd, P O Box 2516, Kuala Lumpur.

5605 Tee Hing San, 47 Kg. Abdullah, Segamat, Johore.

2989 Collier, D R L Massey, 3 High Bank, Jalan Damansara, Kuala Lumpur.

4503 Hirst, R H, BSc (Hort), c/o Trentext Co Ltd, Ave. Shah-Reza 111, Teheran, Iran.

New members

5846 Tan Boon Joo, Sagil Estate, Tangkak, Johore.

5848 Tham Seng, Sagil Estate, Tangkak, Johore.

5860 Chew Kai Pho, James, Bukit Serampang Estate, P O Box 506, Tangkak, Johore.

5872 Cheah Fook Wan, Nadefinco Berhad, P O Box 10, Kemaman, Trengganu.

5873 Hislop, J C, Tomanggong Estate, P O Box 1209, Sandakan, Sabah.

5874 Singh, Manjit, Batu Lintang Estate, Serdang, Kedah.

5875 Chai Hon Chee, c/o Rubber Research Unit, University of the West Indies, Trinidad, West Indies.

5876 Hooi Chiew Choong, Muar Itam Estate, 11th Mile Jalan Bakri, Muar, Johore.

5877 Hassan bin Haji Ahmad, Ranchangan Pemulehan Tanah Pinggir Gong, d/a Wakil Pos Kuala Krau, Temerloh, Pahang.

5878 Wong Chin Kheng, Nadefinco Berhad, P O Box 10, Kemaman, Trengganu.

5879 Lo Kwok Chiang, Pritchard, P O Box 38, Tawau, Sabah.

5880 Ong Guan Leong, Hay Estate, Layang Layang, Johore.

5881 Wong Chu Meng, CEP Estate, Layang Layang, Johore.

5882 Hashim bin Syed Abdul Rahman (Syed), Sedenak Estate, P O Box 726, Johore Bahru.

5883 Liew Ah Luk, Alex, Ace Agricultural Sdn Bhd, ¼ Mile, Kuala Pilah Road, Bahau, Negri Sembilan.

5884 Lau Kok Chin, Swee Lam Estate, Kulai, Johore.

5885 Ho Thian Hua, 48, Road 21/42, Petaling Jaya, Selangor.

5886 Chee Chuan Chai, Kamuning Estate, Sungei Siput (N), Perak.

5887 Tham Kok Choy, Nam Heng Estate, Kota Tinggi, Johore.

5889 Siow Heng Kin, Sabrang Estate, Teluk Anson, Perak.

5890 Balasingam, E J, United Raub Oil Palms Sdn Bhd, Bukit Koman, Raub, Pahang.

5891 Tang Lang Lang, Rengam Estate, P O Box 104, Rengam, Johore.

5892 McKinnon, E Edwards, PTPP London Sumatra Indonesia, P O Box 155, Medan, North Sumatra.

5893 Abdullah bin Ismail, Dow Chemical Pacific Ltd, P O Box 714, Kuala Lumpur.
5894 Abdul Talib bin Kidam, Fraser Estate, Kulai, Johore.
5895 Rosely bin Kusip, Muar River Estate, P O Box 503, Segamat, Johore.
5896 Fox, Dennis, S, c/o Mr S C Yoong, Shell Malaysia Ltd, P O Box 1027, Kuala Lumpur.
5897 Zulkifli bin Sulaiman, Guthrie Waugh (M) Sdn Bhd, 6 Jalan Jim Quee, Johore Bahru, Johore.
5898 Wong Soh Har, Guthrie Waugh (M) Sdn Bhd, 6 Jalan Jim Quee, Johore Bahru, Johore.

Rejoined

4604 Pereira, W J, Sungei Sedu Estate, Banting, Selangor.
4826 Zainal Ariffin bin Abdul Ghani, Bukit Serampang Estate, Tangkak, Johore.
4657 Simmons, M J, 4 Lorong Jelutong Kanan, Damansara Heights, Kuala Lumpur.

Life membership

4096 Martin, W S, Hope Cottage, Muirhouses, Bo'ness, West Lothian, Scotland.
4688 Pichaymuthu, A, 122 Kajang Gardens, Kajang, Selangor.

Suspense list

5373 Wong Yong Jo
5177 Pereira, A A

Resigned

5430	Francis, F W G	(Negri Sembilan)
5528	Mak, Anthony, G	(South Johore)
5635	Cheong Wan Chin	(South Johore)
5205	Raghavan, K	(Malacca/Muar)
4135	Chow Yoke Chong	(Negri Sembilan)
3956	Ibberson, G A R	(Overseas)
4193	Shepherd, R A	(Overseas)

Births

RICHMOND: Charles James Richmond born at BAL Hospital, on 7 April 1972. A brother for Pene.

SARGEANT: To Asmah and Howard a son, Jason Nasri, on 10 July 1972 at Assunta Hospital, Kuala Lumpur.

SERGEANT: To Fanchon and Colin a daughter, Joanna Susan, on 11 August 1972 at Assunta Hospital, Kuala Lumpur.

Marriage

GARNER — LIAO: Hugh Johnson Garner of Selangor River Estate to Vivien Liao, on 22 July 1972.

Death

OWEN: Gwilym, FISP, formerly Head of Soils Division RRIM, in Rhyl Hospital, North Wales, on 25 July 1972.

Chicken Tandoori

Ingredients

2 spring chickens
2 pips of garlic
2 small onions
1 piece of ginger (about 2 in. long)
10 red dried chillies
3 teaspoons coriander seeds
2 teaspoons cummin seeds
4 tablespoons yoghurt
Juice of 1 lime
2 teaspoons vinegar (according to taste)
1 teaspoon turmeric powder
Few drops of cochineal
Salt to taste

Method

Grind, or use a blender to make a paste of the garlic, ginger, onions, chillies, coriander and cummin seeds.
Mix this with remainder of ingredients.
Clean chickens, removing the wings, neck and skin. Wipe dry.
Make a few long, deep cuts on breasts and thighs.
Spread the ground masala paste on inside and outside of chickens.
Leave to marinate for 4–5 hrs.
Bake at 450°F (or Gas Mark 5) for 1–1½ hrs, depending on the size of chickens.
Turn chickens occasionally.
Serve hot with chappaties or plain white rice.

(*From* Miss J Viswanathan, Pasak Estate, Kota Tinggi.)

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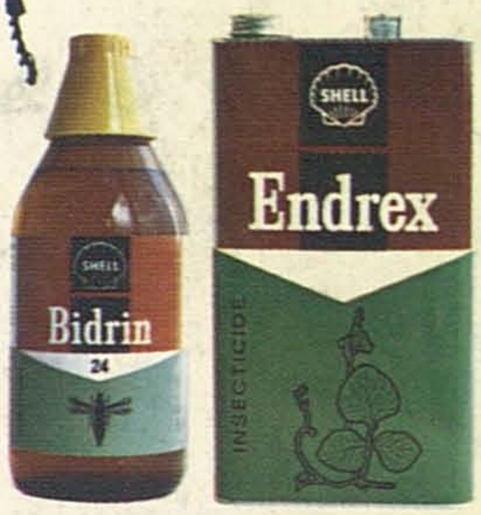
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