

ESTATE PRACTICE EXAMINATION.*

19TH MARCH, 1938.

(Time allowed 4 hours.)

QUESTIONS AND ANSWERS.

FIELD WORK.

(Opening up New Jungle Areas.)

Questions 1 and 3 compulsory; one other question to be answered as well.

Question 1.

The I.R.R. Committee decided to permit companies to plant up a small percentage of their reserve jungle areas under the new scheme.

Your directors decided to take advantage of this opportunity, and you are instructed to select a suitable area of 100 acres for planting up on the latest methods.

You are told that you must have an original stand of approximately 200 plants per acre, and that the planting material is two basket plants per hole.

The land is hilly, but the ravines will not be difficult to drain.

Your directors request you to send them a rough sketch plan showing the salient features of the area as soon as you can.

Describe *briefly* your procedure from the time you received instructions to proceed with the work until the clearing is planted.

Answer 1.

Upon receipt of instructions to proceed with the selection and planting up of 100 acres of my reserve jungle land, my methods would be as stated below.

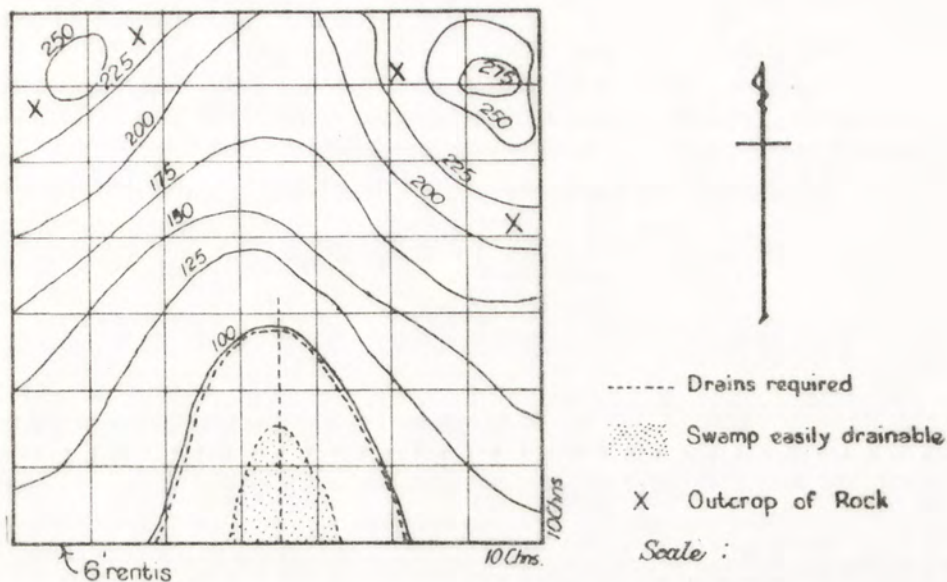
The land is hilly, and I would assume that only a light burn would be done, so that as much timber as possible would be left to help arrest erosion.

Details of work to be done—

1. Survey the area, cutting a 6-ft. rentis round the boundaries.
2. Cut 3-ft. inspection rentises every 10 chains across the area from east to west and north to south.
3. Take a field note book, and record as you walk along these rentises any salient features seen, such as swamps, steep ravines, lallang patches, outcrops of rock or laterite, &c., &c.
4. You can now draw your plan and with the aid of a local topo. survey map put in the contours approximately.

* From *The Planter*, April, 1938, Vol. XIX., No. 4, pages 166-175.

Your plan would then be something like this—



5. Now call in contractors and get tenders for felling, burning and clearing. It should be stipulated that wherever possible felling must be done on the contour.

A time and penalty clause should be inserted to ensure that the schedule is being kept up to date. The contract should stipulate that all trees to be felled should be cut off at 3 feet–6 feet from ground level. A fire-belt of 2 chains should be left round the boundaries where these are adjacent to forest reserve or old rubber; this is later felled and burnt off after the main burn is completed.

6. Whilst felling is in progress, a gang of Javanese drainers should be employed to cut the necessary drains before the trees are felled, and the felling contractor should be warned to see that his coolies do not close up these drains with felled timber.

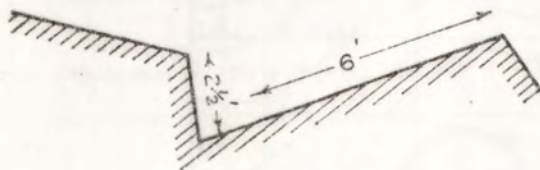
7. About three weeks after felling has been completed, when the weather is suitable, say no rain for four days, a light "scorch burn" should be put over the clearing.

8. Immediately after the burn is over a gang of lining coolies should mark out the planting lines on contour at a spacing of about 20 feet by 10 feet.

9. Coolies, sowing seed of a leguminous creeper or creepers, should follow the liners, and the seed should be established in drills between the planting lines. If sufficient money is available, then phosphate should be applied in the drills prior to planting, at the rate of 1 oz. per running yard. This helps the cover to get established quickly.

10. Chinese felling coolies will now follow the liners, clearing 6-ft. wide strips along the marked contour planting lines. All lying timber will be slewed round to form a bund, to help arrest erosion, and stumps up to 8 inches—10 inches will be eradicated along these lines.

11. Terracing will next be carried out. Terraces 6 feet wide, cut $2\frac{1}{2}$ feet into the solid, will be cut and the spoil thrown forward and be well beaten to form a bund. Terraces should be cut on the wedge form, viz.:—



Stops of uncut earth 2 feet wide can be left between each plant or pair of plants along the contour. These stops help to arrest lateral movement of water along the terraces, and thus prevent large breakages occurring at any weak points.

12. Holes 2 feet by 2 feet by 18 inches will then be cut at each planting point, and these should be left open for some time, and then be filled with debris and good top-soil taken from between the terraces. It should not be necessary to apply fertilizers on this virgin land to begin with.

13. Regular rounds of weeding and lallang patrols will be carried out from the time the burn was completed.

14. Any extra drainage seen to be required can now be done.

15. Germination nurseries to receive good seed collected on the estate will now need to be prepared, with a top layer of fine river sand spread over the soil in the beds. Trenches should also be cut, and baskets filled with good earth be put upright in them to receive the seed after germination.

If the soil on the area is of a friable nature, then a small amount of clay should be placed at the bottom of the basket to save the earth falling out during transport to the field.

The nursery should have attap or palm shades placed over the beds, and these should be gradually removed to accustom the young plants to the strong sunlight. These nurseries should be scattered over the clearing to save transport charges later, and should be near water.

They should be fenced to guard against rats, and if snails are known to be causing trouble on the estate then Meta-Bran pellets should be placed round the nursery, outside the fence.

16. Due to the light burn, your natural covers should regenerate quickly, and these will probably need slashing back to 4 feet before planting takes place.

17. When the basket plants are about 14 days old, they can then be transferred to the planting holes in the field.

Care should be taken to cut the bottom of the baskets to allow the tap root to pass straight down to the bottom of the hole. A surplus of at least 10 per cent. of basket plants should be kept in the nurseries to allow for planting up failures.

In the event of rats causing losses, then rat baits, in which a poison is incorporated, should be put down over the area affected and, if necessary, wire guards should be made to enclose each pair of plants.

18. To stop sun scorch of the soil on the terraces, it has been found useful to plant seed or cuttings of *Desmodium ovalifolium* on them. This plant does not climb, and only needs to be kept back about 1 foot on each side of the rubber plants.

N.B.—If your directors insist on a normal burn, then this will be done three months after felling is completed, and the rest of the programme will remain the same as for an area lightly burnt off. Heavy burns arrest the regeneration of natural covers, and soil wash is often very serious. If, however, an estate is opening up an area adjacent to oil palms, it is often necessary to burn completely, to get rid of rats. The clearing should be fenced with a rat-proof fence if sufficient money is available, and if this is not possible a 4-strand barbed wire fence should be erected to keep out pig and deer.

Question 2.

When burning off a clearing, what precautions do you take to ensure that an even burn results and that no harm comes to the firing coolies?

Answer 2.

When burning off a clearing I should take the following precautions to see that an even burn ensued and that no harm came to the firing coolies:—

1. I should see that the timber was properly dry. For a normal burn the bark of the felled trees should be seen to be splitting.

2. I should wait for a period when I had good dry weather and start the burn after four days of completely dry conditions.

3. I should arrange to have sufficient coolies to have them spaced one coolie per chain across the area to be burnt off.

4. I should muster good coolies, count them and issue each coolie with a bamboo torch filled with kerosene, at the end of which would be placed a sacking wick. Each coolie would be supplied with a box of matches. I should explain carefully the procedure to be adopted, and see that the coolies realized they must keep a straight line, and not try and rush ahead of their neighbours. A Kangany should go with each 15 men.

5. At about 2 p.m. the coolies would be lined up on the far side of the area (towards which the wind was blowing) and be spaced at 1-chain intervals.

I would then station each Kangany in the middle of his party, and tell him that I would be on the left of the line, and that he must not start burning till he heard my whistle.

6. Coolies on hearing the whistle should start the fires and walk towards the wind, burning heaps as they go.

7. On completion of the burn, I should muster all the coolies and count them. I should then leave a few watchmen to see that smouldering logs did not start up new fires that might spread to the reserve jungle areas, or to the old rubber.

8. If my area to be burnt was adjacent to a forest reserve, then I would notify the District Forests Officer and ask him to have some forest guards stationed along his boundary.

Question 3.

You are advised that a series of consignments of expensive isolated garden seeds will be arriving at intervals during the next few weeks.

So that casualties amongst this valuable material may be kept as low as possible, describe how they should be dealt with upon receipt?

Answer 3.

Having been advised that a consignment of valuable isolated garden seed was due to arrive at regular intervals during the next few weeks, I would begin my preparation for their receipt *at once*.

1. I would order sufficient baskets for my requirements, and on their arrival would fill them with good soil and set them upright in trenches in a shaded nursery, or series of nurseries.

2. Germination beds would be prepared, and a top layer of fine sand would be spread over the soil. A fertilizer at the rate of 4 oz. per square yard would be incorporated in the soil.

3. The nurseries would be carefully shaded and well fenced, to keep out rats, &c. Baits for snails, if likely to prove troublesome, would be laid down on arrival of the seed.

4. If the nurseries were to be made in the replanted area, and were near old rubber, I should see that deep isolation trenches were cut, to stop the old rubber roots penetrating the nursery area and competing for the manure.

5. Upon arrival of the seed, which would be received by a competent person, the boxes would be unpacked and the seed established in the beds. The beds would then be lightly watered, and this watering would be continued twice daily whenever there was no rain.

6. The seeds after germination would be transferred to baskets, and these would be watered every day carefully.

7. Shading would be gradually removed to accustom the young plants to the strong sun.

8. Planting would then take place after about 14 days.

N.B.—If I were notified that germinated seed were being sent, then I should prepare baskets only, and plant direct from the boxes to them.

Question 4.

A clearing planted with seedlings to be budded later in the field is backward in growth at six months from planting.

Your agents require immediately as accurate a census as possible of plants likely to prove buddable at one year.

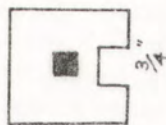
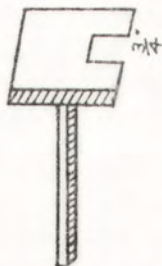
Describe your procedure.

Answer 4.

1. I should carry out a tree-to-tree inspection of all plants on this area.

Any plant found to be affected by root disease would be treated, but would not be included in the final census.

2. I would then have a series of small measuring sticks made, similar to the one shown in the sketch below—



Looking on Top

These measuring sticks are more accurate than a tape, which when it gets wet tends to stretch. The reason I make the cut $\frac{3}{4}$ inch wide in the top of the measuring stick is because any tree that has a diameter of $\frac{3}{4}$ inch at six months will be found to be easily buddable by the end of a year. The leg is made 4 inches long, as this is considered by the R.R.I. to be optimum height from the ground for budding operations to be carried out.

The measuring sticks would be issued out to a Conductor and/or Kangany and they would be told to make a careful census, showing only those trees that either fit exactly into the nick, or are larger than it, as being likely to be fit for budding at the end of the year.

REPLANTING.

Question No. 1 compulsory: answer two other questions.

Question 1.

You are instructed by your agents to write to the directors of the R.R.I. and ask for the Institute's advice with regard to clones to be used on an area to be replanted.

What information is required by the R.R.I. from you in order that they may be able to select the clones most suitable for your particular situation?

Answer 1.

The R.R.I. in their *Journal* of October, 1937, Vol. 8, No. 1, page 74, state that they require the following information from estates when a request for advice on clones to be used during replanting is made:—

1. General brief description of the area; lie of the land, &c. Notes on the quality of the rubber trees cut out; age, growth, condition of foliage and bark, previous yields. Notes on history of previous cultivation.

2. Soil profile pits should be dug in representative parts of the area. Pits should be 6 feet deep by 3 feet square, and one side of the pit should be kept free of excavated soil.

3. Description of the soil profiles should be given on the following lines:—

(a) Position of pit, i.e., top, side or bottom of hill.

(b) Colour of soil with changes at different levels and the depths at which changes occur.

- (c) Depth of organic colouring ("humus") of surface soil.
- (d) Notes on texture and compactness of soil at different levels.
- (e) Presence of stones, laterite (shape and size of lateritic masses is of interest), quartz fragments or other types of stones.
- (f) Depth of water-table, if visible.

4. Average rainfall for the district should be given. The occurrence of heavy storms likely to result in damage to trees should also be noted, particularly if the area is in an exposed situation.

5. If young budded areas have been established on other parts of the estate on soil of similar type to that in the replanted area, notes on the appearance and vigour of different clones will be of great interest and value.

Question 2.

You are told by your visiting agent to put down $\frac{1}{2}$ lb. of artificial fertilizer per hole during your replanting operations.

When would you apply the manure and in what position is it placed in the planting holes?

Answer 2.

Having been told by my visiting agent to put down $\frac{1}{2}$ lb. of artificial fertilizer in the planting holes during replanting operations, I should incorporate this in the good soil that is placed in the top half of the planting hole, about 5 days before planting actually takes place. This point I consider especially important where replanting was being done on a friable soil.

If the manure is put at the bottom of the planting hole there will be a tendency for it to leech away before the rubber gets full benefit from it.

Question 3.

Why is it safer to use hand-pollinated and/or isolated garden seed when replanting, rather than to use so-called clonal seed collected from an area of mixed buddings?

Answer 3.

I should consider it safer to use hand-pollinated and/or isolated garden seed when replanting, rather than so-called clonal seed collected from an area of mixed buddings, for the following reasons:—

1. The hand-pollinated seed will have been made by artificial pollination from trees of proved quality, and the chances of variation amongst the resultant crosses will be considerably less than from seed collected from a mixed clonal area. Hand-pollinated seed is not usually available in commercial quantities.

2. Seeds from an isolation garden are also more desirable, as they, although they have crossed naturally, are presumed to be free from the risk of contamination from seedling pollen or pollen from a mixed area in which a number of poor yielders are situated.

3. If, however, I was satisfied, and the seller would guarantee that in his area of mixed clones he had a predominant stand of a strong mother tree such as AVROS. 157, then I would not object to planting out this seed.

In the event of this guarantee not being available, I would prefer, as stated above, to use hand-pollinated or isolation garden seed.

Question 4.

Your clearing is hilly and has had to be terraced, and natural covers are trying to establish between terraces.

Signs of erosion, however, are to be seen, and your visiting agent recommends that low leguminous covers should be established and be allowed to climb over the natural covers, thus helping to arrest erosion.

Describe your method of procedure for establishing these low covers.

Answer 4.

My visiting agent having noticed that, despite the fact that natural covers are trying to establish between terraces, there are signs of erosion taking place, I would adopt the following precautionary measures:—

1. I would purchase seed of *Centrosema pubescens*, allowing for 8 lb. per acre.

2. In a small drill just below the terraces, I should apply a fertilizer, probably rock phosphate, at the rate of 1 oz. per running yard. The earth would be lightly scuffed over the fertilizer after it had been applied.

3. I would then plant my *Centrosema* seed at the rate of about 5 oz. per yard in this drill, and would take care to see that weeds, &c., were regularly eradicated and the young cover given a chance to establish and climb over the natural covers. Some people prefer to soak this seed overnight before planting; others consider that this is unnecessary.

GENERAL UPKEEP OF A PLANTED AREA.

Questions 1 and 2 compulsory: two other questions to be answered.

Question 1.

Your clearing has a healthy cover of *Pueraria*, *Calopogonium* and *Centrosema* established over it, and despite the fact that you are keeping 4-ft. diameter rings around the plants free of covers, you notice that the rubber is retarded.

Describe a method of cultivation that should help improve the growth, but does not necessitate fertilizers being applied.

Answer 1.

The retardation seen in the rubber is probably due to competition for moisture and plant food from the cover crops.

Three methods would appear to present themselves for consideration—

1. In the event of my agents instructing me to carry out the work as cheaply as possible then I should simply pull back the covers, leaving 6-ft.-8-ft. rings free round the plants.

2. If, however, the question of expense did not arise, I would prefer to cut and roll back the covers, leaving a 6-ft. ring free round the plants. The cut-off covers would then be buried in a trench cut between each pair of plants. This would have a beneficial effect on the rubber and would take the place of an artificial fertilizer.

3. Another method which is not as expensive as the one above is to pull the covers back so that 6-ft.-8-ft. rings are kept free round the plants. The rolled-back cover is then cut and spread over the exposed soil round the rubber plants. This helps to keep the soil cool and also keeps weeding costs down. A combination of methods 2 and 3 would be good.

Question 2.

On your clearing you have a stand of mixed bushy *leguminous* covers. These covers require slashing.

At what height do you recommend that these covers be slashed and during which periods of the year would you carry out slashing?

Answer 2.

I would slash my covers back to 4 feet during or just prior to the main wet seasons in March-April, October-December.

The cover will be flowering about this time and the nitrogen content in the leaves will be heavy. I would not slash my covers back during the dry season as the covers will not rot away quickly then, and there is also the danger of fire occurring. Further, the shade from the bushes is needed during the hot dry spells to keep the soil cool.

Question 3.

On your clearing, upon which the low *leguminous* creeping covers are establishing well and in which 4-ft. rings are kept free of covers round the plants, monthly weeding is done.

Describe the correct procedure to be carried out by your weeders in this area.

Answer 3.

My weeders on their monthly rounds would be given the following instructions:—

1. They would be told to eradicate all weeds seen in the rings or along the strips and in the covers between the rows.

2. They would be instructed to keep a careful look out for lallang and to eradicate this completely when seen. The eradicated lallang to be placed in "kutty sacks" and be brought back to the lines after work where it would be burnt off.

3. If hand-weeding is necessitated the weeders would be told to see that they knocked all the earth off the roots of the weeds as they pull them up and lay them on the cover outside the rings.

4. If Tajah weeding or forking is to be done weeders should weed the circles, one month towards the trees from the outer edge of the rings, and the next month away from the trees. This will prevent the formation of a hollow or a mound round the collars of the young plants.

Question 4.

Scale insects attack one of your nurseries, and you are instructed to get rid of these pests as quickly as possible.

Describe your method of procedure.

Answer 4.

Finding that scale bugs have attacked my nursery, I should issue the coolies with tins containing a soft soap-kerosene emulsion, or a tar-acid emulsion as is used for mouldy rot, and would instruct them to wipe the affected stems and branches of the plants in the nursery with a cloth dipped in one or other of these disinfectants.

Question 5.

On the area that you have to replant, the soil is of a friable nature.

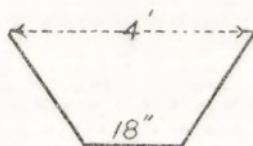
You are instructed to put in a drainage system prior to planting commencing.

What precautions would you take when cutting your drains to ensure that you did not experience considerable trouble in the future from slipping occurring on the banks of the drains?

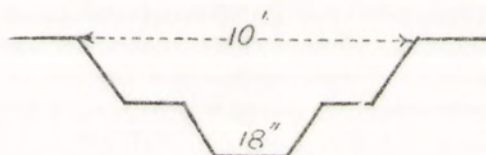
Answer 5.

Having been instructed to put in a drainage system prior to planting commencing in an area in which the soil is very friable, I would take the following precautions to ensure that trouble from bank slips was reduced to a minimum.

1. I would cut the drains, if small, with good sloping sides, say 4 feet at the top and 18 inches at the bottom, viz. :—



2. For the main outlet drains the sides would be cut with steps, viz. :—



3. The water in the bottom of the drain, especially during the wet weather, will tend to undercut the banks, and to prevent this I would establish a creeping grass such as *Axonopus compressus* from 6 inches above water level for 2 feet up the banks on either side.

I would not plant the grass right down to the water level, near coolie lines, &c., as this might make breeding places for *anopheline* larvae to collect. In some areas this undercutting of the banks after rains may necessitate revetting being done.

Question 6.

Your stand of young bud-grafts is 150 to the acre at four years of age.

Your agents instruct you to proceed with a thinning-out programme so that your stand will be reduced to 130 trees per acre.

Describe your method of procedure.

Answer 6.

It is generally accepted that within a clone bud-grafts can be thinned out on size and appearance.

Weak trees and those affected by root disease, white ants and wind damage will, therefore, be eradicated first.

In the event of this not being sufficient to bring the stand down to the required number, trees of small girth are next taken out.

It is not necessary to carry out test tapping unless the clones planted on your area are improved ones.

In the event of your having on your area a clone which is known to be a higher yielder than the others, it may be possible to keep a higher stand of this clone provided due attention is paid to spacing.

CONTROL OF PESTS AND DISEASES.

Answer two questions.

Question 1.

Describe the method of treatment recommended by the R.R.I. for the treatment of pink disease.

What precautions is it necessary to take to ensure that the disinfectant is correctly applied?

Answer 1.

The method of treatment recommended for pink disease by the R.R.I. is as follows:—

1. On trees with mature bark attacked by this disease the affected parts and also 6 inches of good bark (i.e. that in which latex can be seen to flow if scraped) above and below should be painted with asphaltum-kerosene mixture. This is made up by heating together 10 lb. of asphaltum D.X. and 1 gallon of kerosene or solar oil, and when cool adding one pint of a recommended wood preservative, such as Brunolinum, Noxo, &c.

2. On trees where the bark is still green it is better to paint with one of the water-miscible disinfectants that are used for mouldy rot, instead of the asphaltum-kerosene mixture (Killgerm Agrisol, Izal, &c.) at proportions recommended, i.e., 5 per cent.-10 per cent.

3. Dead or badly diseased branches should be painted first, and then be cut off and burnt. Painting can be done at any time, but it is best done when the trees are fairly dry. Cutting off of dead and badly diseased branches should be done in the dry weather and those affected parts should be burnt immediately.

4. It is important to remember that when using the asphaltum-kerosene mixture it must not be applied hot, and must be spread evenly over the whole affected part and not on one side of the branch only.

(Question 2.

Describe briefly the treatment recommended by the R.R.I. for root disease control in young rubber.

Answer 2.

The method of control for root diseases in young rubber and the treatment employed as recommended by the R.R.I. of Malaya, is as follows:—

A careful tree-to-tree inspection of every plant in the clearing can be carried out quite inexpensively. The ground at the collar of each tree should be opened up to show about 6 inches of the lateral and tap roots.

Digging should be done with a pointed hard-wood stick, and changkols should *not* on any account be employed. The coolies should be instructed to try and keep root damage during opening to a minimum. The exposed parts of all the roots seen should then be examined for signs of root disease. If no rhizomorphs are found on the roots the holes should then be filled in and the soil trodden down firmly.

Where a plant is seen to be infected, the hole is left opened and treatment is later carried out as follows:—

1. Dig out until all infected roots are exposed. This will probably lead to the infected jungle root or old rubber root which has caused the infection.

2. Remove the source of the infection and burn it. If any other old rubber roots or stumps adjacent to the infected plants are seen they should be inspected and, if diseased, eradicated and burnt.

3. Cut off and burn all parts of the roots of the rubber tree which have been penetrated by the disease fungus.

4. Wash all other roots on which there are rhizomorphs, but which have not yet been penetrated (i.e. if they still contain latex), with a solution of 2 per cent. copper sulphate in water. While washing rub hard enough to remove the rhizomorphs, but do not rub too hard, for the copper sulphate will burn the bark of the roots.

5. Trees which are dead or seriously infected should be removed and burnt together with the diseased jungle or rubber roots which have caused the infection.

6. Trees which have been infected but have been treated should be marked with a paint band. If this is done it is easy to make a "kira" of the number of cases of infection and to plot out on a chart the infected areas.

7. Regular round of inspection should be carried out twice a year and again all infected trees should be marked. It is thus hoped that by the fourth or fifth year, the marked trees will show up the areas which are still potential danger spots and work can be concentrated on these areas to try and find the disease focus and remove it and opening up and inspection of healthy trees may prove unnecessary.

8. On replanted areas where there has been no history of disease in the past, and no disease was found when felling was carried out, an annual root disease inspection should suffice.

Question 3.

Root *Ustulina* is prevalent on your estate.

What precautions would you take to ensure that there was no recurrence of this disease on your trees?

Answer 3.

Finding that root *Ustulina* is prevalent on my estate I should institute a careful round of inspection and treatment.

Seriously affected trees would be eradicated and burnt, and those lightly affected would have the infected portion at the foot of the tree or on the root chiselled out until no more signs of the disease were to be seen. The cut surfaces would then be protected with a suitable wound dressing such as asphaltum-kerosene mixture or tar.

As the disease is carried by wind-blown spores I should see that all earth scrap latex round the base of the trees was carefully removed now and in the future and I would instruct the coolies to make as few wounds as possible whilst removing this earth scrap, any wounds made being treated immediately. These precautions should be sufficient to rid the estate of this trouble, as the spores can only gain entry to a tree through a wound surface.

FACTORY.

Answer any two questions.

Question 1.

Give the reason for copper contamination in sheet and how the danger of extraneous copper may be overcome.

Answer 1.

Danger from copper contamination in sheet can be overcome by eliminating all articles containing copper in the factory. Brass sieves should be scrapped, monel-metal ones should be purchased and be used. These monel-metal sieves and strainers are more expensive than the brass ones but last considerably longer and therefore repay the original outlay.

Copper contamination may also take place from worn bearings on the sheeting battery. When this occurs, the minute particles of copper reach the sheet along the rolls, on a thin film of oil. Care should, therefore, be taken to see that over-oiling is not done and that the rollers are cleaned regularly.

Question 2.

How do you proceed when receiving latex at the factory if you desire to obtain sheets standardized at $1\frac{1}{2}$ lb. dry rubber content?

Answer 2.

To standardize latex to $1\frac{1}{2}$ lb. D.R.C. the following method can be adopted.

Pour the latex on arrival at the factory through strainers into the Shanghai jars or bulking tanks. Then take a tin vessel and put into it one part of latex and two parts of water by volume; then take your metrolac and get the reading of the mixed latex and water. Multiply this reading by three which will give you the D.R.C. of the field latex.

Provided that the D.R.C. of your field latex is not less than 3 lb. per gallon fill your tanks half full of water and put the latex from the Shanghai jars or bulkers into your tanks. Stir well and take a second reading.

If the reading does not show $1\frac{1}{2}$ lb. D.R.C. add more water and stir well and take more readings with the metrolac until the latex reaches the required standardization of $1\frac{1}{2}$ lb.

In the event of the original reading of your field latex being less than 3 lb. D.R.C. the tanks should then only be quarter filled with water before the latex is added.

Formic acid is then added to the latex in the tanks at the rate of $7\frac{1}{2}$ oz. per gallon of standardized latex. The latex in the tanks is then well stirred and all froth carefully skimmed off. The tank slats are then put in and the latex is left in the tanks overnight. Milling is done next morning.

Question 3.

Why is *para-nitrophenol* used in the manufacture of sheet rubber and how is it applied to latex in the raw state and for soaking purposes?

Answer 3.

Para-nitrophenol is used in the manufacture of sheet rubber to prevent the development of "mould and rust".

For adding to latex a stock solution is made by dissolving 1 lb. of the commercial solid in 10 gallons of water. One gallon of the stock solution is then added to 60 gallons of standardized latex before the coagulant is added. For soaking sheet a dilute solution of 5 gallons of stock solution is made with 50 gallons of water and the sheets are passed into this as they leave the marking machine. Fifty-five gallons of this solution are sufficient for 1,000 lb. of sheet per day. The solution should be renewed daily, and the stock solution should be prepared sometime before it is needed, as *para-nitrophenol* is not readily soluble in water.

Question 4.

Your smoke house is burnt down and you are told to erect immediately a temporary smoke house so that you may carry on until a permanent smoke house has been built.

State what type and capacity you assume the burnt-down smoke house to have been, and give approximate cost of the temporary building and its capacity.

Answer 4.

My smoke house, which deals with a crop of 2,800 lb. per day, gets burnt down, and I have to make preparations to continue smoking in temporary conditions. I would immediately call in a Chinese or Malay contractor and get him to put up eight temporary attap and bamboo smoke houses as recommended by the R.R.I.

These buildings, 12 feet square and 11 feet to the eaves, would consist of outer walls of split bamboo fixed on to hardwood posts. The inner walls and ceilings would then be lined with brown paper stuck on to the bamboo with sodium silicate or tapioca flour paste. Roofs of attap would cover the inclined ceilings. Ventilation holes 1 foot x 9 inches would be cut near ground on

three sides and two further ventilation holes would be cut in the ceilings. Two windows and a door would be made and be fixed. In each building a firebox from half (60 gallons) an old oil drum would be placed in the centre of each chamber with a corrugated iron baffle plate hung over it. Uprights with racks would be put in across the width of the building on both sides of the fireboxes. The uprights adjacent to the fireboxes would be enclosed with corrugated iron sheets to prevent them from catching fire. Chambers of these dimensions will hold 1,800 lb. of sheet rubber and provided the sheet is of a thickness of from $\frac{1}{8}$ inch to $\frac{1}{10}$ inch will dry the sheet in five days. Thus from each chamber one gets 350 lb. dry sheet per day making a total of 2,800 lb. from the eight smoke houses.

The cost of each of these buildings is at present approximately 70s. and therefore the total expenditure on the eight buildings will be 560s.

It is possible to get an insurance policy for European estates for sheet rubber smoked under these conditions.

Question 5.

Give reasons and remedies for the following defects in sheet:—

- (i) Dark patches.
- (ii) Greasy surface.
- (iii) Pitted surface.

Answer 5.

Dark patches.—Irregularly shaped dark and light coloured patches often occur on sheets. These are caused by surface oxidation on the sheet, especially when coagulation is done in pans as the latex tends when coagulated to rise above the surface of the water.

Another cause is soaking sheets in water after rolling and allowing them to come into irregular contact with each other during this operation.

1. After coagulation the pans or tanks should be flooded with water to prevent the upper surfaces coming in contact with the air. The use of sodium sulphite in the latex will help to reduce this tendency to oxidation.

2. Sheets which are not spread with water during rolling and which are subsequently soaked in water should be placed singly in the soaking tanks in order that they may not become massed together.

3. When sheets are allowed to soak in water or have to be piled in a wet condition, they should be passed through a solution containing 1 lb. of *para-nitrophenol* in 100 gallons of water.

Greasy Surface.—1. Insufficient washing of the coagulum on the machine rolls. A water spray should be used on sheet machines.

2. The use of too strong a coagulant or too much sodium sulphite.

3. The use of firewood giving an excess of smoke products.

Moulds.—1. Soak the freshly-machined sheet in water if no water spray is available on the rolls.

2. Soak the freshly-machined sheet in a solution of 1 lb. *para-nitrophenol* in 100 gallons of water.

3. More efficient ventilation during the early stages of drying and smoking.

Pitted Surfaces.—Pitted surfaces usually take the form of small pockets or depressions on the surface of the sheet.

1. This is generally caused by careless skimming so that the surface bubbles remain, which are broken when the sheet is machined.

2. The division boards in the tanks may become sour owing to the growth of micro-organisms which set up fermentation when they come in contact with the slats.

3. A lack of water on the machine rolls so that the water only gets on the upper surface of the sheet leaving the lower roller dry. This may cause pitting of the surface of the sheet in contact with the lower roller.

Remedies are—

1. Proper skimming and removal of all froth.

2. Periodic skimming and washing of coagulation tank slats in a dilute solution of formalin and/or *para-nitrophenol* solution, and subsequent exposure of the slats to sunlight.

3. Solution of $\frac{1}{2}$ lb. of *para-nitrophenol* to 10 gallons of water should be used for soaking boards and tanks.

4. More water on the rollers using an efficient spray so that both rollers get a fair proportion of water.

SANITATION AND ANTI-MALARIAL.

Answer both questions.

Question 1.

A wave of malaria among the labour force follows replanting of an area near the lines.

Describe—

- (i) How would you ascertain whether the malaria does in fact emanate from the replanted area?
- (ii) What precautions should have been taken at the time of replanting to obviate this danger?
- (iii) What precautions must now be taken to render the areas safe?

Answer 1.

1. (a) I should take a muster of all coolies having fever or showing palpable spleens. I would try and trace out what these coolies had been doing for the past 10-12 days and see if the fever had been contracted on the estate or outside it.

(b) I would make the dresser do an anti-malarial survey of the replanted area and see if any anopheline larvae were to be found in planting holes, ravines or swamps. I should then state my conclusions to the V.M.O., and ask for his advice as to treatment to be adopted.

2. (a) All ravines, hollows and streams should have been carefully drained prior to felling being done, and care should have been taken to see that felled trees, &c., did not close up these drains.

(b) All planting holes likely to hold water should have been filled up as soon as possible.

(c) Regular oiling rounds over a mile radius should have been carried out.

3. (a) Labour force should be mustered and all coolies having fever or palpable spleens be put on treatment.

(b) Drainage as required to be put in hand at once and all holes holding water to be filled up.

(c) Regular oiling rounds instituted and close supervision be given to this work by the dresser.

(d) V.M.O. to be asked to inspect on his next visit and to approve methods used or to make suggestions for further improvements.

Question 2.

A coolie on your estate returns from the fields complaining that he has got fever.

What procedure do you adopt?

Answer 2.

1. Dresser should take two blood slides (one to be sent to V.M.O. for inspection).

2. Dresser to examine for spleen and take haemoglobin test.

3. If slide proves positive, put to bed and give 10 grains of aspirin. Ring up V.M.O. and ask for details of treatment to be carried out. If estate hospital available send to the hospital.

4. If no hospital available, and V.M.O. approves, give treatment on estate and, on completion of course, put coolie on an iron tonic course.