

THE NATURAL REGENERATION OF CEYLON FORESTS*

(Continuation)

BY

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THE first attempts at natural regeneration of Ceylon forests were confined to the Dry Mixed Evergreen Type for the reason apparently that it was these forests that yielded the best known indigenous hard woods which alone received much attention then. The earliest date back to about the beginning of this century. It has, for instance, been recorded that "Improvement Fellings" had been carried out before 1908 in a block of 63 acres of the Kilinochchi Reserve and that further opening up of the canopy was made in that year when what were called "impeditive trees" were removed at a cost of Rs. 9 per acre. Much valuable young growth was claimed to have resulted. The Vannivilankulam Reserve appears to have been a favoured centre for operations of this kind between the years 1922 and 1928, when rather intensive operations appear to have been carried out in different blocks varying from 160 to 360 acres and totalling to about a 1000 acres in all.

"Improvement Fellings" carried out in 1922 in the latter Reserve apparently amounted to the removal of large trees of inferior species interfering with the principal timber species. The results do not appear to have been quite such as they had been over-enthusiastically acclaimed in the local Divisional Forest Officer's Report for that year—for it had been necessary subsequently (1924) to attempt supplementing this natural regeneration artificially by broadcast sowings and planting basket and stumped plants of *Palu*, *Satin*, *Margosa*, *Ebony* (*DIOSPYROS EBENUM*), *Mahogany* (*SWIETENIA MACROPHYLLA* AND *MAHOGANI*) and *Halmilla* unfortunately without success. An enumeration in 1940 of 11.2 acres making strip counts at 1 chain intervals over a gross area of 560 acres of the section of this Reserve treated to so-called "Improvement Fellings" gave a total of only 152 to the acre of trees below 12" girth at breast height. Other test enumerations in treated and untreated forest areas showed there was no improvement gained. In 360 acres worked in 1928 for supply of firewood to the Railway through "Improvement Fellings" the exploitation contract required:—(i.) all trees and shrubs under 12" girth at breast height and all timber species be retained, (ii.) all trees above this dimension of non-timber species except those specially marked for retention be felled, (iii.) all branchwood and slash be distributed evenly throughout the area but cleared away from large timber trees in a radius of 10 ft.

Test enumerations carried out in 1940 showed a slight but no significant difference between the numbers of plants of preferred timber species below 18" girth at breast height taken from counts in treated and untreated sections, respectively.

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Straightforward fuel exploitation restricted to non-timber species in a portion of the Kantalai Reserve in 1931-32 was followed by prolific and vigorous regeneration of *Halmilla*. This happened again in a later firewood exploitation block of 1940-41. In both cases the regeneration was subsequently overwhelmed and entirely suppressed by regrowth of shrubs of *Mallotus* spp. and *Mora* and *Dikwenna*.

Other forms of regeneration fellings had been tried experimentally in an area of just over 160 acres of DIPTEROCARPUS ZEYLANICUS-forest in the Kankaniyamulla Reserve in the years 1931 and 1932. These took the form of rather drastic fellings of non-timber species irrespective of size and were originally intended to be carried out in 3 annual operations. The first felling removed nearly 50 per cent. of the stand and the second, which was carried out only in the portion of the area first felled in 1931, nearly half again of what was left. These fellings proved altogether too much. They brought back the jungle in a veritable flood. Masses of *Lanka-palu* covered most of the area in a seething pall. A bumper seed year of *Hora* in 1935, assiduous creeper cutting aided by natural colonization by *Kande* retrieved the situation and brought it to a fairly satisfactory state of young *Hora* regeneration by 1937-38. Subsequent neglect under War-time conditions has resulted in some deterioration of the situation to the advantage of the *Lanka-palu* !

In a portion of the Pituwela Block of the Beraliya Forest Reserve of the Galle District the "Improvement Fellings" of 1927-28 took the form of a clearing of the undergrowth and all small trees and saplings up to 6" girth at breast height followed by the removal of scattered overmature *Tawenna* (*PALAEQUIMUM RUBIGINOSUM*) besides other large non-timber species. Examined in 1940 the felling gaps were found to be choked out by dense growths of *Kekiri-wara*. Regeneration of *CALOPHYLLUM* species was abundant but few of the *Palaquiums* which formed the predominant species in the area were to be found. All were well below expected growth for their age and no progress had been made for lack of subsequent attention.

The poor results from these earlier ventures have undoubtedly been due to lack of silvicultural knowledge of the species concerned, of the technique of the operations required and the failure to follow up initial treatments. Properly planned and better controlled experimental trials, after a period of preparatory investigations, commenced only a few years ago but these have already yielded interesting and valuable information.

There are two principal systems of canopy-manipulation in tropical forests through which the induction and establishment of natural regeneration may be brought about. One begins with the breaking up of the dominant overwood into evenly distributed gaps by removal of the branchiest and largest crowned trees of the fuel type. The preferred species are carefully retained except when in groups and they themselves must be felled to obtain an even breaking up of the canopy. This initial fellings or "Seeding Felling" as it is termed helps to bring light and warmth to the forest floor, expose and prepare the soil for seed germination, reduce root competition of the parent overwood and stimulate to a certain extent the greater production of seed by isolation of the crowns of the preferred tree species. If regeneration obtained is insufficient, it is followed by further fellings of a similar nature, enlarging the original gaps where they have been inadequate and breaking up

close sections as may have been left in the first felling. If resultant regeneration, however, has been satisfactory cleanings to release preferred species from shrubs, weeds and climbers and graduated final fellings to remove the overwood are undertaken.

The amount of opening up required varies according to the type of forest concerned. Relatively small gaps are required in the Wet Evergreen High Forests not only because of the greater hazard from rank weed growth but also on account of the more shade bearing nature of timber species in such forests and much less acute competition for soil moisture as compared with forests of the Dry Mixed Evergreen Type which require definitely heavier initial fellings.

Under the other system of regeneration fellings referred to, the order of canopy manipulation is reversed. It depends on the gradual raising and lightening of the canopy from below upwards commencing with the undergrowth and sub-canopy storeys and working up to the ultimate dominants—removing first the non-timber species and finally the timber dominants.

There is much to be said for and something against each of these systems. The latter system would appear silviculturally better suited to the more shade tolerant Wet Evergreen species and the former to the Dry Mixed Evergreen type which includes more light demanders. Recent experience has been that even in the Wet Evergreen High Forests considerable opening up of the canopy is required for establishment of fresh seedling regeneration. For instance preparation for routine experimental planting trials under shelter began with the removal of the undergrowth up to a height of 20' but this was found to be totally inadequate and canopy had to be raised almost immediately to 40'. In the years that followed this was then gradually further increased till we find now that to obtain the best results we have to remove all trees under the crown of any other for Wet Evergreen High Forest Type and also thin the ultimate dominants to about a canopy density of $\frac{1}{2}$ in the Dry Mixed Evergreen Forests just to begin with.

A number of closely controlled experiments have been carried out in recent years following both these systems of natural regeneration and other variations of them. Some of these experiments dealing with particular species, *e.g.*, *Hedawaka* and *Hora* have been successfully concluded. A fair proportion of the other trials have also reached the final stages involving the removal of the forest overwood.

The success of a natural regeneration venture is judged by the number of plants of preferred or acceptable timber species raised per unit area, their distribution or frequency over the area as a whole and the mean height of such regeneration as compared with the acknowledged Establishment Height. All these factors are combined in the computation of the *Establishment Stocking Factor*—E.S.F. for short. For the purposes of this paper this has been worked out as simply the product of the ratio of stocked miliacre quadrats to the total number of quadrats and the ratio of the average height of the tallest plants of each preferred species or class of regeneration in each miliacre quadrat to establishment height multiplied by 100. The establishment height has been taken generally as 6' except in certain cases where 10' has been adopted as shown in the summary of results. In calculating average

height all heights above establishment height were taken as equal to it. The total number of plants unrelated to distribution by quadrats was not considered for the reason that all requirements of adequate stocking would be met if one established plant per miliaacre resulted.

The Wet Evergreen High Forests nearly always carry a large number of seedlings of trees of timber value. On average about 6,000 seedlings to the acre mostly of the unestablished class—say 2 to 3' in height with E.S.F.F. working out round about 25 to 30. The principal species comprising this regeneration are :—*Hora*, *Hedawaka*, *Duns*, *Kinas*, (*CALOPHYLLUM BRACTEATUM*, *C. TOMENTOSUM*, *C. SOULATTRI* and *C. PULCHERRIMUM*), *Kirihembliyas* (*PALAEQUIM PETIOLARE*, and *p* *CANALICULATUM*), *Molpedda* (*ISONANDRA LANCEOLATA*) *Pelan*, *Welipenna*, *Milla*, *Del*, *Alubo*, *Dambus* (*Syzygium* spp.) &c. Under treatment the regeneration of preferred and other timber species have been raised to the order of 12 to 15,000 and even to 20,000 and more seedlings per acre giving E.S.F.F. of 90 to 100 or complete Regeneration in three years from initial treatment.

The canopy condition under Seeding & Fellings best conducive to this type of forest appears to be when gaps about 1 to 1½ chains in diameter are evenly distributed and separated from one another by preferably no more than single rows of dominants. Under the procedure of raising the canopy gradually upwards an ultimate canopy density of ½ appears to be conducive to best results. Climber cutting is always an essential and necessary preliminary to any form of regeneration treatment. Cleanings carried out annually in anticipation of monsoonal growing periods have generally given better and quicker results than more restricted cleanings carried out periodically as and when considered desirable.

The sub-tropical Montane Forest type presents the most difficult task from the point of view of Natural Regeneration. Observations in a 100 miliaacre quadrats located 50 in the gaps and 50 in the intervening closed sections, in a part of the Kandapola Forest Reserve felled selectively in 1941 for emergency war supplies gave a return of only 6 and 67 established plants of Timber species respectively in 1943! Most of these were obviously pre-treatment and had made no appreciable growth since. Even the *Kuretiya* shrubs (*Hedyotis* species) in the gaps had died back. Grasses, highland bata (*TEINOSTACHYUM ATTENUATUM*) and Stinkweed followed by various kinds of Ferns appear to have been the initial inhibitors. Examination in 1943 of other sections of the same forest felled about the same time revealed the larger felling gaps nearly free of any regeneration of Tree species excepting for a stray *Kududauwula* (*LITSEA FUSCATA*) and an occasional *Malweralu* (*ELAEOCARPUS SUBVILLOSUS*) from coppice and Root sucker regrowth respectively. The floor was found covered generally with a close mat of creeping grasses, Stinkweed, patches of the highland bata and clumps of *Anchusa* species and Ferns. The closed sections of Forest and smaller gaps carried unestablished plants of *Dambu* (*SYZYGIVM* species) *Kududauwula* (*LITSEA FUSCATA*), *Mihiriya* (*ADINANDRA LASIOPETALA* and *GORDONIA ZEYLANICA*) *Kina* (*CALOPHYLLUM WALKERI*) 'common' to 'occasional' in frequency beneath an undergrowth of *Bata* and *Kuretiya*. The slow tempo of the growth of the mountain Tree species more than special difficulties over any particular types of Weed species like *bata* and *nellu* (*STROBILANTHES* species) is our heaviest handicap.

In the Dry Mixed Evergreen High Forest *ad hoc* experimental investigations have been current only a few years but observations have been kept on other older large scale experiments following different variations of canopy manipulation. In certain of these owing to remoteness of the forests concerned, felling of anything but the most valuable Timber trees would not pay its cost and trees required to be removed for Regeneration purposes had to be got rid of by other means. Plain deep and Poison frill-girdling of such trees have been tried.

The efficiency of these methods of canopy manipulations depends on the efficacy of the girdlings and rates of mortality of the treated trees. The following results were obtained from 2 sets of large scale experiments conducted in the Omunugala and Kumbukkan Reserves of the Batticaloa District :—

		Percentages of Mortality in—			
		6 Months.	9 Months.	20 Months.	48 Months
A. Omunugala Reserve—					
I. Plain deep girdling	..	24%	30%	46%	94%
II. Poison Frill girdling ($\frac{1}{2}$ lb. Sodium Arsenite per gallon)	..	35%	59%	75%	96%
		2 Months. 17 Months. 25 Months.			
B. Kumbukkan Reserve—					
I. Plain deep girdling	..	8%	13%	67%	
II. Poison frill girdling ($\frac{3}{4}$ lb. of Sodium Arsenite per gallon)	..	37%	80%	93%	

The much quicker results with poison frill-girdling in the latter case is probably due to the higher concentration of poison used and drier climatic conditions. The reactions to plain deep girdling are always variable, no matter how carefully the operation is carried out, and difficult to understand. Some interference may very likely be caused by root-grafts with ungirdled trees. The full effects of plain deep girdling appear to take about 4 years to show up as against a period of about 2 years in the case of poison frill girdling.

The regeneration of preferred Timber species—mostly of *Ranai Satin* and *Halmilla* is just beginning to show up in the good quality high Forest sections under poison frill girdling but remains poor in low jungle portions. It does not appear that regeneration under plain deep girdling will be only a question of the time taken for the girdling to have full effect. The final result of the more gradual opening up of the overwood may be quite different. In the Omunugala plot there are indications that the understory and shrubs are stimulated to denser growth thereby reducing *not* increasing the chances of regeneration establishing itself whereas the more sudden opening up following poison frill-girdling tends initially to check rather stimulate the understory trees and undergrowth.

The pretreatment incidence of natural regeneration of preferred timber species is much lower than in the Wet Evergreen Forest Type and very variable according to quality of the Forest concerned. The better quality High Forest generally carries about 1,000 to 2,000 unestablished seedlings of Timber species to the acre—mostly of *Satin*, *Ranai* and *Ebony*. The incidence of unestablished plants also varies enormously with the time of the year at which counts are taken owing to the annual die back of such seedlings

referred to earlier. Including other Timber species like *Welang* and *Mora* pretreatment incidence of natural regeneration may be of the order of 5 to 6,000 seedlings per acre of the better quality forest.

Satisfactory regeneration has been obtained in two other areas of Dry Mixed Evergreen type—in the Kilinochchi Reserve. In the older of these all undergrowth and non-timber trees were cut between 1930 and 1934 leaving a few scattered standards of *Palu*, *Satin* and *Ranai*. By 1941 a low thorny scrub jungle mostly of *Phyllanthus* species, *MEMECYLON UMBELLATUM* *CARISSA SPINARUM* and *HEMICYCLIA SEPIARIA* &c., had come up amongst which was to be found a large number of unestablished plants and established saplings of *Ebony*, *Satin*, *Ranai*, *Milla*, *Palu* and *Chaddafakku*—*Vide* analysis of enumeration given against Experiment No. H. 7 in the summary of enumeration given against Experiment No. H 7 in the summary of experimental results.

The other area adjacent to the above was exploited for firewood in 1940 felling non-timber species to a girth minimum of 3' 6" and later to 2' 6" at breast height. Counts of 800 and 200 miacre quadrats in March 1941 and 1944 respectively, taken distributed at $\frac{1}{2}$ chain intervals on either side of a linear observation plot of 80 chains in length, gave the figures summarized against Experiment No. H. 10.

Thus it will be seen that though the regeneration of Timber species is by no means as prolific in the Dry Mixed Evergreen High Forest as in the Wet Evergreen High Forest, it can yet be satisfactorily induced. Though we may not for the present add "and entirely established" it is hoped we would be able to advance to that in due course.

Starting practically 'ab initio' experimental investigations carried out in the last 8 years have yielded a mass of information on the flowering and fruiting of our principal Timber species, their seed germination, seedling behaviour, characteristics and requirements. Experiments dealing with the induction and establishment of natural regeneration have been eminently successful in the Wet Evergreen High Forests of the Wet and Intermediate climatic zones of the Island. Little is yet known as to the possibilities of successful natural regeneration in the sub-tropical montane forest where besides special difficulties caused by weeds and shrubs like the highland *bata* and *nellu* we have to do with the tardy seed germination and slow growth of the seedlings of preferred tree species. In the Dry Mixed Evergreen High Forests regeneration of economically valuable Timber species is much less abundant and readily established than in the Wet Evergreen Forests but satisfactory progress has been made under more favourable conditions.

REFERENCE

1. Flowering and Fruiting of Forest Trees of Ceylon by C. H. Holmes—(Indian Forester Vol. LXVIII., Parts 8, 9 and 11—1942.)

SUMMARY OF NATURAL REGENERATION EXPERIMENTAL RESULTS

Experiment Number and Locality.	Forest Type and Climatic Zone.	Treatment.	Species or Class of Regeneration.	Analysis of Regeneration per Acre.										Remarks.	
				Pretreatment.					Post Treatment.						
				R	U	E	S	Wtd. Ht.	R	U	E	S	Wtd. Ht.		
B. 1 1933 Udugama	Wet Evergreen High Forest WET ZONE. (Hedawaka predominant)	1933 to 1937 undergrowth cleared annually preserving Hedawaka. 1937 C.D. reduced to $\frac{1}{2}$ C.H. raised to 30' and gradually all understorey trees removed reducing C.D. to $\frac{1}{3}$ by 1940	CHAETOCARPUS species mostly C. CASTANOCARPUS Est. Ht. 10 ft.	September, 1937					August, 1940						
				2730	680	260	10	4.2'	33.6	6500	8460	1080	540		16.5
L1A. Kekanadara	Do. (Hora predominant)	1931 All non-timber trees felled for firewood, shrubs and creepers cut in 1932, 1935 and 1939	DIPPEROCARPUS ZEPHYLANICUS Est. Ht. 10 ft.						February, 1939						
									45900	1700	1300	18.9'	92.9		
L1B. Kekanadara	Do. (Hora predominant)	1933 All non-timber species felled for firewood. Shrubs and creepers cut in 1935, 1937 and 1939	do.						April, 1940						
									16500	1760	1300	23.3'	95.9		
K2.	do.	1934 All undergrowth removed leaving Overwood intact. Undergrowth recleared in 1935 and 1936	CHAETOCARPUS SPECIES (CASTANOCARPUS CORIACEUS and PUBESCENS)	November, 1937											
				1920	2500	40	—	1.2'	20.2	490	2820	80	10		2.2'
				4,460					3,400						
									April 1944						
				2890	1200	140	530	12.2'	4,760	4020	6080	260	550		6.2'
									a						
									+ preferred sps. CAILOPHYLLUM sps. SCOLOPIA ACUMINATA + other Timber species other tree sps.						

Note:—C, D, = Canopy Density; C, H. = Canopy Height; Wtd. Avg. Ht. = Weighted Average Height.

	November, 1937					April, 1940						
(b) Cleanings as required. April 1943	Chaetocarpus species + Preferred species.					1480	880	220	220	9.8'		
	+ Other species					10800	10760	440	350	6.5'		
	Timber mostly SCOLOPIA ACUMINATA and CALOPHYLLUM species					13720	13670	770	460	6.5'		
	Other trees species.					420	2730	280	120			
										76.9'		
do.	1934 All undergrowth and some of the non-timber species of the overwood removed. Undergrowth re-cleared in 1935 and 1936.	4270	1840	10	10	11.5'	1290	2680	10	10	1.3'	15.3'
	1941 As midstorey had already been removed dominants excepting <i>Hedawaka</i> , <i>Milla</i> , <i>Dawata</i> , <i>Kina</i> and <i>Etamba</i> were deep-girdled.	6,130					3,990					
	(a) Rains weeded annually in March/April.											
(b) Cleanings as required. April 1943	CHAETOCARPUS species					9390	1570	160	290	10.0'		
	+ Other preferred species.					12230	7350	440	600	6.4'		
	+ Other Timber species.					14710	15110	1310	1010	7.3'		
	Other tree sps.					560	2970	300	180			
										93.7'		
(b) Cleanings as required. April 1943	CHAETOCARPUS species					740	200	10	40	3.0'		
	+ Other preferred species.					3140	5500	190	690	6.9'		
	+ Other Timber species.					5550	10000	390	1100	7.9'		
	Other Tree sps.					520	2350	130	500			
										77.1'		

SUMMARY OF NATURAL REGENERATION EXPERIMENTAL RESULTS (contd.)

Experiment Number and Locality.	Forest Type and Climatic Zone.	Treatment.	Species or Class of Regeneration.	Analysis of Regeneration per Acre.										Remarks.				
				Pretreatment.					Post Treatment.									
				R	U	E	S	Wtd. Ht.	R	U	E	S	Wtd. Avg. Ht.		E.S.F.			
A. 59 Indikade Reserve	Wet Evergreen High Forest <i>Wet Zone</i> (Doona species predominant)	1941 Undergrowth left intact and Intermediate Storey below Dominants and Predominants removed. Climbers cut. Final Felling 1, 1944.	Preferred sps. Doona species. DIPTEROCARPUS ZEYLANICUS, CALOPHYLLUM sps. Artocarpus nobilis ANISOPHLOEA ZEYLANICA PALAQUITUM PETIOLARE KURRIMIA zeylanica. Other Timber + other Tree sps. (B. other Timber species alone) Other tree species Small Tree species. Preferred and other Timber sps. CALOPHYLLUM sps. ARTOCARPUS NOBILIS. ANISOPHLOEA ZEYLANICA: XYLOPIA PARVIFOLIA APOROSA LATIFOLIA CHAETOCARPUS sps. + Other Tree and small Trees sps.	800	2080	200	90	3.4'	30.0'	830	10070	270	90	2.5'				
				2450	11260													
				2010	5030	410	120	—	—	—	—	—	1040	11210	360	110	—	
				7,570	12720								20	470	20	10	—	
				—	1320	250	30	—	—	—	—	—	80	2780	130	50	—	
				1942.	1943.													
				680	2610	1930	1000	7.5'	2500	1750	2640	680	8.7'					
				6220	7,570													
				1500	4070	3710	1110	8.0'	5180	4680	4570	820	8.4'					
				10390	15,250													
—	3682	770	410	6.2'	1540	1770	1270	730	7.5'									
4860	5310																	
360	8760	200	770	6.4'	5680	3910	2050	1140	7.7'									
11890	12,780																	
1941.	1944.																	
60	1050	90	20	3.2'	50	1030	120	—	3.2'									
1,220	1,200																	
150	5520	150	60	—	440	4610	240	—	—									
5,880	5,290																	
A. 60. Indikade Reserve	do. (<i>Milla</i> predominant)	1941 Seeding Fel- lings makings gaps approximately 1 chain in diameter separated from one another by single rows of Dominants	Preferred sps. DIPTEROCARPUS ZEYLANICUS; CALOPHYLLUM sps. ANISOPHLOEA ZEYLANICA; KURRIMIA ZEYLANICA ARTOCARPUS nobilis. + Other Timber species.	60	1050	90	20	3.2'	24.4'	50	1030	120	—	3.2'				
				1,220	1,200													
				150	5520	150	60	—	440	4610	240	—	—	—	—	—		
5,880	5,290																	

61.4

41.8

		10	8650	40	0	10	2770	40	10			
Q. 26A. Kankaniyamulla Reserve	Wet Evergreen High Forest Intermediate Zone.	Other tree species	8,700			2,830						
		Small tree species.	25	1610	260	125	20	4320	270	120		
		Preferred and other Timber species. Ar. TOCARPUS nobilis: MAGNIFERA ZEYLANICA: XYLOPIA PARVIFOLIA:	1620	6450	180	70	4.6'	2200	6050	800	110	8.6'
		MYRISTICA LAURIFOLIA: CANARIUM ZELANICUM: VITEX PINNATA: MIMUSOPS ELENGI	8,320									
		+ Other Tree species	3990	11110	220	70	4.5'	3920	12860	890	120	8.5'
		cies	15,390									
		1940 Climbers cut and undergrowth cleared. No treatment thereafter	5350	7000	120	50	4.4'					
		Preferred and other Timber sps. as above	12,520									
		+ Other Trees species.	7900	10500	170	50	5.3'					No counts or measurements for 1944
		cies.	18,650									
B.		Preferred and other Timber species as above	5550	2180	140	40	4.7'	500	1230	290	160	8.5'
		Seeding Fellings. 1942 Cleanings. 1943 Final Fellings. 1944 Clearings.	7,910									
		+ Other Tree species	7210	7300	170	50	5.1'	2730	8400	500	170	8.6'
		cies	14,730									
		As in A. Cleanings only when required but not annually but cleared 1942 and 1943	1770	1790	20	10	4.0'	1190	1680	110	10	5.2'
		Preferred and other Timber sps. as above	3,590									
		+ Other Tree species.	3930	10180	180	60		6500	11100	830	30	7.4'
		cies.	14,350									
		Preferred Species.	1690	2220	230	30		150	4350	400	50	6.8'
		Ar. TOCARPUS INTEGRA NEPHELIUM longana Xylopia parvifolia VITEX PINNATA BERY CORDIFOLIA	4170					4950				
+ Other timber species.	1880	2400	230	40		200	5360	400	50	6.2'		
cies.	4550					6,010						
Other Tree species	4300	2200	160	110		1790	6900	80	30			
		6770				8800						
Q. 25. Sundapola Reserve Iruk-goda	Wet Evergreen High Forest of poor quality heavily exploited in the past. Intermediate Zone.	Preferred and other Timber species as above	1690	2220	230	30	150	4350	400	50	6.8'	
		Seeding Fellings. 1941 Cleanings. 1942 Final Fellings. 1944 Clearings.	4170				4950					
		+ Other Tree species	1880	2400	230	40		200	5360	400	50	6.2'
		cies.	4550				6,010					
		As in A. Cleanings only when required but not annually but cleared 1942 and 1943	1770	1790	20	10	4.0'	1190	1680	110	10	5.2'
		Preferred and other Timber sps. as above	3,590									
		+ Other Tree species.	3930	10180	180	60		6500	11100	830	30	7.4'
		cies.	14,350									
		Preferred Species.	1690	2220	230	30		150	4350	400	50	6.8'
		Ar. TOCARPUS INTEGRA NEPHELIUM longana Xylopia parvifolia VITEX PINNATA BERY CORDIFOLIA	4170					4950				
+ Other timber species.	1880	2400	230	40		200	5360	400	50	6.2'		
cies.	4550					6,010						
Other Tree species	4300	2200	160	110		1790	6900	80	30			
		6770				8800						

Q. 26A.
Kankaniyamulla Reserve

B.

C.

D.

Q. 25.
Sundapola Reserve Iruk-goda

September, 1944.

August, 1941.

April, 1941

March, 1944

SUMMARY OF NATURAL REGENERATION EXPERIMENTAL RESULTS—(contd.)

Experiment Number and Locality.	Forest Type and Climatic Zone.	Treatment.	Species or Class of Regeneration.	Analysis of Regeneration per acre.						Remarks.					
				Pretreatment.			Post Treatment.								
				R	U	E S	R	U	E S		Wtd. Avg. Ht.	Wtd. Avg. Ht.			
O.1.i. Omuugala Reserve	A. (Open High Forest	1940 Climbers cut and non-timber species of the over-wood poison Frill-girdled	Preferred and other Timber sps. CHLOROXYLON SWIETENIA; ALSEODAPHNE SEMECARPIFOLIA; BERRYA CORDIFOLIA VITEX PINNATA, PTEROSPERMUM CANESCENS, DIOSPYROS OCCARPA NEPHELIUM LONGANA do.	March, 1942						A. Originally open and festooned with climbers which being cut, opened up canopy still more. C.D. ‡ to †					
				3160	—	—	1.5'	15.8	—		2860	190	230	8.1'	
				3,280							April, 1945				
O.1.ii	B. Open Moderately High Forest C. Close High Forest	Cleanings in January, 1945	do.	April, 1942.						B. Moderately high Forest with <i>Halimida-Rana</i> poles. Heavily opened up by girdling of non-timber species. C.D. ‡ C. Close high Forest of good quality slightly opened up C.D. ‡ or †					
				2500	—	—	4.3'	19.4	—		750	800	350	19.9'	
				1,900							July, 1944.				
O.2.i. Kumbukkan Reserve	Dry Mixed Evergreen High Forest A	1940 Climbers cut and non-Timber species girdled (<i>Wirra</i> virtually felled)	Preferred and Timber species nearly all ALSEODAPHNE SEMECARPIFOLIA	August, 1942.						A. Secondary Close High of <i>Wirra</i> . C.D.1					
				2700	—	—	0.7'	8.3	—		3340	180	200	8.3'	
				3,720							May, 1944.				
O.2.i.	Dry Mixed Evergreen High Forest	1942 Climbers cut non-timber species poison frill girdled	Preferred sps. and other timber sps. mostly CHLOROXYLON SWIETENIA and some BERRYA CORDIFOLIA	May, 1944.						A. Secondary Close High of <i>Wirra</i> . C.D.1					
				1260	—	—	25	1.5'	8.5		20	740	—	40	4.3'
				800							May, 1944.				
O.2.i.	Dry Mixed Evergreen High Forest	1942 Climbers cut non-timber species poison frill girdled	Preferred sps. and other timber sps. mostly CHLOROXYLON SWIETENIA and some BERRYA CORDIFOLIA	August, 1942.						A. Secondary Close High of <i>Wirra</i> . C.D.1					
				230	—	—	230	(2.0'	—		3500	1500	—	—	
				460 approx.)							5,000				

