

THE
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(PUBLISHED QUARTERLY.)

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Notes on Lac Cultivation—(Contd.)

BY, S. RANGASWAMY,
Research Ranger.

Enemies of Lac.

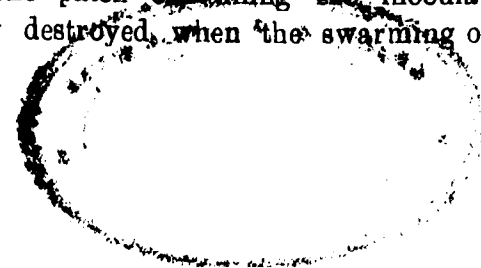
The lac insect has to fight against enemies of different kinds which are classified as follows by Mr. E. P. Stebbing.

(1) Animals, (2) Insects, (3) Fungi, (4) Natural influences, (5) Forest fires and (6) Man.

(1) *Animals*.—"Birds, rats, squirrels, and monkeys prey upon and injure or destroy the lac insect and are at times a source of considerable loss.

"Birds feed upon the young larvae when swarming and after they have come to rest upon the twigs and before the shell covering has formed to shelter them." This was not noticed in our areas.

"Squirrels and rats remove the resinous encrustation probably "to eat the contents of the cells." In the monsoon crop of 1928, one patch containing 128 inoculated trees was completely destroyed, when the swarming of larvae



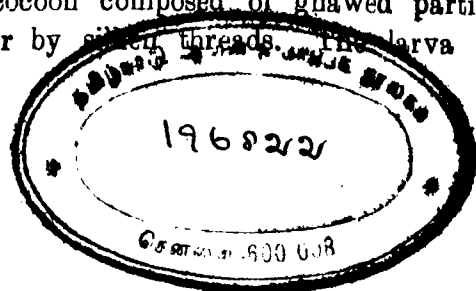
Lastly cheap rat-traps were laid near the base of every tree with baits for several days and nights and this put an end to the wholesale destruction though occasional bites are still noticed.

“Monkeys also feed upon the sweet encrustations and also commit damage out of pure mischief. They pull off the small bundles of lac bearing twigs tied upon the branches and sometimes break off the branches encrusted with lac”. I had this trouble only once but a few shots from my gun frightened them off for ever.

(2) *Insects* :—(a). Predators, (b). Parasites, and (c) Ants.

Predators:— The predator is an enemy which lays its eggs on the top or crevices of lac encrustation whence the larvae bore through the encrustation and feed on the lac insects. While boring, the encrustation crumbles into powder and it looks as if the lac is eaten up. Under this class of pests come *Eublemma amabilis*, *Eublemma scutula*, *Holococera pulvera*, and *Chrysopa*. Various other predators have been mentioned by Messrs. Stebbing, Imme, and Chatterjee but these are not yet noticed in North Salem areas.

Eublemma amabilis, Moore:—This appears as a white larva but when it matures it gets pink in colour due probably to its feed on lac insects. It weaves around itself a loose cocoon composed of gnawed particles of lac held together by silken threads. The larva moves with the



31.16.1

Physical measures :—(1) The portion of the crop used as brood lac for infecting the plants should be kept under water from 6 to 10 days immediately after all the lac insect larvae have emerged from it and the rest of the crop should be similarly treated immediately after it has been reaped. (2) Selected and as far as possible, parasite and predator free brood should be used for every crop. Self inoculation should be avoided to inoculate other host plants excepting Kusum for Kathki crop. This will save the destruction of the lac insects by predators and parasites for further 3 months, i. e., November—January and also check the further multiplication of the predators and other injurious insects and their attacks on the Baisakhi and Jethwi crops.

Chemical measures :—The portion of the crop as suggested above should be fumigated with Carbon bisulphide at the rate of 1 ounce of Carbon bisulphide to 10 C.ft. of space.

With these measures alone, the cultivator is sure to raise his yield of lac by about one fourth in each crop".

The list of natural enemies will also not be out of place here. These have been put by Mr. Negi under 2 classes :—(A) Known and (B) Suspected.

(A) *Known* :—

(1) *Bracon tachardiae* :—Parasitises the *Eublemma* larva. The larva feeds externally on the *Eublemma* caterpillar.

(2) *Chalcis tachardiae* :—Larva is an endoparasite of the *Eublemma* pupae.

(3) *Componotus compressus* :—(The big black ant) and *Solenopsis geminata* pick up *Eublemma* larvae when they come out from the egg shells and are trying to enter lac cells by biting at the encrustation.

(4) *Ephestia* sp. Mainly a scavenger but its larva always attacks *Eublemma* larvae and pupae when it comes in contact with them while entering into the galleries of *Eublemma*.

(B) *Suspected* :—

(1) A black braconid (unidentified).

(2) A Chalcid fly *Elasmus claripennis*, Cam. (This has definitely been proved an ectoparasite of the *Eublemma* larvae after this paper had been sent for publication)".

In our cultivation the monsoon crop of 1927 was completely destroyed by predators and the postmonsoon crop was partially destroyed. The only remedy resorted to successfully was by removing the stick lac from the inoculated trees within 20 days of larval emergence and soaking the stick lac in water. Other methods such as

hand picking and keeping a light in the area to attract the moths for killing were also tried, but not with complete success.

Eublemma scutilla :— This predator was only identified as being present in the crop but no intensive damage was noticed and no observations have been so far recorded.

Holococera pulvera :— This predator was also not observed on a large scale in *Shorea* lac crops. The larva is thin and long and very active unlike the *Eublemma*. It makes a tunnel on the encrustation and when full-fed gets the tunnel covered with silken threads.

Its life-history and control methods are briefly described in the annual reports of the Lac Research Institute, Ranchi, for the year ending 31st March 1928.

The control methods above described have completely put an end to these predators.

Chrysopa :— This is briefly described by Mr. Lefroy in his book on "Insect Pests". It is recognised by its patchy attack on the encrustation.

Its life-history has been worked out and given to me by Mr. Neelakanta Sarma of Bangalore.

"These predators are green coloured moths. Their wings, two in number, are delicate and quite transparent. The eyes have a golden lustre. The abdomen is elongated. It has a pair of antennae and the moth gives off a disagreeable odour.

These predators, probably attracted by the honey secreted by a month old lac insects, lay oval shaped green eggs, each at the end of a long foot stalk, which are attached to the underside of the leaves and twigs, colonised by lac insects. As days progress, these eggs develop and

turn grey with a dark centre. At the end of about 4 days young larvae known as *Crysopa*, emerge out, one from each egg shell through a small hole. These hatched larvae make their first meal of the unhatched ones, if any, showing that they are carnivorous in nature.

The larva is stouter than the moth and is endowed with a pair of curved, tubular, sucking jaws and rough hairs all over its back. The body is elongated and ends in a pointed anus. These larvae pierce the young lac insects with their sucking jaws and after extracting juice from its body, carry the skin of the head insect over their back. This havoc proceeds till the lac insects are 2 months old when the thin lac encrustation protects the insect from further attack.

The number of *Crysopa* larvae and eggs decrease as we ascend a lac infected plant. The number would be less if the undergrowth allround has been removed and a still less number of them are found on plants inhabited by ants. (Hence these latter two can be used as control to a certain extent-see table attached)

Tree No. and the description of the plant inoculated.	No. of larvae in the crop.	No. of larvae in the middle.	No. of larvae in the bottom.
Tree No. 30, I.I.S. area Doraisanipalaya (undergrowth removed and soil aerated.)	15	41	72
Tree No. 62 I.I.S. area Doraisanipalaya (undergrowth removed and soil unaerated.)	12	29	46
Tree No. 92, I.I.S. area Doraisanipalaya (undergrowth removed and soil aerated.)	28	50	93
Tree No. 641, Govt. area Doraisanipalaya (undergrowth removed.)	14	26	40
Tree No. 646, Govt., area Doraisanipalaya (undergrowth removed.)	30	48	72
Tree No. Govt. area, Doraisanipalaya (undergrowth not removed.)	21	39	73
Tree No. Govt. area, Doraisanipalaya (undergrowth not removed.)	84		90

N.B.—Compare 7 with 5 and 6 with 4. as their sizes and shapes are approximately identical.

The *Chrysopa* larvae, when mature (i.e. 15-20 days after emergence from the egg shell) spins itself into an oval shaped cocoon from which the moth comes out through a circular slit at the end of 10-12 days. This again gives rise to fresh eggs and thus a new generation of larvae. The number of larvae and eggs go on drying out after 2 months or more correctly after the emergence of males as the natural development of the lac encrustation prevents these larvae from attacking the lac insects.

Hence the most critical period of attack is the interval between the swarming of lac insects and the male emergence. The remedy has to be done in the early stages of attack or else there is every danger of the whole crop being completely wiped out."

Parasites:— The following parasites have been collected from our North Salem crops and identified by the Ranchi Research Institute.

- (1). *Cocophagus tschirichii* (Yellow Chalcid No. I).
- (2) *Tetrastichus purpureus* (Black Chalcid No. I).
- (3). *Tachardiaephagus tachardiae* (Yellow Chalcid No. II).
- (4). Yellow Chalcid No. III.
- (5). Black Chalcid No. III.

The life history of any of these is not yet worked out and the Ranchi Institute has taken them up.

Samples of *Shorea talura* and *Atylosia albicans* lac sticks collected from the postmonsoon crop of 1930 and caged in March gave the following number of various parasites.

		3rd March.	4th March.
Black Chalcid.		334	342
Yellow	No. I.	1	1
Black	No. III.	1	0
Yellow	No. III.	86	55

The control method taken was that all the brood not used for inoculation were cut and immersed under water for a week and then dried in the sun. Specimens of these parasites have been collected and preserved at Denkanikota Research Ranger's Office for reference and future identification in the field.

(c). **Ants:**— Messrs. P. S. Negi, M. P. Misra, and S. N. Gupta of the Ranchi Institute have stated in their publication "Ants and the Lac insect", "that ants in general are not injurious to the lac insect, but undoubtedly pick up the crawling lac larvae and the male insects; at the same time all of them are useful to the lac insect as they remove the excreted "honey-dew", which otherwise mixed with dust in the absence of rains is likely to block up the respiratory organs of the lac insect and cause its death by suffocation. In addition, many of them and especially *Camponotus compressus* (Big black ants) and *S. geminata* help the lac insect by feeding on the larvae of the predator moths".

In our areas eight species of ants are noticed and all except the small red ants which tuck up their abdomen while running and feeding (*Crematogaster dohrin*) are harmless. With this particular species an experiment was carried out. Two inoculated plants were taken. On one the ants were allowed free access and on the other they were prevented by painting the stem with tar every morning and also tying fly-paper all round. In 20 days time the control plant was with good encrustation and on the experimental plant nearly 60% of the lac larvae has been destroyed. Therefore, I have to view this species as harmful.

(3). **Fungi:**— Mr. Stebbing states that several species of parasitic fungi prey upon the lac insects but no investigation has been made in this line.

(4). **Natural atmospheric influences.** Heavy rain at the time of male emergence washes out the moving insects. Hot winds kill the insects outright. In the postmonsoon crop of 1929 the damage was very great.

(5). **Forest fires:**— They are very harmful both to the host and to the lac insects in our *Shorea* areas. Two

patches near Deverbetta were burnt in March 1929. The trees though big, have not yet recouped. Some of them are completely and many are highly infested with borers. In an inoculated patch the fire kills out the lac insects outright. Therefore fire protection¹ is the most important operation in all our lac areas.

(6). *Man*:— Due to high prices of lac, thefts are said to be very common in Northern India but as our operations are in the initial stages and as there is no local market for the produce this damage is not yet known, but graziers² occasionally break off the encrusted sticks either on account of curiosity or out of mischief.

Closing the areas to grazing will put an end to this sort of damage.

Uses of Lac

Lac is chiefly used in the preparation of gramophone records, sealing wax, buttons, lithographic inks, corundum and emery wheels, imitation ivory, oil cloth, high grade varnishes and polishes and for stiffening silk and straw hats. Shellac is employed in the making of electrical insulators and explosives.

The industry may also be strengthened by the economic utilisation of the bye-products. The question of bye-products is discussed fully by Mr. M. Venugopalan of the Ranchi Research Institute.

"These may roughly be divided into 2 classes. (1). Those which occur during the preparation of seed lac,

¹In the estimate special provision is made that all dead branches etc. are removed from areas before inoculation takes place.

—J. E. M. MITCHELL, D. F. O.

²I think that some of the Denkanikota merchants have got wind of this and have removed the sticks to try and inoculate trees on patta fields. The sooner we get it a "Royal Produce" the better, save trouble.

—J. E. M. MITCHELL, D. F. O.

and (2) those which result during the manufacture of Shellac, button-lac, garnet lac etc.

To the first class belong (1) residual twigs from the "Phunki lac", after the removal of encrustation, (2) fine dust "molemma" arising from the sieving preliminary to the washing of lac, (washed liquors containing the dye, finely divided resin, insect bodies etc. (4) dye cakes got by precipitation of the washed liquor by Calcium Chloride.

To the second class belong:—

(1). "Kiri" a refuse remaining in the bag used for making shellac and button lac, (2). Lac-wax The first bye-product left in any lac factory is the accumulation of twigs got from the "Phunki lac" after the removal of lac by beating with wooden mallets. The lac adhering to the fragments of twigs especially to those of the summer season crop, cannot be completely removed by simple mechanical means and a fair percentage of resin may be got by neutralisation with acid. The twigs after drying can be used as fuel".

The molemma consisting of very fine grains of lac mixed with powdered wood, insect bodies, dust, wax and dye may be used for the manufacture of low grade varnishes and for bangle-making with necessary addition of rosin, of the molemma from which the fine particles of resin are extracted by some special method may be put on the market for the dye.

The third bye-product is the dye in the liquors resulting the crushed lac. This may be used, as it is, for dyeing silk and wool. If there is no market, it can be used as a fertiliser since it contains a large supply of albuminoid nitrogen in the insect bodies or the dye may be separated by precipitation and the cakes so obtained may be used (1) as a fertilising material, (2). as fuel for boilers, and (3) for the preparation of low grade varnishes.

Since lac dye closely resembles Cochineal it may also be used to give a lake with tin or aluminum, yielding a product very much akin to "Cochineal carmine" which could be used for the same purpose.

While manufacturing shellac a large quantity of refuse or "Kiri" is accumulated in the portion of the bag exposed to the fire after the shellac has been squeezed out. It is a blacky mass, consisting of animal remains, woody material with a large proportion of lac resin and a considerable quantity of lac-wax. It is utilised for preparing garnet lac, cheap grades of Shellac, and also for making toys and bangles.

If the lac-wax can be recovered from "Kiri", "Mollemma" etc., by a cheap method it can be used to replace bees-wax in industries".

Though the produce is used in ever so many ways, yet due to want of steady supply and abnormal fluctuation of market prices, the users, are running for artificial products which are supplied cheap and at a steady price, even though they are not as good as the genuine product. The only hope to maintain the industry therefore lies in the concentrated mass production by Government agency and flooding the market at normal prices.

Inoculation of Shorea brood on other¹ species.

The species on which the transference was effected may be divided into 3 classes.

I. Species on which the insects thrived well and produced as much yield as on the mother host. These are :—

1. I consider these experiments besides being interesting are most useful. We can make use of a lot of species in our dry forests for lac production. I am optimistic as I read that the substitute used for gramophone records fell much below expectations. I notice the market for lac is also rising.
J. E. M. MITCHELL, D. F. O.

(1) *Atylosia albicans* :—During the 1229 monsoon crop, $\frac{1}{2}$ lb. of brood put on 10 *Atylosia albicans* yielded 5 lbs. i. e., 10 times the seed. In 1930 monsoon crop $\frac{1}{2}$ lb. yielded 9 $\frac{1}{2}$ lbs. The experiments are being continued.

(2) *Acacia sundra* :—During 1930 monsoon crop, 9 lbs. of brood yielded 45 lbs., i. e., 5 times. In some cases the encrustation was much thicker than *Shorea*. It is now attempted to raise a separate strain on *Acacia sundra* alone.

(3) *Dichrostachys cinerea* :—2 lbs. of brood yielded 5 lbs. in the premonsoon crop of 1930, but in this species the plants were flooded with predators. Attempts made to separate a strain in the monsoon crop of 1930 also failed. Experiments are now proposed to be carried out in pot culture.

II. Species² on which the insects thrive but no appreciable quantity of resin is produced :—

(1) *Pterolobium indicum*, (2) *Bridelia retusa*, (3) *Desmodium gyrans*, (4) *Flemingia congesta*, (5) *Acacia suma*, (6) *Anona squamosa*, (7) *Acacia farnesiana*, (8) *Zizyphus jujuba*, (9) *Butea superba* and (10) *Rynchosia rufescens*.

III. Species on which the insects failed to thrive :—

(1) *Cochlospermum gossypium*, (2) *Odina Wodier*, (3) *Zizyphus xylopyra*, (4) *Dalbergia paniculata*, (5) *Phyllanthus emblica*, (6) *Ficus Arnottiana*, (7) *Terminalia belerica*, (8) *Mallotus philippenensis*, (9) *Premna tomentosa*, (10) *Eugenia jambolana*, (11) *Vitex pubescens*, (12) *Acacia pennata*, (13) *Acacia intsia*, (14) *Chloroxylon swietenia*, (15) *Psidium guayava*, (16) *Indigofera mysorensis*.

2. Some of these experiments will have to be repeated again.
J. E. M. MITCHELL,
District Forest Officer.

APPENDIX "A" — History of crop. Deverbetta centre.

Name of crop.	Date of inoculation.	Date of swarming of the brood.	Date of transference to other fresh trees.	Date of removal of stick lac.	Male swarming.		Date of swarming of the brood.	Time taken for the crop.		REMARKS.
					Period.	Time taken from the swarming of the brood.		Days.	Weeks.	
1. Monsoon crop. (July-Novr. '27)	13-7-27	13-7-27	20-7-27 to 30-7-27	9-8-28	13-9-27 to 26-9-27	62 days	20-11-27	131	9½	Swarming period was in most cases 3 weeks and in a few sticks to one month.
2. Postmonsoon. Novr. '27—March 1928.)	9-11-27 to 10-11-22	9-11-27	1st transfer. 12-11-27 to 22-11-27 II transfer. 26-11-27 to 27-11-27	26-11-27 to 27-11-27	24-1-28 to 11-2-28	77 days	26-3-28	138	20	Plants on which 2nd transfer was effected were so full of predators that they were cut and burnt.
3. Pre monsoon. March '28—July 1928.)	28-3-28 to 1-4-23	26-3-28	6-4-28 to 10-4-28	18-4-28 to 19-4-28	18-5-21 to 7-6-28	85 days	16-7-28	113	16	The stick lac was removed earlier at the risk of losing some insects to minimise predator attack.
4. Monsoon crop. July-Novr. 1928	18-7-28 to 25-7-28	16-7-28	2-8-21 to 4-8-28	12-8-28 to 17-8-25	16-9-28 to 15-10-28	63 days	23-11-28	131	19	Practically no transfer was effected except on 6 shoots as trans. ferred shoots all ways failed

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5. Postmonsoon (Novr. '28—March 1929).	30-11-28 to 8-12-21	23-11-28	10-12-28	31-12-28 to 3-1-29	7-2-29 to 25-2-29	77 days	11-4-27 and 13-4-22	140	20	
6. Premonsoon (April 1929—July 1929).	10-4-22 to 20-4-29	9-4-29 to 13-4-29	15-4-28 (Only 5 trees.)	20-4-29 to 30-4-29	2-6-29 to 22-6-29	53-75 days.	23-7-29 to 8-8-29	107 to 111	15 to 16	
7 Monsoon crop (July 1929—December '29).	28-7-29 to 11-8-29	25-7-29 to 8-8-29	2 trees on 21-8-26	12-8-29 to 2-9-29	25-9-39 to 15-10-29	59-79 days.	25-11-29 to 9-12-29	120 to 135	17 to 19	
8. Postmonsoon (December 29—March 1930.)	24 11 22 to 23 12 20	25 11 29 to 9 12 29	3 trees on 25 12 29	20 12 29 to 17 1 30	8 2 30 to 8 3 33	75 days	16 7 21	130	19	
9. Pre-monsoon crop 1930.										
Crop I.	5 4 30 to 8 4 30	4 4 30	...	22 4 30 and 23 4 30	25 5 30 to 10 6 30	52 days	23 11 28	115	16½	
Crop II.	26 4 30	22 4 33	...	10 5 30	9 4 30 to 25 6 30	49 days	11 4 22 and 13 4 29	137	19½	

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APPENDIX "A". — Javalagiri Centre.

Name of crop.	Date of inoculation.	Date of swarming of the brood.	Date of transference to other fresh trees	Date of removal of stick of lac.	Male swarming.		Date of swarming of the brood.	Time taken for the crop.		REMARKS.
					Period.	Time taken from the swarming of the brood.		Days.	Weeks.	
1. Premonsoon. (March—July 1928)	30 3 28	26 3 28	...	20 4 28	18 5 28 to 7 6 28	85 days	16 7 28	113	16	No transfer effected as it was found useless. Transfer effected on 13 shoots due to over inoculation.
2. Monsoon crop. (July—Novr. 1928)	18 7 28 to 24 7 28	16 7 28	30 7 28 to 2 8 28	13 8 28 to 19 8 28	18 9 28 to 2 10 28	65 days	26 11 28	134	19	
3. Postmonsoon. (Novr. 1928—March 1929)	4 12 28 to 6 12 28	26 11 28	...	1 1 29 & 21 29	7 2 29 to 25 2 29	74 days	20 4 29	146	21	
4. Premonsoon. (March 1929 to July 1929)	10 4 29 to 20 4 29	9 4 29 to 13 4 29	...	20 4 29 to 30 4 29	10 6 29 to 25 6 29	61 days	10 8 29	113	16	
5. Monsoon crop. (July to Decr. 1929)	11 8 29	10 8 29	...	2 9 29	15 10 29	68 days	3 1 30	146	21	
6. Postmonsoon. (Decr. 1929 to March 1930)	22 12 29	9 12 29	...	25 12 29	23 2 30 to 10 3 30	76 days	22 4 30	134	19	
7. Premonsoon crop. 1930.	24 4 30	22 4 30	...	12 5 30	8 6 30 to 30 6 30	48 days	24 8 30	125	18	

APPENDIX B.

Experiments to find out the space covered by lac insects.

Shorea Brood : —Four experiments were carried out, two in 1928 and two in 1929 premonsoon and monsoon crops. The brood was divided into three classes as noted below:—

A Class :—Best brood, i. e., good continuous encrustation without any parasite or predator attack. **B Class :—**Good encrustation on one side of the stick but with slight attack by predators. **C Class :—**Discontinuous encrustation with predator and parasitic attack.

Representative sticks were selected from each kind of brood and individual shoots of more or less the same height and girth and with the same amount of foliage in the same patch were selected and inoculated, the area covered by insects measured up and average struck, the results of which are tabulated below.

Steps taken to ensure freedom from parasites and predators.—The best sticks were selected and examined with a high power lens. They were removed after emergence of insects and examined for the exit of predator moths. Those that had holes from which the predator had emerged were rejected and the remaining sticks were kept under observation for a period of 2 months to see if there was any further emergence of moths. The area covered by insects on the particular plant on which the clean brood tested as explained above, alone, was taken into account. The box in which the sticks were kept was examined for the presence of Chalcids and none were found. Hence the brood was taken to be clean. The quantity of brood on different sticks was not however the same.

NOTE :—For want of facilities the experiment has not yet been repeated in a more accurate manner.

Name of crop.	Class of brood.	Length of encrustation in inches.	Area covered by insects in square inches.	Area covered for every inch of encrustation in square inches.
Premonsoon crop 1928.	A.	3½	195	56
	B.	3½	69	20
	C.	4	24	6
Monsoon crop 1928.	A.	3	211½	70½
	B.	3	84	28
	C.	4	31½	8
Premonsoon crop 1929.	A.	4	212	53
	B.	4	82	20½
	C.	4	32	8
Monsoon crop 1929.	A.	3	198	66
	B.	3	93	31
	C.	3	27	9

APPENDIX "C".

(Sample list maintained at the time of lac inoculation)

No. of trees.	Description of trees.	No. of bundles.	No. of sticks.	No. of baskets.	Remarks.
1	One lopped tree. ...	4	2	...	Full of big red ants.
2	Two lopped trees. ...	1	16	...	
3	One lopped tree and shoot ...	10	11	...	
4	Stumps and shoots ...	4	2	...	
5	One lopped tree ...	1	8	2	
6	Three lopped trees ...	10	8	12	
7	One lopped tree ...	8	...	2	
8	Stumps and shoots ...	...	10	...	
9	Three lopped trees ...	22	8	...	
10	Four lopped trees ...	18	7	...	

LOCALITY:—Thalli R. F. Unreserve Patch 1.

Name of species inoculated:—*Shorea talura*.

Total number of trees inoculated:—8.

Total quantity of brood inoculated:—25 lbs

Date of inoculation:—27-11-29.

Brood obtained from Gulkaigundu patches 1 and 2 of last crop.

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**The Aim of Scientific Forestry is to
Aid Nature.**

*[Winning essay for the Indian Forester prize for
present students, 1931.—By, Sen Gupta,
1929-31 Division.]*

Though the term "Scientific Forestry" embraces more than one subject, for the present article it will be interpreted as "Silviculture" which is of course the soul of Forestry and is also suggested by the latter portion of the heading i. e., to aid nature.

Long before the subject of forestry was born and long before the present all-embracing civilization had its origin with its scientific advancement, the surface of the earth was covered with a most magnificent forest growth of natural origin. For the production of these forests no human interference, no nursing and nothing of the sort were required. They sprang out themselves and grew themselves. But there was nobody to observe the struggle out of which they arose. As a result of indiscriminate exploitation of these forests and an ever-increasing demand of mankind for forest produce it became necessary to maintain and improve these old forests and create new ones. Here "silviculture" took origin and its present structure is the embodiment of the observations and experience of several centuries of the most cultured brain. From the present knowledge it can be said beyond a shadow of doubt that had the natural forests been treated judiciously much better result would have been obtained.

What happens in nature as regards forestry? In nature forests grow themselves. If they are analysed it is found that there is a regular harmony as regards the distribution of species, according to their respective silvicultural

characteristics—e. g., evergreen and deciduous and sporadic habit, light or shade demanding nature, requirements of climatic conditions etc. No human effort or application of scientific knowledge of forestry can interfere with these particulars. Nothing can change the inherent nature of the seed of any species. Nature herself has got many devices and contrivances to effect regeneration and formation of the subsequent crop. Then what is within the power of scientific forester to aid nature? And how is it effected? It has been seen that nature's process is too slow to keep pace with the qualitative and quantitative requirement of mankind. Here nature fails to serve the wish of man without being helped by him. So, the knowledge of silviculture, as revealed from the study of nature, comes to her aid in the following way.

Nature in the formation of Forest and Silviculture.

(a) *Treatment of the stand during the process of regulation*:—Seeds are available in nature on the trees. But it is seen that under various circumstances they cannot properly germinate and the tree cannot grow. A few of these circumstances may be enumerated as follows—(1) Unfavourable nature of the seed for germination e. g., very strong testa or very delicate and minute structure or short period of retentivity of germinating power. (2) Natural calamity, like falling of seeds by storm before maturity or failure of timely rain. (3) Breaking of fire while the seeds are on the ground. (4) Unsuitable seed bed (hard, stiff, or baked). (5) Dense covering of grass or undergrowth. Silviculture can overcome all these difficulties and help nature.

The seed which has got very hard testa rendering easy germination difficult, is artificially treated by hot water or acid solution of certain concentration for a specific

period, just to soften or wear away the hard testa and make it fit for quick response to the conditions of germination. Similarly, the delicate nature and short retentivity of power of germination of seeds can be made to suit and adopt nature by treatment by a silviculturist.

As to the immaturity and quality of seed a silviculturist can gather in time the best quality of seed from the ideal specimen of trees for a particular locality and make the best use of them by distributing in nature. As to failure of rain, silviculture waters the plants till the period of crisis is over.

To protect the seeds and crop from fire the silviculturist has got an elaborate chapter on fire protection in forestry, by proper application of which he can secure the safety of his forest. The adverse nature of the bed due to hardening or baked nature may be overcome by timely wholesale tillage or working of soil in required areas. Obstruction due to dense grass or undergrowth to reach the seed up to the ground and subsequent suppression, are minimised by their removal. The opposing nature of wood land, like two equally powerful but hostile nations which repeatedly fight against each other for domination over the soil, can be successfully interfered by a silviculturist in favour of wood land.

It is most interesting to see that a silviculturist can overcome all the above difficulties by the application of a single and simple operation. It is the raising of a nursery. Here he can raise the plants, under desired circumstances independent of the meteoric influences and can rear them till suitable conditions in nature permit them to be put in the forest.

In nature, the plants in their infancy, while establishing themselves on the earth are faced by some invincible enemies. In the first place come the noxious weeds. They compete

with the tiny baby plant for light and rob most of the available moisture in the soil, causing starvation to the latter. They further choke the young plant from all sides causing suffocation. Silviculture saves the plant from this danger by the proper operation of "weeding". In the next place come the plants of inferior species, climbers, etc., which are also almost equally detrimental to the plants. Silviculture frees the plants from their clutches by "cleaning" and "climber cutting".

(2) *Treatment of the stand after Establishment.*

In nature inferior species often flourish at the expense of better varieties. Silviculture eliminates and keeps them from re-appearing by the most thoughtful application of knowledge of "improvement felling", thus, helping, rather improving upon nature, in regulation of composition.

In nature sometimes forests are too sparsely or too densely stocked—both of which are detrimental to the final value of the crop. Silviculture maintains throughout life, enough trees to stock the area properly and no more. In sparsely stocked area silviculture brings it into normal state by planting the gaps. In the case of the densely stocked area it relieves the congestion of the crop by "thinning". It minimises the struggle for growth among trees and produces the maximum quantity and the best quality. It is interesting to note that apart from aiding nature, thinning has improved much upon the structure of the wood, in specific gravity and hence in strength, especially of the ring-porous broad leaved species, like Teak.

In nature mis-shapen, crooked and defective trees, even of valuable species, are apt to accumulate and retard the development of the better individuals. Silvicultuer removes them and aids nature for the development of better ones.

In nature gaps are often created by, fire, storm, logging or any other reason. These are at once re-stocked by silviculture without waiting for nature to do it in a slow process—if at all.

(3) *Disposal of Slash.*

In forests, slash or debris often accumulates as a result of logging, wind, fire, or some other reason. This when properly disintegrated improves the quality of the soil and helps regeneration. But in nature the process of disintegration is too slow and it further exposes the forest to the risk of "insect and fungus attack", for which the debris is a favourable abode. A silviculturist disposes the slash either by progressive burning, by piling and burning, by broad-cast burning, by light burning or by simply piling, or lopping. Thus nature is much helped in improving the soil and ensuring regeneration.

(4) *Protection of stand against various injuries.*

Though nature has provided some plants, according to environment with thick bark, spines stinging hairs etc. for protection against natural calamities and animals—these are not at all adequate for protection of a stand against the injuries of varied nature to which they are subject. Of these, fire, insect, fungus, and animals are prominent. Protection from these are necessary for successful growing of any crop. To aid nature, most efficiently, a Silviculturist is led into various specialised fields—such as fire protection, entomology, pathology etc. Here the help consists in classifying and describing the injurious agencies, revealing the scientific facts which are required in determining control methods and formulating and solving the administrative problems connected with control and prevention of losses, through the specialists in the respective branches.

(5) *Nature of individual species.*

One of the greatest boons of silviculture is the systematic knowledge of the nature of each individual species, and the best use of it has been made by aiding nature by artificial introduction of woods. The most valuable species often struggle in nature, in mixture with other inferior species, for light, space and other requirements. A silviculturist raises them pure or in mixture with associates, in plantation and give every facility to grow. Here the crop though of artificial origin—everything subsequent is dependant on nature, subject to occasional interference of man. So, principally, even in plantation, it is nature which is more easily and systematically aided by silviculture.

(6) *Nature herself (with vegetation and soil)*

Here the word nature will be considered in its most abstract sense. If nobody interferes with her, she smoothly goes on with her beauty and resources—to the utmost benefit of mankind. But indiscriminate action of man on nature in the mountains as regards her forest resources causes baldness on the surface of earth. Nature does not tolerate it calmly and the inevitable results that accompany are as follows: The rivers become torrents when it rains, causing sudden flood over the plains with all its devastating consequences, like famine and epidemics etc., the valleys are no longer supplied with water, the rivers become dry and irrigation becomes impossible. Hence it is seen that the prosperity of agriculture, the health of the inhabitants and public fortune depend upon a normal proportion of forests. Again this percentage itself is an element to regulate the world's circulation of cloud, rain, snow, flood and even the ocean. Hence the necessity of restocking the denuded zones in the mountains and establish order in nature, without which all economics are profoundly upset.

It is only silviculture which can establish order in nature by restocking the denuded area, stopping further action of man and proper treatment of the mountain forests.

In conclusion, it may be drawn up in a nut-shell that the details and execution of all silvicultural systems—both permanent and provisional, corroborate the same truth of aiding nature to form a normal crop. All the experiments of research are actuated by the principle of establishing facts which will aid nature. In the continent, specially in Germany, silviculture has advanced so much and is aiding nature in such an intimate manner that forestry has become almost like agriculture from nursing and treatment point of view, with the difference that one is harvested biennially or annually and the other after a quarter, a half or one century.

“ RAMAKRISHNA ”.

**College-day, Madras Forest College,
June 28th, 1931.**

On the 28th June 1931, the concluding day of the 'Forest college week,' a large gathering of ladies and gentlemen assembled in the spacious hall of the college to witness the distribution of prizes and certificates to the 18th batch of trained students. The Hon'ble Mr. A. Y. G. Campbell, C.S.I., C.I.E., O.B.E., V.D., I.C.S., presided over the function.

Mr. J. C. Wrench, the Principal, opened the proceedings, and addressed the gathering as follows:—

“ The Hon'ble Mr. Campbell, President and Members of the Board of Visitors, ladies and gentlemen,

1. “ In welcoming you, Sir, there is an additional pleasure: for, it is wholly unnecessary to search record, page, and paragraph to ascertain your interest and association with our College. This is well known. For it was but last year, that you honoured us by being present at our annual prize giving, here, in this hall. We are very conscious of the honour done in your presiding to-day: and on behalf of the college, I express to you, sir, our sincere appreciation.

2. “ Our true book of revelation is our annual administration report. But it is customary, however, on this occasion, to anticipate this to some extent and to disclose what was before unknown, and to announce to you, Sir, and to the public in general, certain of the more important activities of the College and particularly the progress (mental and physical) of students, and particularly of the Seniors, who to-day are given their certificates of proficiency in matters forest (if such a term can be used) and whose appearance in this hall is their last as students of this College.

3. "To-day is our 18th prize distribution, which means some 470 students have gone forth from this college certified fit to undertake the duties and responsibilities of a Range Officer. You, sir, and members of this audience present to-day, who attended at the annual prize-giving last year may perhaps recall from what other provinces and what distant places students come.

4. "As is possibly known, the course of study at the college is a period of some two years and a senior and a junior division is distinguished. The subjects of study are technical and comprise, Engineering, Survey, and Drawing, Forest Utilization, Range Administration, Botany, Forest Management, Silviculture and some Physical Science and First Aid. Recently the variety of the syllabus was a matter for debate at the college and the motion was "that a forester is a Jack of all trades and a master of none." It is confidently hoped that, those students who are going down and who shortly will be handed certificates of proficiency, feel themselves on the way to becoming a master of at least one subject, and with a strong determination, in so far as in them lies, ultimately, to be a master of them all.

5. "The total number of students at present at the college is 36: 16 seniors and 20 juniors. With the exception of one private student from Madura, there are no students from this presidency. It may be noted that two private students joined the college during the year and took advantage of the concession awarded to such students. We anticipate having a total of 50 students from the commencement of the coming college year beginning on the 1st of August next.

6. "Regarding the ability of students, this is average; there is no student of any outstanding merit neither is

there any of very poor attainment. All the 16 senior students obtained higher standard certificates. The highest placed student is from Bonai (Orissa).

"An analysis of the examination results show:—(1) That in respect of Seniors in class examinations the percentage highest marks is 83; the lowest 60.5 and the class average 67. (2) While in the final examinations in the seniors the percentage highest marks is 78, the lowest 60 and class average 68. (3) And for the juniors the percentage highest marks is 74, the lowest 57 and the class average 69.

7. "Both in headquarters and in camp every opportunity is taken to arrange special lectures on forest matters for the benefit of students. In October last, at headquarters, Dr. Lyon of Honolulu, Government Botanist, in the Hawaiian Islands gave a special lecture to the students on "Some Forest problems in the Hawaiian Islands."

"In camp, certain officers on special duty, namely, the Assistant Forest Utilization officer, the Extra Assistant Conservator in charge of sleeper operations gave lectures and demonstrations on sleeper passing and conversion of sleepers, and Mr. Venkateswara Ayyar, Assistant Working Plans Officer, in Botany and prescriptions in Working Plan. As regards territorial officers, Mr. R. S. Browne, District Forest Officer, Nilambur, lectured on Silviculture.

8. "Some 5½ months of the year are spent by students and staff in camp. The following places were visited:—

<i>Camp. (Seniors)</i>	<i>Camp. (Juniors)</i>
Walayar.	Sadivayal.
Nedungayam.	Mount Stuart.
Silent Valley.	Kargudi.
Arambyshola (Ooty).	Bandyshola (Coonoor).

"The previous year's camp at Olavakkot was abolished during the year and in its place the students visited Silent Valley as this camp affords a greater facility for study of evergreen forests.

9. "During the year a regular course of lantern lectures was begun. At the start, about 150 slides relating to some four different subjects were purchased.

10. "Mr. A. A. F. Minchin, Conservator of Forests, was pleased to offer prizes for the two best essays for both the divisions, the subjects for essays being :— *Seniors :—To prepare an address to small children aged between 8 and 11 at a primary school, regarding the utility of forest.* *Juniors :—To address a class of young people of Secondary school age between 14 to 16 on the value of forests in the country.*"

"The prize for Seniors was won by student M. Haq with student H. Sen Gupta 2nd, and that for Juniors by student V. N. Sharangapani with student Mandke, 2nd.

11. "A debating society, has been started during the year. Subjects for debate are technical and non-technical, alternately, and a meeting is held every Friday during Headquarters terms. It is hoped this society, begun very modestly will attract the increasing interest of students especially of those students, who, in recreation, are unable to gather laurels in the playing field, but who in debate find a field all their own.

12. "Games at the College are organised and controlled by the Athletic club: office bearers are drawn from members of the staff and from students. Games are held 3 afternoons a week during Headquarters terms and are compulsory. They comprise hockey, cricket, athletics and tennis. The average student on arrival at the College is as a rule, best at hockey, then cricket, athletics, and tennis.

During the past year the College has been most successful in athletics: both in open local competition and at home in the annual sports. At the Agricultural College sports, in July 1930, one of our members was 2nd in the open half mile race. In the Grigg Sports the College won the open events' cup, after a period of four years' fruitless but keen endeavour. At these sports one member of our team broke the local 120 yards High hurdle race record.

"In the College sports four College records were broken, three of which have held since 1916, 1918 and 1919. In the Y. M. C. A. sports held at the beginning of the year the individual and institution Championship were both won by this College.

"From Hockey and Cricket we have derived much recreation and pleasure. It is always a point for regret that want of opportunity and facility, in our camping periods, make it impossible to develop a team to its full proficiency, except of course when we have the pleasure of playing our Visitors and make 158 runs for 2 wickets. But I think, it can be said, we have a sense of side and a spirit of College. In Cricket our strength lies with the Junior division and as they will be with us next year we have hopes of possessing a strong side. The other games and sports which we have at the College need no special mention.

13. "With the exception of a case of typhoid in September last the health of the students both in headquarters and camp has been satisfactory. Students are weighed on arrival and before leaving the College. It is of interest to note that recent weighments of seniors show a decided increase of weight in students—to be precise an average increase of $7\frac{1}{2}$ lbs. The present tutorial staff numbers a total of 4 including the Principal. We do not

say, sir, that this is inadequate, but we rather hope that this is an indication of quality and not quantity.

14. "I should like to take this opportunity to thank the staff for their most willing co-operation throughout the past year in those additional duties which go to make up College life: Mr. Griffith for his interest in and able control of games. Mr. Ramachandra Rao, for his able, wise and tactful management of all of those numerous duties which are his as House Tutor. To Mr. Belliappa for his ever-ready willingness to do anything that may be asked of him.

15. "Before calling upon you, sir, kindly to present the certificates and prizes, I would ask the students to remember this College—It cannot be said, I think, that, if you have made proper use of your time here, that you have had no interest, no pleasure, as onlooker or participator, in your games. It cannot, I hope, be said, that you have failed to make friends. Surely a spirit of gratitude and remembrance must arise. But this I have rather failed to find in the past and therefore, I tell you this, that you may know. Finally, on behalf of the staff and students, I again wish to thank you, sir, for presiding here to-day.

16. "I will now request the President kindly to present the certificates and prizes:—

Higher Standard Certificates :—

1. H. Prasad Sen Gupta, 2. Maqboolil Haq, 3. Harbans Singh, 4. Abdul Hamid, 5. Shaida Mohammed Khan, 6. Pandurang Asabe, 7. Mohammed Khan Pathan, 8. Girija Sankar Deb, 9. Amarjit Singh, 10. Mohammed Ishaque, 11. Mohammed Ghouseuddin, 12. Raghuraj Singh, 13. Syed Husain Ahmed, 14. Bhaskar Rao Lawelekar, 15. Mohammed Sher Afgan Khan, 16. Churamani Pandey.

Prizes.

- | | | |
|---|-------------------------|---|
| 1. Gold medal for the best senior student on marks | ... | H. Prasad Sen Gupta. |
| 2. Campbell Walker prize for the best student in Forestry | | Harbans Singh. |
| 3. Brazier prize for the student likely to make the best outdoor Ranger | ... | H. Prasad Sen Gupta. |
| 4. Lodge prize for Engineering | | H. Prasad Sen Gupta. |
| 5. Madras Conservators' prize for Survey and Drawing | ... | Shaida Mohammad Khan. |
| 6. Madras Conservators' prize for Botany | | H. Prasad Sen Gupta. |
| 7. Madras Conservators' prize for Range Administration | ... | Amarjit Singh. |
| 8. Chief Conservator's prize for the best Junior student | ... | Jag Mohan Singh. |
| 9. Indian Forester prize for an essay by past student | | Mr. T. D. Ponniah. |
| 10. Indian Forester prize for an essay by present student | ... | H. Prasad Sen Gupta. |
| 11. Pentland Shield for the best allround athlete | | Mohammad Ishaque. |
| 12. Fischer cup for Tennis | | V.M. Sharangapani. |
| 13. Moopil Nayar cup for cross country race. | | 1st—Raguraj Singh.
2nd—Mohammad Sher Afgan |
| 14. Swimming Medal | ... | Senior—H. Prasad Sen Gupta.
.... Junior — H. P. Sanap. |
| 15. Cowley-Brown cup for the interdivisional hockey |(1929-31 division). | Senior division |

16. Hockey sixes :—
(1) Shaida Moham-
 med Khan. (2) V.N. Sharangapani. (3) R.
 A. Mandke. (4) H. Prasad Sen Gupta. (5)
 T. K. Bhagawant. (6) Syed Hussain Ahmed.

17. Winner of the best essay in
 the Madras Forest College
 Magazine for the year 1930-
 1931 H. Prasad Sen
 ... Gupta.

In addition 13 Senior students have been awarded the Saint John's Ambulance certificates in First Aid.

The Hon. Mr. Campbell then distributed the prizes and certificates to the students and addressed the gathering. He said :—

"I should like in the first place to express my high appreciation of the honour which has been done to me by the invitation that I should preside on this occasion. I have always taken a great interest in the College and have visited it on more occasions than I can remember and have always carried away with me the happiest memories of my visits.

"I am glad to observe in your remarks, sir, indications of progress in various directions during the past year and I should like to congratulate those students who have won distinctions in various directions. I notice with pleasure that the College has been most successful in athletics and I congratulate the College especially on winning the open event's cup at the Grigg Sports and the individual and institutional championships in the Y. M. C. A. sports and on the breaking of four college records in the College sports. Physical development is essential in the coming Forest Officer as well as mental development, for although the life of a Forest Officer spent in the open air may appear at first sight to be particularly healthy, there is no doubt that he has at times to work in unhealthy loca-

lities and his duties always involve strenuous physical exertion if he is to carry them out efficiently.

"I am glad to hear, too, that so many Senior students have obtained, St. John's Ambulance certificates in First Aid.

"The fate of the College has, I believe, recently hung in the balance. You referred, Sir, to the fact that there are at present no students of the Madras Presidency except one private student from Madura. The reorganisation of the Forest Department has been under the careful consideration of the Government for some time and certain important conclusions have been recently arrived at. In consequence of the existence of many supernumerary officers in the Department, and in view of the fact that its future organisation had not been settled, very few Madras candidates have been selected for training here in recent years. The College has, therefore, been working at less than its proper strength of students and critics have been led to question the necessity for retaining the College solely for the benefit of other Provinces and Indian States. *Now that the future organisation of the Department has been settled, the Chief Conservator has submitted proposals for the training of ten Foresters in the 1931-33 course.*

We hope that highly qualified candidates will offer themselves for training in future years. In these circumstances it is expected that the College will have its full complement of students hereafter.

Course of Training.

"The course of training which the students undergo here seems to be well calculated to fit them for their duties, for they receive not only theoretical or literary instruction but they spend about five and-a-half months in the year in camp and so have actual practice under proper super-

vision in carrying out the duties which will later fall to their lot. I trust, however, that when the students leave this College, they will not go away with the impression that they have nothing more to learn. Forestry, like other sciences nowadays, is making constant progress and every officer in the Department should endeavour, as far as his opportunities permit, to keep himself abreast of this progress. This he may do to some extent by studying books and periodicals but he should also make use of his own powers of observation in the forests and he may perhaps be able to make some valuable contribution to forestry in consequence. The life of a Forest Officer must necessarily be to a great extent a lonely one as he must spend a large part of his time in the forests, but I cannot but think that he will find there very much to interest him. He has opportunities for the study of nature to a far greater extent than those who are employed in any other walk in life. Foremost in their study is of course that of trees and shrubs and their growth and uses, but he may also include the study of the habits of birds and beasts insects and moths, etc.

Maintenance of Forests.

"I was very much interested to hear you say, Sir, that Mr. Minchin has offered two prizes for the best essays on the utility of forests. I would like to suggest that a Forest Officer should regard it as part of his duty to enlist public opinion in favour of the proper preservation of forests and to take such opportunities as may occur to impress upon the people the very important reasons which exist for the creation and preservation of forests. From the point of view of the Finance Department of the Government, the net revenue may be of great importance and indeed forests in that respect form a valuable asset in the wealth of the country; for any net profit necessarily saves the people from a corresponding amount of taxation for the provision

of such facilities and amenities as are provided by the Government. But the absolute necessity for the maintenance of forests for the preservation of water-supplies and for the supply of wood and other products for the use of the people are perhaps even more important. The difficulties experienced in the preservation of forests from the ravages of villagers who trespass into them and drive their goats into them in spite of regulations to the contrary would be minimised if an active public opinion in favour of forests could be created.

"I had the pleasure of hearing your Chief Conservator Mr. Richmond give a most interesting address on the utility of forests to the Rotary Club last December and I am sure that he carried conviction to all his hearers of the necessity of the preservation of forests. It is only sixty years since the first trained forest officer was employed in this province and fifty years since the first Forest Act was passed and during that period remarkable progress has been made. It is to some extent a disadvantage of your profession that while you see the results of the good work of your predecessors you may not remain long enough in the Department to see the full benefits conferred by the work which you do; but you should bear in mind that you form part of an organisation which now has great traditions of good work well done and you should endeavour to carry on those traditions to the best of your ability.

"To those of you who are leaving the College now I wish every success in your future careers and I trust that you will always remember with pride this College to which you will owe so much in your future life.

"In conclusion, I should like to congratulate you, Mr. Principal, and your staff on your devotion to your important duties and on the success which has attended your efforts during the past year." (Cheers)

MR. A. WIMBUSH, the Chief Conservator of Forests then gave the following speech :—

“ Mr. Campbell, Principal of the Forest College, ladies and gentlemen,

“ My first privilege and duty is to express to Mr. Campbell the thanks of the Forest department and of the staff and students of the Forest College for having consented to preside over our proceedings today. You all know what a busy man Mr. Campbell is and it is a great compliment to us all that he should have made time amongst all his multifarious activities to come to Coimbatore for our Forest College Prize day. Mr. Campbell was responsible for making me deliver the first public speech that I ever made many years ago and I look upon it as a happy augury that he should be presiding again today when I make my first speech at the Forest College.

“ The Principal has just given you an account of the past year's activities at the College and it is therefore only necessary for me to refer briefly to one or two points which came to the notice of the Board of Visitors when considering the reports of those officers who have conducted the final examinations. As has been the case in several recent years several examiners have found that some students experience great difficulty in expressing themselves clearly in the written papers. This is attributed largely to an imperfect knowledge of English. I am glad to say, however, that by exercising patience in the oral examinations it has often happened that an examiner has found the existence of a deeper knowledge of the subject than he had been led to expect from the written papers. I should like to thank all the examiners for the thorough and conscientious way in which they have spared no pains to ascertain what the students really know. The class is an

even one with no outstanding members either at the top or the bottom.

“ In this connection I was interested to read, the other day, an opinion expressed by one of the delegates at a Head Masters' Conference in England regarding the type of boy that he considered likely to turn out best in after life. He placed first the boy of average ability at work and of average all round ability at games. Next came the student pure and simple and last came the boy who is a hero at games but lacks ability and interest in work.

“ Let us hope that a large proportion of the members of the outgoing class, having proved their average ability at work, also possess that average ability at games which will put them into the first category.

“ You students who are leaving the College are about to enter upon your life duties which will often be very difficult. A Forest Officer's life is arduous and sometimes lonely. It has however very great compensations, as Mr. Campbell has said, specially for those who are able to enter the forest not only in order to do some specific piece of work but also in order to study and enjoy the numerous aspects of nature which the forest presents. There are many things inside the forest besides trees—animals, birds and insects to mention a few of them—and a natural love for the study of any one of these is a great asset to any forest officer. It takes him into the forest during his spare time and I have been impressed over and over again by the fact that decisions on various important points, which have to be made from time to time, are often come to during a solitary evening walk in the forest and not only whilst sitting at an office table. The ignorance of the average Ranger in matters connected with the birds and beasts in his forests is surprising and in the case of birds

especially there are very few of us who do not share this ignorance to a greater or less extent. Until very recently it has been almost impossible to get hold of any simple and comprehensive book dealing with the birds of India. Quite recently two books have been published which fill a very great every day want. One is entitled "A popular Handbook of Indian Birds" by Whistler, priced, I think, at Rs. 15 and beautifully illustrated; the other is "Birds of Southern India" by Baker and Ingles. This latter is available from the Superintendent of Government Press, Madras, and costs Rs. 15 and it also contains some pictures of birds.

"One has heard it said that every man should have a hobby and it has further been stated that a forest officer's hobby should be his work. I would like to improve upon this by saying that if a forest officer can arrange that the hobby which occupies his hours of relaxation is one which involves a study of any branch of natural history or sport, inside his forests, his work is likely benefit if not directly, at any rate indirectly.

"Finally I should like to ask you students who will shortly be scattered over a great part of India to keep a warm place in your hearts for the Madras Forest College and the friends that you have made here. The College Magazine is a medium through which past and present students can keep in touch and it is always gratifying to see in the Magazine matter emanating from past students of the College.

"I will now wish you all the best of health and happiness in your future careers on behalf of your brother Forest Officers in Madras." (cheers)

The meeting over, the gathering adjourned to the garden party where refreshments were served on a lavish scale, and H. B. the Governor's Band played a fine selection of music.

Grigg Sports, 1931.

These sports were held in the Coronation park on Saturday, August 22nd. In the open events, only the Police Recruit School and ourselves had entered, and in consequence no heats were necessary.

The results were as follows:—

100 yards.....	Moinuddin I.	Mandke III
Hurdles.....	Do.	Do. (Record 18 secs.)
$\frac{1}{4}$ Mile.....	Do.	Tuggerse III.
Mile... ..	Ismail Khan III.	

Tug of war: W. O. as the Police team were disqualified for having nails in their boots.

The college thus won the aggregate and Individual championship. Great credit is due to Moinuddin for his efforts as he had conscientiously trained for some time. The result of training was practically to be seen in the $\frac{1}{4}$ mile in which he ran a well thought out race, having already won two other events.

A General review of games, 1930—31.

I. Athletics :

Grigg sports: The college won the Institution championship.

Y. M. C. A. sports: The college won the Institution championship, and the individual championship. (Ishaque).

Agricultural college sports: Our representative, (R. R. Singh) came second in the open half-mile.

In our own sports four records were broken. Credit is due to Ishaque, R. R. Singh, and Moinuddin.

II. Cricket :

Matches played five, won three, lost two. The team was a stronger one than in the last few years and as a result of hard work at practice improved very much particularly in fielding. The college won a decisive victory over the visitors during 'Forest college week' scoring 158 for two wickets against the visitors 105.

III. Hockey :

Played twelve, won four. The hockey team was a weak team, and throughout the year lacked combination. The great weakness was the half-back line.

In the interdivision hockey the Seniors beat the juniors 3—1 after a very good game.

IV. Tennis :

No outside matches were played as it is considered a minor game.

In Forest college week against the visitors the college lost the singles but won the doubles on games while losing on sets—a curious result.

College Notes.

1. It is of interest to record that, of the students who went down last June, Mr. H. Sen Gupta is placed on Working Plans duty in Bonai state, Mr. Maqbool Haq is employed in the Mint Workshop in Hyderabad, and Mr. Abdul Hamid is on grazing duty in Yeotmal in the Central Provinces.

2. We welcome the following students who have been admitted to the 1931-33 course of the college :—

Serial No.	Name of students.	Circle or state to which attached
1	S. V. Gulvadi	Bombay.
2	B. Y. Patil	"
3	N. D. Kelbag	"
4	S. A. Fareed	"
5	A. A. Sidiki	"
6	I. N. Dube	C. P.
7	R. R. Budholia	"
8	J. C. Sarwate	"
9	V. B. Sahu	"
10	G. D. Saranjame	"
11	Mohammad Saleh	Hyderabad.
12	Ahmad Khan	"
13	H. U. Dasondi	Dharampur State.
14	K. N. Singh	Jobat State.
15	P. N. Mulay	Dhar State.
16	A. A. Khan	Bhopal State.
17	Velayudhan Nair	Travancore.
18	K. R. Varma	"
19	T. R. Rajagopalan	Private.

3. *Variety entertainment by the students* :— The staging of a drama during the last college week was one of the new items of our programme which attracted the attention of all the visitors. This year we staged a small drama by name " Surgeon General's prescription."

We had very little time for preparations. The college week followed the final examination of the seniors and the second periodical of the juniors, separated by a fortnight only. Lastly one of our chief actors V. N. Sharangapani who played the part of Vanela daughter of a retired Surgeon, was suffering from intermittent fever during the period, so he had barley a day for the preparation of his part.

The acting of different parts did not on the whole come up to the standard of good dramatic act. Credit is due however to the actors considering the disadvantages under which they laboured. The success was also due to Mr. Krishnasami Iyer, the college accountant who coached us very ably.

Student R. C. Parikh took the part of Devi, wife of Sitapati. As in life, so on the stage also he was modest and natural. At times his acting was very remarkable. High praise is due to J. M. Singh, who took the part of Sitapati, for preparing his part in the very short time at his disposal. His acting was refreshingly natural and his speeches which were accompanied by appropriate gestures were most effective. One of the Seniors H. Sen Gupta took the part of "Surgeon General." He was in his speech every inch of him a "Surgeon." Though he did not play the main part he came off exceedingly well and the drama is also named after his wonderful prescription for the immediate cure of Kamala. Student Gousuddin played the part of an old Zamindar. His get up was thoroughly in the old fashioned Zamindar's style. The part of native physician was played by G. P. Tiwari who acted up to the standard. Student M. I. Khan played the part of Krishnamurti son of Sitapati. His acting was greatly and genuinely humorous. P. S. Rajamani added to the beauty and success of the drama by his able acting in his part as a servant.

The programme came to an end with the closing song of all the actors.

G. P. TIWARI,
Honorary Secretary, Students' club M. F. C.

EXTRACTS.

I. The Bamboo Pulp and Paper Industry :

The following are extracts from the Progress Report of Forest Research Work in India for the year 1929-30:—

Paper Pulp Section of the Forest Research Institute, Dehra Dun.—The paper and pulp plant was in operation throughout the year under review. Bamboo paper was made and supplied to the Government Presses at Calcutta and Simla for the printing of the Report of Forest Research Work in India and for the additional copies of Mr. Raitt's report on "The Burma Bamboo Pulp Survey." Paper was also made for the varied requirements of the offices of the Forest Research Institute and College.

At Mr. Raitt's request three tons of unbleached pulp from *Melocanna* bamboo from Arakan was manufactured and is awaiting despatch pending further advice from him.

Mildewed Bamboo from the Titagarh Paper Mills.—A consignment of very badly mildewed bamboo (*Dendrocalamus strictus*) was received from the Titagarh Paper Mills in order that experiments might be carried out to ascertain whether it would be possible to produce clean white paper from such material. These experiments proved very successful and paper made from this material was utilised for the printing of the Report of Forest Research Work in India for the year 1928-29.

Publications.—An Illustrated report on the best water transport projects for the manufacture of bamboo pulp in Burma entitled "The Burma Bamboo Pulp Survey" by W. Raitt was published during the year. This report has proved so popular both in India and abroad that arrangements have had to be made for printing additional copies.

New Paper Mills, etc.—A new concern, Messrs. The Andra Paper Mills Co., Ltd., was floated during the year during the year to take over the paper mill at Rajahmundry which had never been worked since its erection in 1925. At the request of the firm Mr. M. P. Bharghava visited the mill twice during the year to give advice regarding its reconstruction and putting it in running order. The plant was found to be inadequate and improperly designed for the profitable production of paper from bamboo and it was found necessary to adopt the fractional method of digestion as developed at this Institute for pulping bamboo. Modifications in the digester plant were accordingly made, and considerable alterations and additions to the existing machinery and buildings were also found to be necessary. A detailed scheme for the reorganisation of the mill was drawn up and is at present under consideration by the firm. The adoption of the scheme would open up the hitherto more or less unexploited bamboo forest areas in the Rekapalle hill reserves of the Upper Godavari Division.

Messrs. The Titagarh Paper Mills Co., Ltd., Calcutta have recently completed the erection of a modern plant at Mankinara for the production of pulp and paper from bamboo from the Angul reserved forests as the result of Mr. Raitt's report on these areas.

It is understood that the two financial groups in London which are making plans for the exploitation of the Arakan and Tennasserim areas in Burma for the production of bamboo pulp have joined forces and have nearly completed plans for the erection of a pulp mill for the production of unbleached bamboo pulp on a large scale.

The movement towards the establishment of a bamboo pulp and paper industry in India thus appears to be making satisfactory progress.

—*The Indian Trade Journal, 21st May, 1931.*

2. The Burmese Timber Industry :

Uses of Burma Timbers.—The following is an extract from the Progress Report of Forest Research Work in India for the year 1929-30 :—

Efforts to Increase the Sales of Burma Timbers other than Teak.—The main object of the Timber Research Division is to increase the sales of Burma timbers other than teak.

There are three main classes of timber, namely :—

- (1) Constructional timbers such as *pyinkado* (*Xylia dolabriformis*) and *thitya-ingyin* (*Shorea obtusa* *Pentacme suavis*) for general and usually rough use such as building, sleepers, etc.
- (2) Industrial timbers such as *yon* (*Anogeissus acuminata*) and *binga* (*Stephegyne diversifolia*) for tool handles, printing blocks, etc.
- (3) Furniture timbers such as *taukkyan* (*Terminalia tomentosa*) and *yinna* (*Chukrasia tabularis*) for house furniture of artistic value.

In constructional timbers the prime requirement is durability, especially when exposed to weather and white ants. Almost the only promising Burma timber in this class which is not already thoroughly well known and exploited seems to be *thingan* (*Hopea odorata*). In the past its reputation has suffered from confusion with similar but inferior timbers such as *th.nadu* (*Parashorea stellata*). It should find more favour outside Tenasserim, where alone it is really well known, now that the Timber Research Division has shown how to identify it readily. Messrs. Steel Bros. have reported a good sale for it both in export and internal markets. The major supplies of the province are in Tenasserim and their market both in Rangoon and outside Burma seems to be restricted only by the high

freights to Rangoon. Such *thingan* (*Hopewia odorata*) as the Timber Research Division has stocked has either found a use in the workshops or a fair sale as unwrought timber.

In dealing with industrial timbers the dominating fact is that Burma is still mainly an agricultural country and her demands for such timbers are at present very limited. The Timber Research Division has been definitely successful in finding a market in three cases, *viz.*—

- (1) *Yon* (*Anogeissus acuminata*) for tool handles used by the Burma Railways, Burma Corporation Mines, Irrawaddy Flotilla Co., etc.
- (2) *Yindaik* (*Dalbergia cultrata*), *panga* (*Terminalia Chebula*) and similar very hard woods for the friction collars or oil well sucker rod protectors used by the Indo-Burma Petroleum Co. and other oil companies.
- (3) *Bmga* (*Stephegyne diversifolia*) and *hnaw* (*Adina cordifolia*) for photo printing blocks used by several Rangoon presses.

But the total demand under these heads is not yet large enough to induce any firm or trader to take up the supply as a profitable venture.

The largest box consumers in Burma are the oil companies. Efforts have been made from time to time to sell to them but the fact of the matter is that for most boxes conifers are the best woods. The production of conifer box making wood is so cheap and efficiently organised in Japan, Scandinavia and North America that there is little prospect of successful competition by countries like Burma which are devoid of cheap accessible conifers and badly off for light weight timbers of the broad leaved trees. In this connection it is useful to mark how scarce in Burma are light timbers of the type of *yemane* (*Gmelina arborea*

which makes excellent boxes, and *thikado* (*Cedrela Toona*) which is particularly good both for boxes and for the backs and linings of furniture. Other countries with better resources of light timber than Burma have found it impossible to compete with imported conifers.

The Customs returns show a considerable annual import into Burma of sampan making wood from the Federated Malay States. In 1928-29 there was a drop in this import but during the previous five years it averaged over Re. 1 lakh in annual value. This wood is a light *Dipterocarp*, of the Philippine *lauan* type, closely related and similar to *kyilar* to *kyilan* = *Shorea assamica* of Myitkyina. There seems to be no reason why Burma *kyilan* (*Shorea assamica*) should not replace imported Malayan sampan wood if the former can be secured cheaply and abundantly enough. The Timber Research Division's efforts in this direction have been hampered by conflicting reports from Myitkyina as to the amount of accessible *kyilan* (*Shorea assamica*) available and by the receipt of logs as *kilyan* (*Shorea assamica*) which proved to be other species.

On purely utilitarian grounds there is little or no case for making furniture in Burma of anything but teak. In point of beauty teak is surpassed by a dozen or more Burma woods such as *taukkyan* (*Terminalia tomentosa*) and the two mahoganies, *yinma* (*Chukrasia tabularis*) and *kyana* (*Carapa moluccensis*). Public sales are a good test. The growing volume of such sales by the Timber Research Division even after discounting for the high standard of workmanship, proves that there is in Burma a growing market for furniture in woods other than teak.

Three of the most abundant and important possible export furniture woods of Burma are *taukkyan* (*Terminalia tomentosa*), *padauk* (*Pterocarpus macrocarpus*) and *thitka*

(*Pentace burmanica*). *Taukkyan* (*Terminalia tomentosa*) is not an easy timber. In the log it is very subject to cracking and in the converted form it needs great care in seasoning and is not easy to work with tools. On the other hand the colour and figure are very attractive and the timber is relatively cheap and plentiful. The reasons for the poor sales for export are not very clear but possibly the seasoning problem and the relative difficulty of working have been most to blame.

Burma padauk (*Pterocarpus macrocarpus*) has been overshadowed by Andaman padauk (*Pterocarpus dalbergioides*) which is cheaper and easier to work with tools. The Burma species is so hard as to be definitely more expensive to work than most furniture woods and the logs are not by any means cheap. These facts may account for the poor export sales.

Thitka (*Pentace burmanica*) has had ups and downs. Considerable amounts have been exported to Europe in the log, the last considerable consignment being 150 tons sent departmentally to Holland in 1929. Supplies are not so plentiful as those of *tauikkyan* (*Terminalia tomentosa*) and padauk (*Pterocarpus macrocarpus*) but they are appreciable for a furniture timber. As a result of the shipments of 1929 and certain rash expectations of further orders several hundred tons of *thitka* (*Pentace burmanica*) logs were brought to Rangoon in 1930 by private interests. They have failed to find an export market even at reduced prices. The previous Dutch buyers are reported to have enough in hand and to be watching cautiously the behaviour of the wood where it has already been used for panelling and furniture. The cause of the poor sale is not clear but possibly it is that *thitka* (*Pentace burmanica*) is a wood with a pleasing but not really outstanding figure, available in rather irregular and somewhat limited supplies which are

not cheap. Hence in competition with *lauan* which has a highly developed lumber industry behind it, the odds seem to be rather against *thitka* (*Pentace burmanica*).

The poor sales of unwrought timber of the species stocked are thought to be due mainly.—

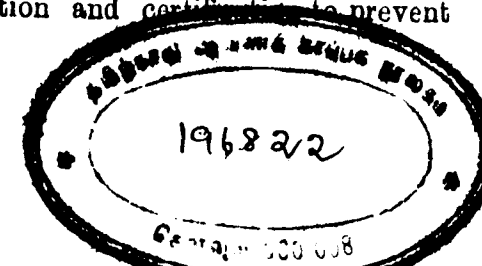
(1) In constructional woods, such as *gyo* (*Schleichera trijuga*), *leza* (*Lagerstræmia tomentosa*) and *thingadu* (*Parashorea stellata*) to lack of durability and any advantage over the common established trade timbers such as *pyinkado* (*Xylia dolabriformis*) and *kanyin* (*Dipterocarpus alatus*).

(2) In industrial, i.e., special use woods, such as *yon* (*Anogeissus acuminata*), *binga* (*Stephegyne diversifolia*) and *yemane* (*Gmelina arborea*), to the small industrial development in Burma and the fact that imported conifers would appear to be cheaper and more suitable for boxes than indigenous light woods are ever likely to be.

(3) In furniture woods such as *tauikkyan* (*Terminalia tomentosa*), padauk (*Pterocarpus macrocarpus*) and *thitka* (*Pentace burmanica*) to the competition by cheap by-product teak to the as yet small demand for the more beautiful woods, to the seasoning problem (which teak escapes through girdling and low shrinkage), and to the fact that export markets are extremely exacting and competitive.

The conclusions drawn from the above as to future stocking and efforts to promote sales are as follows:—

(1) In constructional woods *thingan* (*Hopea odorata*) is worth attention because it is durable, fairly free from cracking and splitting, cheaper than teak, easier to work than *pyinkado* (*Xylia dolabriformis*) and at present it requires expert identification and certification to prevent



confusion with inferior but similar woods, like thingadu (*Parashorea stellata*).

(2) In industrial or special use woods yon (*Anogeissus acuminata*) for handles, binga (*Stephagyne diversifolia*) and hnaw (*Adina cordifolia*) for printing blocks, yindaik (*Delbergia cultrata*) and panga (*Terminalia Chebula*) for oil well rod protectors are worth attention because they meet a demand which no established indigenous trade timber can meet. Also thitkado (*Cedrela Toona*) in its special use as an auxiliary to the true furniture woods for which woods it is the best lining and backing.

(3) In furniture woods most or all of the nine species under demonstration are worth attention for the internal market where their increased use depends chiefly on showing how they can be seasoned satisfactorily and at an economic cost.

In the external market which is highly competitive no easy success can be expected but there appear to be distinct possibilities in taukkyan (*Terminalia tomentosa*) and yinma (*Chukrasia tabularis*); taukkyan (*Terminalia tomentosa*) because of its outstanding figure and colour and its relative cheapness; yinma (*Chukrasia tabularis*) for the same reasons and because it is a true mahogany. The case for export of the other cabinet woods requires cautious investigation.

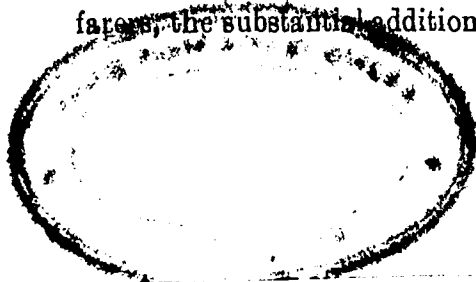
—*The Indian Trade Journal, June 4, 1931.*

3. Roadside Arboriculture :

Extract from "P. W. D. Handbook"—Bombay (Vol. II).

1. Selection of Avenue trees and spacings.

1. *Preliminary.*—The question of the provision and maintenance of trees along roadsides in one of real importance because of the welcome shade afforded thereby to way-farers, the substantial addition to the beauties of the land-



scape, and the mitigation of the discomforts of long journeys by road.

2. *Selection of trees for avenue.*—The best general principle to follow is to select trees of those kinds which are found growing under similar conditions in the district. As a rule the trees in the same length of avenue should be of the same kind. If the trees are uniform in look and growth, the effect is excellent, and a much better price can usually be obtained for the produce where all trees of the same kind are together.

3. *Suitable spacings of trees.*—The spacings of trees should vary according to the kinds of trees, from 30' to 50'. For most of the trees a fair distance would be 33' i.e. 160 trees in a mile.

4. *Distances from road centre.*—The distances of trees from the centre of the road will depend on the width of the various roads. No trees should be within 6 feet from the outer edge of the side width. A suitable distance is 20 feet from the road centre. Trees should be planted zigzag. Overhanging road-side trees should not be allowed on laterite roads where the rainfall is over 30 inches a year. Otherwise the surface is ruined by getting into waves.

II. Raising trees from long cuttings at roadside.

5. Cuttings, 10 to 12 feet long, taken from "wad" 'pimpri' or 'Nandruk trees (preferably the latter as being of a hardy regular growth with better shade and appearance) with one end firmly planted 3 to 4 feet in tree pits are self-protective against goats. They, therefore, save to a very great extent the expenditure required for erecting and maintaining tree guards. These cuttings only require

Tali=*Dalbergia sissoo*. *Ber*=*Zizyphus Jujuba*. *Siris*=*Albizza Lebbeck*.

Wad=*Ficus bengalensis*. *Pimpri*=*Ficus tsiela*. *Nandruk*=*Ficus retusa*.

to be protected with fencing, when they are planted along-side villages and grazing grounds.

6. Concentrate the work of tree planting, taking up portions of the road at a time. This gives better results, ensuring better supervision and economy in maintenance and more especially in watering charges. Arrange watering by "ghara" as explained under preparing pits. Cuttings should be planted not later than the end of June, they thrive best then as the sap in the trees is still rising at the time the cuttings are taken, and the full period of cloudy weather is available for them after they are planted.

7. The rooting of the cutting may be ensured and growth encouraged by breaking through the bark in a few places along the part to be buried as well as by cutting the end buried with a sloping cut. The cuttings should not be more than 48 hours old when planted, and the earth in the pits in which they are planted should be fully moistened at the time of planting, and kept moist with the aid of a buried pot filled with water throughout the first monsoon. Cuttings should be encouraged to grow upwards by removing all sprouts, except those at the top, during the monsoon following that in which they are planted.

8. Such cuttings flourish well with moderate watering, especially in light muram or mixed soils and dry climates. In deep black cotton soils, adjoining rice lands, they do not thrive well, and in places where cartage from distant parts is required, their use becomes prohibitively expensive and the liability to failures in their growth great, since they will then have lost their freshness by the time they reach their destination.

III. *Planting out trees by the road-side.*

1. *Size and age at which the trees are to be planted out.*—It is hardly necessary to point out the desirability of uniformity in the age and growth of trees in avenues, and

the bad effect produced when some of the young trees die each year, to be replaced in subsequent years. To minimise the cost of providing and maintaining tree guards and fences and of watering trees scattered along a stretch of road it is advisable to do as much of the work of tree growing as possible in nursery and of planting on the road-side none but well grown healthy trees which will not require protection and watering for more than a brief period.

Trees planted in the streets of towns should, as a rule, have a stem free of branches for a height of 9 to 11 feet from the ground, and this rule should be followed whenever possible, with all road-side trees. No trees should be planted by the road-side before they are 5' high. Most of the failures in road-side planting are due to the use of too small seedlings or of trees which have not had their roots formed by being transplanted in the nursery. If trees are not transplanted, they may develop long tap roots and, as these have to be docked, before the trees can be planted out at the road-side they are put out practically without any roots and have small chance of surviving. The age at which the young trees attain to the height required for road-side planting varies with the kind of tree and the soil and the climate. It will rarely be less than three years.

10. *Season for planting.*—The best season for planting at road-side is about the beginning of the rains when the rain-fall is well established. Some trees, especially deciduous trees may be satisfactorily planted out in the cold weather, when the leaves have fallen.

11. *Selection of plants in the nursery.*—Only healthy plants should be taken from the nursery for planting out. Plants with a single erect stem should always be chosen in preference to those whose stem is crooked or forked. The best time to ascertain whether plants are strong and healthy or the reverse is when they are in full growth in the

season before they are required for planting out. At this season the bark of healthy young trees is clear and free from the scaly appearance of sickly plants, and the under-bark is healthy transparent green and full of sap.

12. *Lifting the young plants with and without earth.* Plants may be lifted and transported either with or without the soil round their roots. The former method is always the safer, where the young trees have been frequently transplanted in the nursery, if sufficient care can be taken to prevent any injury to the roots and the ball of soil containing them. By this method the roots, when planted out, remain in the same position as in the seed beds and there is hardly any check to the growth of the tree. During transport the roots should be prevented from drying.

13. *Transporting.*—A ball of earth should be taken up round the roots of young trees in transplanting them, since, by doing this, the risk of moving is reduced to a minimum. When the nursery is near the locality in which the planting is in progress, they may very easily be done, but it will add a great deal to the cost of carriage should it be necessary to send the plants any distance. It is well to keep the plants without water for ten days or a fortnight, since this will check the formation of tender roots and thereby lessen the risk. But, during the last two or three days before moving, water should be given, since this will greatly facilitate taking up balls of earth with the roots.

The precautions to be taken, while transporting, are those required to prevent the roots and tops from drying. Where the trees can be lifted with a ball of earth round the roots, the main difficulty will be to prevent the earth breaking away from the roots. If the trees are to be conveyed for a short distance only, they may be conveyed in baskets on men's heads when it will only be necessary to prevent

the ball from drying. Where they must be conveyed in carts, special precautions must be taken to prevent the earth from being separated from the roots. Each ball may be bound with grass or matting or both, or the balls may be packed in baskets or boxes and the intervals tightly filled with good earth or leaf mould. When the trees have been lifted without the soil round their roots, it is even more necessary to take measures to prevent the roots from drying and it may be advisable to dip the roots in a compost of cowdung and water of the consistency of cream, if the plants have to be conveyed for any distance. The plants should, in this case, be packed closely together in bundles with damp earth or grass round the roots, or the bundles may be placed in boxes filled in with moist earth to cover the roots.

In the centre of the bundle should be a core of damp moss or leaves for the plants to lie against. They must be watered as frequently as may be required to prevent the roots becoming dry and the stems and tops may also be damped. Protection from sun and wind should be provided as far as practicable for all plants in transit, and when the plants are packed in bundles, matting or leaves should be bound over the whole bundle.

Plants should not be kept out of the ground longer than is absolutely necessary. While on the ground, waiting to be put into the pits, they should be kept in a shady place lightly covered with earth and watered in dry weather. Where possible no more plants should be lifted from the nursery than can be planted in the same day.

14. *Preparing pits.*—The pits must be at least of size required to take in the ball of earth or the roots, with sufficient space to firm the earth filling between the ball or roots and the sides. It is advisable to place good sized

"ghara" in each pit for economy and efficiency in watering. Unless the soil is naturally very rich it is advisable to have a good body of rich soil in the pit to push on the growth of the tree and reduce the period for which maintenance is required. For this reason the pits should be at least 4 feet wide at top and 3 feet wide at bottom and 3 feet deep or $4' \times 4' \times 4'$. In street planting the size may, with advantage, be increased, but a depth of 4 feet is sufficient. The shape of the pit is immaterial.

The pits should be dug as long as possible before the planting is expected to commence, so that the soil taken from them may weather before it is required for filling in again. The upper soil to a depth of about 1 foot from the surface is the best, and should alone be used for mixing with the manure for filling near the plant. When digging the pit, it should, therefore, be kept on one side for that purpose. In March or April each pit should be half filled with dry leaves which will become saturated on the first fall of rain. In planting, the leaves should be drawn away from the middle and the bottom of the hole, so as to leave a clear space 3 feet deep by 2 feet in diameter, which should be filled in with prepared soil on the centre of which the tree should be planted. If there is any reason to think that a bed of sheet kankar underlies the pit, it should be dug out and removed.

15. *Soil for filling the pits.*—The best soil available should be used. Finally to encourage growth use manure. A cartload of good manure mixed with the soil in a tree pit, at the commencement of the monsoon, shortly after the cutting or plant has been planted will result in a saving of one year's cost of maintenance, which is a heavy item. When manure cannot be obtained at reasonable rates, a cartload of black soil should be mixed with the soil in the pits in muram or red soil and one of red in black soil pits.

16. *Providing arrangements for watering.*—Watering charges are the main source of expenditure in tree planting and can be reduced by providing each tree pit with a sound earthen pot planted as deep as possible in the pit. A country roof tile (not divided in two for roofing purposes) should be inserted into the mouth of the pot to serve as a channel for the water and to prevent earth falling into the pot. The ordinary ghara holding about two gallons of water, will when in contact with earth, exude sufficient moisture into the soil in the pit, to keep a sprouted cutting or young plant alive through the dry season. The rate at which water will pass through ghara depends on the nature of the ghara and of the climate, also on whether or not the gharas are clean and free from earth inside. If the gharas are free from cracks or holes through which water can pass, the water will last from 10 to 20 or more days. Since water carts hold from 100 to 200 gallons, a water cart, making two trips per day, will fill from 100 to 200 gharas per day, or, allowing 25 per cent loss in cartage, filling gharas, etc. will fill 75 to 150 gharas per day. The gharas must be filled every ten days and one water cart will then serve 750 to 1500 gharas according to the size of the cart. Where the source of supply is not far distant the smaller cart will fill the larger number.

With this system there is no danger of over watering and no waste of water, and a glance at the ghara will show at once whether the mali has been neglecting his work. It is advisable to give each mali a bamboo pipe about four feet long or some similar arrangement by which he can direct the water with certainty into the ghara while standing outside the guard. Gharas which have been in use a year should be examined at the beginning of the hot weather and replaced, if they are broken or if their pores have become choked by mud.

The objection to the plan of using gharas is that unless the ghara is moved at intervals, tree roots are apt to grow lop-sided. The following is a better arrangement: Good earth to which old manure, if possible, has been added or road silt, dead leaves, etc., is filled in at the bottom of the hole. On this is built up drystone of the roughest and cheapest description (quarry rubbish etc.,) leaving a cylindrical space in which the seedling is planted, and is surrounded by good soil, and the top is finished off with clean porous material. When the seedling is watered, practically all the water descends evenly all round to the bottom of the drystone, very little is evaporated from the surface and the rootlets are thus induced to grow downwards and are thereby protected from drying by the sun. The holes cost a little, but much less than the value of the watering they save and they give the seedling a good start.

17. *Planting the tree.*—The pits should first be well soaked with water and then filled in with the prepared soil to such a depth that when the soil has settled, the trees will stand at the right level. The trees should be set so that the earth will stand round the stems at about the same height as in the nursery, being not lower on the stems and not much higher.

18. *Level of planting.*—The following rules cover all ordinary cases:—

(a) When the land is high and well drained the trees should be planted flush with the surrounding soil. (b) Where the trees are planted on the side of an embankment no special precautions are necessary as water can escape the sloping bank. (c) Where the land is lowlying, the trees should be planted on mounds about one foot high, with diameter at least three times the height and sides sloping very gently. If the sides are steep or the mound narrow, heavy rain may wash the earth away and expose the roots

of the tree, which will then almost certainly die. (d) The tendency to plant trees below the surface of the surrounding soil must be rigorously checked. Malis often prefer this system, because it saves trouble in watering and careful supervision of this point is, therefore, essential.

Only one tree should be planted in each pit. The common practice of planting several trees and subsequently throwing away all but one, is not only wasteful but injurious. If the tree, to be planted, has a ball of soil round the roots, this ball may be placed on the filled soil and then more soil filled in and firmly trodden down round it. It is essential that the soil should not separate from the ball as the ball will then dry and the tree die. This should be watched shortly after planting. When the tree to be planted is without soil round the roots more care must be taken in planting. The best practice is to water and ram the earth immediately round the stem for about 6 inches from the stem. It is not advisable to cut back the roots further than to remove the injured portions with a sharp knife.

There shall always be two or three planters, one to hold the tree in its proper position with its collar at about the point where the final ground level is to be, the others to shovel in the earth round the tree and tread it firmly in, taking care that it is broken up fine and not in large lumps.

The earth should be slightly raised round the stem and lower towards the edge of the hole, so that, when irrigated, the stem may stand in a little island.

If any damage has been done to the roots so that their growth has been in any degree checked, it is advisable to cut back or shorten some of the branches and to remove some of the leaves if excessive. This is of greater importance in proportion to the dryness of the air at the time of planting.

19. *Steadying the young tree.*—It is always necessary to keep the young tree steady until the roots have caught hold of the soil, as otherwise the formation and growth of the roots will be prejudicially affected. If stakes are provided for this purpose two should be used for each tree and these should be placed in the line of prevailing wind. The band or rope should not be tied round the tree, but should touch it for half its circumference only. The bark should be protected from danger by the rope by interposing a piece of cloth. The stakes and ties should be removed as soon as the tree is steady without their assistance.

IV. *Protection.*

Different methods are in use, and the decision which of them shall be adopted must depend on the circumstances of the locality. With all forms of guards it is essential that the mali should be able to reach the soil round the tree and to break up the surface with his kurpi.

(a) *Iron guards.*—These may be made of standards of iron hooped together and enclosed with wire netting. They must be strong enough, that is, the standards must be sunk sufficiently deep, to withstand an animal knocking against them. They must also be high enough to prevent animals reaching over the top. They are expensive, but suitable in and near towns where traffic is very heavy and unsightly forms of guards are open to objection. The best pattern is that made of iron hoop lattice, in two pieces, each framed on iron bars, curved and tapered towards the top. When set up, the two pieces are fastened together with wire. This pattern of guard stands firmly, and has the merit that it can be easily taken off a tree that has outgrown the need of it, and carried off for use in another place.

(b) *Wooden guards.*—Have usually been failures except to a limited extent in and near towns. The remarks made as to iron guards apply here also, while in addition they are often destroyed by white ants or the materials used by the people for fuel.

(c) *Live hedges.*—Probably the cheapest protection is a hedge of Cactus, not prickly pear; Babul, Agave and other thorny plants may also be used. They should be planted at least a year before the tree is to be planted so as to give the protection at the time when it is required. They may be made effective, but it is difficult to make them grow evenly and a very small space is sufficient to admit a goat inside the hedge. They should not be allowed too near the tree; four feet is the minimum distance that should be allowed, as otherwise they will compete with the young tree for the moisture in the soil. They must be regularly pruned twice a year in order to prevent their becoming too thick and so stopping light and air from reaching the tree. Where live hedges are adopted, the supervision over them must be constant and vigilant.

(d) *Thorns.*—A circle of thorny branches fixed firmly in the ground round each tree may be very effective, if care is taken, and economical, if thorns are readily to be had in the neighbourhood. They must be firmly fixed in the ground and pegged down if necessary, and the hedge must be made thick and strong. The thorns will have to be renewed and the hedge repaired at least once a year, and careful supervision is required to insure that the hedge is always effective and especially to see that the mali fills up any gaps that he may have made in order to get at the ground round the young trees. To prevent this a light bamboo step ladder should be used. These hedges have the disadvantage that they are liable to be broken down and stolen for fire-wood. Dry thorn loppings piled up round

the trees, with the addition of a mud wall and ditch, may be made a real defence. The inside diameter of the circle enclosed by the wall should be at least six feet, the ditch being outside the wall. The ditch, to be useful, should be two feet deep. Such protections are useful on country roads.

(e) *Mud walls*.—This is the commonest form of protection and is effective if the wall is kept in proper repair and enough thorns stuck into the top to prevent animals from reaching over it. The cost of this protection is rather high, and where it is adopted, supervision is required to see that the walls are not allowed to fall into disrepair, and that surplus water does not collect inside the guard in wet weather.

(f) *Trenches*.—The ordinary trench, dug with steep sides close to the young tree, is most unsuitable. The tree is left standing on a narrow cylinder of earth which soon washes down into the trench and exposes the roots. Where space is available a trench and bank combined make perhaps the most effective guard of all, provided it is properly laid out.

The hole in which the young tree is planted should be at least 3 feet deep and 4 feet in diameter at top and 3 feet at the bottom. Taking the middle of the tree hole as centre, draw two circles round it, 4 feet radius and the other of 6 feet forming two concentric circles of 8 feet and 12 feet diameter. Dig out the earth from the space between the two circles, and throw it up on the space between the tree hole and the inner circle, so as to make a trench $2\frac{1}{2}$ ' deep 2 feet broad at the top and 1 foot broad and $2\frac{1}{2}$ feet high. Inside the mud wall will be the plant hole. The ditch will thus be at least 3 feet distant from the roots of the young tree. Some Babul thorns should be stuck into the top of the bank while the earth is wet.

The bank and ditch should be made during the rains after the tree has been planted. Little repair will be required as soon as the tree is old enough to dispense with it, the bank can easily be thrown back again into the ditch, and the ground neatly levelled. Before filling in the ditch, it will be as well to take the opportunity of 'mulching' the tree roots by half filling the ditch with dead leaves, and then saturating them with water. This will tend to draw out the roots and give the tree increased power of resisting drought.

(g) *Wire fencing*.—Is durable and not very costly. The wires must be close together for some length from the ground. The standards usually supplied are too light and are damaged by cattle.

(h) *Wattle fencing*.—Used where branches of trees bamboos, or other suitable material is available; is made by interlacing long flexible branches, basket fashion, round stout uprights embedded in the ground. Such a fence costs little when the material for making it is available on the spot. It has, however, all the disadvantages of other wooden fences.

21. *Removal of guards*.—It is not necessary to remove the tree guards immediately an avenue is classed as "established." This should be done only when the lower branches of the trees are sufficiently high to be out of reach of cattle and goats and the trunks are steady enough to withstand cattle. Live hedges should be destroyed at once as the risk of their growing into rank jungle and injuring the tree is too great to be run.

V. Watering.

22. *Need of irrigation*.—In ordinary cases trees require irrigation for the 1st three years after planting out, but no absolute rule can be laid down, as much depends on

the soil and climate and also on the kind of tree. In the rains watering is necessary only during periods of fine weather, but then it is required at very short intervals; in the cold weather the water lasts much longer, while from March to June constant attention is needed to save the trees from injury.

23. *Water supply.*—At the time of deciding on the sections of road to be planted, the question of water-supply should be considered. If there is no canal, or only one with an intermittent supply, existing wells can be used; and if there are none, wells must be sunk at convenient distances.

24. *Conveyance to trees.*—Where the distance is not great, water can be carried in gharas, or preferably in kerosine tins, fitted so as to be slung from the shoulders. In this case it is usually necessary to give each mali a labourer as an assistant during the times when frequent irrigation is needed. It may be more economical to employ bhistis with mashaks, those in ordinary use holding about 8 gallons, or bullocks with pakhals holding about 30 gallons. Where the distance is great, economy can be secured by carting the water along the road. It can be carried in barrels mounted on small country carts or in such other way as may be suitable to the locality. It is advisable to give each mali a bamboo or other pipe about 4 feet long so that he can direct the water to the required place while standing outside the tree guard. Most kinds of guards suffer a good deal of injury from the constant entrances of the mali.

25. *Application of water.*—The most effective way of applying water to a tree is by means of a ghara buried in the pit.

The ghara can be filled with certainty by means of a pipe as described in the last para. Where this method is

not employed and water is applied to the surface of the soil, it must be remembered that no trees except a few which are always found growing by water, will stand the constant application of water to their bark. Road-side trees are frequently killed by kindness of this sort. The bark is split by the sudden change of temperature and the sap-wood rots. It is the roots which need water, not the stem. It is, therefore, well to keep up the earth round the stem and to hollow it out at a distance into a circular ditch, so that, when the water is poured in, the tree stands on a small mound surrounded by water. It is better to give water in good quantity at intervals of three or four days than to give smaller supplies daily, as this causes them to send their roots deeper into the soil where the natural moisture is greater and a more steady growth is the result. The best time for applying water is the afternoon.

26. *Loosening the surface soil.*—It is important to keep the surface soil for a foot distance all round the trees as loose as possible. A hard crust on the surface is injurious to the young trees, and in particular makes the soil below dry much faster than if the surface is kept loose. Where water is applied direct on the surface of the soil, the ground should be hoed with the kurpi after each watering; where gharas are used, hoeing should be done whenever the surface is getting compact.

27. *Special measures in droughts.*—Special care is needed to secure that irrigation is adequate in seasons of drought. The responsible official must be on the alert throughout the rains, and when a break is prolonged he must take instant measures to secure that the trees are getting enough water. A year's work may often be thrown away by neglect of a very few days at this season.

28. *Replacing measures in droughts.*—If a length of road has been planted early in the rainy season, the trees

should be examined carefully after three weeks or a month, and any that have not made a good start should be pulled up and replaced by new plants from the nursery.

VI. *Pruning and Lopping.*

29. *Object.*—The object of pruning is to obtain a shapely healthy tree with shade not overthick. It should begin in the nursery and continue almost to the end of the life of the tree. Since the tree must not interfere with the traffic on the road, it must have a clear stem free from branches for a height of 8 to 10 feet. If the branches grow horizontally it may be necessary to shorten some of these; but the height of 11 feet to the first branch should not be exceeded.

30. *Forming straight boles in young roadside trees in nursery.*—The natural tendency of many trees, notably the firs and pines, is to grow with a straight stem and regular conical crown. Other trees, including most the broad-leaf trees are most irregular in their growth and naturally have many trunks or great lateral branches. By a judicious pruning while young and small, of the lower branches, isolated trees growing along roads may be given tall, straight stems. To obtain these conditions, the *trees should be pruned while young*. The terminal buds of any secondary leading shoots that appear should be pinched off at once; and the lowest lateral branches should be pinched off *each year* while they are *still small*. If the top is weak or broken, it may be cut off and one of the side branches allowed to take the lead. Not more than about two rows or tiers of branches should be removed in one year. If many branches are removed, the health of the tree suffers; it becomes top heavy and has to be supported.

31. *Roadside pruning.*—Pruning at the road-side will follow the same lines until the stem is clear of branches

for the desired height from the ground. After that, except for the removal of broken branches the pruning will consist of removing superfluous branches with a view to keeping the tree shapely, to prevent it from obstructing the traffic, to reduce the shade when desirable in the interest of economical road maintenance, and sometimes to rid the trees of certain fungus diseases or insect pests.

32. *Axes not to be used in pruning.*—The pruning of road-side trees in this country is generally done by a coolie climbing the tree and hacking off the branch it is wished to remove at 6 inches or a foot from the stem, leaving a jagged, unsightly stump. These snags rot and bring about the quick decay of the tree. All this is avoided by using the saw instead of the axe and by cutting off the branches smoothly flush with the stem. Such wounds soon heal and become covered with bark. When cutting back lateral branches, always cut at a fork. Valuable timber trees are constantly hacked to admit a free circulation of the air, as it is called, and are in consequence rendered useless, except for firewood. There are few stations or road-side avenues where such eye-sores are not to be found. *The use of axe by coolies should be strictly prohibited*. Pruning can be done with an axe if sufficient care were taken. But this care never is taken, and the only possible way to prevent hacking is not to allow axes to be used under any circumstances.

All prunings should, therefore, be done with the saw or good sharp steel instruments. Small branches or twigs should be cut with pruning knife, larger branches with the saw or pruning chisel. In removing a large branch first cut through the bark all round with the pruning knife or chisel. Then saw it off roughly about a foot from the trunk, cutting the *underside first*, and afterwards the upper a few inches further from the trunk, and finally saw off

the stump; or the pruning chisel may be used first to cut all round the branch before using the saw. In this way there will be no tearing of the bark. After the branch has been removed, any jagged ends left should be pared smooth with the pruning knife, and then the whole cut should be painted over with tar. The cut, where possible, should be vertical or slant downwards, so that rainwater may not lodge on it, or get into the stem through the wound. Where the wound is necessarily large, it should always be covered with tar to protect it against moisture and decay.

33. *Season for pruning.*—The end of the cold weather, just before the leaves appear, when growth is least active, is the best season for pruning, as the wounds are then left exposed for the shortest time possible. If done during winter, they remain uncovered too long; if during the warm weather, when trees are in full growth, the wounds bleed, and tar, if used, will not adhere to them.

34. *Lopping.*—The proper season is the winter, when the sap is down. A watch must be kept over the established avenue, particularly in the neighbourhood of towns, to see that branches are not being cut for fodder by camel drivers or goat herds. Trees suffer serious injury owing to the repeated stripping of leaves and young branches that result, when people are allowed to make free use of them.

(To be continued.)

Additions to the College Library.

The following books have been added to the Library during 1931 :—

1. Text Book on Zoology, by Bhatia.
2. Progress report of Forest Administration in the Province of Assam for the year 1929—30.
3. Notes on some of the Indian Markets for Madras Timbers by J. A. Master Esq., I.F.S.
4. Fauna of British India—Birds—Volume VII by E. A. Stuart Baker, 1930.
5. The Practice of Silviculture by Ralph C. Hawley, 2nd Edition, 1929.
6. Annual Return of statistics relating to Forest Administration in British India for the year 1928—29 (with which is incorporated the quinquennial review ending 31st March '29.)
7. P. W. D. Hand Book, Bombay, Volumes I and II (1931) Edition, by Captain E. L. Marryat.
8. Report on the Administration of the Meteorological Department of the Government of India in 1929—30.
9. The Biological control of Insect and Plant pests by W. R. Thompson. P. H. D. S. C.
10. Burma Forest Bulletin No. 12 "Lac in Burma" by F. W. Withers I. F. S. and E. C. Simmons I. F. S.
11. Burma Forest Bulletin No. 13.—Report on Aerial Reconnaissance, stock mapping, and Photography of the Forests of the Tavoy and Mergni districts. (South Tenasserim Forest Division—January to April 1925, by C. W. Scott D.F.C. and C. R. Robbins.
12. Progress Report on Forest Administration in the Punjab for the year 1929—30.
13. Progress Report of the Forest Administration in Coorg for 1929—30.
14. Bird Friends and Foes of the Farmer.
15. The Vilagers' Calendar 1931.
16. Burma Forest Bulletin No. 24 (Silvicultural Series No. 14 Published in 1931), Experiments in connection with sowing and planting Teak Taungya plantations by H. R. Blanford.
17. Administration report on the Forest Department of the Central Provinces for the year ending 31st March 1930,
18. Do. Appendix volume.
19. Silviculture Research Manual for use in India, Volume I. The Experimental Manual by H. G. Champion.
20. Do. Volume II—The Statistical Code.

21. The Empire Forestry Hand-Book—1931.
22. Indian Forest Service Examination question papers for 1928 (1930).
23. A text book of Systematic Botany, by Swingle.
24. Glossary of Botanic terms by Jackson.
25. Elements of Highway Engineering by A. H. Blanchard.
26. A popular Dictionary of Botanical names and terms, by Zimmer.
27. Indian Engineering, by Strange.
28. 1 set of 2 parts—Building construction, by Mitchell.
29. Mendel's principles of Heredity, by Bateson.
30. An outline of Plant Geography, by Campbell.
31. Plant Ecology, by Weaver.
32. Extinct Plants and Problem of evolution, by Scott.
33. Text Book of Evolution and Genetics, by Lindsey.
34. Royal Botanic Gardens Kew, official guide to the Museums of Economic Botany No. 1 Dicotyledons,
35. Malaria—(Its investigation and control with special reference to Indian conditions by Knowles and Senior White,

BIRTH NOTICE.

On 9th September, at Coimbatore, to Beatrice, wife of J. C. Wrench, I. F. S., a daughter.

Departmental Notifications.

29—7—31. The following transfers are approved :—

1. Mr. D. V. Nagaratnam
trained forester.
 2. „ P. Gulab Singh „
 3. „ S. M. Ansur Ali „
 4. „ Y. Subramania Naidu
trained forester.
- } From I to II circle.
-
5. „ P. Shanmugasundam
Pillai trained forester.
- I to IV circle.
-
6. M. R. Ry. K. Raghuraman, Ranger VI grade, from the II to the III Circle.
 7. M. R. Ry. M. Rajaram Pillai, trained Forester from the III to the VI circle.
 8. M. R. Ry. Y. V. Anjaneyulu, trained Forester from the III circle to the Forest Utilization Division.
 9. M. R. Ry. G. Narasimhacharya,
Ranger, V grade.
 10. M. R. Ry. M. S. Krishnaswami
Ranger, VII grade.
- } From IV to III circle.
-
11. M. R. Ry. T. S. Sankaranarayana Ayyar, temporary Ranger VII grade from the V to IV circle.

14—8—31. I. With effect from 27-11-1930 in an existing vacancy in the Fourth grade.

1. M. R. Ry. A. K. Kunjanni Nayar, from IV grade sub *protem* to IV grade permanent.
2. M. R. Ry. S. G. Venkataramanan, from V grade permanent to IV grade sub *protem*.
3. M. R. Ry. P. Ramaswami Ayyar, V grade sub *protem* to V grade permanent.
4. M. R. Ry. A. Muthukrishnan from VI grade permanent to V grade sub *protem*.
5. M. R. Ry. S. V. Nagalingam Pillai from VI grade sub *protem* to VI grade permanent.
6. Mr. Abdul Khalak Sheriff, from VII grade permanent to VI grade sub *protem*.

7. M. R. Ry. K. O. Anandan, from VII grade *sub protem* to VII grade permanent.

8. M. R. Ry. S. Narayanaswami Ayyar, from VII grade temporary to VII grade *sub protem*.

9. Mr. A. Arogyaswami Pillai, Supernumerary Ranger, to VII grade temporary with effect from 11-4-1931, the date of sanction of the temporary post.

II. With effect from 2nd May 1931 *vice* Ranger V.D. Ramalingam Pillai, VII grade, *invalided*.

1. M. R. Ry. P. Gopalan, from VII grade *sub protem* to VII grade permanent.

2. M. R. Ry. T. S. S. Sankaranarayana Ayyar from VII grade temporary to VII grade *sub protem*.

3. M. R. Ry. P. K. Subbunarayana Ayyar, Supernumery Ranger to VII grade temporary.

III. With effect from 5th July 1931 *vice* Ranger S. Ramanujam Sesha grade, *deceased*.

1. M. R. Ry. C. R. Regunathan, from V grade *sup protem* to V grade permanent.

2. M. R. Ry. M. Umapathi Mudaliar, from VI grade permanent to V grade *sub protem*,

3. M. R. Ry. T. Balaramaswami Nayadu, from VII grade permanent to VI grade permanent.

4. M. R. Ry. P. Madhavan. Nayar, from VII grade *sub protem* to VII grade permanent.

5. M. R. Ry. A. Subramaniam, from VII grade *sub protem* to VII grade permanent.

6. M. R. Ry. S. Venkatarama Ayyar, Supernumerary Ranger to VII grade temporary.

IV. With effect from 21st July 1931 *vice* Ranger A. Swamikutti, II grade *deceased*.

1. Mr. G. S. King, from II grade *sub protem* to II grade permanent.

2. M. R. Ry. S. Ramachandea Ayyar and Mr. Antony Oulas, from III grade permanent to II grade *sub protem* with effect from 14-10-1930 and 21-7-1931 respectively in the arrangement due to the deputation of Rangers V. T. Staggs and N. E. Rama on other duty.

First Circle.

10-7-31. 1. M. R. Ry. K. Venatesam Naidu, Ranger VI grade due from leave on 22-7-1931 to Guntur Range, Guntur District. 2. M. R. Ry. B. Kottilingam, Ranger VI grade due from leave on 23-7-1931 to Devagiri Range, Paralakimidi Maliahs. 3. M. R. Ry. R. Jagannatham Naidu, Ranger VI grade due from leave on 24-7-1931 to Marrigudem Range, Godavari Upper. 4. M. R. Ry. D. Ramakrishnayya, Ranger IV grade due from leave on 31-7-1931 to Mahendra Range, Paralakimidi Maliahs. 5. Mr. G. A. Dawson, Ranger V grade, due from leave on 1-8-1931 to Bontha Range, Ganjam District. 6. M. R. Ry. C. T. Tiruvengadam, Ranger IV grade due from leave on 13-6-1931 to Sathiavedu Range, Nellore District. 7. M. R. Ry. T. Balaramaswamy Naidu, VII grade due from leave on 30-8-1931 to Balliaguda, Ganjam District.

11-7-31. M. R. Ry. P. Chengalreddi, Ranger VI grade granted leave on average pay on medical certificate for 4 months from 4-5-1931.

25-7-31. On relief by Ranger S. Kottilingam, M. R. Ry. V. N. Leapingwell, Supernumerary and acting Ranger VII grade posted to Guntur Range charge, Guntur District, until Ranger K. Venkatesam returns to duty.

6-8-31. On relief in Ganjam, Mr. Arogyaswami Pillay, Supernumerary Ranger posted to Vizagapatam Dn. for special duty in connection with the revision of Working Plans.

20-8-31. 1. M. R. Ry. V. N. Leapingwell, will be considered to be acting as Ranger VII grade from 29-6-1931, *vice* Ranger P. Doraiswami Ayyar on leave for 4 months from 29-6-1931 to 28-10-1931. 2. M. R. Ry. A. Neeladri Rao, will be considered to have been acting as Ranger VII grade from 22-7-1931 *vice* Ranger K. Venkatesam Naidu on leave for 3 months from 22-7-1931. 3. M. R. Ry. P. Gopalakrishna Rao, will be considered to be acting from 29-6-1931 to 7-9-1931 *vice* Ranger C. S. Krishna on leave. 4. Mr. Abdul Razack, will be considered to be acting as Ranger VII grade from 22-7-1931 to 3-9-1931 *vice* Ranger P. Chengalreddi on leave.

22-8-31. M. R. Ry. V. N. Leapingwell, on return from leave, posted to Palnad Range in relief of Ranger B. Chenchurama Naidu applied for leave. 2. M. R. Ry. P. Chengalreddi, Ranger VI grade on expiry of leave, posted to Guntur Range. 3. M. R. Ry. C. G. Krishna, Ranger III grade, on expiry

of leave, posted to Chendragiri Range of Parlakimidi Division.
4. M. R. Ry. B. Chenchurama Nayudu, Ranger III grade granted l. a. p. on medical certificate for 4 months from date of relief.

Second Circle.

- 21—6—31. M. R. Ry. A. Ranganayakulu Nayudu, Ranger II grade Cuddapah South Dn. granted extension of l. a. p. for 4 months from 28th June 1931 in continuation of the leave already granted.
- 7—7—31. 1. M. R. Ry. N. Rajagopalachetti Ranger VII grade on return from leave on 17-8-31 posted to Porumamilla Range, Cuddapah North Dn. 2. M. R. Ry. K. Raghuraman, Ranger VI grade in charge of Porumamilla Range, Cuddapah North Dn. on relief by No. 1 transferred to III Circle.
- 9—7—31. M. R. Ry. N. C. Mahadevan Pillai, Ranger II grade, on return from leave posted to Ganganapalli Range Anantapur Dn. 2. M. R. Ry. D. N. Subramanya Ayyar, Ranger VI grade, on relief by No. 1 transferred to Turimella Range, Kurnool East Dn. 3. M. R. Ry. S. Varadarajulu Reddi Forester I grade, now in charge, will, on relief by No. 2 revert to his Forester's post in Cuddapah South Dn.
- 29—7—31. M. R. Ry. Y. Pedda Lakmayya Nayudu Ranger V grade on return from leave posted to Bairlutty Range vice M. R. Ry. P. Dhananjaya Rao transferred to I Circle.
- 29—7—31. Y. Subrahmanyam, M. R. H., transferred from I Circle posted to Chelama Range, Kurnool South, with head quarters at Nandyal. 2. M. R. Ry. T. K. Ramaswami Ayyar Ranger II grade on relief by No. 1 granted l. a. p. for 2 months. 3. M. R. Ry. D. V. Nagarathnam M. R. H. transferred from I Circle posted to work under the Range Officer Gundlakama Range, Kurnool South, with head-quarters at Giddalore. 4. M. R. Ry. B. Gulab Singh M. R. H. transferred from I Circle posted to work under the Range Officer Gundlabrahmeswaram Range Kurnool West, with head-quarters at Velgode.
- 14—8—31. 1. M. R. Ry. M. Krishna Rao Ranger III grade permitted to return to duty before the expiry of his leave and posted to charge of Sivapuram Range, Kurnool West. 2. M. R. Ry. A. Muthukrishnan, Ranger VI grade in charge of Sivapuram Range on relief by No. 1 transferred to Bairlutty Range. 3. M. R. Ry. P. Dhananjaya Rao Ranger

IV grade in charge of Bairlutty Range on relief by No. 2 transferred to First Circle.

- 14—8—31. Y. Peddalakshmiiah Nayudu Ranger V grade on expiry of his leave on 31st August 1931 posted to charge of Cuddapah Range.
- 14—8—31. M. R. Ry. K. R. Viswanatha Ayyar Ranger III grade on expiry of his leave posted to charge of Dornal Range, Kurnool East. 2. M. R. Ry. B. T. Seetharama Ayyar Ranger V grade, Dornal Range on relief by No. 1 posted to charge of Chelama Range, Kurnool South.

Fourth Circle.

- 18—6—31. 1. M. R. Ry. A. Subramaniam, Ranger VII grade *sub protem*, Vizagapatam on transfer to this circle to charge of Mamandur Range, Chittoor Dn. 2. M. R. Ry. P. Shanmuga Sundaram Pillai, Trained Forester I grade, Vizagapatam on transfer to this circle to charge of Chamala Range, Chittoor Dn. 3. M. R. Ry. K. Karunakaran Nambiyar Ranger III grade on relief by No. 1 transferred to Central Salem to charge of Shevaroy's North Range. 4. On relief by No. 2 M. R. Ry. M. S. Krishnaswami Ayyar, Ranger VII grade, Chittoor to III Circle. 5. On relief by No. 3 M. R. Ry. C. N. Narasimhachari Ranger V grade Central Salem to III Circle. 6. M. R. Ry. T. S. Sankaranarayana Aiyar Ranger VII grade *sub protem* on transfer from V Circle to this circle posted to North Salem for supervision of sandalwood work.
- 22—6—31. M. R. Ry. K. Thathachari, Ranger III grade in charge of Dharmapuri Range posted to be in additional charge of Krishnagiri Range during the absence on leave of Ranger S. M. Srinivasagam Pillai or until further orders.
- 13—7—31. M. R. Ry. M. S. Krishnaswami Ayyar, Ranger in charge of Chamala Range, Chittoor Division, granted l. a. p. on medical certificate for 3 months from date of relief.
- 16—7—31. M. R. Ry. T. Vedantha Ramanujam, Trained Forester, Vellore division on return from leave posted to charge of Tiruvannamalai Range, Vellore Division. He will act as Ranger VII grade, so long as he holds Range charge.
- 16—7—31. M. R. Ry. P. Shanmugasundaram Pillai, trained Forester I grade, posted to charge of Mamandur Range, Chittoor division. He will act as Ranger VI grade for the period he is in charge of the Range. 2. M. R. Ry. K. Karunakara Nambiar Ranger III grade, on relief by No. 1

posted to charge of Chamala Range Chittoor Division and relieve M. R. Ry. M. S. Krishnaswamy Ayyar, Ranger VII grade granted leave.

- 24—7—31. K. P. Chathu Nair, Central Selam division granted extension of leave for two months.
- 25—7—31. If declared fit to rejoin duty M. R. Ry. S. M. Srinivasagam Pillai, Ranger, V grade will join duty at Krishnagiri and relieve M. R. Ry. K. Thathachariar, Ranger, III grade of the additional charge of Krishnagiri Range.
- 28—7—31. M. R. Ry. A. Siddha Pillai, Ranger, Alangayam Range, granted l. a. p. on medical certificate for two months with effect from date of relief. 2. M. R. Ry. P. K. Subbanarayana Ayyar, Supernumerary Ranger on return from leave posted to charge of Alangayam Range, Vellore division vice No. 1 granted leave. 3. M. R. Ry. Saiyid Munavar Sahib, Range Officer, Tirupattur, will relieve M. R. Ry. A. Siddha Pillai forthwith and be in additional charge till M. R. Ry. P. K. Subbanarayana Ayyar relieves him.
- 31—7—31. M. R. Ry. P. A. Krishnaswami Mudaliar, Ranger IV grade Odugathur range granted leave on average salary on medical certificate for 2 months from date of relief. 2. M. R. Ry. K. R. Subramanyam, Ranger VI grade Changam Range Vellore division posted to charge of Odugathur Range vice No. 1. 3. M. R. Ry. T. N. Vedantaramanujam, Trained Forester, in charge of Tiruvennamalai range posted to be in additional charge of Chengam Range.
- 7—8—31. M. R. Ry. S. Duraiswamy Ayyar Ranger III grade in charge of Chandragiri Range, Chittoor division, granted l. a. p. without medical certificate for four months from 28-10-31. preparatory to retirement.
- 20—8—31. M. R. Ry. S. Rangaswamy Iyengar, Ranger, V grade, Research Ranger Denkanikota, granted l. a. p. on medical certificate for 6 weeks i. e. from 3-8-31 to 13-9-31 (both days inclusive).
- 20—8—31. M. R. Ry. V. Narayanaswamy Ayyar, Ranger IV grade on return from leave posted to charge of Odugathur range.

Fifth Circle.

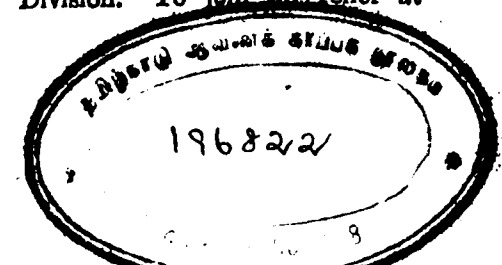
- 16—7—31. M. Gopalswami Naidu, M. F. C. trained Forester, posted to charge of Kannikatti Range, Tinnevelly District, vice Ranger A. K. Anantharama Ayyar granted leave.

- 22—6—31. 1. Mr. A. B. Fenn, Ranger V grade, on expiry of his leave, posted to charge of Kollagal Range. 2. Mr. P. Philip, Ranger VI grade, on relief by No. 1 transferred to South Coimbatore.
- 29—6—31. A. Sitarama Sarma, M. R. H. Forester, working in the North Coimbatore Dt., posted to charge of Srivilliputhur Range, Tinnevelly Dt., vice Ranger, Mr. H. Myers, granted 3 months' leave. The Forester should take charge of the Srivilliputhur Range on or after 21-7-31.
- 11—8—31. M. R. Ry. T. Kondatha Goundan, Ranger V grade, in charge of Bargur Range, granted l. a. p. for four months with effect from date of relief. 2. Mr. M. P. Philip, Ranger VII grade, is posted to charge of Bargur Range. 3. The transfer of Ranger Philip to South Coimbatore District, ordered in this office S. O. No. 49/31 dated 22-6-31, is cancelled in public interest.
- 11-8-31. The following officiating promotions are ordered. 1. R. Rama Ayyar, M. F. C. trained Forester, I grade, to act as VII grade Ranger from 5-7-30. 2. S. Rangamannar Doss, M. F. C. trained sub proteum Forester, I grade, to act as Ranger VII grade from 13-5-31. 3. A. Sitharama Sarma, M. F. C. trained Forester III grade to act as Ranger VII grade from 22-5-31 to 21-6-31 and from 24-7-31. 4. M. Gopalsami Naidu, M. F. C. trained Forester III grade, to act as Ranger VII grade from (1-8-31) date of taking over charge of Kannikatti Range.

On expiry of his present leave, M. R. Ry. A. K. Anantharama Ayyar, Ranger, VII grade, Tinnevelly District, posted to charge of Mettupalayam Range, North Coimbatore District.

Sixth Circle.

- 25-6-31. On the expiry of the leave, M. R. Ry. K. Kunhiraman Menon, Ranger VI grade, will rejoin the Mannarghat Range in relief of No. 2. 2. On relief by No. 1, M. R. Ry. T. G. Sankaran Nair, Ranger IV grade, in charge of Mannarghat Range, granted leave as follows,—(a) L. a. p. without medical certificate for three months from date of relief. (b) Leave on half average pay without medical certificate for one month in continuation thereof.
- 4—7—31. M. R. Ry. V. Viraswami Naidu, Ranger VII grade acting, Palghat division, posted to hold charge of Mangalore Range, North Mangalore Division. To join on relief at Palghat.



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