DEPARTMENTAL AND OTHER NOTES

NOTES ON RUBBER SEEDLING NURSERIES*

LOCATION

THE nursery should be in a sheltered position but not overshadowed by trees, preferably on flat land with good soil. Deniya land is suitable if capable of being drained to a depth of 4 ft. If an old line site is selected for a nursery it is advisable to give the soil a preliminary dressing with sulphur or sulphate of ammonia to counteract alkalinity in the soil. The nursery should be within easy distance of a water supply.

LAYOUT OF BEDS

The suggested planting system is to space the rows alternately 1 ft. and 2 ft. apart and to plant the seed at 6 in. intervals in the rows. The 2 ft. passages provide access to the plants for budding. It is convenient to cut the beds 11 ft. wide (see Diagram No. 1).

PREPARATION OF BEDS

On average flat land there is no difficulty in lining out the beds. On sloping land they should be lined on the contour and levelled. It may be necessary to decrease the width of the beds on steep land. It is convenient to start levelling the beds from the top of the slope and work downwards. The edges of the banks should be sloped off and turfed. A drain 1 ft. by 1 ft. is cut at the back of each bed. On flat land the depths and frequency of drains will depend on local requirements to prevent water-logging. Paths should be provided at intervals in a large nursery, both to facilitate inspection and to allow for free movement of air through the area.

All stumps and roots down to the thickness of a pencil should be removed from the beds to prevent the risk of root disease infection. Stones should also be removed. This operation will normally disturb the soil to a depth of about 2 ft. and no further forking will be necessary. If, however, the nursery is laid down in an area without any tree roots the soil should be dug out to a depth of 1 ft. and forked to a further depth of 1 ft. before final levelling. Areas with hard subsoil may be loosened by means of half charges of dynamite. In deniyas forking to a depth of 1 ft. is sufficient.

GERMINATING BEDS

Initial growth in a nursery depends largely on the quality of the seed used. It should be freshly collected and all small, light and unhealthy seed rejected. The seed should be

* Rubber Research Scheme (Ceylon) Advisory Circular No. 3.

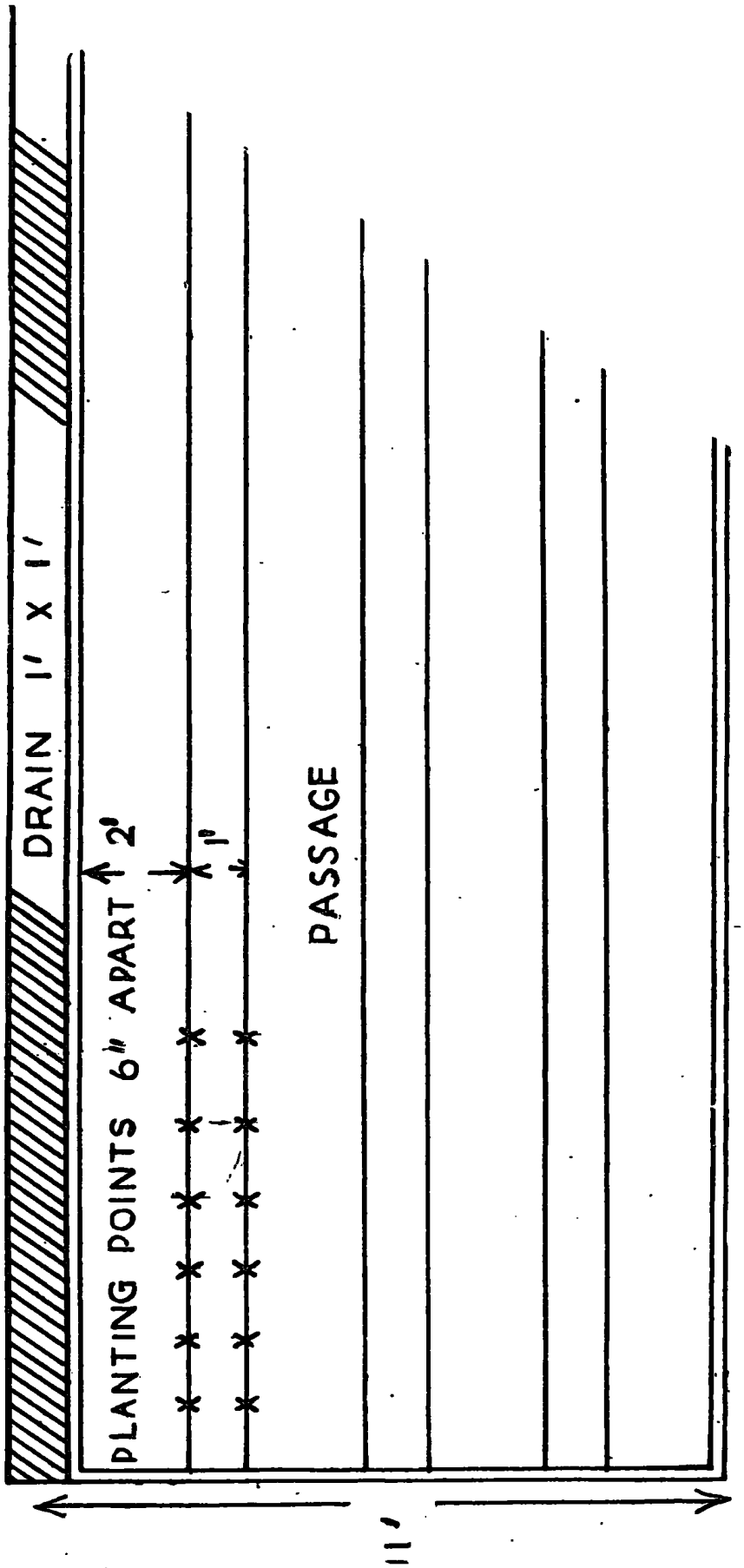


Diagram No. 1.

germinated before planting. Germination is carried out in prepared beds of river sand (not necessarily sieved but not too coarse) about 3 ft. wide and 9–12 in. deep, protected by a cadjan roof. Several layers of seeds may be laid in the bed, each layer being covered with about 2 in. of sand.

The seeds should be placed with the flat side downwards. The beds are kept moist by frequent watering but should not be allowed to become water-logged.

Germination usually starts about the 8th day, distinguishable by the rupture of the seed coat at one end of the " scar " and the appearance of the young root. The germinated seeds are sorted out and used for planting. The remainder is replaced in the germinating beds and re-examined at intervals of 2–3 days. Seed not germinating within 14 days should be rejected. In handling the germinated seeds great care must be taken not to damage the young growing points.

PLANTING

Holes about 1 in. deep are made with a stick at the spacing indicated in an earlier paragraph. The seeds are planted in a horizontal position with the flat sides downwards and lightly covered with earth The beds are then shaded with bracken or other green material. If dry weather occurs after planting it will be necessary to water the beds daily. Watering should be done in the late afternoon.

WEEDING

The nursery beds should be kept clear of grass and weeds. Weeding with scrapers should not be allowed.

MANURING

Manurial treatment will depend entirely on the growth of the plants and no hard and fast rules can be made. The aim should be to bring the seedlings to a suitable size for budding within two months. Animal meal (analysis N 7 per cent. P_2O_5 10 per cent., K_2O_5 per cent.) is a safe fertilizer to use in nurseries and may be applied in quantities varying from $\frac{1}{4}$ to 1 oz. per plant according to the stage of growth. An initial dressing at the rate of 500 lb. per acre can usefully be given when the beds are being prepared for planting. A mineral fertilizer mixture, such as Niciphos No. 2, 4 parts, muriate of potash 1 part, can safely be applied at the rate of $\frac{1}{2}$-1 oz. per plant after the seedlings have reached the age of six months. It should be mixed with four (or more) parts of black soil or compost and dibbled in between the rows. Manure should not be applied within three months of budding.

PESTS AND DISEASES

1. *Rats.*—These animals eat through the tap roots of young seedlings or gnaw them near the collar. An effective poison bait is prepared by mixing 1 part of barium carbonate with four parts of bread crumbs or grated coconut and putting out in the form of small pellets wrapped in paper. Rats may also be caught in traps or snares.

2. *Hares.*—Hares eat off the top of young plants, but can be kept out by surrounding the nursery with wire netting.

3. *Mites.*—These insects attack the young foliage causing distortion of the leaves and sometimes defoliation. They usually attack the poorest plants so that manuring and cultivation methods which ensure vigorous growth are to be recommended. Efficient control can be obtained by periodical dusting with sulphur powder. Several makes of hand dusters are on the market. On a small scale sulphur can be applied by beating with a stick on a linen bag in which the powder is loosely contained.

4. *Cockchafer Grubs. Leucophilis* (*Lepidiota*) *pinguis.*—These larvae, which are large fleshy white grubs up to 3 in. in length, hatch out in the soil and eat off the roots of the young plants just below ground level. The most effective means of control is soil injection with Carbon Bisulphide, but this is a somewhat expensive chemical. It must be used with great care as it is highly inflammable and poisonous. It can best be applied with an instrument known as a Soil Injector, but if this is not available it is satisfactory to make small holes, 6 in. deep with a stick, pour in the liquid and then cover with earth. The minimum effective dose will depend on the number and size of the grubs present, but as a basis for trial it is recommended that $\frac{1}{4}$ liquid oz. be injected every 15 ins. half way between the rows of seedlings.

5. *Oidium* (Oidium Heveae).—This fungus may attack the young leaves and cause curling up and distortion or leaf-fall. In older leaves it leads to the formation of yellow translucent spots. The spots become purplish-brown in colour and eventually dry up, while the dead tissues in the centre may fall out, leaving irregular holes. The disease can be controlled by sulphur dusting at intervals of 7–10 days.

6. *Bird's Eye Spot* (Helminthosporium Heveae).—This fungus causes minute circular purple spots which become white as they increase in size. Severely attacked leaves may fall. The most effective fungicidal preparation discovered to date is "Perenox," sold by Imperial Chemical Industries (India), Ltd. The powder is simply sprinkled on to water at the rate of 3 oz. per 10 gallons and stirred in. The nursery should be thoroughly sprayed with the mixture at weekly intervals. It has also been found that light shade reduces the intensity of attack. This may be provided by erecting thin cadjan shades several feet above the plants, or by planting shade trees such as Albizzia.

THINNING OUT

At intervals of two or three months the nursery should be thinned out by the removal of the weaker plants, with a view to reducing the stand by at least 50 per cent. before the stage of budding is reached.

BUDDING

Described separately in Advisory Circular No. 1 "Notes on budgrafting procedure."

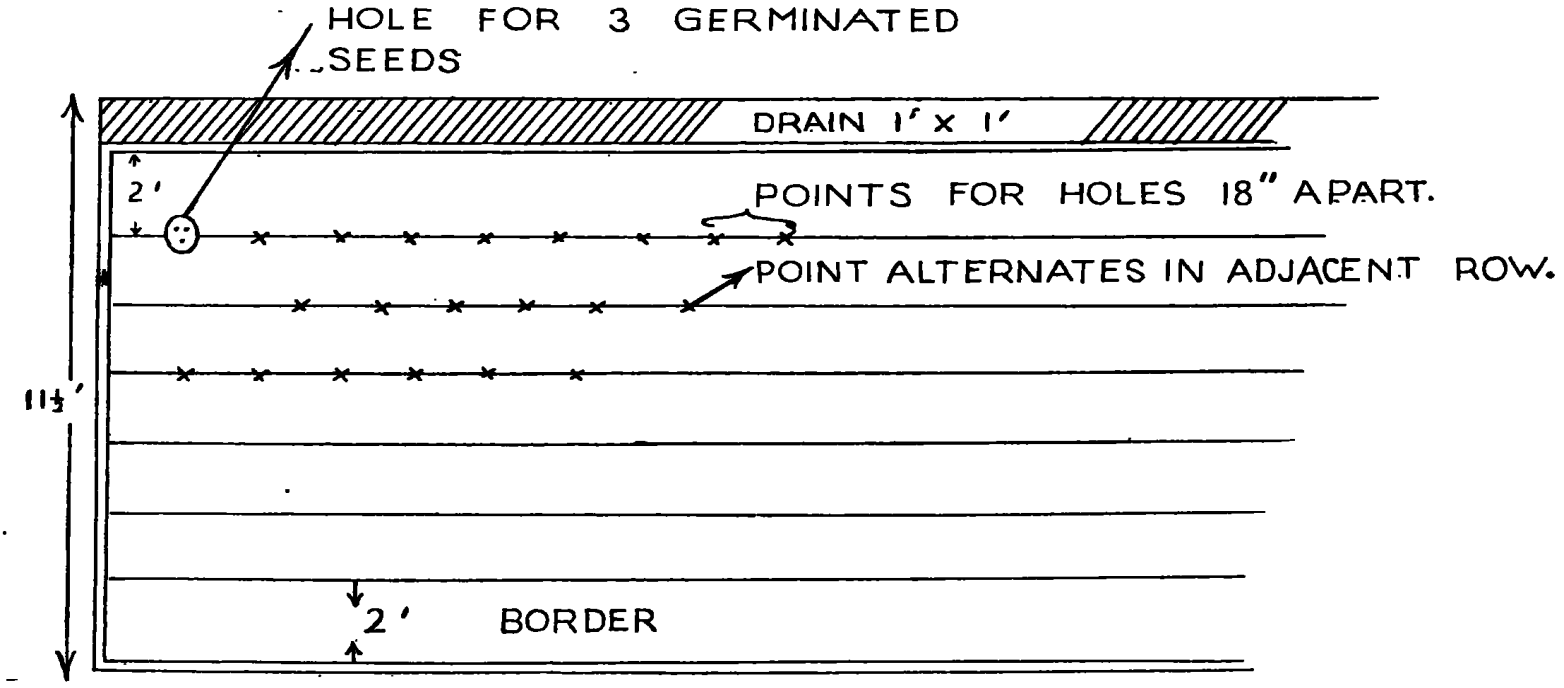
SIZE OF NURSERY REQUIRED

An acre of land, laid out in beds as described, will accommodate approximately 30,000 seedlings but the number is reduced to 15,000 by periodical thinning. Assuming a field stand of 150 budgrafts per acre, one acre of nurseries will just suffice for 100 acres of clearings. There is, however, the risk of a large proportion of casualties when transplanting the stumps and it will be prudent to allow a margin of 50 per cent. in the provision of nursery accommodation. Under present conditions surplus plants are not likely to be wasted as, if not required as supplies, they can be utilized for a subsequent clearing or sold.

ALTERNATIVE LAYOUT OF BEDS

The following alternative layout of nursery beds is particularly useful if the plants are to be transferred to the field as stumped buddings or if it is necessary to establish a nursery on land with a hard subsoil. The rows are spaced 18 in. apart and planting points are marked at 18 in. intervals in the rows on the quincunx system, so that the position of the plants alternates in adjacent rows. In this case the beds are cut 11½ ft. wide. At each planting point a hole of about 8 in. diameter is cut to a depth of 2 ft. and the earth loosened with an alavango to a further depth of 1 foot. The holes are filled in with top soil. Three germinated seeds are planted at each point, at the corners of a 4-in. triangle, and the two weaker plants thinned out before the stage of budding is reached (see Diagram No. 2). This layout gives a theoretical stand of 19,000 points per acre, but the provision of drains and paths reduces the number to about 14,000. The capacity of the nursery is slightly less than is obtained on the other layout but the stand of plants is evenly spaced at the time of budding.

Diagram No. 2.



COSTS

The costs of opening and maintaining a nursery will naturally vary very substantially according to local conditions and the following figures should only be regarded as a rough guide. They are based on the assumption that the nursery will be made by clearing an area planted with mature Rubber :—

ESTIMATED COST OF OPENING 1 ACRE OF NURSERY LAND

				Rs.	c.
1.	Felling, burning and clearing			30	0
2.	Dynamiting			10	0
*3.	Planting (including cost of germinating beds, &c.) ..			75	0
4.	Weeding at 1·50 per acre for six months			9	0
†5.	Fencing 90 milla posts at 0·30 ..	27	0		
	1½ cwt. barbed wire at 22·50 ..	33	75	66	0
	Staples and labour for mixing ..	5	25		
6.	Paths and steps			10	0
7.	Drains			15	0
8.	Preparing beds and removing roots			200	0
9.	Pests and diseases			25	0
	Total ..			440	0

UPKEEP (ASSUMING PLANTS ARE BUDDABLE AT 12–15 MONTHS)

				Rs.	c.
1.	Weeding—12 months at 50 cts.			6	0
2.	Thinning out backward plants and general upkeep ..			25	0
3.	Manure and application—15,000 seedlings at 2 oz.=				
	16¾ cwt. at 7·50‡ (excluding cost of carriage)	125	0	155	50
	2 applications at 15	30	0		
4.	Budding and attention 15,000 plants at 4½ cents, including cost of uprooting stumps for transplanting			675	0
5.	Uprooting for transplanting at 1½ cts.			225	0
6.	Pests and diseases			50	0
				1,136	50

Add cost of budwood if not available on estate : 1,500 yards at 50 cts. Rs. 750.

TOTAL COST

	Rs.	c.
Opening	440	0
Upkeep, &c.	1,136	50
Budwood	750	0
Total (for 15,000 stumps) ..	2,326	50
Cost per stump 15½ cts.		

November, 1939.

* Assuming seed is available on the estate.
† Delete cost of fence posts if cheaper material is available.
‡ At pre-war prices.