Observations on Rubber Growing in Malaya

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THE following report contains information received and observations made during a study tour of Malayan rubber estates in the State of Selangor, and of the Rubber Research Institute of Malaya at Kuala Lumpur, during the period 23rd April to 6th May, 1963.

Seed Treatment.

An interesting visit was made to Prang Besar Estate near Kajang (Selangor). This estate is well known in this Territory as a supplier of high yielding clonal seeds and has developed a number of widely used clones.

Prang Besar clonal seeds are transported daily from their isolated seed gardens over a distance of 180 miles to Prang Besar Estate, where the seed is inspected and sorted out. It was noticed at this inspection centre that PR 107 seeds were taken out and discarded. According to Prang Besar people PR 107 seed tends to become mouldy very quickly and does not give a good high yielding tree. PR 107 seed amounts to about 6 per cent. of total seeds collected from Gough Gardens, and this clone seems to serve mainly as a male parent in the Prang Besar seed gardens.

After inspection and sorting, the seeds are placed in germination beds for a few days and sold to Malayan plantations as germinated seed at 22 cents * per seed for Gough Garden I, II and Plot C seeds. Where a journey of three days and over is involved the seed is supplied ungerminated.

In cases where the roots of germinated seed are too advanced for safe packing and transport, seeds are planted in nurseries and sold six to twelve months later as clonal seedling stumps at 45 cents per stump.

Seed to be sent away as ungerminated seed is kept in cold storage at Prang Besar Estate. At a temperature of 40 degrees-50 degrees F. the seed was said to keep its viability for up to six months.

* Dollars and Cents are Malayan Currency.

Another method of keeping rubber seed viable was demonstrated at the R.R.I.M. Experiment Station where seeds are packed with sawdust in polythene bags in which are a few breathing holes. Here, ten pounds of seeds were mixed with moist sawdust (ten lb. dry sawdust to three lb. of water) and then placed in polythene bags. Seed may be kept viable for up to three months by this method. Normally rubber seeds can be kept viable for only ten days.

The packing of clonal seed at Prang Besar estate is usually done in sawdust. The sawdust is boiled in water to take out the acidity which otherwise will effect the germ.

The following points on treatment of Prang Besar seed upon arrival in this Territory were stressed by Mr. J. B. McIntosh, Manager of Prang Besar Estate :—

Wash the seed free from sawdust, since ants, attracted to the sawdust, may disturb the soil around the seed ;

The sooner the seed is planted the better will be germination results ;

Keep seeds in a cool atmosphere during planting operations as direct sunlight will cause damage to tissues ;

Use a light friable type of soil for a germination medium. At Prang Besar pure river sand is used. Aeration is more important than nutrition since seeds are mainly dependent on food reserves at this stage ; and

Germination beds must be shaded and the germination medium should be kept moist but not wet.

Mr. McIntosh thought that wrong handling by planters was the main reason of the sometimes poor germination experienced in the Territory.

Since there are two periods of seed fall in Malaya, namely the so-called autumn fall (August-September) and the spring fall (February-March) it will be noted from the above

that Prang Besar seed stored under refrigeration will be available at any time of the year. Purchase of seed could thus be planned to suit the planting conditions of the locality. There is no truth in the often heard opinion of Territory rubber planters that the Malayan autumn fall gives a better seed than the spring fall. There is a difference in quantity between these two falls, the autumn one being the heavier seed fall, but there is no difference in the quality of the seed.

Nurseries and Planting.

The well known practice of digging deep nursery beds, the raising of planting material on these beds, and subsequent transplanting to the field at an age of approximately one year seems on the way out in Malaya. On most of the estates the new technique is to raise planting material in polythene bags and transplant to the field at an early age (two to six months).

The advantage of polythene bag planting is that the roots of the young trees are not disturbed, there is practically no set-back after transplanting and very few losses occur. Time of planting to suit weather and other conditions can also be better controlled.

Seedlings, as well as budgrafts, are transplanted by the polythene bag method. The main aim of the new planting techniques is to reduce the period of immaturity. Several methods to shorten the time to maturity are under investigation at the Rubber Research Institute, but results will not be available for some time. An interesting article on polythene bag planting techniques by the Dunlop Research Centre was published in *Planters' Bulletin* No. 63, November, 1962.

Further details of polythene bag planting are reported under the heading Vegetative Propagation.

Stump Poisoning.

Poisoning of rubber stumps in replant areas is now done by 2, 4, 5-T treatment and has replaced the old method of sodium arsenite poisoning. A five per cent. solution is made by mixing one part of 2, 4, 5-T concentrate with 19 parts of Dieselene. Stumps are treated by painting this solution on the bark from ground level up to a height of 15 inches. The cut surface of the stump is treated with Creosote to prevent fungi diseases entering the stump. Cost of poisoning is approximately 20 cents per tree.

Vegetative Propagation.

Experiments in propagation by means of cuttings are carried out by the Rubber Research Institute, but otherwise the only practical method of vegetative propagation is by budgrafting. The budgrafting technique is well known in the Territory and needs no further description.

Budgrafting on estates in Malaya is usually done by contract labour, which is paid approximately 6½ cents per successful budgraft. They bring their own tools and binding material and also do the opening-up and cutting back of the budgrafts. A skilled operator does about 40 budgrafts per hour by conventional method ; in green budding they do more per hour but are at present paid at the same rate as for conventional budgrafting.

Green Budding.

The budgrafting on young seedlings of three to eight months with buds from green budwood sticks of approximately the same age (the so called green budding method) is becoming increasingly popular on estates in Malaya. The green budding technique has been fully described in the *Planters' Bulletin* of the R.R.I.M. (No. 62, September, 1962). A demonstration of green budding at the R.R.I. experiment station was witnessed by the writer and source bushes for greenwood budsticks and cuttings were inspected. It was stated that it takes about eight weeks from pruning to obtain suitable material for cuttings and green budwood sticks. A wide spacing is essential to build up a good framework in source bushes. Greenwood budsticks may be kept under refrigeration temperature in polythene bags for about two weeks. In a bucket with some water they can be successfully kept for three days.

The practical use of green budding was seen at Effingham Estate near Kuala Lumpur. On this estate large nurseries of seedling stock were established by planting seed in polythene bags during September, 1962. Green budding on these seedlings took place in December, 1962, and transplanting the buddings into the fields was done during April-May, 1963. Nurseries

and field plantings of these green buddings looked most vigorous when this estate was visited on 27th April, 1963, although very little rain had fallen since transplanting.

When transplanting green buddings from the nursery to the field the young plants are not pruned at all ; they should be in a dormant stage, i.e., without a flush when a topwhirl of leaves is more or less matured. A cylinder of soil stays around the roots when the polythene bag is removed. This technique of transplanting ensures a very high survival and unchecked growth of the young trees.

Other methods of transplanting green buddings, and without the use of polythene bags, are :—

(*a*) To transplant as a budded stump four weeks after the budding, i.e., one week after opening-up and cutting back ; and

(*b*) To transplant as a stumped budding at about nine months after budgrafting.

Green budding in the field was also observed on Effingham Estate. Germinated seeds were planted in the field on 7th October, 1962, green budded 8th January, 1963, and cut back on 29th January, 1963. Opening-up and cutting back is done in one operation. Growth of the three month old budshoots, on the six month old stock, was excellent.

According to R.R.I.M. people, it was expected that green buddings generally would reduce the immature period of a planting by some four to six months. The writer is, however, doubtful on this particular aspect of the green budding after having observed at Prang Besar Estate no significant difference in growth between a field of PB213 green buddings at 15 months after budding (on six month old stock) and an adjoining field of nine month old PB213 buddings done by the conventional budding method (on 12 month old stock). Seedling stock in both fields was planted at the same time.

The polythene bag planting method of three month old green buddings, budded on four to six month old stocks, will undoubtedly appeal to many planters. However, the economics of this method are not fully examined. Polythene bags for raising seedlings and green buddings cost 5-12 cents each, depending on size. Polythene budding tape is priced at $3.30 for a roll of 1,000 yards length and $\frac{5}{8}$ inch wide.

Cuttings.

Another interesting method of vegetative propagation, cuttings, was seen at the R.R.I.M. experiment station at Sungei Buloh.

Greenwood cuttings of about one foot in length are placed in a rooting medium of rotted sawdust with river sand under a continuous overhead mist spray for six to eight weeks. Rooted cuttings are transferred to polythene bags and after hardening-off planted into the field. Most clones rooted only in very small percentages. Among the better known clones which did have good rooting success are : PB86, GT1, PB5/51, PR107, RRIM 600, 623 and 701.

The absence of a taproot system in rubber cuttings appears to be the more serious disadvantage in this method of vegetative propagation. This was quite obvious in a field of $2\frac{1}{2}$ year old cuttings (clones PB86 and GT1), where a very heavy storm on 20th April, 1963, caused severe wind damage. Trees were blown over in most cases ; an attempt was made to save the trees by pruning the crowns, erecting the trees, and anchoring them with ropes. Interesting to note was that 25 per cent of the trees obtained from cuttings and five per cent of the trees obtained from ordinary budgrafts had to be anchored.

PB86 trees from cuttings suffered comparatively greater wind damage than GT1 cuttings of the same age. A number of excavated root systems in four year old PB86 cuttings revealed a complete absence of any vertically growing roots, while excavated root systems of four year old RRIM 605 cuttings showed quite a number of roots growing downwards, which appeared to have taken over the function of the taproot. It was thought that this may be a clone characteristic in root development of clonal cuttings.

A point in favour of cuttings was the remarkably better girth of cuttings as compared with budgrafts of the same age in clones PB86 and GT1.

The propagation of rubber clones by cuttings is still experimental, and is more of an academic interest to our rubber planters than of practical value at the present stage. The most interesting point to watch will be the comparison in future yields between cuttings and budgrafts, the cuttings being on their own roots and the budgrafts on a seedling rootstock. The latter may adversely affect growth and yield of the scion. In this

regard it may be mentioned that a 10 year old crown budding experiment was seen at the Sungei Buloh station, which clearly indicated that the influence of the scion on the stock is much greater than the influence of the stock on the scion.

It was stated that in post-war plantings on estates in Malaya the acreage of budgrafted trees is more than twice the acreage of clonal seedlings. Clonal seed of the more modern seed gardens is, however, gaining in popularity.

Cover Crops.

The extensive use of leguminous cover crops is one of the striking features of rubber cultivation in Malaya. There is practically no estate or smallholding which has not one or more of the well known cover crops established in their immature rubber areas. In some instances one even gains the impression that the cover crop is of more importance than the rubber trees. Cover crops in Malaya are meticulously weeded and fertilized as well. It is said that green manuring by leguminous cover crops and the suppressing of weeds increases growth of the rubber tree, thus reducing the immaturity period. This seems to be the main purpose of cover cropping in Malaya, soil protection apparently comes in second place. Weeding of cover crops is a major cost item. It is mostly done on a contract basis and works out at approximately seven dollars per acre per weeding round. If done by the regular labour force these costs could be double that amount. Total costs of legume cover crops for the first three years, including fertilizing, seed drilling and general upkeep, were quoted at 250 dollars per acre at the R.R.I.M. station but were said to be higher on some places.

Of the creeping legumes the combination of *Centrosema pubescens, Calopogonium mucunoides* and *Pueraria phaseoloides* is widely used. The most attractive among the creeping cover crops seen was *Calopogonium caeruleum* at Prang Besar estate. It forms a dense, quick growing cover, is easily established from cuttings (seed production is poor), shade tolerant, and does not die back during the dry season. *Calopogonium caeruleum* appeared to be one of the most promising new cover crops.

Of the bushy type of legumes, the most impressive was *Flemingia congesta.* This is said to give about 10 tons of mulch per acre per year at two years from planting. An excellent stand of *Flemingia* was seen at Effingham Estate, where the plants were raised in small polythene bags and transplanted to the field as soon as a few leaves were formed. The dense growth of branches from ground level gives a wide coverage. *Flemingia* is kept to a height of about three feet by regular slashing, which it stands well. It is most vigorous in the open but does not do well under shade ; it has a deeper rooting habit than creepers, gathering soil nutrients from greater depths and aerating the soil more thoroughly. Spacing between lines is three feet by three feet kept about six feet from the rubber lines.

Another interesting cover crop seen at the R.R.I. experiment station was *Stylosanthes gracilis.* This is a quick and erect growing legume and is used to prevent soil erosion in rubber, oil palm, and coconut plantations. In Eastern Malaya it is also used as a cattle fodder, where it grows up to a height of seven feet. It can easily be established from seed as well as from cuttings. *Stylosanthes gracilis* appeared to be an effective cover crop in the R.R.I.M. trials ; however, the R.R.I. has its reservations on Stylo. as a cover plant in rubber, because in some trials it showed a depressing effect on the growth of rubber trees.

Weed Control.

Hand weeding in immature rubber areas is the major cost factor in maintenance work and the R.R.I. has intensified its investigations into the use of weedicides. Most grasses can be controlled by spraying with a sodium arsenite solution, but the use of sodium arsenite is banned on plantations because of its toxicity. No cheap alternative to sodium arsenite has been found, but R.R.I. trials in this regard are at an advanced stage and results are likely to be published in the near future.

Among the weedkillers used are :—

Dowpon or Dalapon. This weedkiller is effective in the control of many grasses including *Imperata,* but is too expensive for use on a large scale.

Simazine, among the pre-emergence weedkillers, has proved effective in maintaining weed-free conditions for three to four months after initial clean weeding, but is also uneconomical in practical use.

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Paraquat, one of the newer contact herbicides, has shown promise and is likely to become more important in weed control if the price can be reduced. It will then be most useful in young rubber areas to keep planting lines free of weeds. *Paraquat* does not damage young rubber trees of one year and over and may be sprayed right up to the trees.

Pests and Diseases.

Insect pests in general are not a serious problem in Malaya. Insects, and their control, of interest to this Territory are :—

Cockchafers, damaging roots of young rubber trees. Control : 2E Heptachlore 20 per cent. emulsion, one part to 200 parts water. Holes are made around the base of the plant six to eight inches deep, one inch in diameter ; two pints solution per point for trees up to two years of age, and for older trees four pints. One application is sufficient for approximately two years.

Termites, damaging taproots. Control : Dilute one part of Dieldrin emulsion to 600 parts of water—scrape soil around the tree to two to four inches deep and apply one to four pints of Dieldrin solution, depending on size of trees.

Caterpillars and leaf eating insects. Endrin is mostly used, sprayed with a solution of one to 800.

Of the rubber diseases in Malaya fungi are the most troublesome.

Root diseases, particularly in replantings, are a serious problem. After felling for replanting, all stumps are poisoned with 2, 4, 5-T concentrate (one part in 19 parts of Dieselene) and the cut surface of the stump is treated with Creosote. Root diseased trees are dug out and burned *in situ.* In the young replant regular collar inspection rounds are carried out, and sources of infection are removed and burned. The R.R.I. is investigating the use of chemicals as a protective dressing to the collar.

Oidium fungus disease of the leaves, which can cause serious leaf fall is not such a serious problem in Malaya as it is in Ceylon and Indonesia. Treatment consists of sulphur powder dusting by mechanical blower, but appears to be carried out in seed gardens only.

Powdery mildew caused by *Oidium hevea* was quite prominent in estates around Kuala Lumpur at the time of the visit, but little or no attenion is paid to the disease and it is apparently regarded as of minor importance.

Pink disease occurs mostly in young trees of two to seven years of age and can become a serious problem in clones susceptible to the disease, like RRIM 501. Control in immature rubber consists of spraying infected parts with Bordeaux mixture, and for trees in tapping the fungicide " Fylomac 90 " is used.

Gloeosporium is widespread but causes serious damage in susceptible clones only. This was clearly demonstrated in a clonal trial visited at Harpenden estate (Selangor) where trees of clone RRIM 526 were partly or wholly defoliated and a number of these trees had died back severely while trees of other clones in the area were not affected. Incidentally, the I.R.C.I. clones 5, 6, 9 and 10 in the R.R.I. exchange clone trial prove all more or less susceptible to the disease and clone PB 86 in a clonal trial at Kualah Selangor was also noticed to be very much affected by *Gloeosporium.* Control of the disease consists of spraying with " Trifungol " (active ingredient Ferbam), a wettable powder for high and low volume spraying. ($33 per 10 lb.)

Brown Bast. Of the tapping panel diseases the most serious is Brown Bast. This is undoubtedly the greatest problem of rubber trees in Malaya, on estates as well as small holdings. On some estates the incidence of Brown Bast was as high as 10 per cent. of tappable trees. Investigations into the Brown Bast problem are given first priority by the R.R.I.M. The disease was hitherto thought to be a physiological response of the tree to excessive tapping, but recent investigations seem to point to a bacteriological cause, aggravated by heavy tapping. It appears also that Brown Bast is associated with soil types and minor elements in the soil. Interesting studies on the Brown Bast problem are at present going on at the Rubber Research Institute and it is expected that the nature of the disease, and prevention methods, will be known in about one to two years' time.

Wind Damage.

Serious damage by wind was evident in the Sungei Buloh and Effingham Estate areas when visited on the twenty-fifth of April, 1963. A big storm on the twentieth of May, 1963, lasting only ten minutes, caused thousands of pounds damage. At the RRI Station severe trunk snap occurred in clone AVROS 1907. Another clone which repeatedly suffered serious wind damage is RRIM 613. Practically all the young trees (2½ years) in the large scale clonal trial at Sungei Buloh suffered more or less from bending of the stem and crown, in particular clone RRIM 519. At an estate some seven miles outside Kuala Lumpur at least 40 acres of rubber were lost by wind damage in the big storm of twentieth of April—the damage claim by this estate amounted to £8,000 Stg. An insurance scheme exists against wind damage, and payment by insurance companies for totally lost trees was said to be £2 10s. Stg. for trees under seven years old and £3 16s. 2d. Stg. for trees of seven years and over.

Pollarding.

Pollarding of trees is only done if the stand is in a wind-prone condition and is known to be liable to trunk snap (RRIM 501). Pollarding in the past was done at a height of 12 feet, but is no longer recommended because of :—

1. Serious loss in yield.
2. Slow renewal of branches and general recovering of the tree.
3. Big pruning wounds causing serious die-back and rotting of the pith.
4. Severe scorch by sudden exposure to the sun.

If pollarding is necessary it is done either by,

(*a*) partly pollarding at 12 feet and after sufficient re-growth the other half is pollarded, or

(*b*) pollarding all growth above 25 feet.

Before any pollarding is done the trees should be white-washed the day before to prevent scorch ; white wash (lime) reflects the heat radiation.

Tapping.

The merits of the numerous tapping systems are a continuous source of discussion and each system has as many advocates as critics. It seems quite impossible to recommend a uniform acceptable system of tapping. So much depends on the planting material used, its age, location, climatic conditions, and likes and dislikes of the manager, that the systems used vary almost from plantation to plantation.

Worth mentioning may be the tapping systems favoured by the manager of Prang Besar estate. Mr. McIntosh's contention is that with a 100 per cent. intensity tap the Sr/d3 system, i.e., full spiral cut reduced by six inches, third daily, is better than S2/d2 (½ spiral cut, second daily) ; and in a 67 per cent. intensity tap Sr/d4 is a better system than S2/d3. The methods favoured by Mr. McIntosh will, of course, give a higher production per tapper and thus be more economical in tapping costs, but will probably give less yield per acre and may have an adverse effect on girthing.

The RRI is conducting several tapping trials at present ; recent observations were published in Planters' Bulletin No. 66, May, 1963. The writer was told that further results of tapping trials will be published in the July or September, 1963, issue of the Planters' Bulletin. Generally speaking, observations so far indicate that every second day tap over half the circumference (S2/d2) gives most economic results in seedling plantations. In budgraft plantations a third daily tap over a ½ spiral cut (S2/d3) with added stimulation every six months gives the highest production per tapper.

The aim of these tapping trials is to come to a more economic tapping system with higher yields per acre and per tapper and increasing the economic life of the tree.

Yield Stimulation.

In an experiment at the RRI station clone RRIM 600 has yielded 3,500 lb. per acre over a one year period by stimulation at six months interval, applying 2, 4, 5-T at 2½-3 inches below the tapping cut. Tapping system used was S2/d2 in virgin bark of the second tapping panel, sixth year of tapping in this case. Yield obtained represented an increase of some 40 per cent. over not stimulated trees of same age and same clone.

In another experiment it was shown that with half yearly stimulation in the second tapping panel on S2/d3 an increase in yield per acre was obtained of approximately 20 per cent. over S2/d2 without stimulation.

Discussions on stimulants with the RRI staff could be summarized as follows—

—do not stimulate in virgin bark.

—2, 4-D stimulant is safer to use than 2, 4, 5-T, as the latter is slightly stronger and will cause damage if applied too thickly. Increase in yield is about the same for both stimulants.

—six monthly application over three inches below the tapping cut gives best results.

—bark should be scraped very lightly before application, only the corky tissues are to be removed.

Results of further stimulant trials by the RRI are to be published shortly.

Seed Gardens.

The clonal seed gardens visited at the RRI Sungei Buloh station cover an area of approximately 200 acres, consisting of gardens A, B, C and D. Seed from these gardens is reserved exclusively for smallholders in Malaya.

Typical of the RRI seed gardens is garden B on which the following information was received:

Area : 41 acres.

Budded : 1949.

Spacing : 60 feet by 4 feet.

Production : Average 20,000 seeds per acre per year.

Composition : Clones AVROS 157, BR2, Tjir 1, RRIM 509 and PB 49.

Percentage of seed per clone varies during seed fall periods. Seed percentage per clone collected on five days during the main seed fall of 1960 is given in the following table :—

Collection date	Total No. of seeds collected	Percentage of seed per clone				
		Tjir 1	Av 157	BR2	RRIM 509	PB 49
16.8.1960	2233	45	4.3	49.7	0.5	0.4
17.8.1960	2077	44	8.4	41	0.4	6.2
29.8.1960	2258	29	2.3	65	1.3	1.5
5.9.1960	2004	40	0.8	52	1.8	5.5
12.9.1960	2068	33	2.2	53	2.6	9.2

Information received on seed production of Malayan seed gardens varies from as low as 3,000 seeds to 100,000 seeds per acre per year. The average for Prang Besar Gough Garden is 45,000 seeds per acre and in 1962, being a good seed year, 80,000 seeds per acre were obtained from a 12-year old seed garden.

Climatic conditions influence seed production, for instance many overcast days during the flowering season reduces fruit setting.

Although cross pollination by insects is the rule, natural self-fertilization happens more than hitherto thought, particularly in clones Tjir 1, LCB 1320, RRIM 501 and 605.

Spacing of the trees in seed gardens is an important factor in seed production. A wide spacing to ensure good crown development and the maximum of sunlight to reach the crowns seems essential. Prang Besar Gough Gardens are spaced at 22 ft. x 22 ft., giving 90 trees per acre initially, and is later reduced to 60 trees to the acre. Even an initial spacing of 24 ft. x 24 ft. (76 trees per acre) is said to be not too extreme for seed gardens.

An interesting note on fertilization of seed gardens was received from the R.R.I.M. Experiments conducted showed that the application of a nitrogenous fertilizer increased seed production by 30 per cent. in one experiment, and by 100 per cent. in another. No effects due to phosphate or potassium fertilizers could be measured. There was also an indication that nitrogen increased the percentage of seed germinating.

At Prang Besar estate, fertilizing with sulphate of ammonia at the rate of two cwts. per acre per annum gave approximately a 20 per cent. increase in seed production.

Sulphur dusting to control *Oidium* is essential in seed gardens in Malaya ; *Oidium* fungus causes the dropping of flowers and immature fruit.

An examination into the clones in Malayan seed gardens revealed that AVROS 157, Tjir 1, RRIM 501 and PR 107 are most widely used. This is particularly interesting as our Bisianumu seed garden consists of these four clones with the addition of BR 2. In the light of present day experience and observations it was advised that

PR 107 and PB 49 should not be included in seed gardens anymore. PB 5/51 instead was strongly recommended. Other clones mentioned for possible use in seed gardens were : RRIM 600, 605, 614, LCB 1320 and PB 28/59.

Production Costs.

Production costs in Malaya vary from estate to estate. Cost price depends a great deal on the material planted and tapping system used. From the information gained the following table is an attempt to give cost factors in cents per lb. of dry rubber at various yield levels per acre.

Cost factor	Costs in Cents at a yield per acre of—				
	400 lb.	600 lb.	800 lb.	1,000 lb.	1,200 lb.
Planting and Maintenance	7	6	5	4	3
Tapping	28	23½	18½	12½	7½
Manufacturing	8½	8½	8½	8½	8½
Packing and despatch	3½	3½	3½	3½	3½
General costs	13	11½	9½	7½	5½
TOTAL	60	53	45	36	28

Note.—Planting and maintenance in this table includes clearing and fertilizing.

Tapping includes collection and transport to factory.

General costs include depreciation of plant, equipment and land, insurances, building, electricity, etc.

At the time of the visit the Singapore market price for No. 1 smoked sheet rubber was 75 cents per lb. It was, however, expected that the price would go down and even a figure as low as 60 cents was mentioned as a possible future market price.

Smallholdings.

Although a study of the smallholders' set-up in Malaya was not included in the tour a few words have to be said about the excellent organization of the smallholders replanting schemes.

The Federal Government of Malaya as well as the State Governments have enterprising schemes to settle the small rubber planter. The main object of the various schemes is to assist the farmer in the planting and replanting of his land with high yielding material. It was expected that during 1963 some 125,000 acres will be replanted by smallholders, the 1962 figure was 79,665 acres replanted. The replanting grant to smallholders was increased from 600 dollars to 750 dollars per acre. This grant is paid in five instalments enabling the small producer to weather the first unproductive years. The Replanting Board requires certain standards in preparation of land, planting and maintenance to qualify for the grant. The RRI Smallholders Advisory Service and the Replanting Board Staff, advise the smallholder in his task.

One typical Government subsidised project of the State Development Scheme was seen near Ulu-Langkat village, about 12 miles south of Kuala Lumpur. In this settlement the State Government organized jungle clearing and rubber planting by contract labour, houses were built, and the settler only moved in when housing and planting were completed. Work on this particular settlement commenced early in 1961, and 42 families (28 Malay and 14 Chinese) were settled on their holdings at the time of the visit. Contouring, lining, planting, fertilizing, cover cropping, fencing and maintenance for six months after planting was all done by contract labour at Government expense. Family settlers moved in and are expected to work the holding under the supervision and guidance of a manager appointed by the Land Development Authority. The new settler received a subsistence allowance to the amount of 400 dollars per acre spread over a number of years and has to pay back the interest free loans when his rubber comes into production. Budwood was supplied at one year after planting, the smallholder doing the actual budgrafting. Clones supplied were RRIM 513, 605 and PR 107. Each family holding here consisted of six acres of rubber and two acres for house and gardens (fruit and vegetables). This is one example of the various schemes in existence to help the Malayan smallholders, who number 250,000. With such generous assistance it is not surprising that the smallholder is able to play such an important part in rubber production in Malaya.

Finance for the various schemes appears to come mainly from a cess of 4½ cents per lb. of rubber exported, while rubber research work is financed by another cess of ¾ cent on every pound of rubber exported.

Notes on Clones.

A description of the clones in commercial use can be found in the yearly Planting Recommendations published by the Rubber Research Institute of Malaya.

PB 86. This clone has been withdrawn from the 1963-64 planting recommendations in Malaya. The main reason seems to be the slow growth of this clone on many estates. An example of extremely slow growth was heard of when Kepong estate was visited. PB 86 was budgrafted on this estate in 1951 and could not be taken into tap before 1961. Another well known clone extensively planted on this estate was—

PR 107, taken into tap at Kepong estate at an age of 5½ years after budgrafting, and produced 1,100 lb. per acre in its third year of tapping. This old and proven clone may well be one of the best for extension work in Papua and New Guinea. Of particular importance in this regard is its thick bark in virgin as well as renewed bark and the high girth increment after tapping. The trees have a well balanced crown and are fairly wind-resistant.

PR 252 *and* 255. These two clones in the exchange clone trial at Harpenden Estate showed considerable promise. PR 252 was the more vigorous of the two.

PB 5/51. This clone is becoming increasingly popular in Malaya. Prang Besar recommends an initial stand of about 150 trees per acre with at least ten feet between trees in the planting line. This clone has a very nice horizontal branching habit. No wind damage has been reported so far. Yields at Prang Besar are around 1,600 lb. for the fifth year of tapping.

PB 217. According to the Manager of Prang Besar, this is one of the best of the newer P.B. clones. A robust tree with a fairly well balanced crown and seems resistant to wind damage. There is some evidence of above average susceptibility to *Gloeosporium*.

Conclusion.

Considerable knowledge was gained and important information received which will be of benefit to the rubber industry in this Territory. The work done by the Rubber Research Institute of Malaya is undoubtedly of great importance to our rubber producers.

As to the future of natural rubber in our Territory, I wish to state that it is of vital importance that we reduce cost of production by higher yields per acre and more efficient management. It was thought in Malaya that natural rubber will remain competitive for a long time, but further research is of the utmost importance. Production costs have to be reduced and technical qualities of rubber have to be increased.

To conclude I would like to quote the words of Dr. L. C. Bateman, Controller of Rubber Research in Malaya : " Competition in the future would not be between natural and synthetic rubber, but between efficient and inefficient producers of whatever kind of rubber."

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