

GOVERNMENT OF MAHARASHTRA



**WORKING PLAN**  
FOR THE  
**MELGHAT FORESTS**

**EAST & WEST MELGHAT DIVISIONS**

BY

**Shri P. P. JOSHI, I. F. S.**  
*Divisional Forest Officer, Working Plans*  
*Nagpur Circle, Nagpur*

## TABLE OF CONTENTS

Paragraph No. (1)	Subject (2)	Pages (3)
	Introduction .. .. .	I
	Foreword .. .. .	II
	Summary of the Working Plan for Melghat Forest Division, Amravati Circle, Maharashtra.	III—V
	Abbreviations used in the Plan .. .. .	VI
	Glossory of Local Terms used in Plan .. .. .	VII
	Botanical & Local Names of Plants .. .. .	VIII—XIV
 <b>PART I: SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED.</b>		
<b>CHAPTER I: THE TRACT DEALT WITH</b>		
1—6	Section 1 : Name and Situation .. .. .	1
7—12	Section 2 : Configuration of the ground .. .. .	1-2
13—26	Section 3 : Geology, rock and soil .. .. .	2-3
27—39	Section 4 : Climate .. .. .	3-4
40—43	Section 5 : Water-supply .. .. .	4-5
44—46	Section 6 : Distribution of Area .. .. .	5
47—49	Section 7 : State of Boundaries .. .. .	5
50—53	Section 8 : Legal Position .. .. .	6
54—57	Section 9 : Rights and concessions .. .. .	6-7
 <b>CHAPTER II: THE FOREST</b>		
58—61	Section 1 : General description and condition of the forest .. .. .	8
62—85	Section 2 : Composition of the crop .. .. .	8—10
86—108	Section 3 : Injuries to which the crop is liable .. .. .	10—12
 <b>CHAPTER III: UTILIZATION OF THE PRODUCE</b>		
109—118	Section 1 : Agricultural customs and wants of the population .. .. .	13-14
119—126	Section 2 : Markets and Marketable products .. .. .	14-15
127—129	Section 3 : Lines of export .. .. .	15
130—178	Section 4 : Methods of exploitation and their cost .. .. .	15—21
179—180	Section 5 : Past and current prices .. .. .	21—23
 <b>CHAPTER IV: STAFF AND LABOUR SUPPLY</b>		
181—184	Section 1 : Staff .. .. .	24-25
185—191	Section 2 : Labour .. .. .	25-26
192—197	Section 3 : Forest villages .. .. .	26-27
 <b>CHAPTER V: PAST SYSTEMS OF MANAGEMENT</b>		
198—221	Section 1 : General history of the forest .. .. .	28—30
222—290	Section 2 : Past systems of Management and their results .. .. .	30—37
291—317	Section 3 : Special works of improvement .. .. .	37—42
318-319	Section 4 : Past yield .. .. .	42
320	Section 5 : Past Revenue & Expenditure .. .. .	42

Paragraph No. (1)	Subject (2)	Pages (3)
<b>CHAPTER VI : STATISTICS OF GROWTH AND YIELD</b>		
321—328	Section 1 : Growth of Teak .. .. .	43-44
329—363	Section 2 : Stocking .. .. .	44—53
364	Section 3 : Volume tables .. .. .	53
365—368	Section 4 : Increment .. .. .	54
369—378	Section 5 : Yield .. .. .	55—58
379	Section 6 : Inferences .. .. .	58
<b>CHAPTER VII : ESTIMATE OF CAPITAL VALUE OF FORESTS</b>		
380—387	Section 1 : Capital value of the forest .. .. .	59
388—393	Section 2 : Profitability of the forest allotted to Selection Working Circle ..	59-60
<b>CHAPTER VIII : WILD LIFE</b>		
394-395	Section 1 : Distribution of the game .. .. .	61
396	Section 2 : Legal position .. .. .	61
397-398	Section 3 : Rights & Concessions .. .. .	61
399-401	Section 4 : Injuries to Wildlife .. .. .	61
402—407	Section 5 : Past & Present History of Management .. .. .	61-62
408—415	Section 6 : Measures adopted for protecting wild life .. .. .	62-63
416	Section 7 : Wild life captured, hunted or otherwise dead .. .. .	63
417—422	Section 8 : Special works of improvement Dhakna-Kolkaz Wild Life Sanctuary ..	63-64
<b>PART II : FUTURE MANAGEMENT PROPOSED AND DISCUSSED</b>		
<b>CHAPTER I : BASIS OF PROPOSALS</b>		
423-424	Section 1 : National Forest Policy .. .. .	65
425	Section 2 : Factors affecting the general objects of Management .. .. .	65
426	Section 3 : Objects of Management .. .. .	65
427—441	Section 4 : Analysis and Valuation of the crop .. .. .	65—67
442—448	Section 5 : Functional Classification of Forests .. .. .	67-68
449—460	Section 6 : Method of Treatment .. .. .	68-69
461—463	Section 7 : Working Circles .. .. .	69-70
464—469	Section 8 : Blocks & Compartments .. .. .	70
470	Section 9 : Period of the Plan .. .. .	70
<b>CHAPTER II : WORKING PLAN FOR SELECTION WORKING CIRCLE</b>		
471—473	Section 1 : General constitution of the Working Circle .. .. .	71
474	Section 2 : Special objects of Management .. .. .	71
475-476	Section 3 : Character of the vegetation .. .. .	71
477—483	Section 4 : Analysis and Valuation of the crop .. .. .	72-73
484	Section 5 : Method of treatment .. .. .	73
485	Section 6 : Choice of species .. .. .	73
486—499	Section 7 : Exploitation girth .. .. .	73—76
500	Section 8 : Felling cycle .. .. .	76
501—503	Section 9 : Formation of the Felling Series .. .. .	76-77
504	Section 10 : Regulation of Yield .. .. .	78

Paragraph No. (1)	Subject  (2)	Pages  (3)
<b>CHAPTER II : WORKING PLAN FOR SELECTION WORKING CIRCLE—contd.</b>		
505	Section 11 : Agency of Exploitation .. .. .	78
506—508	Section 12 : Method of executing the felling .. .. .	78
509	Section 13 : Cutting back operation .. .. .	78
510	Section 14 : Sequence of Fellings .. .. .	78
511—514	Section 15 : Plantations .. .. .	79
515—521	Section 16 : Cleaning and thinning .. .. .	79
<b>CHAPTER III : WORKING PLAN FOR COPPICE WITH RESERVES WORKING CIRCLE</b>		
522-523	Section 1 : General constitution of the Working Circle .. .. .	80
524	Section 2 : Special objects of Management .. .. .	80
525-526	Section 3 : Character of the Vegetation .. .. .	80
527—530	Section 4 : Analysis & Valuation of the Crop .. .. .	81-82
531	Section 5 : Method of Treatment .. .. .	82
532	Section 6 : Choice of Species .. .. .	82
533	Section 7 : Rotation .. .. .	82
534-535	Section 8 : Formation of Felling Series .. .. .	82-83
536	Section 9 : Regulation of Yield .. .. .	83
537	Section 10 : Agency of Exploitation .. .. .	83
538—542	Section 11 : Method of Executing the fellings .. .. .	83-84
543	Section 12 : Cutting Back Operations .. .. .	84
544	Section 13 : Sequence of Fellings .. .. .	84
545—548	Section 14 : Subsidiary Cultural Operation.. .. .	84-85
<b>CHAPTER IV : WORKING PLAN FOR THE IMPROVEMENT WORKING CIRCLE</b>		
549	Section 1 : General Constitution of the Working Circle .. .. .	
550	Section 2 : The special objects of Management .. .. .	86
551	Section 3 : Character of the Vegetation .. .. .	86
552—555	Section 4 : Analysis and Valuation of the Crop .. .. .	86—88
556-557	Section 5 : Method of Treatment .. .. .	88
558	Section 6 : Choice of Species .. .. .	88
559	Section 7 : Felling cycle .. .. .	88
560-561	Section 8 : Formation of Felling Series .. .. .	88
562	Section 9 : Agency of exploitation .. .. .	88
563-564	Section 10 : Method of Executing the Fellings .. .. .	89
565—567	Section 11 : Plantation .. .. .	89
568	Section 12 : The sequence of Felling .. .. .	89
569—571	Section 13 : Thinning.. .. .	89
<b>CHAPTER V : WORKING PLAN FOR THE PROTECTION WORKING CIRCLE</b>		
572—575	Section 1 : General Constitution of the Working Circle .. .. .	90
576-577	Section 2 : The Special objects of Management .. .. .	90
578-579	Section 3 : General character of Vegetation .. .. .	90-91
580-581	Section 4 : Method of Treatment .. .. .	91

Paragraph No.	Subject	Pages
(1)	(2)	(3)
<b>CHAPTER VI : WORKING PLAN FOR THE MISCELLANEOUS WORKING CIRCLE</b>		
582	Section 1 : General Constitution of the Working Circle .. .. .	92
583-584	Section 2 : Character of the Vegetation .. .. .	92
585-588	Section 3 : Analysis and Valuation of the Crop .. .. .	92-93
589-590	Section 4 : Method of Treatment .. .. .	93
<b>CHAPTER VII : WORKING PLAN FOR THE BAMBOO OVERLAPPING WORKING CIRCLE</b>		
591	Section 1 : General Constitution of the Working Circle .. .. .	94
592	Section 2 : Special objects of Management .. .. .	94
593-595	Section 3 : General Character of the Vegetation .. .. .	94
596-597	Section 4 : Analysis and Valuation of the Crop .. .. .	94-95
598	Section 5 : Method of Treatment .. .. .	95
599	Section 6 : Cutting Cycle .. .. .	95
600	Section 7 : Formation of Cutting Series .. .. .	96
601-604	Section 8 : Calculation and Regulation of Yield .. .. .	96-97
605-607	Section 9 : Method of executing Cutting .. .. .	97-98
608	Section 10 : Sequence of Cutting .. .. .	98
609	Section 11 : Agency of exploitation .. .. .	98
<b>CHAPTER VIII : WORKING PLAN FOR THE RUSA GRASS WORKING CIRCLE</b>		
610-611	Section 1 : General constitution of the Working Circle .. .. .	99
612	Section 2 : Special objects of Management .. .. .	99
613-614	Section 3 : General Character of the Vegetation .. .. .	99
615	Section 4 : Method of Treatment .. .. .	100
616-617	Section 5 : Cutting Series .. .. .	100
618	Section 6 : Sequence of Closure .. .. .	100
619-623	Section 7 : Rusa Grass Plantation .. .. .	100
624-625	Section 8 : Agency of Exploitation .. .. .	100
<b>CHAPTER IX : WORKING PLAN FOR WILD LIFE CIRCLE</b>		
625 a	Section 1 : General constitution of the Working Circle .. .. .	101
625 b	Section 2 : Special objects of Management .. .. .	101
625 c	Section 3 : Distribution of game .. .. .	101
625 d	Section 4 : Legal protection .. .. .	101
625 e	Section 5 : Method of Treatment .. .. .	101
625 f	Section 6 : Prescriptions .. .. .	101-102
625 g	Section 7 : Game sanctuary .. .. .	102
625 h	Section 8 : Water holes .. .. .	102
<b>CHAPTER X : ESTABLISHMENT AND LABOUR</b>		
626-630	Section 1 : Establishment .. .. .	103
631	Section 2 : Labour supply .. .. .	103

CONTENTS

(v)

Paragraph No.	Subject	Pages
(1)	(2)	(3)
<b>CHAPTER XI : MISCELLANEOUS REGULATIONS</b>		
632	Section 1 : Demarcation .. .. .	104
633	Section 2 : Marginal removal .. .. .	104
634—646	Section 3 : Exploitation and disposal of Forest Produce .. .. .	105-107
647	Section 4 : Irregular Exploitation .. .. .	107
648-649	Section 5 : Maintenance of Boundaries .. .. .	108
650—658	Section 6 : Fire Protection .. .. .	108-109
659—675	Section 7 : Grazing .. .. .	109-110
676-677	Section 8 : Plantation under 5-year plan scheme .. .. .	110
678—683	Section 9 : Roads .. .. .	110
684-685	Section 10 : Building .. .. .	110
686	Section 11 : Water-supply .. .. .	110
687—694	Section 12 : Privileges and concessions for Forest Produce .. .. .	110-111
695	Section 13 : Forest villages .. .. .	111
696—698	Section 13a: Transit of Forest Produce .. .. .	111
699-700	Section 14 : Changes in the range and divisional boundaries .. .. .	111-112
701-702	Section 15 : Maintenance of Maps .. .. .	112
703-704	Section 16 : Rainguage and Temperature recording stations .. .. .	112
705	Section 17 : Forest based Industries .. .. .	112
706—708	Section 18 : Control and records .. .. .	112-113
<b>CHAPTER XII : FINANCIAL FORECAST AND COST OF PLAN</b>		
709	Section 1 : Financial Forecast .. .. .	114
710	Section 2 : Cost of the Plan .. .. .	114

## INTRODUCTION

This Working Plan replaces the Working Plan by Sharma and Working Scheme by Bhathena. The Working Plan by Sharma was introduced in 1956-57 and the Working Scheme was prepared by Shri Bhathena in 1960 for the areas included under Miscellaneous Working Circle in the Working Plan by Sharma.

The preliminary Working Plan Report was prepared by Shri K. H. Chati, Divisional Forest Officer, Working Plans, Nagpur and Amravati Circles, Nagpur. Partial field work was carried out under the guidance of Shri K. H. Chati, Shri A. D. Mesbham and Shri A. G. Oka during their tenure as Divisional Forest Officers, Working Plans, Nagpur and Amravati Circles, Nagpur. Shri A. G. Oka also carried out the stem analysis for teak. The remaining field work was completed by undersigned.

The note written by Shri M. Y. Sowani, Director, Forest Development Board, Nagpur for discussing the exploitable size of teak in Melghat forests was used freely for drafting the Chapter 'Statistics of Growth and Yield'. I am very grateful to him for allowing the access to this note. Similarly I am thankful to Shri V. K. Mokashi, Forest Statistician, Pune for supplying the results of enumeration carried under the Forest Resources Survey Scheme in Melghat forests.

I express my deep sense of gratitude to Shri J. G. Thosre, Conservator of Forests, Working Plans, Pune and Shri D. A. Marballi who succeeded him later for their unreserved guidance and valuable suggestions given in the course of preparation and completion of the plan.

The experienced advice given by Shri D. D. Yellurkar, Conservator of Forests, Amravati Circle, Amravati, from time to time, is gratefully acknowledged. My thanks are due to Divisional Forest Officers of East and West Melghat Forest Divisions and their staff for rendering necessary assistance and co-operation for completion of the plan.

The entire staff of the division worked zealously and untiringly. The stockmapping and other field works were entrusted to the Range Forest Officers while mapping section was ably handled by the Ranger Surveyor and his team of surveyors. The staff associated with the work was :-

1. Shri M. P. Gulhane .. .. R. F. O.
2. Shri S. M. Pathan .. .. Do.
3. Shri G. B. Chinchmalatpure .. .. Do.
4. Shri K. R. Khadse .. .. Do.
5. Shri R. B. Joshi .. .. Do.
6. Shri N. M. Daksha .. .. Do.
7. Shri C. G. Singam .. .. Do.
8. Shri N. G. Kulkarni .. .. Do.
9. Shri A. B. Girhe .. .. Do.
10. Shri M. V. Kale .. .. Do.
11. Shri L. D. Purkar .. .. Ranger Surveyor.
12. Shri B. I. Mattikop .. .. Do.
13. Shri D. L. Ladsaongikar .. .. Surveyor.
14. Shri N. R. Nair .. .. Do.
15. Shri R. V. Apturkar .. .. Do.
16. Shri P. D. Ahirkar .. .. Steno-typist.
17. Shri S. C. Taiwade .. .. Do.

They all deserve commends and my sincere appreciation.

P. P. JOSHI,  
Divisional Forest Officer,  
Working Plans,  
Nagpur Circle, Nagpur.

NAGPUR :  
April 1974.  
A-431-2-A

## FOREWORD

The Melghat forests occur in the northern part of Amraoti district in a big compact block of 3053.9 Sq. km. These are valuable teak forests yielding annually handsome revenue to the State.

After assignment of Amravati district to the British in 1853 big blocks of compact tree forests were selected, demarcated and constituted into reserved forests. Upto 1886 they were given complete rest and were protected from fire, grazing, illicit cutting and shifting cultivation. Regular management of these forests started from 1893 when the first working plan was prepared under which improvement fellings were prescribed for the important blocks of Bairagarh and Gugamal reserves. This plan was revised in 1915-16. In 1935, third plan after detailed stockmapping, stem analysis and collection of required data was prepared by Stein. It was in force till 1956 when the 4th Working Plan prepared by Sharma was introduced. Sharma's Plan and Working Scheme by Bhatthana have been replaced by this working plan.

Since preparation of Sharma's plan, changes of far-reaching importance in economic and developmental fields had taken place. The value of forest produce greatly increased and large quantity of unsaleable forest produce became saleable. Therefore, preparation of new Working Plan for Melghat forests was taken up. While preparing new Working Plan stock-maps were carefully examined and corrected, stocking of different species was determined by carrying out enumerations and growth data of teak was collected by stem analysis. Besides these, market rates and other important statistics were collected.

Keeping in view the objects of management, information collected and seeing the results of Sharma's plan, future management for Melghat forests has been laid down in this plan. It is expected that the new plan will not only increase the yield of all kinds of forest produce but also will improve the forests making them capable of yielding better revenue.

PUNE.

J. G. THOSRE,  
Conservator of Forests,  
Working Plans Circle.



## SUMMARY OF THE WORKING PLAN FOR MELGHAT FOREST DIVISION, AMRAVATI CIRCLE, MAHARASHTRA

FOR THE PERIOD FROM 1975-76 TO 1984-85

### PART I

#### The Tract :

This Working Plan covers the entire forests of East Melghat Forest Division and West Melghat Forest Division. The forests area situated on the southern branch of the Satpuda range known as the Gawilgarh hills. The total area of the forests is 3053.93 sq. km. On its north, east and west are sparsely populated forest tracts while the open Berar plains lie immediately to the south. The tract is hilly. In summer acute shortage of water is felt. The climate is generally unhealthy.

#### Rights and Concessions :

The forests are not burdened with rights. Numerous concessions are, however, allowed to *rayatwari* and forest villagers.

#### Description of the forest :

The forests belong to "Southern Tropical Dry Deciduous forests" type. In most of the forests teak is the prominent species. *Tiwas*, *salai*, *dhaora*, *haldu* and *saj* are the other common species. *Tiwas* is predominant at high elevations and *salai* in the comparatively drier southern and western parts of the tract. Rusa grass occurs mostly in the southern part of West Melghat Division.

Teak percentage in the forests varies from 28 to 51. The areas of teak forests according to Maharashtra quality are II quality 29.74 sq. km., III quality 1211.67 sq. km., IV a quality 191.52 sq. km. and IVb quality 49.60 sq. km.

Bamboos occur over about 521.43 sq. km. and rusa grass concentration is more in the southern and western parts of West Melghat Division.

#### Markets :

All timber is extracted departmentally and sold periodically by public auctions at the established Govt. timber depots at Paratwada, Dharni, Akot and Semadoh from where most of the timber is exported to the timber consuming centres in the country. Firewood and bamboos are extracted on rated passes and are generally sold in weekly *bazars* in the Berar plains.

#### Labour supply :

The tract is very sparsely populated. The residents of Berar plains are averse to forest works. There is, therefore, a chronic shortage of labour. The local population mostly consists of *korkus*, *gaolis* and *mahals*.

#### Past History :

The management of reserve forest of Melghat prior to 1893, chiefly concerned with giving them rest from past ill treatment. Improvement fellings of large unsound teak were carried out in the Chaurakund, Semadoh, Butrum blocks of Bairagarh reserve. In 1893—1915 Working Plan for the Bairagarh reserves and Gugamal reserves completed by Bagshawe, under which Improvement fellings were prescribed for Bairagarh reserves and by a Working scheme for Gugamal reserve introduced in 1910-11 improvement fellings were only prescribed. For Tapti reserves a Working Scheme 1912-13, fellings under coppice with standards system was introduced. Dunbar Brander's Working Plan 1915-16 to 1935-36 covering the whole Melghat Division introduced 4 Working Circles viz. the High Forest, the Coppice with Standards, the Unregulated and Bamboo Working Circle. The High Forest Working Circle covering whole of Bairagarh, Gugamal and Kohana reserves. Tapti reserve being covered by Coppice with Standard and the remaining under Unregulated Working Circle. Stein's Working Plan (1935—55) covered the whole forests except Dhulghat, Wan, Dabida and part of Rupagarh block and two 'C' class blocks. His working plan had 4 working circles. Teak High Forest Working Circle including almost the whole of Bairagarh and Gugamal Reserves, Coppice Working Circle including Tapti, Chithri, Bod, Jhapnadeo, Chikhali, parts of Motha and Chikhaldara, Khirpani and Rupagarh reserves, Miscellaneous Working Circle including all the forest which are unworkable due to poor quality and stocking, remoteness or inaccessible. Forest village and 'C' class were also allotted to this Working Circle. Bamboo over lapping Working Circle was also formed.

Under Sharma's Plan, the better quality forests were worked under Selection system while the coppice with reserves system was continued in comparatively poorer quality forests. The remote and understocked forests were not subjected to any type of regular working. Only in 1960 under Bhatena's Scheme a regular working was introduced with coppice with reserves system in slightly better quality areas from these remote forests for which no regular working was prescribed under Sharma's Plan.

### Statistics of growth :

The stem analysis indicates that teak attains a girth of 120 cm. (b.h.o.b.) in about 84 years. Enumeration results that are computed according to the working Circles in Sharma's Plan and Bhatena's Scheme give the number of trees per hectare as below :—

Working Circle	Number of trees per ha.		
	Teak	Other	Total
Selection	135	142	277
C. W. R.			
(i) Sharma's Plan	133	165	298
(ii) Bhatena's Scheme	87	172	259
Miscellaneous	73	182	252

In Selection Working Circle, teak trees above 120 cm. girth are 8.6/ha. and in 105 U 120 cm. girth class the number is 6.5/ha. According to the rate of growth teak trees of 105 U 120 cm. girth class shall pass over to above 120 cm. girth class in 17 years. The estimated annual yield of teak trees above 120 cm. girth in Selection Working Circle is 43850 M<sup>3</sup>.

A comparison of stocking of teak trees in Selection Working Circle with those according to yield table reveals that the present stocking of teak trees is 50 per cent less.

## PART II

The objects of management are—

1. To preserve forests on the steep hill sides and area stocked with open forests to prevent erosion and rapid run off.
2. To satisfy the local demands of forest produce and grazing.
3. To ensure the maximum sustained yield of forest produce in demand.
4. To increase the valuable growing stock.

Period of the plan : Ten years from 1975 to 1984.

The salient prescriptions of the plan are as follows :—

### I—SELECTION WORKING CIRCLE

Area—179916.3 ha.

*Choice of species.*—Teak is the principal species. *Shisham, bija, tiwas, haldu* and *saja* will receive attention, *Semal* and *kulu* will be reserved in all sizes.

*Felling cycle.*—20 years ; exploitable girth : 120 cm. at b. h.

*Felling Series.*—35.

*Regulation of yield :* Yield will be regulated by area.

*Marking rules.*—All trees of and above 120 cm. in girth will be exploited if available silviculturally. Improvement fellings and thinnings will be carried out in the rest of the crop.

*Plantations.*—Teak plantation over not less than 5 ha. will be carried out. Old plantations will be thinned suitably.

*Subsidiary cultural operations.*—Cleaning and thinning will be carried out in the 6th and 10th year respectively.

### II—COPPICE WITH RESERVE WORKING CIRCLE

Area—49125.8 ha.

*Choice of species.*—Teak is the main species. Other species to receive preference are *shisham, bija, tiwas, haldu, saja* and *dhaora*. *Semal* and *kulu* will not be felled.

*Rotation.*—40 years.

*Felling series.*—13.

*Regulation of yield.*—Yield will be regulated by area.

*Marking Rules.*—Fully stocked areas will be clearfelled retaining well grown poles in groupes and advance growth. Understocked area will not be worked.

*Plantation.*—Teak plantation will be carried out at least in 4 ha.

*Subsidiary cultural operations.*—Cleaning in the 6th year and thinnings in 20th year will be carried out.

### III—IMPROVEMENT WORKING CIRCLE

Area—35925.6 ha.

*Choice of Species.*—Teak is the main species. Other important species are *semal, kulu, saja, tinsa* and *salai*.

*Felling cycle.*—15 years.

*Felling series.*—7.

*Marking rules.*—Only improvement fellings will be carried out. Teak reproduction will be freed.

*Plantation.*—Teak and *tendu* plantations will be carried out over at least 2 ha.

IV—PROTECTION WORKING CIRCLE

Area—16780.9 ha.  
No regular working is prescribed for these forests.

V—MISCELLANEOUS WORKING CIRCLE

Area—23644.4 ha.  
'C' class forests and minor forests which are unworkable at present due to poor stocking are included under this working circle. No regular working is prescribed for these forests.

VI—BAMBOO OVERLAPPING WORKING CIRCLE

Bamboo area—52142.8 ha.  
Cutting cycle—3 years.  
Cutting series—19.  
*Cutting rules.*—The clumps will be cleaned and thinned. The culms of under one year will not be cut and minimum 8 mature culms will be retained. The clumps will not be worked during rainy season.

VII—RUSA GRASS WORKING CIRCLE

Area—253916.7 ha.  
Cutting series—2.  
Each cutting series has been divided into 4 cutting sections. One cutting section in turn will be given rest for one year.  
*Plantation.*—Rusa grass plantation over 10 ha. will be raised, annually.

VIII—MISCELLANEOUS REGULATIONS

*Disposal of Forest Produce.*—All timber will be extracted departmentally to the established Government timber depots, where it will be sold by public auctions. Firewood and bamboos will be extracted on rated passes. Rusa grass from plantations may be exploited departmentally. From other areas it will be exploited through the agency of contractors. Right to collect other important minor forest produce will be sold by auction.

*Irregular exploitation.*—The removal of dry fuel on passes is permitted from all parts of the forest.

*Forest protection.*—Complete fire protection for the whole forest except 'C' class forest has been prescribed

*Grazing.*—The forests are divided into 19 grazing units to which villages have been listed for grazing their cattle.

Worked coupes in Selection and Improvement. Working Circles for 3 years and in C. W. R. Working Circle for 5 years will remain close for grazing. In Miscellaneous Working Circle certain areas will be closed for grazing for 3 years. No grazing is allowed in Protection Working Circle. Plantations will remain close to grazing for a period of 10 years.

*Establishment.*—Additional staff is required for proper execution of the prescriptions of the plan.

*Labour.*—The present labour supply is inadequate.

## I. ABBREVIATIONS USED IN THE PLAN

b. h.	..	..	..	..	..	breast height.
B & C. Department	..	..	..	..	..	Building and Communication Department.
C. A. I.	..	..	..	..	..	current annual increment.
cft.	..	..	..	..	..	cubic feet.
cm.	..	..	..	..	..	centimetre.
comptt.	..	..	..	..	..	compartment.
contd.	..	..	..	..	..	continued.
d. b. h. u. b.	..	..	..	..	..	diameter at breast height under bark.
d. b. h. o. b.	..	..	..	..	..	diameter at breast height over bark.
Dn.	..	..	..	..	..	division.
F. S.	..	..	..	..	..	felling series.
F. V.	..	..	..	..	..	forest village.
g. b. h.	..	..	..	..	..	girth at breast height.
ha.	..	..	..	..	..	hectare.
inch.	..	..	..	..	..	inches.
km.	..	..	..	..	..	kilometre.
m.	..	..	..	..	..	metre.
M <sup>3</sup>	..	..	..	..	..	cubic-metre.
M. A. I.	..	..	..	..	..	mean annual increment.
Mah.	..	..	..	..	..	Maharashtra.
(P)	..	..	..	..	..	part.
P. B.	..	..	..	..	..	Periodic block.
R. H.	..	..	..	..	..	Rest House.
Rs.	..	..	..	..	..	rupees.
Sq.	..	..	..	..	..	square.
U.	..	..	..	..	..	under
W. C.	..	..	..	..	..	Working Circle.
Yrs.	..	..	..	..	..	Years.

## II. GLOSSARY OF LOCAL TERMS USED IN THE PLAN

<i>Ara</i>	..	..	..	..	A roughly fashioned piece of timber suitable for making into a spoke, also a pole of medium girth suitable for use as a ridge-piece or bressumerr in house construction.
<i>Bakhar</i>	..	..	..	..	A hoe.
<i>Balla</i>	..	..	..	..	A plateau.
<i>Balli</i>	..	..	..	..	A thin pole suitable for use as a rafter.
<i>Bidi</i>	..	..	..	..	A cigarette prepared by rolling dried leave generally of <i>tendu</i> ( <i>Diospyros melanoxylon</i> ).
<i>Dahya</i>	..	..	..	..	Shifting cultivation.
<i>Dengri</i>	..	..	..	..	As short pole between 30 cm. and 45 cm. in girth and under 2.5 m. in length suitable for use as a fencing post.
<i>Dhar</i>	..	..	..	..	A narrow ridge.
<i>Doh</i>	..	..	..	..	A deep pond in a stream or river.
<i>Geru</i>	..	..	..	..	A paint prepared from red chalk.
<i>Ghat</i>	..	..	..	..	A road with a steep gradient or a ford on a river; a ridge.
<i>Ghor</i>	..	..	..	..	A sharp spur or narrow ridge.
<i>Heti</i>	..	..	..	..	A cattle camp.
<i>Jagir</i>	..	..	..	..	An estate conferred by the State in return for services.
<i>Jagiridar</i>	..	..	..	..	The holder of a <i>jagir</i> .
<i>Kamdar</i>	..	..	..	..	A village servant.
<i>Katcha</i>	..	..	..	..	Unmetalled (of a road); temporary.
<i>Khandi</i>	..	..	..	..	A saddle or col.
<i>Khora</i>	..	..	..	..	A deep valley.
<i>Lakh</i>	..	..	..	..	A hundred thousand.
<i>Mahout</i>	..	..	..	..	An elephant driver.
<i>Mandawa, Mala</i>	..	..	..	..	A wooden shelter or shed constructed for a temporary purpose such as watching crops.
<i>Murram</i>	..	..	..	..	A reddish hard soil.
<i>Nagar</i>	..	..	..	..	A Plough.
<i>Padao</i>	..	..	..	..	A camping ground or a place where timber is collected for export.
<i>Patel</i>	..	..	..	..	A headman of a village.
<i>Putha</i>	..	..	..	..	A roughly fashioned piece of timber suitable for making into a felloe.
<i>Raiyatwari</i>	..	..	..	..	A form of land tenure, applied to land in <i>raiyatwari</i> tenure and to villagers holding such land.
<i>Ramna</i>	..	..	..	..	A grass reserve.
<i>Satkata</i>	..	..	..	..	Miscellaneous trees.
<i>Shikar</i>	..	..	..	..	Hunting.
<i>Tahsil</i>	..	..	..	..	A part of civil district formed for administrative purposes.
<i>Tatta</i>	..	..	..	..	A mat, usually made from split bamboos but occasionally from twigs of <i>Vitex negundo</i> .
<i>Warli</i>	..	..	..	..	A rectangular boundary cairn.

## BOTANICAL AND LOCAL NAMES OF PLANTS

Note.—(i) H—Hindi; M—Marathi; K—Korku; E—English. V. A.—Very abundant; A—Abundant; F—Frequent; O—Occasional; R—Rare; V. R.—Very rare; L—Local (prefixed to any of the above).

Local Names (1)	Botanical Names (2)	Remarks (3)
A.—Trees		
<i>Amta</i> , H. .. ..	<i>Bauhinia malabarica</i> , Roxb. .. ..	O.
<i>Ambotha</i> , K. .. ..		
<i>Amaltas</i> , H. .. ..	<i>Cassia fistula</i> , Linn. .. ..	F.
<i>Apta</i> , M. .. ..	<i>Bauhinia racemosa</i> , Lamk. .. ..	F.
<i>Aonla</i> , H. .. ..	<i>Emblica officinalis</i> , Gaertn. .. ..	V. A.
<i>Aonla</i> , M. K. .. ..		
<i>Anjan</i> , H.M.K. .. ..	<i>Hardwickia binata</i> , Roxb. .. ..	L. F. Dabida reserve.
<i>Arang</i> , K. .. ..	<i>Kydia calycina</i> , Roxb. .. ..	O.
	<i>Eriolaena hookeriana</i> , W. and A. } .. ..	
<i>Am</i> , H. K. .. ..	<i>Mangifera indica</i> , Linn. .. ..	F.
<i>Amba</i> , M. .. ..	<i>Morinda tinctoria</i> , Roxb. .. ..	L. O.
<i>Ahl</i> , H. M. .. ..		
<i>Ambada</i> , M. .. ..	<i>Spondiam pinnata</i> (Linn. f.) } .. ..	V. R.
	Kurz. } .. ..	
<i>Ain</i> , M. .. ..	<i>Syn. Spondias mangifera</i> , Willd. } .. ..	A.
	<i>Terminalia tomentosa</i> , W. and A. .. ..	
<i>Achar</i> , H. M. .. ..	<i>Buchanania lanzan</i> , Spreng .. ..	F.
	<i>Syn. Buchanania latifolia</i> Roxb. .. ..	
<i>Babul</i> , H. M. K. .. ..	<i>Acacia arabica</i> , Willd. .. ..	R.
<i>Bel</i> , H.M. .. ..	<i>Aegle marmelos</i> , Correa .. ..	F.
<i>Bela</i> , K. .. ..		
<i>Bhosa</i> , K. .. ..	<i>Bauhinia racemosa</i> , Lamk. .. ..	F.
<i>Bahawa</i> , M. .. ..	<i>Cassia fistula</i> , Linn. .. ..	F.
<i>Bhanaka-bongru</i> , K. .. ..		
<i>Baru</i> , K. .. ..	<i>Schleichera oleosa</i> , (Lour) Oken .. ..	F.
	<i>Syn. Schleichera trijuga</i> , Willd. .. ..	
<i>Bhirra</i> , H. M. K. .. ..	<i>Chloroxylon swietenia</i> , D. C. L. A. .. ..	Kohana, Behali.
<i>Bhoti</i> , H. .. ..	<i>Eriolaena hookeriana</i> , W. and A. .. ..	O.
<i>Bhondia-dhaman</i> , M. .. ..		
<i>Bar</i> , H. .. ..	<i>Ficus bengalensis</i> , Linn. .. ..	F.
<i>Banyan</i> , E. .. ..		
<i>Bhorsal</i> , M. K. .. ..	<i>Hymenodictyon excelsum</i> , Wall. .. ..	R.
<i>Barga</i> , H. .. ..	<i>Kydia calycina</i> , Roxb. .. ..	A.
<i>Bhoti</i> , K. .. ..		
<i>Bakain</i> , H. M. K. .. ..	<i>Melia azedarach</i> , Linn. .. ..	V. R.
<i>Bija</i> , H. M. .. ..	<i>Pterocarpus marsupium</i> Roxb. .. ..	O.
<i>Bhilawa</i> , H. .. ..	<i>Semecarpus anacardium</i> , Linn f. .. ..	F.
<i>Biba</i> , M. .. ..		
<i>Bahera</i> , H. M. K. .. ..	<i>Terminalia bellerica</i> Roxb. .. ..	A.
<i>Ber</i> , H. .. ..	<i>Zizyphus jujuba</i> , Lamk .. ..	A.
<i>Bor</i> , H. M. K. .. ..		
<i>Baringa</i> , K. .. ..	<i>Syn. Zizyphus mauritiana</i> , Lamk. .. ..	V. A.
	<i>Grewia tiliacifolia</i> , Vahl. .. ..	
<i>Boria</i> , K. .. ..	<i>Glochidion velutinum</i> , Wight .. ..	L. F. Chikhaldia.
<i>Chichwa</i> , M. .. ..	<i>Albizzia Odoratissima</i> , Benth .. ..	O.
<i>Chichlor</i> , K. .. ..		
<i>Chapa</i> , K. .. ..	<i>Bauhinia Variegata</i> , Linn. .. ..	L. F.
<i>Char</i> , H. M. .. ..	<i>Buchanania lanzan</i> , Spreng. .. ..	F.
	<i>Syn. Buchanania latifolia</i> , Roxb. .. ..	
<i>Chirohol</i> , H. .. ..	<i>Holoptelea integrifolia</i> , X } .. ..	O.
<i>Chilla</i> , K. .. ..		
<i>Chakrej</i> , K. .. ..	<i>Lagerstroemia parviflora</i> , Roxb. .. ..	V. A.
<i>Chandan</i> , H. M. K. .. ..	<i>Santalum album</i> Linn. .. ..	V. R. Gawilgarh Fort.
<i>Choso</i> , K. .. ..	<i>Semecarpus anacardium</i> , Linn. f. .. ..	F.

Local Names (1)	Botanical Names (2)	Remarks (3)
A—Trees—contd.		
Chinch, M. .. .. } Chicha, K. .. .. } Chawar, K. .. .. } Chaura, K. .. .. }	<i>Tamarindus indica</i> .. .. .	O.
Dhaora, H. M. K. .. .. } Dahi-palas, M. .. .. } Dhoban, H. .. .. } Dhuman, H. M. K. .. .. } Dhuman, K. .. .. } Dudhi, H. .. .. } Dudhi, H. .. .. } Dudiya, K. .. .. } Dudhi, H. .. .. } Dudhari, K. .. .. }	<i>Sterculia colorata</i> , Roxb. .. .. . <i>Anogeissus latifolia</i> , Wall. .. .. . <i>Cordia macleodii</i> , H. F. and Th. .. .. . <i>Dalbergia paniculata</i> , Roxb. ... .. . <i>Grewia tiliaefolia</i> , Vahl. .. .. . <i>Grewia orbiculata</i> , Rotter .. .. . <i>Holarrhena antidysenterica</i> , Wall .. .. . <i>Wrightia tinctoria</i> , A. Br. .. .. . <i>Wrightia tomentosa</i> , Roem. and Sch. .. .. .	L. O. Chikhaldia. V. A. L. O. A. V. A. V. R. F. V. R. V. R.
Goria nim, K. .. ..	<i>Cedrela toona</i> , Roxb. .. .. .	L. O. Chikhaldia Bairat Makhla.
Gabdi, H. .. .. } Gongal, M. .. .. } Ganer, M. .. .. }	<i>Cochlospermum gossypium</i> , D. C. A. .. .. .	Dhulghat.
Ganer, K. .. .. } Gular, H. .. .. } Goraghotti, K. .. .. }	<i>Erythrina suberosa</i> , Roxb. .. .. . <i>Ficus glomerata</i> , Roxb. .. .. . <i>Flacourtia ramontchi</i> , L. .. .. . Herit.	L. A. A. F.
Ghetu, K. .. .. } Ghangru, K. .. .. } Ghatbor, M. K. .. .. } Ghota, K. .. .. } Gondan, M. .. .. }	<i>Randia dumetorum</i> , Lamk. .. .. . <i>Randia uliginosa</i> , D. C. .. .. . <i>Zizyphus xyjopyra</i> , Willd. .. .. . <i>Cordia dichotoma</i> , Forst } Syn. <i>Cordia myxa</i> , Linn. }	F. O. A. V. R. Koktu.
Hiwar, M. .. .. } Haldu, H. M. K. .. .. } Homba, M. K. .. .. }	<i>Acacia leucophloea</i> , Willd. .. .. . <i>Adina cordifolia</i> , Hook, f. .. .. . <i>Sacopetalum tomentosum</i> .. .. . H. f. and Th.	L. O. A. and L. V. A. A.
Harra, H. .. .. } Hilda, M. K. .. .. } Hirda, M. K. .. .. }	<i>Terminalia chebula</i> , Retz. .. .. .	L. A.
Imli, H. .. .. } Jamrassi, H. M. .. .. } Jamun, H. .. .. } Jambhul, M. .. .. } Jambu, K. .. .. }	<i>Tamarindus indica</i> .. .. . <i>Elaeodendron glaucum</i> , Pers. .. .. . <i>Eugenia cumini</i> (Linn.), Dru. } Syn. <i>Schyzigium cumini</i> . }	O. O. L. A.
Jhan, K. .. .. } Kala dhendra, H. .. .. } Khair, H. M. K. .. .. }	<i>Schrebera swietenioides</i> , Roxb. .. .. . <i>Randia uliginosa</i> , D. C. .. .. . <i>Acacia catechu</i> , Willd. .. .. .	A. O. L. F. occurs in open dry forest and frost areas.
Kinhi, M. K. .. .. } Khatua, H. .. .. } Katumba, K. .. .. }	<i>Albizzia procera</i> , Benth .. .. . <i>Antidesma diandrum</i> , Roth. .. .. .	O. R.
Keolar, H. .. .. } Keolari, K. .. .. } Kachnar, H. .. .. } Khatsawar, M. .. .. }	<i>Bauhinia purpurea</i> , Linn. .. .. . <i>Bauhinia variegata</i> , Linn. .. .. . { <i>Bombax malabaricum</i> , O. C. } Syn. <i>Bombax ceiba</i> , Linn. }	L. A. L. F. O.
Kasai, H. .. .. } Katiyen, M. .. .. } Karkha, K. .. .. }	<i>Bridelia retusa</i> , spr. .. .. .	A.
Kumbhi, H. M. K. .. ..	<i>Careya arborea</i> , Roxb. .. .. .	C. and L. A. The latter on high plateau X.

Local Name (1)	Botanical Name (2)	Remarks (3)
A—Trees—contd.		
Kesa, K. .. ..	<i>Casearia tomentosa</i> , Roxb. .. ..	A.
Karanleo, K. .. ..	<i>Dolichandrone crisper</i> , Seem. .. ..	R.
Korela <sup>wa</sup> , K. .. ..	<i>Ficus cunia</i> , Ham. .. ..	R.
Korela <sup>wa</sup> , K. .. ..	<i>Ficus hispida</i> , Linn. .. ..	R.
Karkai, M. .. ..	<i>Flacourtia ramontchi</i> , L. .. ..	E.
	Herit.	
Zakar, H. .. ..	<i>Garuga pinnata</i> , Roxb. .. ..	A.
Kekda. .. ..		
Kolya, K. .. ..	<i>Glochidion velutinum</i> Wight .. ..	L. F. Chikhalda.
Kolsa, K. .. ..		
Kasmar, K. .. ..	<i>Gmelina arborea</i> , Roxb. .. ..	O.
Kuda, M. .. ..	<i>Holarrhena antidysenterica</i> .. ..	F.
Kurakat, K. .. ..	Wall.	
Karanjalām, K. .. ..	<i>Holoptelea integrifolia</i> , Planch .. ..	O.
Kukum, K. .. ..	<i>Mallotus philippinensis</i> , Muell .. ..	O.
Kari, H.M.K. .. ..	<i>Miliusa velutina</i> , H. f. and Th. .. ..	O.
Kalam, M. .. ..	<i>Mitragyna parvifolia</i> , Korth .. ..	F.
Kuram, K. .. ..		
Kurumbo, K. .. ..	Syn: <i>Stephegyne parvifolia</i> , Korth.	
Kari, H. .. ..	<i>Saccopetalum tomentosum</i> , H. f. and Th. .. ..	O.
Kusum, H. .. ..	<i>Schleichera oleosa</i> (Lour), Merr. .. ..	F.
Kusumb, M. .. ..	Syn. <i>Schleichera trijuga</i> , Willd. .. ..	
Katamba, K. .. ..	<i>Spondias pinnata</i> (Linn. f.) .. ..	V. R.
	Kurz.	
	Syn. <i>Spondias mangifera</i> , Willd.	
Kulu, H. M. .. ..	<i>Sterculia urens</i> ; Roxb. .. ..	A.
Karhai, H. M. .. ..		
Kudal, K. .. ..	<i>Sterculia villosa</i> , Roxb. .. ..	R.
Kuthada, K. .. ..		
Kalatetu, K. .. ..	<i>Stereospermum xylocarpum</i> , B-enth .. ..	L. O. Chikhalda Bai-rat.
Kahu, H. .. ..	<i>Terminalia arjuna</i> , Bedo .. ..	L. A.
Kowa, K. .. ..		
Khudaibidi, K. .. ..	<i>Trema orientalis</i> , Bl. .. ..	O.
Kura, K. .. ..	<i>Wrightia tinctoria</i> , A. Br. .. ..	A.
Limbori, K. .. ..	<i>Azadirachta indica</i> , A. Juss. .. ..	
Lasora, H. .. ..	<i>Cordia dichotma</i> , Forst. .. ..	V. R. Koktu.
	Syn. <i>Cordia myxa</i> , Linn. .. ..	
Laurikaşmar, K. .. ..	<i>Cordia macleodii</i> , H. f. & Th. .. ..	L. O.
Lawa, K. .. ..	<i>Ficus glomerata</i> , Roxb. .. ..	A.
Lokhanci, M. K. .. ..	<i>Ixora parviflora</i> , Vahl. .. ..	L. A.
Lendia, J. M. .. ..	<i>Lagerstroemia parviflora</i> , .. ..	V. A.
Lenia, K. .. ..	<i>Litsoea sebifera</i> , Pers. .. ..	R. Higher elevations.
Maharuk, H. M. .. ..	<i>Ailanthus excelsa</i> , Roxb. .. ..	R.
Marukha, K. .. ..		
Medsing, H. M. .. ..	<i>Dolichandrone falcata</i> , Seem .. ..	R.
Mohin, H. M. K. .. ..	<i>Lannea grandis</i> , Engl. .. ..	A.
Moyen, H. .. ..		
Mohi, H. M. K. .. ..	Syn. <i>Odina woodier</i> , Roxb. .. ..	
Maidalkri, H. .. ..	<i>Litsoea sebifera</i> , Pers. .. ..	R. Higher elevation.
Mahua, H. .. ..	<i>Madhuca latifolia</i> , Roxb. .. ..	
Mohwa, M. .. ..	Macbride. .. ..	F.
Mu, Moha, K. .. ..	Syn. <i>Bassia latifolia</i> .. ..	
Mango, E. .. ..	<i>Mangifera indica</i> , inn. .. ..	F.
Mainhar, H. .. ..	<i>Randia dumetorum</i> , Lamk .. ..	F.
Mainphal, H. .. ..		
Mokha, H. M. .. ..	<i>Schrebera swietenoides</i> , Roxb. .. ..	A.
Nim, H. M. .. ..	<i>Azadirachta indica</i> , A. .. ..	L. O. occurs in southern foot hills.
	Juss. .. ..	
Nazarijot, K. .. ..	<i>Dolichandrone falcata</i> Seem .. ..	R.



Local Name (1)	Botanical Name (2)	Remarks (3)
A—Trees—contd.		
Niru, K. .. ..	<i>Elaeodendron glaucum</i> , Pers. .. ..	O.
Nagthada, K. .. ..	<i>Erythrina suberosa</i> , Roxb. ... ..	L. A.
Palas, H. M. .. ..	<i>Butea frondosa</i> , Roxb. .. ..	L. A.
Pharsa, K. .. ..		
Phangra, K. .. ..	<i>Cochlospermum gossypium</i> , D. C. .. ..	A. Dhulghat.
Phansi, M. .. ..	<i>Dalbergia paniculata</i> Roxb. ... ..	A.
Passi, K. .. ..		
Padar, M. .. ..	<i>Dolichandrone crispa</i> Seem. .. ..	O.
Phangra, M. .. ..	<i>Erythrina suberosa</i> , Roxb. ... ..	L. A.
Pakar, H. M. .. ..	<i>Ficus infectoria</i> , Roxb. .. ..	O.
Pipri, K. .. ..		
Pipal, H. M. .. ..	<i>Ficus religiosa</i> , Linn. .. ..	
Pipari, K. .. ..	<i>Gardenia turgida</i> , Roxb. .. ..	O.
Phendra, M. .. ..		
Phetra, M. .. ..		
Purputta, K. .. ..		
Phulgatetu, K. .. ..	<i>Oroxylum indicum</i> , Vent. .. ..	R.
Phulangatetu, K. .. ..	<i>Randia uliginosa</i> , D. C. .. ..	O.
Putpuyys, K. .. ..		
Pinj, M. .. ..	<i>Sterculia colorata</i> , Roxb. .. ..	V. R. Chikhalda.
Padar, H. M. K. .. ..	<i>Stereospermum chelonoides</i> , D. C. .. ..	R.
Padar, H. M. K. .. ..	<i>Stereospermum suaveolens</i> , D. C. .. ..	O.
Rawa chachu, K. .. ..	<i>Acacia lenticularis</i> , Ham. .. ..	
Rounjha, H. .. ..	<i>Acacia leucophloea</i> , Willd. .. ..	L. O.
Hinjara, K. .. ..	<i>Casearia graveolens</i> , Dalz. .. ..	A.
Riwit, K. .. ..		
Rori. .. ..	<i>Mallotus philippinensis</i> , Muell. .. ..	O.
Ruthu, K. .. ..	<i>Ougeinia dalbergioides</i> , Benth. .. ..	V. A.
Rohan, M. .. ..	<i>Soymida febrifuga</i> , A. Juss. .. ..	O.
Rohani, M. K. .. ..	<i>Albizzia procera</i> , Benth. .. ..	O.
Safed siris, H. .. ..		
Sagon, H. .. ..	<i>Tectona grandia</i> , Linn. .. ..	V. A.
Sag. Sagwan M. .. ..		
Sipna, K. .. ..		
Saj, H. .. ..		
Sadram, M. .. ..	<i>Terminalia tomentosa</i> , W. and A. .. ..	A.
Siris, H. .. ..	<i>Albizzia Odoratissima</i> , Benth. .. ..	O.
Sitaphal, H. K. .. ..	<i>Anona squamosa</i> , Linn. .. ..	L. F. occurs near Khatkali in Khirpani Range.
Semal, H. .. ..	<i>Bombax malabaricum</i> , D. C. .. ..	O.
Saori, K. .. ..		
Salai, H. M. K. .. ..	<i>Boswellia serrata</i> , Roaxb. .. ..	V. A.
Silu, K. .. ..	<i>Cordia dichotoma</i> , Forest. .. ..	V. R. Koktu.
Shsham, H. M. .. ..	Syn. <i>Cordia myxa</i> , Linn. .. ..	
	<i>Dalbergia latifolia</i> , Roxb. .. ..	O.
Sisoo, K. .. ..	<i>Gmelina arborea</i> Roxb. .. ..	O.
Shewan, M. .. ..		
Shendri, M. .. ..	<i>Mallotus philippinensis</i> , Muell. .. ..	O.
Sejna, H. K. .. ..	<i>Moringan oleifera</i> , Lamk. .. ..	R.
Shewaja, M. .. ..	Syn. <i>Moringa pterygosperma</i> . .. ..	
Shindi, M. .. ..	<i>Phoenix sylvestris</i> , Roxb. .. ..	R.
Sendhi, K. .. ..	<i>Buchanania lanzan</i> , spreng. .. ..	F.
Tarop, K. .. ..		
Tun, H. .. ..	Syn. <i>Buchanania latifolia</i> , Roxb. .. ..	
	<i>Cedrela toona</i> , Roxb. .. ..	L. O. Chikhalda Bairat, Kakhla.
Tendu, H. .. ..	<i>Diospyros melanoxylon</i> , Roxb. .. ..	F. and L. A.
Tembru, M. K. .. ..		
Tembhurni, M. K. .. ..		

Local Name (1)	Botanical Name (2)	Remarks (3)
<b>A—Trees—contd.</b>		
Tetu, K. .. ..	<i>Dolichandrone crista</i> , Seem. .. ..	O.
Thuar, H. M. K. .. ..	<i>Euphorbia nivulia</i> , Ham. .. ..	L. A. Rocky steep and precipitous slopes.
Tetu, K. .. ..	<i>Oroxylum indicum</i> , Vent. .. ..	R.
Tetu, K. .. ..	<i>Stereospermum xylocarpum</i> , Benth. .. ..	L. O. Chikhalda Bairat.
Tinsa, H. .. ..	<i>Ougeinia dalbergioides</i> , Benth. .. ..	V. A.
Twas, M. .. ..	Syn. <i>Ougeinia ougeinensis</i> .	
Teklet, K. .. ..	<i>Sterculia urens</i> , Roxb. .. ..	A.
Teak, E. .. ..	<i>Tectona grandis</i> , Linn. .. ..	V. A.
Thoar, K. .. ..	<i>Trema orientalis</i> , Bl. .. ..	O.
Thori, K. .. ..		
Thoar, K. .. ..	<i>Trema politoria</i> , Planch .. ..	O.
Thori, K. .. ..		
Turat, K. .. ..		
Tilwan, H. K. .. ..	<i>Wendlandia exserta</i> , D. C. .. ..	V. R.
Umbar, M. .. ..	<i>Ficus glomerata</i> , Roxb. .. ..	A.
War, M. .. ..	<i>Ficus bengalensis</i> , Linn. .. ..	F.
Wora, K. .. ..		
Wal, K. .. ..	<i>Morinda tinctoria</i> , Roxb. .. ..	L. O.
<b>B—Shrubs</b>		
Bhandar, K. .. ..	<i>Colebrookia oppositifolia</i> , Smith .. ..	L. A.
Babarang, H. .. ..		
Brengel, K. .. ..	<i>Embelia robusta</i> , Roxb. .. ..	L. A.
Bharangeli, K. .. ..		
Bharati, M. K. .. ..	<i>Gymnosporia montana</i> , Law .. ..	L. O.
Bholari, K. .. ..		
Birhol, H. .. ..	<i>Indigofera pulchella</i> , Roxb. .. ..	L. F.
Banda, H. K. .. ..	<i>Loranthus scurrula</i> , Linn. .. ..	R.
Banda, H. K. .. ..	<i>Loranthus longiflorus</i> , Desr. .. ..	R.
Bhandar, K. .. ..	<i>Pogostemon plectranthoides</i> Desf. .. ..	L. A.
Bhandar, K. .. ..	<i>Strobilanthes callosus</i> , Nees. .. ..	L. V. A.
Bankabas, H. M. K. .. ..	<i>Thespesia lampas</i> , Dalz. and Gibs. .. ..	L. A.
Bor, M. K. .. ..	<i>Zizyphus rotundifolia</i> , Lamk. Syn. <i>Zizyphus nummularia</i> , W. and A.	L. F.
<b>C—Climbers</b>		
Chilati, M. .. ..	<i>Caesalpinia sepiaria</i> , Roxb. .. ..	L. F.
Chamel, H. .. ..	<i>Jasminum arborescens</i> , Roxb. .. ..	L. F.
Chilati, M. K. .. ..	<i>Mimosa rubicaulis</i> , Lamk. .. ..	L. F.
Churni, K. .. ..	<i>Zizyphus rugosa</i> , Lamk. .. ..	F. and L. A.
Dhawai, H. .. ..		
Dhawati, M. .. ..	<i>Woodfordia floribunda</i> , Salisb. .. ..	L. A.
Dhi, K. .. ..	Syn. <i>Woodfordia fruticosa</i> , Kurz.	
Dhin, K. .. ..		
Guno-hi, H. M. K. .. ..	<i>Abrus precatorius</i> , Linn. .. ..	
Gursakri, H. .. ..		
Gordhaman, M. .. ..	<i>Grewia floescens</i> , Juss .. ..	O.
Gwagar, K. .. ..	<i>Hamiltonia suaveolens</i> .. ..	L. F.
Jhau, H. M. K. .. ..	<i>Tamarix gallica</i> , Linn. .. ..	L. A.
Katakholra, K. .. ..	<i>Daedalacanthus roseus</i> , T. Anders. .. ..	L. A.
Korajothi, K. .. ..	<i>Helicteres isora</i> , Linn. .. ..	A.
Karsali, K. .. ..	<i>Nyctanthes arborescens</i> , Linn. .. ..	L. A.
Kawarka, M. .. ..	<i>Loranthus longiflorus</i> , Desr. .. ..	R.
Lalgunchi, H.M.K. .. ..	<i>Abrus precatorius</i> , Linn. .. ..	O.
Lantana, H. .. ..	<i>Lantana aculeata</i> , Linn. .. ..	V. A.
Mekar, K. .. ..	<i>Gymnosponia montana</i> , Benth. .. ..	L. O.

Local Name (1)	Botanical Name (2)	Remarks (3)
<b>C—Climbers—contd.</b>		
Marorphal, H. ..	<i>Helicteres isora</i> , Linn. .. ..	A.
Muradsheng, M.		
Nirguri, M. ..	<i>Vitex negundo</i> , Linn. .. ..	L. A.
Pithondi, M. K.	<i>Fluggea microcarpa</i> , Bl. .. ..	L. A.
Raimunia, K.	<i>Lantana aculeata</i> , Linn. .. ..	V. A.
	Syn. <i>Lantana camara</i> , Linn. .. ..	
Ringni, K. ..	<i>Solanum indicum</i> , Linn. .. ..	F.
Samalu, K. ..	<i>Vitex negundo</i> , Linn. .. ..	L. A.
Sakria, K. ..	<i>Zizyphus rugosa</i> Lamk. .. ..	F. & L. A.
Tarwar, K. M.	<i>Cassia auriculata</i> , Linn. .. ..	L. F.
<b>D—Herbs</b>		
Babra, M. K.	<i>Dioscorea pentaphylla</i> , Linn. .. ..	A climbing herb. O.
Baichandi, H.	<i>Dioscorea daemona</i> , Roxb. .. ..	A climbing herb. F.
Baval, K. ..	<i>Dioscorea bulbifera</i> , Linn. .. ..	A climbing herb. F.
Jangli Kela, H.	<i>Musa superba</i> , Roxb. .. ..	L. F. occurs on rocky hillside and banks of streams especially at high elevations.
Kulu, K. ..	<i>Dioscorea daemona</i> , Roxb. .. ..	A. climbing her F.
Tora, K. ..	<i>Musa superba</i> , Roxb. .. ..	L. F.
Tarota, M. K.	<i>Cassia tora</i> , Linn. .. ..	L. A. occurs in heavily grazed forests in the south.
Wild banana, E.	<i>Musa superba</i> , Roxb. .. ..	L. F.
<b>E—Grasses, Sedges and Bamboos</b>		
Baba Jara, K.	<i>Heteropogon ritchiei</i> (Hook. f.), Blatter and Mc. Laun. .. ..	A.
Bamboo, E. ..	<i>Bambusa arundinacea</i> , Willd. .. ..	L. A.
Bamboo, E. ..	<i>Dendrocalamus strictus</i> , Nees. .. ..	L. A. occurs on frost areas and on old village sites.
Bana, H. M. K.		
Baru, K. ..		
Boru, K.	<i>Sorghum halepense</i> , Pers. .. ..	L. A. occurs in river beds in the North-West.
Dongra, K. ..	<i>Cyperus tegetum</i> , Roxb. .. ..	L. F. occurs in river beds in the North-West.
Gondall, K. ..	<i>Anthistiria ciliata</i> , Linn. .. ..	F. L. A. occurs hill tops and old village areas.
Gondhalt, K.		
Karsali, K. ..	<i>Chionocachne barbata</i> , R. Br. .. ..	L. A. occurs in frost areas and in valleys.
Katang bans, H. M. K.	<i>Bambusa arundinacea</i> , Willd. .. ..	L. A. occurs in the Sipna valley between Semadoh and Pili where it has been introduced.
Kusal, M. ..	<i>Heteropogon contortus</i> , (L) Beauv. ex. Roem. and Sch. .. ..	A.
	Syn. <i>Andropogon contortus</i> , Linn.	
Podar, H. ..	<i>Sorghum halepense</i> , Pers. .. ..	L. A.
Phor, K. ..	<i>Heteropogon ritchiei</i> (Hook, f.) Blatter and Mc. Laun. .. ..	A.
Pochati, K. ..		
Phuli, K.		

Local Name (1)	Botanical Name (2)	Remarks (3)
<b>E—Grasses, Sedges and Bamboos—contd.</b>		
Poc-hati, K. .. ..	<i>Apluda varia</i> , Hack .. .. .	A.
Phuli, K. .. ..		
Rusa, H. M. K. .. ..	<i>Cymbopogon martini</i> , Stapf. Syn. <i>Andropogon Schoenanthus</i> , Linn. .. ..	F. Two varieties called 'Motia' and 'Sofia occur'.
Sainar, K. .. ..	<i>Ischaemum sulcatum</i> Hack. .. .. .	A.
Sukal, M. } .. ..	<i>Steropogon contortus</i> (L) .. .. .	A.
Sukla, M. } .. ..	Beauy. ex. Roem and Sch. Syn. <i>Andropogon contortus</i> , Linn. .. ..	
Tikhar, H. M. K. .. ..	<i>Cymbopogon martini</i> , Stapf. .. .. . Syn. <i>Andropogon Schoenanthus</i> , Linn. .. ..	F. Two varieties called 'Sofia' and 'Motia occur.
<b>F—Plants grown as field crops</b>		
Arhar, H. ... ..	<i>Cajanus indicus</i> , Spreng.	
Betel vine, E. .. ..	<i>Piper betle</i> , Linn.	
Channa H. M. .. ..	<i>Cicer arietinum</i> , Linn.	
Cotton, E. .. ..	<i>Gossypium herbaceum</i> , Linn.	
Gram, E. .. ..	<i>Cicer arietinum</i> , Linn.	
Jagn, K. .. ..	<i>Guizotia abyssinica</i> , cass.	
Juari, H. M. K. .. ..	<i>Sorghum vulgare</i> , Pers.	
Kapas, H. M. . . .	<i>Gossypium herbaceum</i> , Linn.	
Kodon, H. M. K. .. ..	<i>Paspalum scrobiculatum</i> , Linn.	
Kutki, H. M. K. .. ..	<i>Panicum miliare</i> , Lamk.	
Masur, H. M. .. ..	<i>Eroum Lens</i> , Linn.	
Pan, H. M. .. ..	<i>Piper betle</i> , Linn.	
Sawan, K. .. ..	<i>Panicum crus-galli-frumentaceum</i> , Roxb.	
Tur, M. .. ..	<i>Cajanus indicus</i> , Spr.	

## PART I : SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED

### CHAPTER I : THE TRACT DEALT WITH

#### Section 1 : Name and situation :

1. This working plan deals with all the reserved forests of formerly Melghat division which is now divided into East Melghat division and West Melghat division.

2. The forests of both the divisions stretch about 65 km. from south to north between latitudes 21°—11' and 21°—46' north and 100 km. from west to east between longitude 76°—38' and 77°—34' east. The tract is situated on the branch of Saptpuda range to the south of Tapti river, known as the Gawilgarh hills or Melghat, Gawilgarh being the name of an old fortress and Melghat being the name of confluence of Khapra and Tapti rivers in the north. Gawilgarh fort, now in ruins, is situated along one of the southern spurs of Gawilgarh hills in compartment No. 29 and is about 2 km. from the Chikhaldara plateau towards south.

3. With only exceptions of Chikhaldara civil station and Bhawar *raiyatwari* as enclaves, and a small isolated patch of Bod reserve, the forest of these divisions could have formed a perfect compact block. But now it is strewn with numerous enclaves, of second class *raiyatwari* villages which came into existence recently as per Government. Revenue and Forests Department, Resolution No. FLD-4267-I-Y, dated 22nd May 1967 in place of existing forest villages which were hitherto a part of reserved forest. These villages are, however, still designated as forest villages.

4. The entire tract lies in the Melghat tahsil of Amravati district, with the exception of the small two blocks of 'C' class forest, Dhamangaon and Chichona-Nimkhera, which though contiguous with the forests are situated, respectively, in Achalpur and Daryapur tahsils of the same district.

5. The tract is bounded as follows :—

- |        |    |  |
|--------|----|--|
| North— | .. | The Dharni-Bairagarh <i>raiyatwari</i> areas of Melghat tahsil, the Nimar and Betul districts of Madhya Pradesh.   |
| East—  | .. | The Betul district of Madhya Pradesh and Katkumbh <i>raiyatwari</i> area of Melghat tahsil.  |
| South— | .. | The Wastapur-Gaulkhera <i>raiyatwari</i> areas of Melghat tahsil, the Achalpur and Daryapur tahsils of Amravati district, and the Akot tahsil of Akola district. |
| West—  | .. | The Jalgaon tahsil of Buldana district and Nimar district of Madhya Pradesh.   |

6. The forests of Akola and Buldana divisions and Betul district of Madhya Pradesh adjoin these forests. In general, the forests are surrounded by sparsely populated forest tract on the west, north and east ; while the south is bordered by the highly cultivated plains of Amravati and Akola districts.

#### Section 2 : Configuration of the ground

7. As the name implies, Melghat is literally a meeting place of Ghats. The tract is very hilly and consists of succession of hills and valleys in a confused pattern with constant and abrupt variations in altitude, aspect and gradient. Even within the limits of a compartment of which the average area is slightly more than 2 sq. km., all the variations are visible. In some compartments, the difference in elevation is as much as 600 metres but there is hardly any one in which the difference is less than 150 metres.

8. The prominent physical feature is the main ridge of the Gawilgarh hills which enters the tract just north of Ghatang from the Betul district and runs westerly and south-westerly direction through the southern part of the tract barely 15 km. away from the southern boundary leaving 4/5 of the area dealt with to the north of this ridge. After running westerly direction from Ghatang for a short distance, it turns to south-west and widens into Chikhaldara and Vairat plateau with summit levels of 1,100 metres. From here, it continues north of Shabanur river as a flat topped ridge and after lowering at the pass it again attains an elevation of 1,101 metres along Akot-Harisal road just north-west of Jhiri and then gradually descending with peaks of about 820 metres south of Golai, it leaves the district boundary just west of Wan railway station. The conspicuous hump on this ridge at Vairat is the highest point being 1,177.75 metres above sea level and lies in the compartment No. 34.

9. The striking feature of this ridge is its almost flat-topped plateau descending in a series of precipitous scarps on either side, one below the other separated by narrow steps of lesser gradients and finally sloping down to the narrow steep valleys known as *khoras*. These are most conspicuous on the slopes of the plateau of Vairat, Chikhaldara and Gawilgarh fort area. Numerous spurs branch off from this main ridge towards north and south, having narrow ridges known as *ghors* or *dhars* and flat tops known as *ballas*, a few of which towards north are of considerable size such as Masondi, Vairat, Chikhaldara, Makhala, Borkhedi etc., with an average height of about 1,100 metres. Between the plateau and hills there are saddles known as *khandies*, the prominent ones are Sirasbar, Amjhiri etc., used for crossing the ridge. These subsidiary ridges also usually have abrupt scarped sides which are ideal natural fortifications.

10. The area to the north of the main ridge, though interrupted with a series of hills and valleys, gradually descends to the north-west with an altitude of about 480 metres in the east and about 320 metres in the west near the Tapti river. The north-east portion is much cut up by deep narrow valleys, while the north-west is characterised by shallow valleys and low steep hills. The valleys just north of main ridge are very deep but later on they gradually widen where the best forest of the region occurs.

11. From the main ridge to the south, the land slopes very steeply but irregularly through several minor ridges to the Amravati plains. The altitudinal variation along the boundary is from 300 metres in east to 150 metres in west. This main ridge forms a natural hill barrier between the most valuable wooded part of the tract in the north, and cultivated and populated plains in the south.

12. The main ridge of Gawilgarh hills forms the watershed of Tapti and Purna rivers which drain the tract of Melghat towards north and south, respectively. As the ridge is situated in the southern part, the greater area of Melghat is drained north-westwards towards the Tapti river. The more important among the tributaries of the Tapti river are the Khursi, Tingria, Khandu, Sipna, Garga, Dewal and Darbar. The Khursi and Tingria rivers take their sources in Katkumbh plateau. The former after a brief sojourn into the Betul district re-enters the tract flowing close to the district boundary for some distance and then follows it for a while till it leaves it to flow northwards to join the Tapti. The Khandu, Khapra, and Sipna rivers rise near Kukru and Khamla in Betul district, while the Dewal, Garga and Darbar rivers have their sources in the tract itself. The Khandu and Khapra rivers have a fairly long and winding courses in general north-westerly direction cutting their beds deeply through several ranges of hills before joining the Tapti. Khandu just outside the district and Khapra along the district boundary. The Sipna river has a longer course through the tract and with its tributaries including the Kuapati river, drains a greater area than others. Unlike the aforesaid rivers the Sipna has several flat stretches of the land along its lower and middle course, supporting luxuriant forest growth. The southern slopes of Gawilgarh ridge is drained by the tributaries of Purna. The chief rivers and streams in this region are the Sapan. Chandrabhaga, Shahanur, Pathar or Khatkali and the Wan.

### Section 3 : *Geology, rock and soil*

13. The entire region consists of Deccan traps with occasional thin trap soil. Deccan traps are Deccan lava flows of basaltic composition and are emplaced through long narrow fissures in the earth's crust. They generally form flat topped hills and display step-like terraces. The lava flows are almost horizontal or with a very low dip ( $2^{\circ}$  to  $3^{\circ}$  degrees) to the north.

14. In this region crest of the range attains an average elevation of 1,000 metres, the highest point being Vairat at a height of 1,177.75 metres above m. s. l. A fault, which has been responsible for exposing the Gondwanas sandstones at the foot of the Gawilgarh hills, near Mukatagiri and Bairamghat is noticed to the north and NE of Achalpur at the base of the hills, sedimentary beds crop out from beneath the traps.

15. At Bairamghat field sequence of the rocks is as follows :—

<i>Deccan Trap</i>					
Lametas	..	..	..	..	.. Sandstones
Unconformity	..	..	..	..	.. Limestone
Upper Gondwanas	..	..	..	..	.. Conglomerate and gritty sandstone.
					.. Sandstone-Inter bedded with clay.

16. Sedimentary rocks generally dip towards north and the dip varies from  $15^{\circ}$  to  $28^{\circ}$ . As these formations are dipping to north the outcrop is restricted by high hills of Deccan trap. Sandstones are mainly fine to medium grained, dirty white to brownish in colour. Brownish colour is due to ferruginous matter. At Bairamghat, length of sandstone exposure is about 1,800 metres and the width is about 800 metres.

17. Due to weathering of sandstone soil in this area is sandy and clayey.

18. *Lava Flows*.—Two varieties are generally noticed, namely the hard compact and vesicular. The most common is hard compact flow. This form occurs in thick layers and often shows cracks and joints on the surface but with no preferred orientation. These cracks and joints are filled up with secondary silica when thickness varies from a fraction of an inch to nearly one inch. Columnar jointing is well seen. Some times in porphyritic basalts, phenocrysts of plagioclase laths are clearly seen even in hand specimens. Vesicular and amygdaloidal varieties are generally seen along the slopes. The vesicles are filled by zoelite and secondary siliceous minerals.

19. Traps, particularly the soft, amygdaloidal and vesicular varieties on weathering and alteration, give rise to a soft decomposed rock, known as murrium, which is seen specially along the hill slopes. Spheroidal weathering is also common all around the area.

### SOIL—

20. Decomposition of traps has given rise to either deep brown to rich red or black cotton soil. The soils show a wide variation in their depth. The soils on the hills and slopes have shallow to medium depth while in the low-lying areas and river valleys, deep soils are formed due to the accumulation and deposition of the soils from uplands.

21. The run off is very quick and due to the shallowness of the soil on steeper slopes and the impermeable rock which is very near the surface, the moisture is drained off completely and rapidly. In spite of a good rainfall in the Melghat, the soil for most of the year is dry.

#### Different types of soils—

22. (i) *Bouldery Soil*.—This type of soil covers the greater part of the Melghat division and is generally confined to the slopes. It is dark brown in colour, clayey in texture and blocky in structure. In most of the areas the drainage is very excessive which results in the soil becoming absolutely devoid of its moisture content in dry season.

23. Samples of this type of soil were sent to the Forest Research Institute, Dehra Dun, for analysis. The report of the Central Silviculturist reads as follows :

“ Soils seem to be fairly well supplied with nutrients. The texture of the soils in case of slopes area, is clay loam to clay and in valley it is clay in top and sandy loam or sandy clay loam at the lower depth. The pH of soil is neutral to slightly acidic in both the areas ”.

24. The quality of the forest on this soil chiefly depends on its depth and drainage. The best forest of Melghat grow on this type of soil in the valleys and on lower gentle slopes.

25. (ii) *Clayey Soil*.—This type of soil occurs in depression and level areas. It is very fertile but is not suitable for teak because of lack of drainage. Most of the low lying areas where this type of soil occurs are liable to frost damage.

26. (iii) *Lateritic Loam*.—Lateritic loam generally cap the Deccan trap plateau and are noticed around Chikhaldara, Vairat and other parts of the division. It has a characteristic red brown colour. The soil is very shallow and dry.

#### Section 4 : Climate

##### SEASONS :

27. Due to the rapid variations in altitude and aspect, the climate in Melghat is very varying. The year however, may be divided into four periods as follows :—

- (i) The monsoon or rainy season from the middle of June to the end of September.
- (ii) The post-monsoon period from October to November.
- (iii) The cold season from December to February.
- (iv) The hot season from March to middle of June.

##### RAINFALL :

28. Records of rainfall in the tract is available only for Chikhaldara and Dharni. The rainguages were installed at Dhulghat and Tarobanda but due to their faulty functioning the recorded rainfall data is not reliable. However, from the records of rainfall from the surrounding stations and past observations, it appears that there is a wide variation in rainfall from place to place even within a short distance, with a change in altitude and topography. The average annual rainfall is usually higher on the main ridge of Gawilgarh which amounts to 1784 mm. at Chikhaldara. The rainfall gradually decreases towards the north and west, average annual rainfall at Dharni being 1373 mm. Some of the valleys perhaps receive upto 2500 mm. rainfall in a year. It, however, abruptly decreases towards the south of main ridge, the annual precipitation being only 770 mm. Although the total annual rainfall in Melghat is good, it is not well distributed over the period of the year. Almost entire rain i.e. 90 to 94 per cent is received during the rainy season while the cold season receives the least precipitation i.e., only 1 per cent. Occassionally a few showers are received in the month of December, January, March and May. Except for the months of rainy season the rest of the year is dry. The variation in rainfall from year to year is large. The highest annual rainfall recorded at Chikhaldara is 2845 mm. in 1887, while the lowest being 717 mm. in 1918. The heaviest rainfall in 24 hours at Chikhaldara hill station was 431 mm. on August 19, 1886.

29. The average number of rainy days at Chikhaldara and Dharni are 78.8 and 58.5, respectively.

30. The appendix I gives the monthwise data of rainfall during the last 17 years (from 1954-55 to 1970-71) for the rainguage stations at Chikhaldara, Dharni, Achalpur, Anjangaon and Bhainsdehi of Betul district.

##### TEMPERATURE :

31. The temperature, like the rainfall, varies considerably with the altitude. The higher hills, plateau and valleys to the north of the main Gawilgarh ridge are very much cooler in summer than the southern foot hills. The plateau and higher hills enjoy almost equitable and pleasant climate throughout the year while valleys become very cold during winter when the temperature frequently falls below freezing point in December-January. These valleys experience heavy dews and occasional frost. The records do not, however, show the

occurrence of any severe frost during the last 35 years but they are not unknown. Stein records the occurrence of such frosts on the following nights when the temperature at Chikhaldara fell to :—

Night of the 1st Feb., 1929—(39°F) 3.9°C

Night of the 12th Jan., 1934—(36°F) 2.2°C

Night of the 14th Jan., 1935—(46°F) 7.8°C

32. Damage to the crop from ordinary frost does occur as observed by Sharma in a valley near Dhargarh as early as the 11th of December 1954. Such damage was also reported in low valleys near Chaurakund during the winter of 1967.

33. The southern foot hills are warm or even warmer than the Berar Plains and experience hot winds (38°C) in May and June.

34. During summer, there is usually a very marked difference in the day and night temperatures in most of the Melghat valleys. It is not uncommon to get a chilly night after scorching heat in the midday. After October, temperature decreases progressively till December which is the coldest month. After February, temperature rises rapidly till May which is the hottest month of the year.

35. There is no metrological observatory in any part of the Melghat. But the records of temperature given in the Amravati District Gazetteer (1968) are as follows :—

TABLE I

<i>Cold season :</i>	CHIKHALDARA	AMRAVATI
mean daily maximum temperature	about 22°C	28.4°C
mean daily minimum temperature	.. about 13°C	.. 14.7°C
<i>Hot season :</i>		
mean daily maximum temperature	.. about 35°C	.. 42.1°C
mean daily minimum temperature ..	.. about 23°C	.. 27.2°C

36. As no regular temperature record is maintained for the stations in the tract, the monthly mean maximum and the minimum temperatures for surrounding stations such as Khandwa, Betul and Amravati are given in the appendix II.

#### HEALTH :

37. The climate of Melghat has a very evil reputation. It is unhealthy especially during the latter part of monsoon and first half of cold season when shady valleys which retain water in stagnant pools some time after the rains serve an ideal breeding grounds for mosquitoes. The toll of malaria in Melghat was, therefore, very heavy. Due to the continued suffering from the malignant malaria, the general vitality of people is very low and impairs the efficiency of the staff. Later on, they easily fall prey to pneumonia, bronchitis and rheumatic diseases on sudden exposure to chilly, wet weather of Melghat. Severe attack of malaria followed by fatal pneumonia was of common occurrence and it had come to be known as Melghat fever. But due to the implementation of National Malaria Control Scheme, the occurrence of malaria is at present under check.

38. Besides the bad climate allowance, the subordinates serving in Melghat used to get 25% of the their pay as Melghat allowance. This allowance was well earned, but was discontinued from 31st March 1962. Its revival is essential as the conditions of working have not changed very far.

39. A Government dispensary is maintained at Sembadoh and Tarobanda. But generally, it is seen that the local people are averse to these dispensaries.

#### Section 5 : Water-Supply

40. The whole of Melghat suffers very badly from water scarcity.

41. The rain water is quickly drained off the steep slopes and through the hard bedded hill streams. As a result, there are very few perennial springs and not a single perennial river in the tract. Most of the rivers are dry from December onwards and water is confined to stagnant small pools called 'doh' which are usually the camping places of Gawalis who with their herds of cattle lead a nomadic life nearly eight months by shifting camp in search of water. It is not uncommon in summer for the cattle of the villages on the plateau or even the inhabitants to walk about 5 km. to and fro or to climb down and up at least 300 metres every day to reach the pool or water. The plateau have porous shallow soil with a hard impermeable strata. Thus there is no other possible source of water to local inhabitants than to hold up the rain water.

42. Chikhaldara Civil Station is, however, slightly better of having two underground and one over surface tanks for storage of drinking water and three other surface tanks for washing purposes. But this much water is hardly sufficient and in years of scanty rainfall, scarcity of water is greatly felt.



43. The B. & C. Department has constructed a tank at Ghatang and anicuts at Bori, Silona, Behali, Sirashan, Jhira and Khatkali besides some wells for the convenience of local population and travellers. Recently a tank at Tarobanda has been constructed by the Forest Department. A regular programme of constructing anicuts, storage tanks and wells is the urgent need to relieve the local population of this hardship. The existing tanks, anicuts and wells are listed in Appendix III. Water levels as taken on various dates of important wells in the tract are given in appendix IV.

#### Section 6 : Distribution and area

44. The total area of Melghat forest is 3,053.93 sq. km. It consists of 15 blocks of 'A' Class reserved forest covering an area of 3,036.86 sq. km. and two blocks of 'C' Class reserved forest measuring 17.07 sq. km. 'A' Class reserved forest has been divided into 1,264 compartments and 'C' Class reserved forest into 8 compartments for the purpose of description and reference. The areas of forest villages which were disforested in 1969 and 1970 were not excluded from the total area as the notification for disforestation is provisional and final notification for disforestation is yet to be issued after finalising exact areas under cultivation.

45. For the administrative convenience and management of forests this area has been divided into East Melghat division and West Melghat division in 1964 with divisional headquarters at Amravati and Chikhaldara respectively. The East Melghat division consists of 4 ranges while the West Melghat division comprises 6 ranges. The situation of each of these reserves, divisions and ranges is indicated on the reference map on 1"=2 miles scale accompanying this report. Their distribution on 17 map sheets of Survey of India on 2"=1 mile scale is given in Appendix V.

46. The distribution of compartments by ranges is as follows :—

TABLE 2

Range (1)	Compartments (2)	Area in hectares	
		A Class (3)	C Class (4)
<i>East Melghat Division.—</i>			
Jarida .. .. .	1, 2, 3, 9, 10, 51 to 91, 194, to 216, 219 to 222, 261, 265 to 456, 497 to 501.	55,545.5	..
Semadoh .. .. .	92 to 108, 111 to 124, 127 to 135, 143 to 193, 217, 218, 223, 224.	21,045.2	..
Raipur .. .. .	225 to 260, 262 to 264, 457 to 496, 502 to 547 ..	27,946.6	..
Harisal .. .. .	548 to 664 .. .. .	27,944.0	..
	Total .. .. .	1,32,481.3	..
<i>West Melghat Division :</i>			
Chikhaldara .. .. .	4 to 8, 11 to 50, 109, 110, 125, 126, 136 to 138, 142, 777 to 797.	21,679.1	748.7
Dharni .. .. .	665 to 733 .. .. .	15,700.5	..
Tarubanda .. .. .	139 to 141, 734 to 776, 798 to 801, 805, 806, 810 to 902.	35,775.8	..
Akot .. .. .	802 to 804, 807 to 809, 903 to 1070 .. .. .	42,590.0	958.3
Wan .. .. .	1071 to 1139, 1148 to 1150, 1235 to 1264 ..	31,164.6	..
Dhulghat .. .. .	1140 to 1147, 1151 to 1234 .. .. .	24,294.7	..
	Total .. .. .	1,71,204.7	1,707.0
	Grand Total .. .. .	3,03,686.0	1,707.0

#### Section 7 : State of boundaries

47. The total length of the external boundary lines of the 'A' Class reserved forests of the two divisions is 572.7 km. of which 97.6 km. are natural features such as rivers, streams, ridges and scarps. The remaining 475.1' of line are 13 metres (40') wide cleared lines with serially numbered pillars of wooden posts embedded in cairn of stones. Separate series of numbers are used for the pillars along the boundary line of each reserve, for the pillars along the boundary line of each adjoining village including Chikhaldara civil station area, and for the pillars along the Inter-State boundary between the Maharashtra and the Madhya Pradesh.

48. Internal boundary line of the reserve, though originally demarcated with clear line and pillars is not now maintained, so also the inter divisional boundary of these two divisions.

49. The boundaries of 'C' Class reserved forests have a total length of 32.0 km. and are demarcated by warles, the position of which is shown on the settlement maps of the villages in which these forests are situated and which are maintained by the Revenue Department.

### Section 8 : Legal position

50. The Bairagarh and Gugamal reserves were originally constituted in 1866 and 1876, respectively. These reserves and the remaining blocks of reserves were declared as "State Forest, Class A, Division II" or as "State Forest, Class C Division III" by notifications issued under rule 8 of the Berar Forest Rules of 1871 or section 40 (c) of the Berar Forest Law of 1886, as amended by the Berar Forest Law Amendment Law of 1891, as shown in the table below.

TABLE 3

Sr. No. & name of reserve	No. & date of notification issued under rule 8 of the Berar Forest Rules of 1871	No. & date of notification issued under section 40 (c) of the Berar Forest Law of 1886	Particulars
(1)	(2)	(3)	(4)
1. Bairagarh and	H. R. O. No. 14 of 18 January 89.	..	Declared as "Demarcated State Forest"
2. Gugamal	..	H. R. O. No. 184 of 6 June 92. H. R. O. No. 440 of 12 December 94.	Declared as "State Forest, Class A". Declared as "State Forest, Class A, Division II."
3. Chikhaldara	H. R. O. Nos. 205 of 15 November 83 & 213 of 22 July 91	..	Constituted and declared as "Demarcated State Forest".
		H. R. O. No. 184 of 6 June 92. H. R. O. No. 440 of 12 December 94	Declared as "State Forest Class A". Declared as "State Forest Class A, Division II".
4. Kohana	H. R. O. No. 167 of 1 June 92	..	Declared as "State Forest".
		H. R. O. No. 444 of 12 December 94. H. R. O. No. 440 of 12 December 94.	Constituted and declared as "State Forest Class A". Declared as "State Forest, Class A, Division II".
5. Tapti	..		
6. Chithri	..		
7. Bod	..		
8. Jhapnadeo	..		
9. Dabida	..		
10. Dulghat	..		
11. Wan	..		
12. Rupagarh	..		
13. Khirpani	..		
14. Motha	..		
15. Chikhali	..		
		C. P. G. No. 612 of 6 July 1911	Constituted and declared as "State Forest Class A Division II".
		C. P. G. No. 614 of 6 July 1911.	Constituted as a separate reserve of "State Forest Class A Division II".
16. Dhamangaon and	H. R. O. No. 156 of 1 June 92	..	Constituted and declared as "State Forest".
17. Chichona—Nimkhera	..	H. R. O. No. 194 of 6 June 92. H. R. O. No. 440 of 12 December 94	Declared as "State Forest Class C Division II". Declared as "State Forest, Class C Division III".

Notes :—H. R. O. = The Hyderabad Residency Orders.

C. P. G. = The Central Provinces Gazette.

51. Reserves 5 to 14 were formed partly by transfer of areas from the previously constituted Bairagarh and Gugamal reserves, but mostly out of State forests of Class C Division III.

52. Reserves 1 to 15 have been declared as "A Class State Forest" and reserves 16 and 17 as a "C Class State Forest" by the Central Provinces Gazette Notification No. 2121 of the 28th November 1913 under section 75 (d) of the Indian Forest Act, VII of 1878, as amended by Act XV of 1911, and as applied to Berar.

53. A number of alterations and adjustments affecting the area of the reserves have subsequently taken place. Full details of these are recorded in Code Form No. 1, Register of Reserved Forests, which also contains No. of the Notification under which they have been effected. The list of these notifications is given under Appendix VI.

### Section 9 : Rights and concessions

54. Prior to the reservation of the Melghat forests, the petty chiefs who resided in Melghat exercised certain rights in the tract. These rights were commuted at the time of reservation and certain annual allowances were granted to these Rajas. Under the M. P. Abolition of Proprietary Rights Act of 1950 the payment of allowances to the Rajas were discontinued with effect from 14th March, 1951 *vide* M. P. Forest Department No. 2240-2056-XI, dated 13th July 1951 except in the case of Raja Aman Singh of Khatkali. The continuance of payment of the annual compensation of Rs. 1,561-15-7 to Raja Aman Singh of Khatkali was ordered by the M. P. Government *vide* the Forest Department Memo No. 496-2971-XI-51, dated 16th February 1952. From 1969-70, the payment of the amount of compensation to Raja Aman Singh of Khatkali was, however, discontinued under Government of Maharashtra, G. A. D. Resolution No. PPR-1070-62753-S, dated 15th September 1970 under which the privileges and privy purses of the rulers were terminated with effect from 6th September 1970.

55. The forests are not burdened with any other right.

56. The following concessions are, however, permitted :—

(i) The grazing of cattle belonging to the agriculturists of certain villages in the vicinity of the reserved forests, in accordance with the grazing rules in force.

(ii) The villagers of newly constituted Forest villages are allowed the same privileges and concessions regarding grazing of their cattle and obtaining timber and other forest produce for their *bona fide* domestic use as were given to the erstwhile forest villagers.

(iii) Agriculturists of villages in the vicinity of the reserved forests are given certain quantity of timber bamboos for their *bona fide* domestic use at concessional rates from the coupes under working.

(iv) Concessions relating to the cutting, collection and removal of a fixed quantity of fire-wood, grass and bamboos by the B. and C. Department labourers staying at roadside camps and also by the Veterinary Department for use in connection with the cattle breeding farm at Bod as mentioned in paragraph 668.

(v) Concession relating to the removal by Kamdars of forest villages of the hides, horns and bones of domestic animals which lie inside the forest as mentioned in paragraph 693.

57. None of these concessions is a legal right and these can be withdrawn by the Government.

## CHAPTER II : THE FOREST

## Section 1 : General description and condition of the forest

58. In conformity with the locality factors described earlier, the forests of Melghat are entirely dry deciduous and belong to the formation 'Dry Tropical Forests' of the Champion and Seth's "Revised Survey of the Forest Types of India" and fall under the sub-group 5-A 'Southern Tropical Dry Deciduous Forests'.

59. The tract being sparsely populated, the biotic factors are less influential except fires which along with general distribution of rainfall, aspect and changes in depth and nature of soil are responsible in determining the local variations within the above broad type. The area, north of main Gawilgarh ridge which receives rainfall higher than the part south of it, bears good growth. Within this area the better growth is confined to the northern aspects of the lower gentle slopes and in valleys having good drainage. Besides receiving less rainfall, the southern part of the region is also subjected to fires frequently and bears more open forest with species rather resistant to fire.

60. The forests in general are composed of a mixture of mostly deciduous species having teak (*Tectona grandis*) in high proportion resulting in almost pure teak forest in patches. Understorey is not well defined and shrubby undergrowth is rather sparse except lantana which is very dense in the moisture localities where bamboos are absent. Bamboos (*Dendrocalamus strictus*) occur extensively and form the chief undergrowth particularly on moist slopes. The grasses form a thick ground cover throughout the area except where lantana and bamboos are present. *Tikhadi* (*Cymbopogon martini*), though scattered, is found all over the tract but the *motia* variety which contain about 80 to 90 per cent geraniol is confined to southern part while elsewhere it is 'sofia' variety which has only 36 to 66 per cent geraniol.

61. In general, the quality of the forest is III which improves in patches on loamy soil having good drainage, but degenerates into IV quality in poorer and arid locality. Along the lower slopes and in the valleys the density is good but the forests are generally open on the upper steep slopes and plateau. The natural regeneration of tree species is mostly deficient. Though the crop in general is devoid of old and mature trees, it presents a healthy look having trees standing upright.

## Section 2.: Composition of the crop

62. For the purpose of description, these forests are distinguished into the following local sub-types in the types as per Champion and Seth's revised classification of forest types.

— (1)	Champion and Seth's Classification (2)	Local sub-type (3)
Group 5—	Tropical Dry Deciduous Forests	..
Sub-group 5 A	Southern Tropical Dry Deciduous Forests	..
<b>I Climax type—</b>		
(1) 5A/Ci	Dry Teak bearing forest	..
5A/Cib	Dry Teak Forest	.. (i) Teak forest
(2) 5A/C3	Southern Dry mixed deciduous forest	.. (ii) Tiwas forest
		.. (iii) Mixed forest
<b>II Edaphic climax—</b>		
5/E2	Boswellia forests	.. (iv) Salai forests

63. The factors influencing the composition and condition of the crop are so variable in Melghat that even in the limited limits of a compartment it is not uncommon to find abrupt changes in the crop representing all the above local sub-types.

## (i) TEAK FORESTS :

64. These forests are more extensive and cover major parts of Bairagarh, Gugamal, Bod, Tapti, Chithri, Chikhali, Jhpnadeo, parts of Kohana, Rupagarh, Chikhaldā and Motha reserves comprising of whole of Sembadoh, Harisal, Raipur Jarida ranges of East Melghat division and Tarobanda, Dharni and part of Akot and Chikhaldā ranges of West Melghat division. It generally occurs between the elevation ranging from 300 m. to 900 m. The extent of the forests is about 148,253.3 ha.

65. The general quality of the forest is III. The better growth is found all along in Bairagarh and Gugamal reserves except along higher steep slopes and plateau which are covered with poor forests of IV-a or IV-b quality. II quality forest is found in patches confined to the valleys of Sipna and Kuapati rivers. In these valleys teak (*Tectona grandis*) was raised artificially during 1869 to 1879 and also in narrow belt on the banks of Tapti river in Harisal range. The forests lying to the south of main ridge and in Bod, Tapti, Chithri, Chikhali, Jhpnadeo and parts of Chikhaldā reserves are mostly of IV-a and IV-b quality.

66. The density of stocking is throughout good, being best in the valleys and along the moderately steep slopes. However, it degenerates along the higher steep slopes having southern aspect and on high elevation plateau.

67. (A) By far, teak (*Tectona grandis*) is the most prominent species in the better quality forests. It forms nearly 50 per cent of the growing stock. Teak (*Tectona grandis*) has higher percentage along the lower gentle slopes and in valleys where in small patches it is almost pure but the percentage decreases with the rise in altitude.

68. Teak (*Tectona grandis*) is of young to mostly middle aged with sprinklings of old and mature tree usually concentrated on *ballas* and steep slopes not easily accessible.

69. *Haldu* (*Adina cordifolia*), and *dhaora* (*Anogeissus latifolia*) are the main associates of teak while *saj* (*Terminalia tomentosa*) forms a fair proportion in low lying areas. Other associates are *lenda* (*Lagerstroemia parriflora*), *kekad* (*Garuga pinnata*), *kasai* (*Bridelia squamosa*), *kalam* (*Mitragyna parvifolia*), *dobin* (*Dalbergia paniculata*), *mokha* (*Schrebera swietenoides*), *kahu* (*Terminalia arjuna*), *bahera* (*Terminalia bellerica*), *mahuwa* (*Madhuca latifolia*), *am* (*Mangifera indica*), *bhilwa* (*Semecarpus anacardium*), *bija* (*Pterocarpus marsupium*), *kulu* (*Sterculia urens*) and *kusum* (*Schleichera oleosa*).

70. The understorey consists of *moyen* (*Lennea grandis*), *tiwas* (*Ougeinia dalbergioides*), *tendu* (*Diospyros melanoxylon*), *dudhi* (*Wrightia tinctoria*), *dhman* (*Grewia tiliaefolia*), *aonla* (*Emblia officinalis*), *salai* (*Boswellia serrata*), *achar* (*Buchanania lanzan*), *siwan* (*Gmelina arborea*), *gongal* (*Cochlospermum religiosum*), *ghot* (*Zizyphus xylopyra*), *bhos* (*Coix gigantea*), *aran* (*Eleaeodendron glaucum*), *amaltas* (*Cassia fistula*), *palas* (*Butea monosperma*), *rohan* (*Soyimida febrifuga*), *hirda* (*Terminalia chebula*), *khair* (*Acacia catechu*) and *ber* (*Zizyphus mauritiana*).

71. The shrubby undergrowth is sparse except in areas invaded by *lantana* which forms practically impenetrable dense mass throughout the moist locality. However, it is rare or practically absent where bamboos are present as in Jarida range or where dense growth of grass exists. Other shrubs that occur are *marorphal* (*Helicteris isora*), *bhandar* (*Colebrookia oppositifolia*), *nirgudi* (*Vitex negundo*), *khirsali* (*Nyctanthes arbortristis*), *bankapas* (*Thespesia lampas*), *baibarang* (*Emblia tsjeriamcottam*), *gokharu* (*Acanthospermum hispidum*) and *pithondi* (*Flnggea microcarpa*). The grassy undergrowth is dense and forms main ground cover where bamboos and *lantana* are absent. The most common and abundant grasses are *pochati* (*Heteropogon ritchei*), *gondhali* (*Anthistria ciliata*), *kusal* (*Heteropogon contortus*), *sainar* (*Ischaemum sulcatum*). Other grasses found are *phuli* (*Apluda varia*), *tikhari* (*Cymbopogon Martini*), *paonia* (*Ischaemum sulcatum*), *marvel* (*Dicanthium annulatum*), *sheda* (*Ischaemum laxum*), *baru* (*Sorghum halepense*) and *Jungalikela* (*Musa superba*).

72. The climbers are few and generally confined to moist localities. These are *nagbel* (*Cryptolepis buchmanii*), *palasbel* (*Butea superba*), *mahul* (*Bauhinia vahlii*), *Chilati* (*Acacia pennata*), and *kaunchkhuri* (*Mucuna pruriens*).

73. *Jungalikela* is found very scattered along the rocky hill sides and on slopes along the streams.

74. *Haldu* (*Adina cordifolia*) is found where the crop is well stocked, generally at an elevation above 600 m. Trees of over 180 cm. girth are usually common throughout as *haldu* (*Adina cordifolia*) was not exploited in the past. *Salai* (*Boswellia serrata*) occurs along drier upper slopes which are poorly stocked. The trees are mostly crooked. *Tiwas* (*Ougeinia ogeinensis*) though common in occurrence, increases its percentage with the rise in elevation, but does not attain big size. The trees of 75 cm. girth are generally rare, and if present, are unsound and cranky. *Semal* (*Bombax ceiba*), *bija* (*Pterocarpus marsupium*) and *shisham* (*Dalbergia latifolia*) form a negligible proportion in the crop.

75. Natural regeneration of teak (*tectona grandis*) is somewhat deficient, through, stray, very small patches of reproduction are sometimes observed in the fully stocked forests. Regeneration of *dhaora* (*Anogeissus latifolia*), *tiwas* (*Ougeinia ogeinensis*), *haldu* (*Adina cordifolia*) and *saj* (*Terminalia tomentosa*) is fair, while that of other species is generally scanty. The seedlings of *saj* (*Terminalia tomentosa*) are usually plenty in frosty areas and the seedlings of *haldu* (*Adina cordifolia*) are seen sometimes concentrated in patches on flat raised ground.

76. (B) Comparatively poorer and more open teak forests of IV-a and IV-b quality having composition of the crop almost the same as described under paras 69 to 72 are found in Bod, Tapti, Chithri, Jhapandoo, Chikhali and parts of Kohana, Chikhaldia, Motha and Rupagarh reserves. The percentage of teak (*Tectona grandis*) in the crop is, however, not more than 45. The density and quality of the crop improve in depressions on cooler aspects and along the streams.

#### (ii) TIWAS FORESTS ;

77. This type is found on the top of the higher hills, plateau and terraces over almost the whole of area at an altitude of over 1,000 m. The quality of the forest is poor, mostly IV-b. These forests are generally very poorly stocked with stunted tree growth. There are numerous blanks containing only grasses, *lantana* or *bhandar* (*Colebrookia oppositifolia*). *Tiwas* (*Ougania ogeinensis*) is the most prominent species although it forms only 10-15 per cent of the growing stock. The remaining stocking is made up by *dhman* (*Grewia tiliaefolia*), *aonla* (*Emblia officinalis*), *kumbhi* (*Careya arborea*), *jamun* (*Schyzigium cumini*), *gular* (*Ficus glomerata*), *semal* (*Bombax ceiba*), *arang* (*Eriolaena hockeriana*), *amaltas* (*Cassia fistula*), *pakar* (*Ficus infectoria*), *phangra* (*Ery*

*thrina suberosa*), *kolsa* (*Glochidion velutinum*), *dahipalas* (*Cordia macleodii*), *bahera* (*Terminalia bellexica*), *ghatber* (*Zizyphus xylopyra*), *thur* (*Euphorbia nivulia*) and *maidalakri* (*Litsea glutinosa*) etc. Teak (*Tectona grandis*) occurs in this type of forests but is generally scattered. On some of easy slopes on northern aspects, it reaches to fair dimensions but elsewhere it is stunted and very poorly formed.

78. Lantana and *bhandar* (*Colebrookia oppositifolia*) have invaded large areas to the exclusion of other undergrowth. Most of the tops of ridges and plateau in the Chikhaldara, Sembadoh and parts of Raipur and Tarobanda ranges are under dense impenetrable lantana. *Kusl* (*Heteropogon contortus*) *sainar* (*Sehima sulcatum*) and *gondhali* (*Anthistiria ciliata*) are the common types of grasses found in this type. *Tikhari* (*Cymbopogon martini*) grass is also found here and there and is generally of *sofia* variety.

79. Most of these high level plateau have been under shifting cultivation for a long time and besides locality factors such as high winds, shallow soils, and lack of soil moisture, this has been a very important factor responsible for the inadequate stocking of these areas.

80. Regeneration of teak (*Tectona grandis*) is absent but *tiwas* (*Ougeinia oogeinensis*) seedlings and saplings are plentiful. Regeneration of other tree species is scanty.

### (iii) MIXED FORESTS :

81. This type of forest is found on the upper hills of Kohana, Chikhaldara, and Rupagarh reserves, southern-eastern part of Gugamal reserves and practically whole of Kirpani reserve. It also occurs in Dhulghat, Dabida and Wan reserves in valleys. In Bairagarh reserve, it occurs in patches interspersed with teak forest. The quality of the forest is most IV-a and IV-b. But in shady places it touches to III. The forest is well stocked, better stocking being obtained along the northern aspect. The composition of crop is a mixture of variety of species, prominent being *tiwas* (*Ougeinia oogeinensis*), *dhaman* (*Grewia tiliacifolia*), *moyen* (*Lannea coromandelica*), *salai* (*Boswellia serrata*), *ghatber* (*Zizyphus xylopyra*), *saj* (*Terminalia tomentosa*), *sewan* (*Gmelina arborea*), *tendu* (*Diospyros melanoxylon*), etc. *Bhirra* (*Chloroxylon swietenia*) is very common along the hill near Behali. Teak (*Tectona grandis*) is rare, however, it is found encroaching on the fringes where teak forest adjoins this type. Bamboos are generally absent. The undergrowth varies considerably with the density. Lantana has invaded this type at many places. Common grasses are *gondhali* (*Anthistiria ciliata*) and *pochati* (*Apluda varia*). Regeneration of trees species is scanty.

### (iv) SALAI FOREST :

82. Forest of this type is mostly confined to West Melghat division, covering practically whole of Dhulghat, Dabida and Wan reserves, Southern-Western part of Gugamal and western part of Rupagarh reserves. It also occurs along the lower slopes of Chikhaldara range. The quality is mostly IV-a and IV-b. The crop is generally open. Full stocking is found only on relatively small areas. *Salai* (*Boswellia serrata*) is the main species and in many places grows almost pure. Its most usual associate is *dhaora* (*Anogeissus latifolia*), other being *lendia* (*Lagerstroemia parviflora*), *tiwas* (*Ougeinia oogeinensis*), *moyen* (*Lannea grandis*), *kekad* (*Gaurga pinnata*) *mokha* (*Schrebera swietenoides*), *palas* (*Butea monosperma*), *aonla* (*Emblica officinalis*) *dhobin* (*Dalbergia paniculata*), *gongal* (*Cochlospermum religiosum*), etc. Teak (*Tectona grandis*) occurs only in small patches particularly along the *nala* banks and is found invading sheltered locations. *Khair* (*Acacia catechu*) and *hingar* (*Acacia leucophloea*) occur chiefly on the plain areas at the foot hills in the southern portion of Wan range. *Khair* (*Acacia catechu*) is found to attain size not more than 45 cm. in girth. *Lokhandi* (*Ixora parviflora*) is common only along the streams while *rchan* (*Soymida febrifuga*) is most common near Khatkali in Akot range. *Anjan* (*Hardwickia binata*) is confined to the foot hills on the southern outskirts of Wan and Dhulghat reserves.

83. Natural regeneration is generally very scanty. *Gongal* (*Cochlospermum gossypium*) regenerates profusely on some of the dry hills. Bamboos are generally absent, except on some of the moist slopes in Akot range and to a smaller extent in Dhulghat reserve. Bushes of *ber* (*Zizyphus mauritiana*) *chilati* (*Acacia pennata*), *bharati* (*Gymnosporia monthana*), *tarota* (*Cassia tora*) and *samalu* (*Vitex negundo*) and grasses such as *pochati* (*Apluda varia*), *gondhali* (*Anthistiria ciliata*), *kusl* (*Heteropogon contortus*) and *sainar* (*Sehima sulcatum*) form the undergrowth.

84. *Tikhari* grass (*Cymbopogon martini*) both of *sofia* and *motia* varieties occur in good quantity in this forest. *Motia* variety is in abundance in almost the whole of Akot range, Dhulghat and Wan reserves and is scattered on the southern foot hills in Chikhaldara range.

85. The climbers are very few and usually found in shady, moist situations along the streams. The more common climbers are *palasbel* (*Butea superba*), *nagbel* (*Cryptolepis buchanani*) and *chilati* (*Acacia pennata*).

### Section 3 : Injuries to which the crop is liable

86. The most significant menacing agency causing considerable damage to the forest is fire. Next to it, is lantana followed by frost and drought to some extent. Other injurious agencies such as, grazing, insect, wild animals etc. are very negligible. The offence cases registered during the period from 1953-54 to 1969-70 are given under appendix VII.

87. *Fire*.—Fires, though not heavy, are of common occurrence in the recent past. Due to highly combustible undergrowth consisting of dense mass of dried grass and dry twigs of lantana, a tiny spark can trigger off a conflagration in a short time. As the area is thinly populated the labour is in short supply. The high hot winds during summer, combined with the hilly configuration of the land spread fire easily when it occurs and engulfs vast areas before it can be brought under control only by counterfiring. With a long standing fire protection measures and vigilance of the staff, the forests, in general, have been well protected against fires in spite of the handicaps.

88. *Lantana*.—Lantana, which is indigenous to South America, was introduced into Ceylon in 1824 and thereafter into India as an ornamental garden shrub. It was brought to Melghat probably from South India by some misguided persons many years ago round about 1870 and certainly much before 1890. It is said by old forest villagers that when lantana first appeared in Melghat, it was planted intentionally along roadsides in Sembadoh and Raipur ranges. It is noticed that lantana is dense near the villages and it is quite likely that it was planted as a hedge round the fields. It is the greatest menace to the Melghat forests now, except for some of the drier *salai* forests in the Akot. Tarubanda and Harisal ranges there is hardly any compartment where lantana is not found and in most of them it forms very dense thickets. Its spread during the last half century is very alarming. Regarding lantana menace in 1895, Bagshawe in his Working Plan for the area, mentioned "At present the only serious inroad is down the Ambadoh nadi", and it was only found in considerable quantities in higher altitudes which contain forest of comparatively little value. Similarly, Dunbar Brander in his Working Plan in 1916 remarked, "Mr. Williamson, in submitting proposals for the revision of the Working Plan in 1901, considered climbers (including lantana) need only be cut when found on teak and was of opinion that during his seven years acquaintance with the Melghat, their tendency was to decrease. This is a most remarkable statement in the light of the present condition of affairs and, if correct, shows the very rapid increase which must have taken place during the last decade". Lantana thrives both in the open and under shade. It has not, however, invaded the area occupied by bamboos. Besides forming a dense cover on the ground which does not permit any regeneration of tree species, lantana, when dry, is extremely combustible. It throws up a huge flame which scorches the leaves of trees completely. The splinters of lantana go high up and are blown across wide area which make fire fighting very difficult.

89. The damage from lantana was realized quite early and it is believed that efforts to control the spread of lantana were made in the early nineties. The measures were relaxed during the World War I, 1914-18, for reasons of economy. By 1921 lantana had invaded extensive area. From 1921 to 1931 deliberate fires in the middle or later part of the hot season were the chief measures adopted to kill lantana. This drastic method had to be abandoned in 1931, because fires were causing appreciable damage to the tree growth not only in the lantana infested areas but in the adjoining forests where they would spread. Since then, uprooting of lantana by hand and with the help of elephants in the coupes under working started. The spread of lantana could not be checked either with burning or by uprooting as its root suckers give rise to shoots again which restock the area very soon. The areas around Chikhaldara which were set to fire and the coupes in which uprooting was tried for few years are as full of lantana as ever.

90. The areas containing lantana were stockmapped to assess the spread under Stein's Plan as well as under Sharma's Plan and also under the present plan. Accordingly, it still covers the whole of Chikhaldara, Sembadoh, Raipur, Tarubanda and part of Akot, Harisal and Jarida ranges. It is still very dense in first four ranges but scattered in others.

91. *Frost*.—Frosts occur in the valleys of Sembadoh, Raipur, Harisal and parts of Akot and Dhulghat ranges. Frost damage is caused in the low areas which are open, have either been once under cultivation or adjoin cultivation. No damage is caused to the crop if it is well stocked unless a severe frost occurs, which is rare. Teak (*Tectona grandis*) is most susceptible to frost damage. Other species usually occurring in these areas viz., *Saj* (*Terminalia tomentosa*), *kahu* (*Terminalia arjuna*), *dhaman* (*Grewia tiliaefolia*) *baranga* (*Kydia calycina*), *ber* (*Zizyphus mauritiana*), *khair* (*Acacia catechu*), and *palas* (*Butea monosperma*) etc. are quite resistant to frost damage. In the years of ordinary frost, the damage is confined to young growth when the leaves and tender shoots are killed, but severe frost kills saplings and the leading shoots of poles and sometimes even the crown of the old trees are affected. In some of the badly affected areas, the teak trees are very forked and branchy and present in general an unhealthy appearance. If such areas are clearfelled, the tree growth is completely prevented from coming up by frost and areas reduced to open grass lands. It is, therefore, indicated that big gaps in canopy should not be created in the frost liable areas.

92. The liability of a particular area to frost damage is indicated by its low lying situation, black cotton soil, the presence of dominant *saj* (*Terminalia tomentosa*) bushes like *dhu*, *samalu*, *pithondi*, *baibarang*, etc., and *karsali* and *baru* grasses.

93. The records show that there has not been any severe frost during the last about 35 years. Small damage to young crop is noticed in some of the worked coupes here and there.

94. The strips felled in Chaurakund (now Harisal) range do not show any particular damage by frost, but it is difficult to say whether it was due to the method of felling, because the system was abandoned too early to give any results and no severe frost year has been reported since. In some of the low lying areas in this part, however, damage was noticed during December, 1967.

95. The forests of Chikhaldara and Akot ranges lying to the south of the main ridge of Gawilgarh hills do not experience frost damage.

96. *Drought.*—The forests, especially in the drier parts in the south and west, are liable to damage from drought only in or immediately after years of deficient rainfall. During the famine in the year of 1899, chiefly old and unsound trees died in such a large numbers that in 1900 and 1901 the prescriptions of Working Plan had to be held in abeyance to exploit these trees. Mortality in small stray patches on rocky substrata during the year of less rainfall is attributed to drought. The damage, however, is negligible. In the past 20 years severe drought has not been recorded. In 1951-53 the rainfall was below normal, but no appreciable damage was noticed to the crop except that few trees of teak dried here and there.

97. *Grazing.*—The forests are not liable to damage from grazing with the exception of two blocks of 'C' class forests, a narrow strip of 'A' class forest in the south and west of the tract adjoining the Berar plains and forests on the plateau of Chikhaldara range. The incidence in grazing units *viz.* Dahigaon, Motha and Memna was occasionally exceeded than that prescribed in the last plan, but it was never heavier than 2 cattle units per acre. The two 'C' class blocks of forests are very heavily grazed. In fact, there is hardly any grass left in these blocks and they only serve as exercise grounds for the cattle. These areas are very undulating and the soil is very poor and are, therefore, even unfit for cultivation. The 'A' class forests adjoining the Berar plains are very hilly, and the upper slopes are steep. The grazing is, therefore, confined to the lower hills and the calculated incidence does not give the true picture of the grazing pressure here, while a large inaccessible area of the units remains ungrazed.

98. The forests on the plateau in the Chikhaldara range are heavily grazed only during the few months of rainy season after which most of the cattle are shifted to lower ranges on account of the shortage of grass and water on the plateau.

99. The incidence of grazing during the last 20 years in the forests adjoining M. P. in the west and Berar plains (Achalpur-Akot tract) varied from about 1 to 2 hectares per cattle unit in Tapti, Jhapnadeo, Chikhali, Popatkhera and Rupagarh grazing units.

100. In the remaining forests consisting of the whole of Sembadoh and Tarobanda ranges, major parts of Akot, Khirpani and Harisal ranges and part of Chikhaldara range, the grazing incidence was as low as 8 to 20 hectares per cattle. These figures are, however, rather misleading as the erstwhile forest village cattle are only grazed in the immediate vicinity of the villages. The true grazing incidence in the areas adjoining the villages is, therefore, heavier than is shown by the figures but it is nowhere so heavy as to cause any appreciable anxiety and damage to the forests.

101. The animals, mostly buffaloes, from Chikhaldara and some *rayatwari* villages, and some cattle from Berar plains are grazed from cattle camps, locally known as *hetts* in the interior of Sembadoh, Tarobanda, Akot and Harisal ranges in the hot season. This hot weather grazing occasionally damages *bamboos* reproduction.

102. The number of cattle that may be kept in Chikhaldara Civil Station including Pandri is limited under the terms of the Melghat taluq settlement as mentioned in paragraph 670.

103. *Illicit fellings.*—The forests are in a compact block and are sparsely inhabited by mostly *rayatwari* villages which were erstwhile forest villages. The markets for forest produce are situated at long distances and there is no local demand of forest produce. The whole of the forests are worked departmentally. The illicit fellings are, therefore, almost unknown. Occasionally, however, illicit fellings are done in the forests on outer fringes adjoining the Dharni-Bairagarh, Hiwarkhed and Akot tracts in the Harisal, Dharni and Akot ranges, where a strict watch is necessary.

104. *Winds.*—The effects of winds are negligible. Occasionally, trees are uprooted and branches broken by the high gusts which accompany thunder storms towards the end of the hot season. The stunted nature of the forest in exposed situations at high elevations is partly due to the strong winds, which are frequent during the hot and rainy season.

105. *Insects.*—Attacks of teak defoliator (*Hyblea puer*) and the leaf skeletoniser (*Hapalia macheralis*) occur almost every year in teak stands but the damage is seldom on of a severe nature. Much damage is done to bamboos by chrysomelid and curculioid beetles which make tunnels in young culms during the rains.

106. *Animals.*—Sambhars are found all over the division although their number is not very great. Bisons are found in small herds in Harisal, Tarobanda, Raipur and parts of Akot range and occasionally in other ranges also. These animals do some damage to the young coppice shoots and poles by scratching their horns or sides against the poles. Occasionally some damage by porcupine is also noticed. They usually eat the outer bark or cambium of *haldu*, *mohwa*, *amaltas*, *bhilwa*, etc., near the base of the trees.

107. Rats are mentioned by Dr. Schlich in 1883 as having done great damage in the teak plantations and their reappearance in large number is recorded in the annual reports of 1902. At present rats do little damage.

108. The damage by animals in Melghat forests, generally, is very little.



## CHAPTER III : UTILIZATION OF THE PRODUCE .

Section 1 : *Agricultural customs and wants of the population*

109. The entire population within the divisions consists of *rayatwari* villagers which were forest villagers till recently. The tract is surrounded by *rayatwari* areas in the north-east and west, and the Berar plains immediately adjoin its southern and south-western boundaries.

110. These villages are mostly inhabited by Korkus except for some villages in Chikhaldara range which are mostly occupied by Gaolies. In addition there are few Gonds, Gaolans, Mahars and Nihals scattered in all the villages. Nihals are most plentiful in the villages in the south and west adjoining the Berar plains. Korkus are a typical tribe of the western part of Satpura range. They are wood cutters both by force of environments and tradition. Trade in forest produce in the nearby market places in the Berar plains has been their main occupation for generations. After the curtailment of issue of forest produce to them for sale, they chiefly depend for their livelihood on forest works. In addition, they do kharif cultivation and grow some *kodon* (*Paspalum scrobiculatum*) *Kutki* (*Panicum miliare*) and *Jagni* (*Guizotia abyssinica*) on light soils in hilly localities. Crop of gram, *juar* (*Sorghum vulgare*) and wheat are also raised on a small scale on heavy clayey soils. Villagers in the south adjoining Berar plains also grow some cotton. Korku is a very poor and lazy cultivator who has little attachment to his land. The Gaolis are professional grazers. They own large herds of buffaloes which are the main source of their livelihood. During the rainy season, however, most of them do some cultivation and grow the abovementioned crops. They are not adapted to manual labour and they do not trade in forest produce. Other residents of the erstwhile forest villages also depend for their livelihood on forest works and do petty cultivation like korkus.

111. The demand for forest produce of these villagers is extremely meagre and generally consists of small size timber of miscellaneous species and some bamboos for house building, *mandwas* and for making agricultural implements, firewood, grazing, *mahul* fibre for ropes and teak leaves for thatching. Occasionally they require teak timber for making the bodies of their carts; fodder grass for journeys to and from markets herbs, roots, flowers, fruits and leaves for edible and medicinal purposes.

112. Chikhaldara is a small hill station with a population little over 1,000 consisting mostly of Government servants, members of mission institutions, Gaolis and few shopkeepers. During summer, the population however, swells by the people coming from the Amravati district and outsides. Pandri, included in this Civil station is a Gaoli village. The chief requirement of forest produce for Chikhaldara is firewood, some timber bamboos and thatching grass is occasionally required for construction of and repairs to buildings.

113. The *rayatwari* villages adjoining Melghat divisions are also mostly inhabited by korkus. Their demand for forest produce is limited and confined to few small poles, bamboos and grazing.

114. The Berar plains are highly cultivated and thickly populated. The chief occupation of the residents of the plains is cultivation, the staple crop grown being cotton, *juar* and *arhar*. Of late, cultivation of *murchi* and orange gardens are becoming very popular. As the demand of land for cultivation is intense, there are practically no areas under forest. Melghat forests are the nearest from where they can satisfy their needs of forest produce. Their requirements of forest produce are :—

- (i) Timber for house building. Poles of almost any species are used but the well-to-do cultivators generally prefer teak.
- (ii) Timber for the construction of carts. Teak is preferred for the body, *tiwas*, *saj*, *dhaman*, *lendia*, *dhaora*, *tendoo* or *moyen* for shafts; *dhaora* for axles; *tiwas*, *kusum* or *kahu* for naves; teak for spokes and felloes and *shivan* for yokes though *moyen* and *salai* are also used if *shivan* is not available.
- (iii) Timber for the construction of agricultural implements such as *nagars* and *bakhars*, *Tiwas* or *Shivan* are preferred in that order.
- (iv) Firewood.
- (v) Bamboos for walls and roofs of houses, for mats baskets and fencing, and for orange gardens.
- (vi) Mahul fibre for ropes and mahul leaves for plates.
- (vii) Grass for thatching, *Kusal* is preferred.
- (viii) Grass for fodder purposes.
- (ix) Grazing for cattle.

115. Teak and *tiwas* timber is preferred and used by all who can afford to buy them. Poles of other species such as *dhaora* *lendia* are used by those who cannot afford to use teak or *tiwas*. Firewood is required for domestic consumption in towns and villages. The demand for thatching grass is very little now as people prefer tiles or corrugated iron sheets as roofing material.

116. Although villages in the Berar plains abutting the border of Melghat divisions consume large quantities of forest produce from Melghat, they do not like to extract it themselves from the forests because they are averse to the climate of this area.

117. The villagers residing in forest area and those residing in the *rayatwari* villages adjoining Melghat bring firewood and bamboos in the weekly markets and sell them to the villagers in Berar plains.

118. The cattle in the Berar plains are mostly stall-fed. Only villages on the outskirts of forest, sent their cattle for daily grazing in the forest. A few more distant villages send their surplus cattle to camps either in the forests or in the bordering villages in the rainy or cold season when their fields are under crops.

#### Section 2 : Markets and marketable products

119. The chief market for the forest produce from this region is Paratwada-Achalpur. Achalpur is the terminal station on a narrow gauge railway line and is connected to the main Bombay-Calcutta broad gauge railway line at Murtizapur. Paratwada is the main outlet for the produce from this tract.

120. The markets at Anjangaon and Akot also consume a fairly large quantities of forest produce. Anjangaon is the railway station on a narrow gauge railway line connecting Achalpur and Murtizapur. Akot is also a railway station of Khandawa-Hingoli meter gauge railway line passing through Akola which is south of Akot at a distance of about 45 km. and is on the main Bombay-Calcutta railway line. Besides, these markets are well connected by good metalled roads with Amravati, Akola and Daryapur which are also consuming centres. Some forest produce from the western part find its way out to Burhanpur through the Government timber Depot at Dharni. Burhanpur is on the broad gauge railway line from Bhusawal to Itarsi. At Paratwada, Akot and Dharni, Forest Department has established timber depots which are well reputed in the timber market and from where timber is further exported to various consuming centres in the country. The Paratwada Depot receives timber from both the divisions while depots at Akot and Dharni solely cater the need of West Melghat division. Average leads from the forests to these depots are :—

To Paratwada .. ..	30 to 100 km.
To Akot .. ..	30 to 80 km,
To Dharni .. ..	30 to 50 km.

#### INTEGRATED UNIT.

121. Teak, being the timber *par excellence* is in great demand in all sizes. But the supply falls short of demand. Further its irrational use aggravated the supply position. This gap between the supply and demand necessitated the tapping of some other sources particularly of miscellaneous species, hitherto unknown in constructional work. Melghat forests contain species such as *sai*, *Haldu*, *Kalam*, *Lendia*, *Mahuwa*, etc. which can be used in place of teak for constructional purposes after proper seasoning and preservation treatment. With this in view the department established the Integrated Unit at Paratwada in 1962-63 to popularise the use of such species. This unit comprises of (i) saw mill section, (ii) wood seasoning section and (iii) wood preservation section. Later on in 1966 Paratwada Timber Depot was also brought under its sphere. After the early years of teething troubles, the unit has started showing profit from the year 1967-68. The unit entertains orders from the Government Departments and private individuals as well. Besides bringing out pre-fabricated portable timber plank huts to suit the common man's need, the unit has popularised the furniture of these species. Considering the general apathy of the public to any change in the conventional and traditional use, the service done so far by the Unit is really commendable. However, much remains to be achieved.

122. *Timber*.—All the timber in all sizes including teak and miscellaneous is transported departmentally to the Government depots where it is sold by public auctions periodically. The local consumption of big size timber being low, most of the timber is then further exported by the purchasers to Delhi, Bombay, Madras and other consuming centres. Material extracted as *Khangri* is mostly consumed locally in the plains of Vidarbha.

123. *Bamboos*.—There is a brisk demand for bamboos in the Paratwada, Akot and Anjangaon markets. The bamboos sold in these markets are for local consumption. They are used for building purposes, fencing, for supporting orange plants and for manufacture of mats and baskets. Bamboo areas from Jarida Range of East Melghat Division have been given on lease to the Paper and Straw Board Mills, Ballarpur for manufacture of paper.

124. *Fire-wood*.—There is a fair demand for firewood in the Paratwada, Akot and Anjangaon markets. All species are used. *Salai* and *moyen* are also accepted but only when no other species are available. The fire wood sold in these markets is extracted chiefly from the forests adjoining to Berar plains and belonging to Jarida, Chikhaldara and Akot ranges, and from the forests of the Semadoh range adjoining to the B. and C. Department road.

125. *Rusa grass*.—Rusa grass is another commercially important commodity of this area and occurs all over. Motia variety which has a higher percentage of geraniol about 80 to 90 per cent is consequently in demand but is found mostly in Akot, Dhulghat, Tarobanda and Chikhaldara ranges of West Melghat division. Rusa grass, being of high commercial value was raised artificially during 1949 to 1954 in Chikhaldara range and again after a lapse of about 11 years the plantations of rusa grass are being raised comparatively on large scale (more than 20 ha. per year) from 1965 in Wan range of West Melghat division.

126. *Tendoo leaves*.—Till recently tendoo leaves for wrapping *bidis* from these forests were not much in demand. But since the nationalisation of trade in tendoo leaves in 1969-70, this commodity appears to be in great demand which reflected in the phenomenal rise in revenue realised from the tendoo leaves from both the divisions as reported below :—

TABLE 4

Division	Season	Gross revenue	Expenditure	Net revenue
		Rs.	Rs.	Rs.
East Melghat, division	1970	23,125	10,355	12,770
	1971	1,06,270	75,994	30,276
West Melghat division	1969	..	..	9,730
	1970	49,119	41,881	7,238
	1971	3,28,746	2,13,133	1,15,613

### Section 3 : Lines of export

127. Both the divisions have a well net work of forest road which lead to the following B. and C. Department roads.

1. Achalpur-Dharni-Burhanpur road
2. Akot-Harisal road.

The Achalpur-Dharni-Burhanpur road passes through the middle of the tract practically dividing the region in West and East Melghat divisions. It runs from east to west for about 100 km. and drains all the produce of East Melghat division and part of West Melghat division either to Paratwada in East or to Dharni in West. Remaining produce of West Melghat division is transported along Harisal-Akot road to Akot.

128. Another important line of export is the Khandwa-Hingoli metre guage railway line which opened for goods traffic in 1960 and is passing through the south-western part of the West Melghat division traversing about 35 km. Wan and Dhulghat railway stations are situated in the tract. The produce can also be exported from other rail heads at Achalpur, Anjangaon and Akot. All are on Central Railway and are important marketing centres.

129. Appendix VIII gives the list of existing roads.

### Section 4 : Methods of exploitation and their cost

130. Firewood, bamboos and grass are extracted by purchasers of rated passes, gum, etc. by contractors and timber and tendoo leaves solely by the department.

#### I. EXPLOITATION BY PURCHASERS :

131. Bamboos, dried fire-wood, grass and other minor forest produce are exploited by the purchasers of rated passes either for their domestic consumption or sale. For the convenience of the public the rated pass vendors are stationed at places on main export roads as listed under appendix IX. The prevailing schedule of rates for extracting forest produce on rated passes is given in Appendix X.

#### II. EXPLOITATION BY KHANGI :

132 This was also a method of exploitation of timber by Korkus on rated passes. In Korku *Khang* means private. Under this method the Korku used to fell tress marked for sale in the coupe for working and after converting at their leisure, used to extract timber on rated passess to weekly markets at Achalpur, Anjangaon and Akot for sale on their own accord.

133. This was the only method of exploitation prevalent in Melghat till 1932 when Mr. Melland, the Divisional Forest Officer, Melghat, to tide over the economic crisis, introduced the departmental working on large scale. The quantity and size of timber to be issued under *Khang* since then, has been reduced gradually by 1955, when Sharma's plan was introduced the local villagers were allowed to remove only small sized timber and poles left behind in a coupe after extraction of all timber of depot class by the departmental agency. Merchants in the timber markets used to advance money to local villagers who in turn, per force of obligation, compelled to sell such timber to these merchants at nominal profits. Shri Sharma in his plan mentions that the villagers could earn much more by doing other forest works but they religiously insisted on being given *Khang* timber. Due to the restriction on issue of *Khang*, certain malpractices crept in. In 1958, under orders of Deputy Chief Conservator of Forests, of the newly formed Bombay State, the system was totally stopped.

134. This naturally cultivated unrest among the tradition abiding Korkus who lost a means of a substantial earning. The Government, after careful consideration of their demand, again sanctioned extraction of *Khangī* by Korkus in Melghat vide Agricultural and Forest Department, Resolution No. TMR 1359/11/10898-E, dated 11th March 1963 with subsequent amendment vide, their letter No. TMR 1363/8112 (II)-E, dated 27th June 1963. Extraction of *Khangī* is at present governed by the following rules framed by the State Government in Revenue and Forests Department vide, their letter No. VMR-1364/167619-Y, dated 11th February 1965.

(i) Annual coupe should be divided into four sections for convenience and check on the exploitation work. After the exploitation of the material of depot specification is completed; that coupe should be thoroughly checked to ensure that the remnant is of the type fit to be given as '*khangī*' only.

(ii) '*Khangī*' will comprise of :—

- (a) Teak and tiwas poles upto 36 cm. girth.
- (b) *Aras* and *puttas* not exceeding 2.5 metres in length and 90 cm. in girth.
- (c) Dengris 30 cm. and 45 cm. in girth and under 2.5 Metres in length.

(iii) *Khangī* will be allowed to be removed by those persons who have worked in the coupe, in the proportion of work done, which would be one cart load or 0.85 M<sup>3</sup> per 10 M<sup>3</sup> of converted material for the forest villagers and 11.25 M<sup>3</sup> for other villagers or to person, if his attendance on the departmental works is for a period of 30 days in the case of forest villagers and 40 days in case of others.

(iv) The person should collect *khangī* material at the depot in the coupe set apart for it. Each piece will be given a special *khangī* hammer mark before removing it from the forest and this will be checked at the coupe depot at the time of final passing. The department will maintain a list of persons removing *khangī*. *Khangī* material should be measured after completion of fashioning at coupe depot and then passed for transport for Paratwada or other Government depots for sale.

(v) Separate ledger should be opened for each villager for maintaining an account of *khangī* material delivered at the sale depot. Loading, unloading and stacking of *khangī* should be done by the villagers themselves.

(vi) The material so collected at the sale depot should be auctioned by the Divisional Forest Officer or his assistant periodically at the time of the regular depot auctions after arranging it in separate lots. Sale-proceeds should be apportioned on 50 : 50 basis between the Government and the persons who extracted the *Khangī* timber. From the 50 per cent Government share, expenditure on account of sales, municipal and sales taxes etc. will be paid and remainder will be the royalty to be remitted into Government treasury.

135. Government in Revenue and Forests Department vide their resolution No. TMR-1364-167619-Y, dated 15th February 1965 have also sanctioned following staff for conducting sales of *khangī* :—

1. Range Forest Officer	..	..	..	..	..	One post
2. Forester	..	..	..	..	..	Do.
3. Forest Guards	..	..	..	..	..	Do.
4. Orderly Guard	..	..	..	..	..	Do.
5. Junior Clerk	..	..	..	..	..	Do.

136. The present *khangī* extraction method in fact, turns to be a form of departmental extraction. These sales are known as *khangī* sales in contrast to the sale of departmentally extracted timber, which the Korkus call depot sales.

137. This *khangī* system, if properly executed will ensure complete extraction of saleable material which otherwise would have remained in the coupe scattered for want of labour and uneconomical cost of extraction.

138. The details of *khangī* extracted and revenue realised during the last five years is given in appendix XI.

### III. EXPLOITATION BY DEPARTMENTAL AGENCY :

139. Departmental exploitation consists of felling, fashioning, rough conversion and extraction of timber. The work is conducted under departmental supervision by recruiting labour from *rayatwari* villages within the adjoining Melghat forests, paid generally on fixed job rates for felling, conversion and extraction to forest depots usually in the coupe.

140. From the forest depots, the timber is then transported by the fleet of departmental trucks to the established timber depots at Paratwada, Akot and Dharni. Sometimes transport of timber to sale depots is supplemented by private haulage contractors as the departmental trucks could not handle the entire material. In 1970, at the instance of Conservator of Forests, Amravati Circle, some quantity of timber was offered at Semadoh for auction which received a good response from the purchasers. A depot at Semadoh will be an ideal one. Being nearer to the exploitation sites, it will ensure complete extraction of the material before rains and eventually will command better price.

## MECHANISED LOGGING UNITS :

141. In order to introduce the improved logging techniques using modern and efficient logging tools and to mechanise the transport, two Mechanised Logging Units were created, one at Paratwada in 1962 and the other at Akot in 1964 to serve East Melghat division and West Melghat division respectively. The specific objects are:—

- (i) To increase the efficiency of logging and consequently the outturn and the utilisation percentage of timber and ultimately to maximise the money returns in the best interest of Government.
- (ii) To minimise the considerable wastage of valuable timber due to faulty logging techniques.
- (iii) To exploit timber from the difficult and remote locations and thus to increase the output.
- (iv) To increase the wage earning capacity of the individual forest labourer through greater output of works and thus to ameliorate his economic condition.

142. The setting up of each unit meant (i) purchase of basic and additional mechanised logging equipments, (ii) setting up of stores, work-shop for their maintenance, (iii) use of machinery in timber operations and (iv) maintenance of live-stock like elephants and bullocks etc.

143. Mechanisation in actual forest exploitation at present is confined to (i) use of basic logging equipments and power chain saws for felling of trees and conversion of timber, (ii) use of tractors and elephants for dragging of logs from forest to road-side depots, (iii) use of trucks for transport of logs to sale depots and (iv) use of workshop machinery for maintenance of these machines.

## PARATWADA MECHANIZED LOGGING UNIT :

144. The Mechanized Logging Unit at Paratwada was established in 1962.

145. Stores, machinery and buildings in the unit were set on fire during the riots broke out in August 1968 in connection with the agitation for establishment of Agriculture University in Vidarbha. Damage caused to this unit was estimated to be Rs. 7,22,110.

146. The Central Evaluation Unit under its Evaluation Report No. 44 detailed the working of this unit for the period from 1963-64 to 1967-68. The relevant findings are given below:—

147. *Equipments.*—The unit possesses the following equipments, machinery and buildings:—

1. Basic logging equipment	.. .. .	9 sets.
2. Power chain saws	.. .. .	32.
3. Tractors	.. .. .	7.
4. Trucks	.. .. .	17.
5. Jeep	.. .. .	1.
6. Elephant	.. .. .	4.
7. Workshop machinery	.. .. .	Various.
8. Buildings	.. .. .	Residential and non-residential.

148. The working of the unit was judged on the performance of the different constituents of the scheme viz. (a) Basic Logging Equipments, (b) Power chain saws, (c) Tractors, (d) Elephants and (e) Trucks.

149. *Basic Logging Equipments.*—The basic logging equipments contains cross-cut saws, felling and trimming axes, debarking spades, canthooks, wedges, bow saws etc. As the local labourer is illiterate and orthodox, he was reluctant to give up the use of traditional axes and adopt new implements. It was, therefore, necessary to introduce the use of these tools gradually. 3 sets of basic logging equipments were commissioned in the year 1963-64 and 6 sets in 1964-65. The use of these sets is at present restricted to teak. The average outturn per unit per day ranges from 4.26 M<sup>3</sup> to 18.51 M<sup>3</sup>. For the first two years the average outturn was low but in subsequent years, it had stepped up and was even more than the norms. The percentage of outturn handled by these equipments steadily increased from 13.19 M<sup>3</sup> in 1963-64 to 94.79 M<sup>3</sup> in 1967-68. It is thus apparent that the felling and cross cutting is now mostly done by the proper equipments.

150. *Power chain saws.*—12 power chain saws were purchased in 1963 and 20 power chain saws in 1967-68. These have been exclusively used for teak only. These saws work on petrol and are designed for working by a single operator. To start with, these saws were used for cross cutting and limbing only. Later on working with power chain saws was found to be difficult for want of spare chains. Outturn per unit per day was also below the norm.

151. *Tractors.*—The unit has 7 Massey Ferguson tractors with trailers. These were used for dragging of timber by use of draw bar attached to the hydraulic system. The average outturn for dragging was below the stipulated norm in all the years. During the period 1963-64 to 1967-68 the total number of days spent in timber dragging were 144. Dragging by tractors was not restricted to any particular type of timber. It was seen that financially introduction of tractors for dragging was quite successful as compared to elephant dragging.

152. *Trucks*.—Seventeen Leyland trucks chassis were purchased and bodies were built departmentally. These trucks were used for the haulage of timber from roadside jungle depots to sale depot. The outturn of work by trucks was above the norm up to 1966-67 and was ranging from 7.97 M<sup>3</sup> to 9.17 M<sup>3</sup> per day per unit. But in 1967-68 it had gone down to 6.53 M<sup>3</sup> per day per unit. The expenditure on haulage to Paratwada per M<sup>3</sup> was Rs. 42.02 during 1967-68. Nearly 63 per cent of total outturn of the division was transported by the trucks.

153. *Elephants*.—Four elephants were purchased under the scheme. These elephants worked along with 5 other elephants already working in the East Melghat division. The elephants were meant for dragging timber from difficult terrain where a tractor cannot work. When the elephants were not engaged on dragging they were employed for uprooting lantana. The outturn of dragging per day per elephant was 2.24 M<sup>3</sup> in 1967-68. Cost of dragging per M<sup>3</sup> of timber was fluctuating between Rs. 10.37 per M<sup>3</sup> in 1964-65 to Rs. 22.11 per M<sup>3</sup> in 1967-68. These elephants dragged 2 to 6 per cent of the total outturn of the division.

#### AKOT MECHANIZED LOGGING UNIT :

154. This unit was established in 1964-65 to serve the newly formed West Melghat division.

155. The Evaluation Report No. 45 prepared by the Central Evaluation Unit during 1971-72, gives the details of working of Akot Mechanized Logging Unit. The relevant findings of this report are given below:—

156. *Equipments*.—The unit possessed the following equipments and machinery:—

	Item	No.
1.	Basic logging equipments .. .. .	1 set.
2.	Power chain saws .. .. .	30
3.	Tractors .. .. .	5
4.	Trucks .. .. .	8
5.	Jeep .. .. .	1
6.	Elephant .. .. .	1
7.	Bullocks .. .. .	20
8.	Workshop machinery .. .. .	Various.
9.	Buildings .. .. .	Residential and non-residential.

157. The working of the different constituents of the unit were examined.

158. *Basic logging equipments*.—The use of these equipments is not on wide scale except the saws.

159. *Power chain saws*.—Fifteen power chain saws were received and put to use in the year 1967-68. The work done by these saws was just on experimental basis and to train the forest labour. The rate of working per chain saw per day worked to 2.62 M<sup>3</sup> which was 60 per cent of the norm of 4.3 M<sup>3</sup> per day per unit while the same was 0.19 M<sup>3</sup> per day per unit with 30 power chain saws during the year 1968-69.

160. *Tractors*.—In the year 1965-66 the average output of work for dragging as well as for other works was quite below the stipulated norm. It was only 0.44 M<sup>3</sup> per day per unit as against the norm of 14.3 M<sup>3</sup> per day per unit. The subsequent years recorded the slight increase in output but it appears to be quite casual. In 1968-69 the outturn was 4.31 M<sup>3</sup> per day per unit.

161. *Elephants*.—There is only one elephant working in this unit from 1966-67 and the outturn of work per day in that year was 2.42 M<sup>3</sup> which is above the norm, but in subsequent years it had gone down. The cost of dragging per M<sup>3</sup> was Rs. 33 in 1967-68 while the same had gone down to Rs. 21 in 1968-69.

162. *Bullocks*.—There are 10 pairs of bullocks, usually employed for dragging logs. In the year 1965-66 the rate of work per day per pair worked out to 1.19 M<sup>3</sup> but it had gone down later on as the bullocks were employed on other works such as ploughing, etc.

163. *Trucks*.—Eight trucks started functioning from 1967-68. The outturn per day per truck was above the norm and was more or less constant in successive years. It was 9.23 M<sup>3</sup> and 9.54 M<sup>3</sup> per day unit in 1965-66 and in 1968-69, respectively. The cost per M<sup>3</sup> varied from Rs. 20 in 1966-67 to Rs. 25 in 1968-69.

#### NORMS FOR VARIOUS EQUIPMENTS :

164. The Central Evaluation Unit while evaluating the working of Mechanised Logging Units adopted some norms for each equipment.

165. After the study of these units the Central Evaluation Unit has suggested another set of norm based on their actual performance. The existing and proposed norms are given under Table 5 :—

TABLE 5

Unit (1)	No. of working days in a year (2)	Existing Norm Outturn per unit		Proposed Norms Outturn per unit	
		Per year	Per day	Per year	Per day
		M <sup>3</sup> (3)	M <sup>3</sup> (4)	M <sup>3</sup> (5)	M <sup>3</sup> (6)
1. Power chain saw .. .. .	180	774	4.3	5.00	5.0
2. Elephant .. .. .	240	480	2.0	6.00	2.5
3. Tractor lead .. .. . 2 km. to 3 km.	240	3,432	14.3	2,760	11.5
4. Truck .. .. .	240	1,714	7.15	..	..
Lead					
121 to 175 km. .. .. .	..	..	..	1,200	5.0
61 to 120 km. .. .. .	..	..	..	1,560	6.5
below 60 km. .. .. .	..	..	..	2,400	10.0

#### GOVERNMENT TIMBER DEPOTS :

166. During the period of Stein's Plan the timber depots were established at Paratwada and Akot. Some timber was also sold from Chikhaldara and Akola depots for few years. During the period from 1935-36 to 1955-56, the average quantity of teak timber handled by these depots per year and revenue realised were as follows :—

TABLE 6

Depot (1)	Average yearly quantity of teak timber sold in (2)	Average yearly revenue realised (3)
	C.ft.	Rs.
1. Paratwada .. .. .	1,83,367	6,85,768
2. Akot .. .. .	29,388	31,033
3. Chikhaldara .. .. .	927	959
4. Akola .. .. .	19,690	24,104

167. During Sharma's Plan, Paratwada and Akot Depots continued to serve as main clearing depots for Government timber. On the eve of reorganisation of Administrative Units another timber depot was opened at Dharni in 1964 under the charge of Divisional Forest Officer, West Melghat division and the timber depot at Akot was also placed under his jurisdiction while Paratwada timber depot was kept under Divisional Forest Officer, East Melghat division. For the administrative convenience the timber depot at Paratwada was later on transferred to the Integrated Unit, Paratwada, from 1st April 1966.

168. At Paratwada Depot, material from both the divisions was received and auctioned while at Akot and Dharni Depots the material solely from West Melghat Division was received and sold.

#### IV. METHOD OF FELLING, CONVERSION AND EXTRACTION :

169. Usually marking is completed by rains. Felling of all marked trees is done in two stages while extraction of material is completed in three stages.

170. Fellings are 'depot felling' and 'final felling'. In 'depot felling' which starts in winter, only those trees, yielding timber to be sent to sale depots are felled, converted and extracted. Earlier the logs were being rough squared but later this practice was discontinued. After extraction of depot material, fellings of remaining trees are undertaken generally in the next winter. This is known as 'final felling'. Whatever material available for dispatch to sale depots from this felling is extracted and transported. Afterwards the whole coupe is thrown open for extraction under *khangt* which completes the extraction of all the timber.

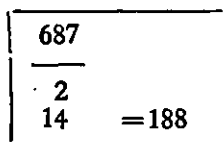
171. At present, felling of trees is with axe and saw ; conversion mainly with saw and dragging to the roadside depot with the help of tractors, bullocks or departmental elephants if the terrain is difficult. For the purpose of dragging, the department maintains 8 elephants in East Melghat division, and 4 elephants and 23 bullocks in West Melghat division. Transport is chiefly by the departmental trucks supplemented by the haulage contract.

172. For the purpose of making a rough estimate of volume of converted timber at the time of marking, the trees are classified into 'Sound' and 'Unsound' categories and outturn is estimated only for the 'Sound' class by using following volume factors given in the last plan.

Girth Class g. b. h. (o. b.)	Volume factor	
	Cm.	Cft. M <sup>3</sup>
25''—30'' (61—75)	.. .. .	4.7 0.133
31''—36'' (76—90)	.. .. .	7.2 0.203
37''—42'' (91—105)	.. .. .	11.2 0.316
43''—48'' (106—120)	.. .. .	14.1 0.399
49''—54'' (121—135)	.. .. .	20.6 0.582
Over 54'' (Over 135)	.. .. .	25.6 0.724

173. The estimation of volume was generally found lower than the actual production. The reason being that the whatever timber converted from the trees classed as 'unsound' was not accounted for and also the volume factor used for the estimation of volume was actually meant for when logs are to be rough squared. The practice of rough squaring logs was discontinued in the latter half of the plan period but these volume factors continued to be in use.

174. After felling, trees are fashioned and markings for logging are given by the staff on them. Before dispatch to sale depot the converted logs are measured and these measurements are embossed on the butt-end of the log along with the serial number of the tree and number of log of that tree as given below. Besides the butt-end of the log bears the mark of passing hammer.



Passing number mark

687  
— = 687 is the tree No. given at the time of marking and the figure 2 below this tree No. 2 indicates the second log of that tree.

14= The logs are measured in 15 cm. girth class starting from 45 cm. The last girth class being 180 cm. and above. Thus there are 8 girth classes. The length classes are 5, i.e., (i) under 2 m., (ii) 2 U 3 m., (iii) 3 U 4 m., (iv) 4 U 6 m. and (v) 6 m. and over. As such there are 40 categories of girth and length. For the convenience of easy working these categories have been serially numbered starting from lower girth class. Thus the serial No. 1 will indicate that the log is in 45 U 60 cm. girth class and its length is below 2 metres and No. 14 conveys that the said log is in 75 U 90 cm. girth class and in 4 U 6 m. length class.

This classification further facilitates arranging of lots in depots for sale.

188= Indicates volume in M<sup>3</sup> in fraction of 1000, i. e., the volume of the log is 188 M<sup>3</sup>.

175. The log on its arrival in the depot is given a serial number of depot receipt and its measurements are checked and actual girth and length are embossed on the butt, of course in different facsimile of digit as given below :—

7417  
19  
455 94  
251

7417 is the depot receipt number.  
19 is the girth class and length class category.  
455 is the length in cm.  
94 is the girth in cm.  
251 is the volume, i. e., 251 M<sup>3</sup>.



## V. COST OF EXPLOITATION :

176. The current rates for various works have increased considerably as compared to those prevailing during the early period of the plan under revision. These rates are given below:—

TABLE 7

Item	Rates in 1935-36	Rates in 1955-56	Rates in 1970-71
	Rs.	Rs.	Rs.
Daily wages—			
(i) Men .. .. .	0.25	1 to 1.25	2.75
(ii) Women .. .. .	0.19	0.50 to 0.60	2.20
Felling, Conversion and extraction to coupe depot ..	0.17 per cft.	0.41 per cft.	12.32 per M <sup>3</sup> .
Carting to road side depot .. .. .	0.01 per mile per cft.	0.12 per cft. per mile for the first 2 miles and Rs. 0.06 more per mile for every additional 3 miles or part thereof.	8.25 per M <sup>3</sup> for first km. and thereafter Rs. 2.09 per M <sup>3</sup> per km.

177. The rates sanctioned by the Wage Board for various forest operations in Melghat for the year 1970-71 are given under appendix XII.

178. The cost of exploitation works out to Rs. 122.30/M<sup>3</sup> and details are given under Table 8. It is based on the outturn and expenditure during 1970-71. The amount of annual instalment of depreciation on machineries, buildings, roads, etc., has not been, however, considered in the calculation of the cost of exploitation.

TABLE 8

Cost of exploitation per M<sup>3</sup>

Item	Amount	Total
	Rs.	Rs.
I. Direct cost —		
1. Demarcation .. .. .	0.24	
2. Enumeration .. .. .	0.34	
3. Geru marking .. .. .	0.42	
4. Recording .. .. .	0.68	
5. Felling, logging and fashioning .. .. .	11.02	
6. Dragging .. .. .	7.14	
7. Sharpening saws .. .. .	0.52	
8. Haulage to Paratwada (average lead 80 km.) .. .. .	29.75	50.11
II. Staff of Mechanised Logging Unit at Paratwada .. .. .	8.24	53.35
III. Exploitation staff .. .. .	4.37	62.72
IV. Other B1a expenditure .. .. .	27.80	90.52
V. Expenditure of 'B' Conservancy (excluding B1a) .. .. .	3.05	93.57
VI. Paratwada depot .. .. .	14.30	107.87
VII. 'C' Establishment (excluding Mechanised Logging Unit, exploitation staff and tendoo staff) .. .. .	14.43	122.30

## Section 5 : Past and current prices

179. The average prices obtained for teak timber for all girth and length classes combined together during the auctions at Paratwada, Akot and Dharni depots as given below indicate the prevailing trend in prices.

TABLE 9

Average Price of Teak Timber

Year	Obtained at		
	Paratwada Rs.	Akot Rs.	Dharni Rs.
1935-36 .. .. .	1-0-0 per cft. (35.31 per M <sup>3</sup> ).	0-13-11 per cft. (30.72 per M <sup>3</sup> ).	.. .. .
1940-41 .. .. .	0-15-2 per cft. (33.55 per M <sup>3</sup> ).	0-14-1 per cft. (30.72 per M <sup>3</sup> ).	.. .. .
1945-46 .. .. .	2-15-1 per cft. (103.82 per M <sup>3</sup> ).	2-4-10 per cft. (81.22 per M <sup>3</sup> ).	.. .. .
1950-51 .. .. .	5-11-10 per cft. (303.81 per M <sup>3</sup> ).	.. .. .	.. .. .
	East Melghat Division	West Melghat Division	
1966-67 .. .. .	376 per M <sup>3</sup>	362 per M <sup>3</sup>	284 per M <sup>3</sup>
1967-68 .. .. .	374 Do.	329 Do.	281 Do.
1968-69 .. .. .	360 Do.	377 Do.	344 Do.
1969-70 .. .. .	395 Do.	389 Do.	346 Do.
1970-71 .. .. .	438 Do.	441 Do.	441 Do.

180. Average price of various sizes of teak and other timber obtained during the recent auctions at Paratwada, Akot and Dharni depots are reproduced below :—

TABLE 10  
Average Price per M<sup>3</sup>

Girth in cm.	Length in M.			Paratwada depot auction during January 1972	Akot depot auction during December 1972	Dharni depot auction during January 1972	
(1)	(2)			(3)	(4)	(5)	
				Rs.	Rs.	Rs.	
<i>Teak logs quality II</i>							
45 U 60	..	..	..	U 2 .. ..	402.42	318.65	..
				2 U 3 .. ..	401.22	419.19	388.70
				3 U 4 .. ..	471.47	479.39	446.03
				4 U 6 .. ..	519.82	454.15	536.02
				6 & Up .. ..	582.02	531.39	544.15
60 U 75	..	..	..	U 2 .. ..	442.65	441.25	..
				2 U 3 .. ..	519.61	559.46	487.37
				3 U 4 .. ..	585.19	602.13	542.14
				4 U 6 .. ..	628.89	627.47	587.34
				6 & Up .. ..	673.59	539.56	585.15
75 U 90	..	..	..	U 2 .. ..	500.81	526.89	..
				2 U 3 .. ..	564.85	599.90	527.27
				3 U 4 .. ..	627.99	..	592.91
				4 U 6 .. ..	671.89	581.28	646.88
				6 & Up .. ..	679.67	..	629.44
90 U 105	..	..	..	U 2 .. ..	514.89	515.34	..
				2 U 3 .. ..	588.46	646.90	584.24
				3 U 4 .. ..	695.39	688.18	636.73
				4 U 6 .. ..	712.19	737.64	699.19
				6 & Up .. ..	735.29	..	691.93
105 U 120	..	..	..	U 2 .. ..	655.55	608.05	..
				2 U 3 .. ..	663.90	687.60	595.24
				3 U 4 .. ..	719.75	698.27	634.19
				4 U 6 .. ..	839.56	698.95	696.80
				6 & Up .. ..	874.81	..	631.00
120 U 135	..	..	..	U 2 .. ..	523.89	485.43	..
				2 U 3 .. ..	721.98	680.99	650.54
				3 U 4 .. ..	796.29	695.42	674.97
				4 U 6 .. ..	818.25	731.73	705.12
				6 & Up .. ..	..	..	..
135 U 150	..	..	..	U 2 .. ..	487.80	511.45	..
				2 U 3 .. ..	853.34	683.45	652.64
				3 U 4 .. ..	878.38	626.15	..
				4 U 6 .. ..	869.89	709.21	..
				6 & Up .. ..	883.98	..	750.35
150 & Up	..	..	..	U 2 .. ..	821.87	..	..
				2 U 3 .. ..	(June 71). 823.39	..	..
				3 U 4 .. ..	889.98	..	..
				4 U 6 .. ..	(June 71). 944.66	..	..
				6 & Up .. ..	..	..	775.02
<i>Saj Logs—</i>							
90 U 105	..	..	..	3 U 4 .. ..	176.89	..	184.80
				3 & Up .. ..	187.28	..	(All girth and length).
105 U 120	..	..	..	3 & Up .. ..	188.48	..	Classes combined.
120 U 135	..	..	..	3 U 4 .. ..	265.96	..	..
				3 & Up .. ..	218.23	..	..
135 U 150	..	..	..	4 U 6 .. ..	237.78	..	..
<i>Haldu Logs—</i>							
45 U 60	..	..	..	2 U 3 .. ..	197.17	..	..
				6 & Up .. ..	246.91	..	..
60 U 75	..	..	..	2 U 3 .. ..	218.72	..	..
				3 U 4 .. ..	214.34	..	..
				4 & Up .. ..	207.42	..	..
				6 & Up .. ..	250.50	..	..

TABLE 10—cont.

Girth in cm.	Length in M.			Paratwada depot auction during January 1972	Akot depot auction during December 1972	Dharni depot auction during January 1972
(1)	(2)			(3)	(4)	(5)
				Rs.	Rs.	Rs.
75 U 90	..	..	..	205.19	..	..
				224.78	..	..
90 U 105	..	..	..	232.56	..	..
				262.60	..	..
				274.91	..	..
				288.75	..	..
105 U 120	..	..	..	165.78	..	..
				312.17	..	..
				339.37	..	..
120 U 135	..	..	..	266.31	..	..
				371.01	..	..
				277.52	..	..
				331.37	..	..
135 U 150	..	..	..	264.59	..	..
				386.45	..	..
				284.56	..	..
				294.79	..	..
150 & Up	..	..	..	324.68	..	..
				342.87	..	..
				277.61	..	..
				346.37	..	..
				324.67	..	..
Teak ballies— per piece.	..	..	..	11.08 (May 71).	9.94 (1971).	6.12 (1971).
Adjat ballies per piece.	..	..	..	7.40 (1970).	..	3.55 (1970).

## CHAPTER IV : STAFF AND LABOUR SUPPLY

## Section 1 : Staff.

181. The Melghat forests were under the charge of the Deputy Commissioner of North Berar for administrative purposes when Melghat tahsil alongwith the rest of Berar came under British rule in 1883. The regular forest administration commenced with the appointment of Assistant Conservator of Forests for Berar in 1865, under the supervision of Conservator of Forests, Central Provinces. Even then the forests of Melghat continued to be under the charge of revenue officer known as Assistant Commissioner, Melghat till 1868 when a professionally trained forester Mr. Ballantyne was employed. With the appointment of a Deputy Conservator of Forests for the whole of Berar forest in 1869, the Assistant Commissioner, Melghat ceased to hold the charge of Melghat forests. In 1880, further reorganisation changes were effected and Elichpur division comprising entire Melghat forest came into existence. Subsequently, it was renamed as Melghat division in 1906. In 1938 the Melghat division was abolished and a new Amravati division was formed by adding Amravati and Morsi ranges of former Amravati division to Melghat forests, with headquarters at Amravati where the divisional staff and office used to stay while Divisional Forest Officers' headquarters was oscillating for 8 months during open season at Chikhaldara and for 4 months in rainy season at Amravati. This arrangement, was however, discontinued after 1952 and Divisional Forest Officer's headquarters were permanently shifted to Amravati.

182. The administrative set up has again undergone a change in 1964. East Melghat division, West Melghat division and independent Amravati Sub-division with headquarters at Amravati, Chikhaldara and Amravati respectively were formed on 1st April 1964 by splitting the existing Amravati division. Amravati Sub-division comprised of forests of Amravati district barring Melghat tahsil and 'C' class forests of Dhamangaon and Chichona-Nimkhera, while as the names suggest, East Melghat division contains forest east of a diagonal line passing through Melghat tahsil from south-east to north-west and forest west of this diagonal line forms West Melghat division. At the same time Integrated Unit At Paratwada was established and to this Unit Government timber depot at Paratwada was transferred from East Melghat division in 1966.

183. The Divisional Forest Officers are usually assisted by a Gazetted Officer. In the post war development period the activities of the department increased considerably. Besides, more and more forest areas which were hitherto inaccessible, were brought under working. Naturally the strength of staff has to increase to cope up with the pressure of work. In 1935 the strength of Range Forest Officers was only 4 while in 1955 it increased to 11 and at present it is 24 for both the divisions. The addition of Mechanised logging units, one in each division, caused a sudden spurt in the strength of staff in various categories.

184. The present strength of staff as on 1st April 1971 is given under Table 11 for each division and Appendix XIII enlists the names of Divisional Forest Officers who were in charge since 1880.

TABLE 11  
Strength of staff

Staff (1)	East Melghat division		West Melghat division	
	Permanent (2)	Temporary (3)	Permanent (4)	Temporary (5)
<i>Gazetted executive</i>				
1. Divisional Forest Officer .. .. .	1	..	1	..
2. Assistant Conservator of Forests .. .. .	1	1	..	3
3. Work-Shop Superintendent .. .. .	..	1	..	..
<i>Non-gazetted executive</i>				
4. Range Forest Officer .. .. .	6	5	4	9
5. Foresters .. .. .	25	13	31	22
6. Forest Guards .. .. .	71	22	85	74
7. Mahawats .. .. .	6	3	..	3
8. Characutter .. .. .	..	6	..	3
9. Surveyors .. .. .	..	2	..	2
10. Paid Vendors .. .. .	6	..	7	3
11. Orderly Guards .. .. .	..	3	..	..
<i>Ministerial</i>				
12. Head Clerk .. .. .	1	..	..	1
13. Sr. Accountant .. .. .	..	1	..	1
14. Jr. Accountant .. .. .	3	..	1	4
15. Jr. Clerk .. .. .	12	7	9	18
16. Daftari .. .. .	1	..	..	1

TABLE 11—*contd.*

	(1)	(2)	(3)	(4)	(5)
<i>Mechanical</i>					
17. Drivers (Truck)	.. .. .	.. .. .	23	..	17
18. Drivers (Tractor)	.. .. .	.. .. .	6	..	..
19. Drivers (Jeep)	.. .. .	.. .. .	1	..	..
20. Cleaners (Truck)	.. .. .	.. .. .	21	..	16
21. Cleaners (Tractor)	.. .. .	.. .. .	6	..	..
22. Mechanics	.. .. .	.. .. .	6	..	4
23. Drillers	.. .. .	.. .. .	1	..	1
24. Store-keeper	.. .. .	.. .. .	1	..	1
25. Welder	.. .. .	.. .. .	1	..	..
26. Leathman	.. .. .	.. .. .	1	..	..
27. Khalasi	.. .. .	.. .. .	1	..	..
28. Operator-Air Compressor	.. .. .	.. .. .	..	..	1
<i>Other staff</i>					
29. Choukidars	.. .. .	.. .. .	4	..	12
30. Peons	.. .. .	.. .. .	5	1	8
31. Orderly Peons	.. .. .	.. .. .	2	..	..
32. Dakrunners	.. .. .	.. .. .	2	..	4
33. Mullies	.. .. .	.. .. .	4	..	12
34. Waterman	.. .. .	.. .. .	1	..	..
35. Part-time Sweeper	.. .. .	.. .. .	1	..	..
<i>Dispensary staff</i>					
36. Assistant Medical Officer	.. .. .	.. .. .	..	1	..
37. Midwife	.. .. .	.. .. .	..	..	1
38. Compounder	.. .. .	.. .. .	..	..	1
39. Wardboy	.. .. .	.. .. .	..	..	1
40. Watchman	.. .. .	.. .. .	..	..	2

**Section 2 : Labour.**

185. The tract being very sparsely populated suffers from a chronic scarcity of labour. According to the census of 1961, the density of population in Melghat tahsil is only 18 per sq. km. The meagre population of the till recently forest villages, constitute the main labour supply for forest works. The density of population of these villages as compared with forest area is only 7.00 per sq. km. as given under Table 12.

TABLE 12  
*Forest Village Population*

Division	Range	No of populated villages	Population in 1969					Density per sq. km. of forest area (9)	
			Men	Womer	Boys	Girls	Total		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
East Melghat (1324.81 sq. km)	Jarida	.. .. .	36	1,501	1,491	1,738	1,641	6,371	..
	Raipur	.. .. .	10	424	454	526	525	1,929	..
	Semadoh	.. .. .	3	196	205	264	250	915	..
	Harisal	.. .. .	12	363	359	397	359	1,478	..
	Total	.. .. .	61	2,484	2,509	2,925	2,775	10,693	8.07
West Melghat (1,729.12 sq. km.)	Dharni	.. .. .	7	209	191	176	189	765	..
	Tarubanda	.. .. .	15	700	690	716	621	2,727	..
	Chikhaldara	.. .. .	23	940	952	1,108	956	3,956	..
	Akot	.. .. .	13	319	323	323	283	1,248	..
	Wan	.. .. .	7	309	300	267	218	1,094	..
	Dhulghat	.. .. .	7	255	233	217	180	885	..
Total	.. .. .	72	2,732	2,689	2,807	2,447	10,675	6.17	
(3,053.93 sq. km.)	.. Grand Total	.. .. .	133	5,216	5,198	5,732	5,222	21,368	7.00

186. Recently these forest villages are constituted as *rayatwari* villages and may not be now considered as a source of labour supply, as a forest villager, being a resident of a forest village, was under obligation to come on forest works, Appendix XIV lists these villages.

187. The residents of *rayatwari* villages in the adjacent tracts of Dharni-Bairagarh and Katkumbh also come for forest works in this division periodically, but they cannot be depended upon as they only come when they are free from their cultivation work or they have nothing better to do or in the years of failure of crop. Similarly, the whole village remains absent from forest work at the time of their important festivals like Holi, Pola and also community functions like marriages etc. Labour is mostly available from December to March every year when they camp in the forests. Labourers of Berar plains can find enough easy agricultural or other employment on better remunerations and also nearer to home. Further, they have a rooted aversion to staying in Melghat forests because of bad and cold climate. Besides, they are not used to forest works. There is, therefore, no hope to supplement the labour supply from Berar plains.

188. Korkus, who form the major part of the erstwhile forest village population, are honest, hardy and skilled forest workers but they have been accustomed to do independent trade in forest produce for generations till very recently. They are, therefore, generally averse to regular employment and consider forest works more of an obligation than a source of livelihood. They had little attachment to the soil and do not hesitate to forsake their homes and migrate to other villages if they are compelled to do more work than they think desirable. They also frequently abandon their villages for superstitious reasons. Their needs are so few and they are so lazy and unambitious that when they have enough for their immediate requirements they would stop working till their earnings are exhausted and the necessity compels them.

189. The residents of adjoining *rayatwari* villages are also mostly Korkus with similar habits. Their main attraction to come to Melghat forests is for obtaining timber and bamboos for trade in Berar plains. In their leisure, they usually come to these forests, oblige the forest staff by doing some works like road repairs, fire protection, climber cutting etc., and they collect bamboos and then cart it to the nearest markets on the weekly market days. Occasionally, however, they offer themselves for employment of felling trees, conversion and carting to departmental depots. Their main attraction is to become entitled for *Khangri* as stated in para 134. This work compromise has been a practice for a very long time. But now the labour is gradually being accustomed to depend more on wages earned by doing forest works than trade.

190. The position of labour supply in this area has been very unsatisfactory and is particularly so in the interior ranges of West Melghat division like Tarobanda, Akot where exploitation of a number of coupes in Belkund, Dhakna, Koha and Dhargarh F. S. have gone in arrears. Labour is available only for a short spell of time when they are free from their agricultural work to complete the forestry works. No large-scale plantations on regular basis could be undertaken as this work synchronises with the agricultural planting season. Availability of labour is, therefore, the foremost consideration before any work of forestry improvement of large magnitude can be embarked upon. The only possible solution is to organize a labour force by creating temporary labour camps in each centre of activity. Besides providing handsome wages to attract outside labour, such labour colonies should provide the basic facilities and amenities of life. More attention is, therefore, needed to this aspect now.

191. Melghat forests provide an ideal condition for introducing mechanisation in forestry works to reduce the pressure on manual labour. Although a start was made in 1962 in East Melghat division and in 1964 in West Melghat division by establishing Mechanical Logging Units, it reduces the labour load only on transport. The basic difficulty of getting labour for felling, conversion of timber, plantation etc. remained unsolved. The labour saving devices envisaged in the Mechanical Logging Unit are yet to be fully geared up. Considering the need of timely operations in forestry the mechanisation though appears to be costly in the beginning will be a proper step in right direction to take off the load of manual labour.

### Section 3: Forest Villages

192. *The Korku*.—An abstract of the details of the Korku tribe given in the Gazetteer (1968) of Amravati district, states that, Melghat is a scheduled area and the main Scheduled tribe is the Korku. Korkus are of Kolarian origin. In language and general type they are said to be identical with the *Kols* and *Santhals*. "The habits of the Korkus of the Tapti valley", says Forsyth, "are a great advance over their counterparts in Mahadeo hills farther east". The Korkus who first came to Berar found the Nihals in the possession of Melghat hills. Gradually, the latter caste lost their power and became the village drudges of the former. The Nihals are fast losing their language also, the younger generation speak Korku or Marathi. The Nihals were once much addicted to cattle lifting but of late have held this propensity in check. The Korkus are divided into the following classes—Marasi or Bhowavaya, Bavaria, Ruma and Bondoyas. They have also gotras and show that totemistic clan names are clothed in a Hindu respectability. According to Mr. Ballantyne, a forest officer, and Mr. Ward a missionary, who made detailed studies of the tribe, the Korkus are worshippers of Sun and Moon whom they regard as male and female deities. Their particular hopes and fears lie in the local deities nearer at hand like Donger gomaj (God of hills and forests), Kulla gomaj (God of the tiger), Mutiya gomaj (special village God), Hardoli gomaj (Cholera God), Mata gomaj (Goddess of small-pox) besides Pench gomaj, Kur gomaj and the Hindu God Hanuman. Many of these are but Korku names for deities adopted by low caste Hindus. The Hindu God Mahadeo tends more and more to fill the principal place in the Korku theogony. Their language is Korku but Hindi is also common. Their villages are built in two rows flanking a straight street and are placed half a mile or so away from the water

source. They are flesh eaters, stronger and stouter than the people of the plains. They surround their fields with bamboo matting or thorn fencing and scare away wild beasts with square crowns of rags and wood. They build high platforms in their fields with roofs called *malas* and live in them when crops are standing in fields. After threshing is over they return the corn to moneylenders in return for money at about 100 per cent to 150 per cent interest. The money lenders get the whole crop into their possession and the Korku seldom keeps more than a two or three months supply.

193. Outside the village, there is a hut with some painted logs thrust in the ground and these are their Gods. As a rule Korkus bury their dead.

#### MANAGEMENT OF FOREST VILLAGES :

194. The object of the establishment of the forest villages was to secure a supply of adequate and assured labour for various forestry operations. The residents of these villages were given cultivable land for their maintenance at a concessional rent and tagai for meeting their basic agricultural needs. They were also given several concessions and privileges regarding grazing and nistar. In return, each family in a forest village has to spare one labourer for any forestry operation on payment at the prescribed rates. The land in the forest villages was legally reserved forest owned by State Government. The holders had no proprietary rights over their lands and had to pay a rent of Re. 1 per holding in the Melghat. As the villagers were not having occupancy rights on their holdings they were denied the benefits of several schemes and assistance of improvement and development of their agriculture or their village etc. which were normally offered by Zilla Parishad and other Co-operative Credit Institutions. State Government, therefore, appointed a committee in 1965 to study this problem and announced their decision *vide* Revenue and Forests Department Resolution No. FLD-4267-1-Y, dated 22nd May 1967 as under :—

- (1) A special impartible and inalienable tenure should be created in respect of present holdings in Forest villages and the grant thereof should be made in favour of the existing recognised holders in these villages.
- (2) The forest villages should continue to be designated as forest villages.
- (3) Their administration should continue to be with the forest department.
- (4) Persons who are by race, caste and occupation habituated to extraction or handling of forest produce should alongwith their immediate families and dependents be admitted in forest villages.
- (5) The holders in these villages should continue to be responsible for provisions of labour on forestry works and for protection of forests.
- (6) The holders discharging their responsibilities in respect of protection of forest and provision of labour on forest works should be charged land revenue at concessional rates not exceeding the fair assessment determined under the provisions of Land Revenue Code and also continue to be given various other privileges and concessions as at present.
- (7) The holders in the forest villages should be given tagai and all other facilities available in Revenue villages but these should be administered by forest department.
- (8) In order to confer upon the present holders fixity of tenure, the lands held by them as lessees of Government on a temporary basis should be granted to them on permanent basis under the provisions of Maharashtra Land Revenue Code, 1966. The gaothans and cultivable lands in forest villages should be disforested and granted under the Land Revenue Code to the present recognised holders as Occupants Class II. The condition that the holders will continue to be responsible for provision of labour on forest works and for protection of forests, should be annexed to the grant of their lands.
- (9) The forest officers of different categories should be invested with powers of Revenue Officers as mentioned below for the areas covered by forest villages :—

Forest Guard	Talathi.
Divisional Forest Officer	Additional Collector.
Conservator of Forests	Additional Commissioner.

Circle inspectors and Tahsildars should exercise control on forest villages as in Revenue villages and for this purpose they should be subjected to the control of the Divisional Forest Officer in his capacity as Additional Collector. Appeals against orders of Conservator of Forests in his capacity as Additional Commissioner, will be with the State Government and Government will take decisions thereon in consultation with the Chief Conservator of Forests.

195. The resolution stated that the above decisions should be implemented after necessary rules are framed under the Maharashtra Land Revenue Code, 1966.

196. The forest villages in Melghat were all unsurveyed. Government has appointed a Special District Inspector of Land Records to complete the survey of cultivable lands and gaothans in 133 Forest villages in 1968. In order to facilitate the survey of these villages, the areas of these villages were temporarily disforested under various Government Notifications issued during 1969-70. On completion of survey a final notification showing exact areas to be disforested is to be issued. The survey of these villages has been completed in 1970 and the final notification for disforestation is under preparation.

197. During 1971 the Forest Officers in various grades have been appointed as Revenue Officers in appropriate categories in respect of these 133 villages. There is, thus, no doubt that the application of the land Revenue Code to the forest villages is going to put special responsibility on forest officers at all levels.

## CHAPTER V : PAST SYSTEMS OF MANAGEMENT

## Section 1 : General history of the forest.—

198. The Melghat *tahsil* along with the rest of Berar came under British rule in 1853 by assignation from the Nizam of Hyderabad. At that time, there was no forest administration in the tract and it was populated by aboriginal Korkus living in numerous scattered villages, whose principal means of livelihood were *dahya* cultivation and export of timber and bamboos to the Berar plains for sale. There is reason to believe that many of the areas now under forest were under cultivation and that the tract supported a larger population than at the present day. Space cannot be given in the report for a detailed account of the subsequent history, but a summary of the principal events showing the gradual growth of forest administration in the tract is as follows.

199. Soon after Berar came under the British rule, the importance of the Melghat forests began to be realised. In 1855 the Deputy Commissioner of North Berar reported the existence of teak in the hills within his district and recommended that fellings should be prohibited for some years in order that a final selection of the best tracts as special reserves could be made. In 1858 the Commissioner of Berar ordered that certain teak trees be selected and conserved for Government purposes in the Melghat forests, the selected trees were to be marked with red paint and were not to be felled by the local population. A small establishment costing Rs. 32-50 per month was sanctioned for the purpose and a report written in 1884 shows that over 12,900 teak trees had been selected and marked by 1862 within the limits of 14 villages where the best timber was believed to exist. It is interesting to note that these villages were situated in the area now comprising Semadoh range and part of Raipur range and which contains the best teak forests of the Melghat at the present day.

200. In 1860 the Government of India called the attention of the Resident at Hyderabad to the importance of the preservation of the teak forests of Berar and directed that rules be framed to effect this. Colonel Pearson, who was at the time Conservator of Forests of the Central Provinces, inspected the forest during 1863-64 and reported on the forests of Berar in accordance with the instructions of the Government of India. The instructions required Colonel Pearson to report firstly whether the forests, which were Government property, were worth preserving and secondly whether they could be managed by the Forest Department of the Central Provinces without undue additional expense. The report written by Colonel Pearson is of great interest as it contains the earliest existing description of the forest of the Melghat in addition to his conclusions and recommendations.

201. As a result of Colonel Pearson's recommendations, as Assistant Conservator of Forests with an establishment of his own was appointed for Berar, subject to the supervision of the Conservator of Forests of the Central Provinces in 1865. This appointment marks the commencement of regular forest administration in Berar and in the Melghat.

202. Despite the appointment of the Assistant Conservator of Forests, the forest of the Melghat continued to be under the revenue officer-in-charge of the tract, who was known as the Assistant Commissioner, Melghat, from 1865 to 1868. The first matter which received attention was the selection and demarcation of areas generally unsuitable for agriculture and suitable for reservation as Permanent State Forests and between 1865 and 1867, Captain Mackenzie, who was Assistant Commissioner, Melghat, at the time, demarcated as suitable for reservation an area of 425 square miles (1100.74 Sq. km.) which now forms the greater portion of the Bairagarh reserve. The remaining unalienated areas of the Melghat *tahsil* were regarded as unreserved forests. In 1866, teak, *tiwas* and *shisham* were reserved and indiscriminate felling of these species in the demarcated area was practically stopped. Uptill 1868, the major portion of the forest revenue was derived by leasing the rights to levy due at certain rates fixed by Government on all timber and bamboos exported from the forests to the Berar plains for sale, but in 1868 this practice was discontinued and replaced by the system of collecting dues by departmental agency at revenue stations, on forest produce exported from the forests for sale. Partly as a result of Colonel Pearson's suggestions and partly owing to Captain Mackenzie's enthusiasm, a forester trained in the Edinburgh School of Forestry, Mr. Ballantyne by name, was engaged for the purpose of forming teak plantations in the demarcated area. He joined his appointment in October 1868.

203. In 1869, the Conservator of Forests of the Central Provinces ceased to exercise a supervision over the forests of Berar and Deputy Conservator of Forests was appointed to the independent charge. With the appointment of the Deputy Conservator, the Assistant Commissioner, Melghat, ceased to hold charge of the forests of the Melghat. The Deputy Conservator was in direct charge of the northern of the two forests divisions into which Berar was divided at the time and which included the forests of the Melghat, and in addition supervised the Assistant Conservator who held charge of the southern division. In March, 1869 Sir Dietrich Brandis, who was then the Inspector-General of Forests, paid a visit to Berar and made suggestions for the future administration and management of the forests.

204. Sir Dietrich Brandis's visit to Berar bore speedy fruit. In 1871, the Berar Forest Rules were published. These defined the status of the forests and made prescriptions for their management and control. These prescriptions were in force until the Berar Forest Law was passed and rules were issued under that Law. In the Melghat, fire protection commenced near Raipur in 1870 and by 1872 it had been extended to the whole of the Bairagarh reserve; teak plantations were formed by Mr. Ballantyne over extensive areas formerly under cultivation in the valley of the Sipna river; the Bairagarh reserve was divided into 40 blocks for working purposes; cutting back of unsound teak commenced in the valley of the Sipna river and the cutting of bamboos was regulated. The general policy at the time was, however, to leave the Bairagarh reserve unworked and give it a



rest to recover from past ill-treatment, and to confine exploitation of timber to the unreserved forest in the Melghat tahsil and certain alienated areas. This policy naturally resulted in heavier fellings than before in the unreserved forests. In 1872, the first attempt of regulating felling was made by Mr. Drysdale, who was then Deputy Conservator of Forests of Berar, by dividing the unreserved forests into 15 blocks only one of which was to be opened annually for the felling of teak, *tiwasa* and *shisham*, though the felling of other species continued to be allowed in all the 15 blocks, and by regulating the cutting of bamboos.

205. These restrictions led to discontent among the population and gave rise to some apprehension that a considerable portion of the population would emigrate. To meet this situation, therefore, a tract of 300 square miles (777 km.) containing the best of the unreserved forests was selected and demarcated in 1876-77 as the Gugamal reserve and measures of protection including fire protection similar to measures that were in force in Bairagarh reserve were introduced in it, while the restrictions on fellings of timber and bamboos in the remaining unreserved forests were entirely withdrawn.

206. Sir Dietrich Brandis, the Inspector General of Forests, paid a second visit to Berar in 1877 and wrote a very interesting report containing a detailed description of the forests and his suggestions for their future administration. The Melghat taluqa at the time contained 725 square miles (1877.74 square km.) of reserved forest and 927 square miles (2400.92 square km.) of unreserved forest. The Inspector-General, in addition to making suggestions for the future management of the reserved forests gave his opinion, that apart from the prohibition of shifting cultivation, no other form of forest conservancy should be attempted in the unreserved forest, the felling of timber and bamboos and grazing should be permitted unrestricted, except for the payment of certain dues, and the extension of permanent cultivation should be permitted. This recommendation largely determined the policy adopted for the unreserved forests of the Melghat during the next thirty years. The chief burden of the demand for forest produce was thus thrown upon the unreserved forests and resulted in their over-exploitation.

207. As a result of another visit of the Inspector General and his suggestions, the reorganisation of the forest charges in Berar was effected in 1880 and the Ellichpur division, or the Melghat division as it was subsequently named in 1906, became a self-contained forest charge. A small area of unreserved forest in the vicinity of Chikhaldara was demarcated as reserve to provide for the requirements of the inhabitants of Chikhaldara for fire-wood and grass.

208. In 1883, Sir William Schlich, who was the Inspector-General of Forests at the time, paid a visit to the Melghat and made suggestions for the future management of the forests, in continuation of his predecessor's suggestions.

209. The Berar Forest Law was passed in 1886 and rules for the constitution and management of these various classes of State Forests were issued in 1892. The Bairagarh, Gugamal and Chikhaldara reserves were constituted as State Forest of class 'A' while the unreserved forests of the Melghat *tahsil* were included in class 'D' (Forests pending further classification).

210. After considerable discussion between the Revenue and Forests Departments, the forests included in class 'D' were reclassified in 1894. About 105 square miles (271.95 sq. km.) were classified as State Forests of class 'A' and added to the existing areas of Bairagarh, Gugamal and Chikhaldara reserves, or included in new reserve called the Kohana reserve; about 6 Sq. miles (15.53 sq. km.) were classified as State Forests of class 'B' and the balance was classified as State Forests of class 'C', Division III (forests in Melghat reserved for pasture).

211. 1894—1903.—The State Forests of classes 'A' and 'B' were under the charge of the Divisional Forest Officer but the State Forests of class 'C', Division III comprising the balance of the State Forests of the Melghat *tahsil* were managed under a system of dual control by the Deputy Commissioner of the district and the Divisional Forest Officer in-charge of the division. The Deputy Commissioner issued licences for felling, the concurrence of the Conservator being necessary in the case of certain trees, and in general, the Deputy Commissioner was the sanctioning authority for any acts done in the C III forests under the rules controlling their management. The Divisional Forest Officer was nominally the authority to see that the rules were enforced and that the concessions permitted in C III forests were not abused, but in practice, as he had no staff in the C III forests and has, therefore, no means of enforcing the rules, and as his attentions were becoming more and more taken up with the State Forest of classes 'A' and 'B' under his control, almost the only concern of the Divisional Forest Officer in C III forests was to collect dues in respect of the forest produce exported from them for sale. This collection was made at the revenue stations situated on the roads leading out from the Melghat to the plains. The dual system of control was not satisfactory, and the C III forests continued to bear the brunt of the demand for forest produce from the Melghat and to become more and more depleted of forest growth, but nothing was done to remedy matters except the transfer of certain areas of C III forests, aggregating 102 sq. miles (264.18 sq. km.) to State Forests of Class A in 1895, 1898 and 1903, these areas being added to the existing reserves of Bairagarh, Gugamal, Chikhaldara and Kohana. In 1892, 799 acres (323.34 hectares) of the Chikhaldara reserves were disforested to form the Chikhaldara civil station area.

212. In 1903, the Nizam of Hyderabad leased Berar to the Government of India in perpetuity in return for an annual rent. In consequence, Berar ceased to be under the administration of the Resident of Hyderabad and came under the administration of the Government of the Central Provinces, and the forests of Berar, including the forests of the Melghat, once again were combined with the forests of the Central Provinces for the purpose of forest administration.

213. By 1905, the C III forests of the Melghat *tahsil* had reached a stage where portions had been entirely depleted of forest growth and had been brought under cultivation, though certain portions still maintained a fair amount of forest growth.

214. In 1911, 370 sq. miles (953.30 sq. km.) of C III forest were disforested and brought under revenue settlement as the Dharni-Bairagarh, Katkumbh and Wastapur-Gaulkhera *rayatwari* tracts; and 320 sq. miles (828.80 sq. km.) of III forest were transferred to State Forests of class A. The transferred areas were either added to the existing Bairagarh reserve or included in the new reserve of Tapti, Chithri, Bod, Jhapnadeo, Dhulghat, Dabida, Wan, Rupagarh, Khirpani and Motha. In the same year, a new reserve called Chikhli was formed by the transfer of 8 sq. miles (20.72 sq. km.) of forest from Bairagarh reserve and 5 sq. miles (12.95 sq. km.) from Gugamal reserve, and readjustment in boundaries of the Jhapnadeo, Dhulghat, Rupagarh and Khirpani reserves was made by transferring certain areas aggregating 52 sq. miles (134.68 sq. km.) of Gugamal reserve. About 2 sq. miles (5.18 sq. km.) of Dhulghat and a small area of Khirpani reserve were also disforested.

215. In 1913, the State Forests of Berar were reclassified, class A and B forming the new A class and class C III division as C class. So far as the Melghat division was concerned, this reclassification chiefly affected the block of State Forest of Class B known as the Hattighat Ramna which became A class forest.

216. In 1914, 8 sq. miles (20.72 sq. km.) were afforested as A class and added to the Dhulghat reserve. After this afforestation the division consisted of 1,175 sq. miles (3043.24 sq. km.) of A class forest, all in the Melghat *tahsil*.

217. The changes which have been made in the area of the division since 1914 were the transfer of the Hattighat Ramna with an area of 3,592 acres (1453.63 ha.) to the Amravati division in 1917; the transfer of the Dhamangaon and Chichona-Nimkhera blocks of C class forest with areas of 2,035 acres (823.54 ha.) and 2,311 acres (935.23 ha.), respectively from the Amravati division in 1917; the afforestation and addition to the Tapti reserve in 1919 of 964 acres (390.12 ha.) of the Bhondilawa *rayatwari* village and the disforestation in 1928 of 188 acres (76.08 ha.) of Chikhaldara reserve to add to the Chikhaldara civil station area and 46 acres (18.61 ha.) of Chithri reserve to improve the boundary.

218. The greater part of the Dhulghat and Rupagarh reserves and the whole of the Wan and Dabida reserves were transferred to Akola division in 1925 for convenience of administration, but were handed back to the Melghat division in 1931, when Buldana division, for the sake of economy, was incorporated with the Akola division to form West Berar division.

219. With the introduction of Dunbar Brander's Working Plan in 1915, the forests were distributed between eight ranges, namely, Chikhaldara, Semadoh, Khandu, Butrum, Chaurakund, Gugamal, Khirpani and Dhulghat. In 1925, certain transfers took place between these eight ranges, and the Dhulghat range became part of Akola division. In 1931, the Dhulghat range was returned to the Melghat division. In 1932, further transfers took place between Chikhaldara, Gugamal and Khirpani ranges for convenience of management, and the Butrum range was abolished as a measure of economy, part of it going to Semadoh range and part to Khandu range. As a further measure of economy, the Dhulghat range was abolished in November 1938 and was merged with the Khirpani range.

220. In 1938, the Melghat division was abolished and the Melghat forest combined with two ranges, Amravati and Morsi of old Amravati division constituted the Amravati Forest division with headquarters at Amravati. Up to 1952 the headquarters of the Divisional Forest Officer were at Chikhaldara for eight months during the open season and at Amravati for four months in the rainy season although the Divisional Office continued to be at Amravati throughout the year. From 1952, this arrangement was discontinued and since then the Divisional Forest Officer's headquarter was permanently shifted to Amravati.

221. The increased activities during the 5-year plan periods intensive working of the forest and bringing hitherto inaccessible areas under working necessitated the change in the territorial limits of the division as the existing Amravati division was found unwieldy both in extent and work. Hence, under the Government of Maharashtra Agriculture, Food and Forest Department, Resolution No. FDM-1361/12464-III-J, dated 6th February 1964 it was divided into three administrative units, e.g., Independent Amravati Sub-division, East Melghat division and West Melghat division and these three units started functioning from 1st April 1964 with headquarters at Amravati. After a year, headquarters of the West Melghat division were shifted to Chikhaldara with the transfer of Chikhaldara round to West Melghat division. Now the East Melghat division consists of Jarida, Raipur, Semadoh and Harisal ranges while West Melghat division comprises of Chikhaldara, Tarobanda, Dharni, Akot, Wan and Dhulghat ranges and Dhamangaon and Chichona-Nimkhera 'C' Class forests. Amravati sub-division contains rest of the forests of Amravati district.

## Section 2: Past system of management and their result

### PERIOD BEFORE 1893:

222. Up till 1886, the management of the reserved forests was chiefly concerned with giving them a rest from past ill-treatment and with the introduction of protection, including fire protection. Improvement fellings to remove the large unsound teak of preservation days were carried out over a portion of Bairagarh reserve, principally the portion lying to the south of the Sipna river near Pilli, and between 1871 and 1883, 117,906

trees were felled. In 1887-88 and 1888-89, 1,000 first class teak, i.e., trees over 6 feet (180 cm.) in girth, were felled annually in the Raipur and Makhala blocks of the Bairagarh reserve under a working plan prepared by Colonel Van-Somereri, Conservator of Forests in Berar and which was based on a valuation survey. But this plan was cancelled in 1889, partly as the author of the plan had been too optimistic about the soundness of large teak, and partly as it was proposed to prepare a working plan to cover the whole of the Bairagarh and Gugamal reserves. Improvement fellings were then recommended and were carried out over 29,685 acres (12,013.10 ha.) in the Chaurakund, Semadoh and Butrum blocks of the Bairagarh reserve between 1889 and 1893.

#### BHAGSHAWE PLAN—1893—1915 :

223. A working plan covering the whole of Bairagarh and Gugamal reserves as then constituted was originally drawn up by Mr. Dickinson, Conservator of Forests in Berar, revised and completed by Bhagshawe his successor and introduced in 1893-94. Under this plan, four felling series were formed in the more valuable forests of the Bairagarh reserve, each felling series with twenty annual coupes to be worked under improvement fellings. Fellings other than selection fellings in forest village areas to meet the requirements of the villagers were not prescribed for the Gugamal reserves. Bamboo cutting was regulated in both reserves on a two year rotation, complete fire protection was prescribed for the entire area of the forests eradication of lantana and climber cutting were prescribed and grazing was confined to forest village cattle, the cattle of Chikalda and Wastapur and the cattle of exporters. Plantations were not considered necessary and therefore, not prescribed. The working of the first ten coupes prescribed in this plan was sanctioned, but as regular working had to be held in abeyance in 1901-02 and 1902-03 to admit of the exploitation of the large number of trees that had become top dry or had died owing to the draught of 1890—1900 and previous years, the ten years sanctioned working did not come an end until 1904-1905.

224. A preliminary working plan report was drawn up in 1901 by Williamson, Deputy Conservator of Forests, who was then in-charge of the division, with the object of revising Dickinson and Bagshawe's plan and introducing regular fellings in Gugamal reserve and other additional areas. The preliminary working plan report was not sanctioned, but as a result of it, one coupe of 684 acres (276.80 ha.) in Chikalda reserve in Chikhaldara range and one coupe of 567 acres (229.46 ha.) near Khatkali, now in Akot range were worked under the coppice with standards system between 1903 and 1909 and seven coupes, aggregating 11,320 acres (4581.04 ha.) in the Koha block of the present Tarobanda range, were partially worked under improvement fellings, between 1902 and 1909.

225. Sanction was obtained in 1905 to continue the prescription of Dickinson and Bagshawe's plan for another ten years. As a result of this plan, therefore, improvement fellings were carried out over the greater portion of the Bairagarh reserve during the period 1893-1894 to 1914-15.

#### GUGAMAL RESERVE WORKING SCHEME, 1910—15 :

226. A working scheme was introduced in 1910-11 under which Gugamal reserve was divided into six felling series, each with six annual coupes and the first five coupes in each felling series were worked under improvement fellings between 1910-11 and 1914-15.

#### TAPTI RESERVE WORKING SCHEME, 1912-15 :

227. In 1912-13 as a result of a visit of Mr. Hart, the Chief Conservator of Forests, fellings under the coppice with standards system were commenced in the newly created Tapti reserve. The reserve was divided into three felling series, and three coupes in each of these felling series were partially worked, according to the demand, under the coppice with standards system during the years 1912-13, 1913-14 and 1914-15.

#### DUNBAR BRANDER'S WORKING PLAN, 1915-16 TO 1935-36 :

228. A revised working plan covering the whole of the division prepared by Dunbar Brander, Deputy Conservator of Forests, who was then in-charge of the division was introduced with effect from 1st July 1915. This working plan divided the forests into four working circles, namely, the High forest, the coppice with standards, the unregulated and the Bamboo Working Circles.

229. The High Forest Working Circle consisted of the best forests considered suitable for eventual treatment as high forest. It covered the whole of the Bairagarh, Gugamal and Kohana reserves, a total area of 724 sq. miles (1875.15 sq. km.). It was divided into ten felling series each with twenty annual coupes, to be worked under improvement fellings. The fellings were carried out in two distinct stages, namely the felling of marketable trees by purchasers of rated passes, and the cutting back of unmarketable trees or cultural operations. The whole of the working circle was completely protected from fires, and coupes were closed to grazing for five years after working.

230. The coppice with Standards Working Circle consisted of the forests containing irregular pole growth and a large number of young teak pollards requiring replacement by coppice shoots as early as possible. It covered the whole of the Tapti reserve, and was divided into three felling series, each with twenty annual coupes which were worked under the coppice with standards system. As in the High Forest Working Circle, the fellings were carried out in two distinct stages. The whole working circle was completely fire protected and coupes were closed to grazing for ten years after working.

231. The Unregulated Working Circle consisted of all the remaining reserves of the division, a total area of 404 Sq. miles (1046.36 sq. km.), and was divided into 14 blocks or units of working. Regular fellings were not prescribed, but improvement fellings were permissible with the Conservator's sanction in Chandrabhaga, Memna and Khatkali blocks. The felling of green timber of species other than teak, *tivas*, *shisham* or *biga* was permitted in a part of Dhulghat block and the felling of green firewood was permitted in any block. Six blocks were completely fire protected, five blocks were protected by early burning and the remaining three blocks were not protected from fire.

232. The Bamboo Working Circle consisted of the best bamboo-bearing tracts and overlapped the other working circles. It was divided into sixteen felling series, eleven of which were worked under a felling cycle of three years and the remaining five under a cycle of two years.

233. In 1922-23, the Khatkali block of the Unregulated Working Circle was made into a felling series with twenty annual coupes and was added to the coppice with Standards Working Circle.

234. The amendment of certain prescriptions of Dunbar Brander's Plan became necessary by 1924-25 chiefly owing to alterations in range boundaries, the transfer of the four felling series of the coppice with Standards Working Circle to the High Forest Working Circle, change in the method of felling in the protected area of the felling series and the coupes having been found to be inconveniently large. Under the amended prescriptions, which were brought into force with effect from 1924-25 the coppice with Standards Working Circle was incorporated in the High Forest Working Circle and the latter was divided into twenty-seven felling series. Twenty-six felling series, contained twenty annual coupes each to be worked under improvement felling along felling series, containing the teak plantations in the valley of the Sipna river in Semadoh range and known as the Pili plantation felling series had five annual coupes to be worked under thinnings. Early burning was prescribed as the method of fire protection in such blocks of the Unregulated Working Circle as were fire protected. The number of felling series in the Bamboo Working Circle was increased to thirty-one of which seventeen were worked under a felling cycle of three years and fourteen under a felling cycle of two years.

235. In 1927-28, the Bamboo Working Circle was reorganised. The Pili plantation bamboo felling series, was omitted and the remaining thirty felling series were worked under a felling cycle of four years.

236. By the end of the period of Dunbar Brander's Plan, one cycle of light improvement fellings had passed over the greater portions of Bairagarh, Gugamal, Kohana, Tapti and Bod reserves during the twenty years 1915 to 1935, but owing to the rearrangement of felling series and coupes in 1924-25 certain areas were worked twice and a few areas were not worked at all. Certain areas in the Tapti reserve and in the Khatkali felling series in Gugamal reserves and the teak plantation areas in the valley of the Sipna river in Semadoh range had been worked, somewhat heavily, the former under the coppice with Standard System and the latter under two cycles of thinnings.

237. The improvement fellings in the High Forest Working Circle, greatly benefited the growing stock, especially in the more accessible coupes where it was possible to carry out through cultural operations. Many of the unsound trees, most of which belonged to the older age classes were removed the forests were not exploited to their full capacity, though since 1931-32 and with the introduction of departmental operations the fellings were distinctly heavier than earlier. On the whole, the result was the gradual building up of a large stock of sound, healthy, young or middle aged poles and trees.

238. The rest given to the forests of the Unregulated Working Circle is recorded as beneficial. The growing stock became denser, the percentage of teak increased, teak reproduction became abundant. Certain blocks, notably the Chandrabhaga and Memna blocks and parts of Popatkhera and Rupagarh blocks were considered fit for the introduction of regular working. The growing stock improved in parts of Chithri, Chikhali and Jhapnadeo blocks and much young pole growth of teak came in.

#### STEIN'S WORKING PLAN, 1935—1955 :

239. Dunbar Brander's Plan was revised by A. H. Stein, Deputy Conservator of Forests and this revised plan came into force on 1st July 1936. This plan was originally sanctioned for a period of ten years but was subsequently extended and it continued to be in force till 1955.

240. Under this plan, the whole of the forest, except Dhulghat, Wan, Dabida and part of Rupagarh block and two 'C' class blocks were divided into 1,086 compartments. These compartments were stockmapped and a detailed description of each was written.

241. Under this plan, the following four working circles were formed :—

1. Teak High Forest Working Circle, area 4,18,625 acres (1,69,411.68 hectares).
2. Coppice Working Circle, area 1,36,869 acres (55,388.97 hectares).
3. Miscellaneous Working Circle, area 2,04,600 acres (82,798.75 hectares).
4. Bamboo Working Circle—Overlapping the above.

242. *Teak High Forest Working Circle*.—Almost the whole of Bairagarh and Gugamal reserves were allotted to this Working Circle. The silvicultural system prescribed was "conversion to uniform forest" with a conversion rotation of 60 years. This period was divided into three periodic blocks of 20 years each. The compartments to be regenerated in the first 20 years formed periodic block I.

243. The following felling rules were prescribed for P.B.I. :—

A. Where established seedlings and samplings of teak were sufficient to ensure restocking—

(i) All teak, with the exception of groups of unsuppressed established advance growth and well grown poles up to 18 inches subsequently amended to 30 inches in girth which were considered fit for retention to form part of the new crop, was to be felled.

(ii) All trees of other species which were standing over or were close to teak reproduction were to be felled. In crops containing 70 per cent or more of teak and no bamboos, all well grown trees of other species between 12 inches (30 cm.) and 24 inches (60 cm.) girth were to be retained even when interfering with teak reproduction. When there was danger of frost, all miscellaneous species, especially *saj*, were usually to be retained even though interfering with teak.

(iii) Bamboos, the removal of which was necessary were to be cut.

B. Where established regeneration of teak was insufficient or absent.—

(i) In all teak forests of II quality and in teak forest of III quality where labour and funds permitted, the old crop was to be clearfelled and the area to be regenerated artificially.

(ii) In other forests only deteriorating and overmature trees were to be felled.

C. In areas of IVb teak and mixed forests where established reproduction of teak and *tivas* was adequate, conversion fellings on the lines prescribed under 'A' above could be carried out at the discretion of the Divisional Forest Officer, otherwise only deteriorating and over mature trees were to be felled.

D. Unworkable areas and steep slopes were ordinarily to be left untouched but the Divisional Forest Officer could permit the felling of deteriorating and overmature trees.

E. Frost areas.—Dominant trees of other species especially *saj* were to be retained. Teak was only to be felled if the over wood of the miscellaneous species was sufficient to protect the resultant teak coppice from frost.

244. In Harisal and Chaurakund felling series where incidence of frost damage was noticed to be the highest strip fellings were prescribed. The annual coupes consisted of a set of strips one chain wide and three chains apart in each of the five cutting sections by turn. These strips were to run from North-East to South-West, so that the new crop in any coupe would be protected from the morning sun for five years by the older trees standing to the South-East.

245. In periodic blocks II and III, the chief object of felling prescribed was to exploit mature and over-mature teak likely to deteriorate and to carry out thinnings. The minimum girth limits for fellings were different for the two P.Bs. and differed from quality to quality. This ranged from 2 feet (60 cm.) in quality IVb in P.B.III to 4½ft. (135 cm.) for quality II or III in P.B. II.

246. These prescriptions were revised in 1945 and in the revised prescriptions, the following work was prescribed in these P.Bs. :—

(i) Crown thinnings.

(ii) All dead and seriously diseased trees were to be felled.

(iii) Such mature trees as could not survive 20 years were to be felled.

(iv) Mature trees of miscellaneous species and those having a disproportionately large crown were to be felled in the interest of teak reproduction.

(v) Thinnings in young teak poles and samplings was to be heavy. Wherever well grown poles of other species were present, they were to be encouraged.

(vi) All malformed teak below 18" (45 cm.) girth was to be cut back wherever there was a reasonable chance of the resulting coppice developing free from suppression.

(vii) All climbers were to be cut.

247. The forests allotted to teak High Forest Working Circle, which had not been worked during Stein's Plan, contained generally young to middle aged teak crop with a few scattered old and mature teak trees, dense undergrowth of lantana and grasses and the natural regeneration of teak was very scanty. The inspection of P.B.I. areas, which had already been worked and the remaining areas not worked suggested that the condition of the crop in Stein's P.B.I. was also the same before working. Natural regeneration having been definitely deficient, there was hardly any area where the prescriptions of Stein's Plan given under (A) could be strictly applied. For a strict compliance of the prescriptions of the plan, therefore, the only recourse was either to clear-fell the stock and regenerate the areas artificially or remove only deteriorating and over mature trees as the plantations were not feasible because of acute labour shortage, and removal of only deteriorating and over mature teak trees could have been an economic failure. The prescriptions of Stein's Working Plan, therefore, did not suit the Melghat conditions, and were not strictly adhered to.

248. The resume of work done in the P.B.I. areas of this plan was as follows :—

249. In the first six or seven coupes of Stein's Plan, all well stocked teak patches were clearfelled and elsewhere marketable teak trees were felled and such other trees were removed which could interfere with teak coppice. In the subsequent coupes, clearfelling was abandoned and the system of working was a sort of selection fellings under which almost every teak tree above 30" (75 cm.) girth could be removed from the accessible areas.

250. This system of working involved a great deal of unjustified sacrifice of young and middle-aged trees putting on valuable increment. Besides, the gaps created in the canopy, specially by fellings in patches during the earlier years of the plan, encouraged the spread of dense undergrowth of lantana and grasses in the worked coupes.

251. No particular attention was paid to improvement fellings or thinnings in the remaining crop in the coupes. The cultural operations were badly neglected. The lantana was removed from the coupes, generally once for the convenience of marking and working but subsequently it was not kept down to help to establish whatever little regeneration was there.

252. The strip fellings were carried out in Harisal and Chaurakund felling series up to 1946 but as the method was very difficult to work and there was not particular advantage against frost damage, the prescriptions of the working plan for the P.B.I. areas of those two felling series were suspended. No work had been done in the P.B.I. areas of these felling series since, except for the removal of marketable teak here and there from the easily accessible areas of the unworked strips.

253. The compartments allotted to P. B. II and III were worked haphazardly till 1947 when work in these compartments was stopped because a number of P. B. I. coupes were in arrears. The compartments which were worked especially those near the roadsides, had very heavy fellings in them and the trees which should have been left for P.B.I. were removed. Improvement fellings and thinnings were carried out rather casually, the main object of working these areas apparently being to supplement the yield.

254. *Coppice Working Circle.*—Tapti, Chithri, Bod, Jhpnadeo, Chikhli and parts of Motha, Chikaldara, Khirpani and Rupagarh reserves were allotted to this working circle and the forests were generally situated near the market where small size timber and fuel are saleable. These forests were also not capable of growing big size teak because of poor soil and low rainfall. The preparation of teak in the growing stock was also generally comparatively small. The silvicultural system prescribed was coppice with reserve. The coppice shoots of the felled trees were to be the chief method of replacing the crop.

255. Generally speaking this system was suitable in view of the condition of the forest and the demand. Most of the worked areas were now well stocked with well grown young poles of teak. There were, however, large areas where this system was not suitable due to the following reasons.

1. The country is too steep, and the stocking is open with the result that the replacement of crop with coppice is not certain.

2. There is practically no demand for small size timber.

256. *Bamboo Working Circle.*—The exploitation of bamboos was generally done from bamboo coupes of the year on rated passes except for a few roadside felling series in Gugamal, Sembadoh and Chaurakund ranges, where the coupes were auctioned. This auction of bamboo coupes diverted the labour to the contractors, therefore, it had been stopped subsequently.

257. The clumps were very irregularly worked as they were left to the mercy of rated pass holders.

258. *Miscellaneous Working Circle.*—Forests which were unworkable due to poor quality or stocking, remoteness of inaccessibility, forest village areas and 'C' class forests were allotted to this working circle. No work was done in these forests except removal of bamboos and firewood on rated passes.

259. In spite of the long rest given to these forests they have not improved enough to be put under working still. One of the important reasons for the slow progress must be the fires which occur frequently in these areas. These forests are very sparsely populated and with the abolition of Dhulghat range most of the area allotted to this working circle was neglected, specially so far as fire protection was concerned.

#### SHARMA'S WORKING PLAN, 1956—1974 (Under revision):

260. Stein's Plan was revised by D. C. Sharma, Deputy Conservator of Forests and was introduced in 1956.

261. This Working Plan covered the whole of the forest area in Melghat but prescribed working only for those forests which were practically under working during Stein's Plan. The whole of Dulghat, Dabida Wan, part of Rupagarh Reserves and 'C' class forests were allowed rest by grouping them under Miscellaneous Working Circle. The stockmapping of the remaining forest area which was divided into 1086 compartments was revised and fresh stockmaps were prepared showing teak forest with quality, mixed forest, unworkable areas and frost liable areas. The description of these forests were written in detail for each compartments Occurrence of lantana was also indicated.

262. The following Working Circles were formed:—

Working Circle	Area	
	Acres	Hectares
1. Selection .. .. .	4,38,885	1,77,610.61
2. Coppice with Reserve .. .. .	1,25,237	50,681.66
3. Miscellaneous .. .. .	1,51,066	61,134.20
4. Protection .. .. .	44,895	18,168.38
5. Rusa Grass .. .. .	Overlapping the above Working Circles.	
6. Bamboo .. .. .	Overlapping the above Working Circles.	
Total ..	7,60,083	3,07,594.94

263. *Selection Working Circle*.—All the good quality teak bearing forests were allotted to this working circle. Selection system was prescribed treating teak, *haldu*, *bija*, *shisham*, *saj* and *tiwas* alike. Felling cycle was 20 years. Yield was regulated by area. Exploitable girth was 4½' (135 cm.) in good quality teak forest and 4' (120 cm.) in comparatively poorer quality teak forest. The coupe was completely protected against fire for 5 years and grazing closure was 3 years from the years of main felling.

264. Stump analysis of 223 stumps of teak trees was carried out. Out of these, 163 stumps were of mature trees growing in open and showed a faster rate of growth than those remaining 60 stumps which were selected in forests having average stocking. At the age of 80 years, the diameter growth over bark at breast height was 20.7" (52.57 cm.) and 14.3" (36.32 cm.) respectively, as computed from these two sets of readings. Besides, local volume tables were prepared. For the first time 5 per cent enumerations were carried out in good quality forest. Teak, *saj*, *dhaora*, *tiwas*, *bija*, *shisham*, *salai*, *haldu* and bamboo clumps were enumerated separately while remaining species were grouped under 'Miscellaneous'. The total growing stock of teak above 25" (63.5 cm.) girth class as indicated by the enumeration was 235 cft. (6.654 M<sup>3</sup>) per acre.

265. The method of treatment aimed at the production of big sized timber. The natural regeneration and advance growth of teak wherever present was to be helped to grow up and it was to be supplemented by as much planting as possible. The areas liable to frost damage were to be approached cautiously.

266. Before marking all teak trees above 42" (105 cm.) in girth at b. h. in good quality felling series and above 36" (90 cm.) in girth at b. h. in poor quality felling series were to be enumerated in 6" (15 cm.) girth class and to be classified into classes I, II, III and IV based on outturn they would yield.

267. The following rules were prescribed:—

(1) 25 per cent of the enumerated teak trees above the exploitable girth were to be reserved from class I and if needed from class II. The remaining 75 per cent teak trees, *haldu* and *saja* were to be felled.

(2) All teak trees of class I, II and III of girth class below the exploitable girth were to be reserved. Trees of class III if growing 5' (1.52 m.) of a reserved tree and of class IV of this girth class could be felled, provided the stocking was not reduced below 0.5.

(3) Thinnings were to be done in lower girth classes.

(4) Suppressed trees of girth below the reserved girth class were to be felled if saleable and trees of class III and IV were to be felled provided these were not required to maintain the minimum stocking of 0.5.

(5) Compact groups of natural regeneration of area not exceeding ½ acre (0.2 ha.) were to be opened out by removing overwood. Established suppressed advance growth were to be cut back.

(6) In lower storey, *satkata* species were to be retained to suppress grass and lantana.

(7) Teak plantation over 40 acres (16 ha.) in the beginning and thereafter on increasing scale were to be carried out.

268. Since their reservation, the forests allotted to this working circle were worked under improvement fellings till the introduction of Stein's plan when a conversion to uniform forest system was attempted, for a brief period of about 7 years. Thereafter, these prescriptions were modified and forests were worked under a sort of selection system under which anything above 3' (90 cm.) in girth could be removed. Sharma, while continuing this method of working for these forests adopted a higher girth limit for exploitation and tried to build up the growing stock in all girth classes by prescribing 25 per cent reservations of trees in the exploitable girth class and placing restrictions on fellings in lower girth classes so much so that even an embargo was placed on the removal of suppressed trees. The safe-guards prescribed for maintaining the stocking density, further restricted the removal of trees even though belonging to class IV, *i.e.* unsound trees having no utilizable timber.

269. These safe-guards in practice were, however, difficult to implement. The advance growth which was to be cut back in the compact groups of natural regeneration was not clearly defined. Subsidiary cultural operations were not prescribed at all and no adequate attention was given to encourage the regeneration. Main coupes were left to nature's care after the main working.

270. Reservation of 25 per cent of trees of exploitable girth was not a sound economical proposition. A teak tree of 135 cm. (exploitable girth) having a volume of .700 M<sup>3</sup> fetches Rs. 400. If it is held back further 20 years its volume would increase to .780 M<sup>3</sup> and would fetch Rs. 455 thus showing an increase of Rs. 55 only over the original value of Rs. 400. This increase of Rs. 55 in 20 years corresponds to a compound interest rate of 0.6 per cent. Even at a very low rate of interest of 3 per cent Rs. 400 if invested today would be Rs. 722 twenty years later and at 6 per cent the amount would swell to Rs. 1,283. Thus, every tree so reserved has caused a loss of Rs. 828 besides suppressing young trees due to its large crown. Their retention cannot thus be justified at least now.

271. The execution of these rules was also found rather defective. It appears that the emphasis was more on marking trees for revenue as trees even belonging to the sanctuary class were found removed probably either under the pretext of thinning or freeing the reproduction. Teak plantations though suggested, were not carried out. The prescription for freeing the natural regeneration remained only on paper.

272. Though these prescriptions helped in building up the teak growing stock, the teak reproduction suffered very badly as no particular attention was paid to encourage the same. However, in general, considering the prevailing condition in Melghat the rules prescribed in Sharma's Plan with minor exceptions were suitable as these were essentially in the nature of a compromise between the requirements of forests and the acute scarcity of labour.



273. *Coppice with Reserves Working Circle*.—The Working Circle contained the remaining comparatively poorer teak forest as was in Stein's Plan. Teak and *tivas* were to be favoured. A rotation of 40 years was fixed with reference to the growth of teak. Fire protection and grazing closure were prescribed for 5 years from the main felling. The felling rules were:—

(A) Fully stocked (density 0.75 and above) areas were to be clearfelled with the following exceptions:—

(i) Groups of well grown unsuppressed saplings and poles up to 18 inches (45 cm.) in girth.

(ii) A strip of trees about 20 feet (6 metres) along roads, rivers and streams.

(iii) The fruit bearing trees.

(iv) In frost liable areas and areas with dense undergrowth of lantana only dead trees and teak trees above 4 feet (120 cm.) girth were to be removed.

(B) In areas with density 0.6 to 0.7, improvement fellings were to be carried out. Teak trees above 4' (120 cms.) girth at b. h. might be felled. Young congested groups of teak and *tivas* were to be thinned.

(C) Only teak trees of 4' (120 cms.) girth might be felled from areas with density below 0.6 and steep slopes liable for erosion.

(D) Bamboos likely to interfere with the coppice shoots might be cut out.

274. Areas suitable for clearfelling being negligible, the working in the most of forest areas resembled to the selection-*cum*-improvement fellings.

275. The young crop was to be kept clear of the climber and lantana for five years after the main felling. Similarly, the cleaning and thinning operations were prescribed at the 11th year of main felling in teak areas. But these prescriptions probably could not be carried out simply because of labour shortage. Available labour being diverted to other operations as the Divisional Forest Officer was allowed to use his discretion regarding their implementation.

276. The forests allotted to this Working Circle have undergone one complete rotation either under coppice with standards system or coppice with reserve system. The C. W. R. system is found ideally suited as the forests adjoin the cultivated plain having demand for firewood, some demand for small timber and most of the forest is capable of growing only small timber.

277. *Miscellaneous Working Circle*.—This working circle included the remaining minor forest and the two blocks of 'C' class forests. These forests were frequently subjected to fires. Hence only fire protection measures were prescribed. Irregular exploitation, however, was allowed at the discretion of the Divisional Forest Officer. The 'C' class forests were to be maintained as grazing grounds.

278. The condition of the forest, though it was allowed rest for a considerable period, did not improve much mostly owing to the unchecked fires which usually found to sweep over large areas once they break out. However, in 1961 part of these forests in pockets were brought under regular working with the introduction of the Working Scheme by Bhatena, in which coppice with reserve system was introduced.

279. *Protection Working Circle*.—The upper precipitous and very steep slopes of the main ridge of Gawilgarh hills were included in this working circle. As these forests were to be maintained for the indirect benefits, no regular working was prescribed.

280. *Bamboos Working Circle*.—This was an overlapping working circle containing bamboo bearing forests of other working circles. In all 36 cutting series were formed with a cutting cycle of 4 years and bamboos were to be exploited only on rated passes. Simple bamboo felling rules were prescribed.

281. In 1969, this working circle was reconstituted on cutting cycle of 3 years and 19 felling series were formed to cover the areas of both the divisions.

282. Though the bamboo felling rules were simple, it was found impossible to enforce these strictly except in areas allotted to the paper mill as the exploitation was diffused on rated pass.

283. *Rusa Grass Working Circle*.—All the rusa grass area overlapping other working circle was allotted to this working circle and was mostly confined to Chikhaldara, Akot, Wan and Dhulghat ranges. With the object of allowing the grass to seed once in 4 years, the forests were divided into 4 cutting sections. Each cutting section would be given rest for one year after 3 years of exploitation in rotation. Rusa grass plantations over 5 acres (2 ha.) in each range every year were prescribed.

284. Old plantations which were carried out near Bihali were abandoned after their exploitation. After a gap of few years, fresh plantations of rusa grass were carried out near Barukheda in Wan range from 1965. But no departmental distillation was done.

#### BHATHENA'S WORKING SCHEME, 1961—1974 (UNDER REVISION):

285. With a view to start a systematic management in areas of Miscellaneous Working Circle of Sharma's plan, this working scheme was prepared and introduced in 1961. It covers all those forests which were not brought under regular management in Sharma's Plan and included Dabida, Dhulghat and Wan reserves and part of forests were divided into 178 compartments which were numbered serially from 1087 to 1264 in continuation to the compartment numbers given in Sharma's Plan. No stockmaps, however, were prepared.



286. Having limited objects, this Working Scheme contained only two working circles as below :—

- (i) Coppice with Reserves Working Circle area-54482 acres (22010.7 ha.)
- (ii) Miscellaneous Working Circle area-69324 acres (28006.9 ha.)

287. *Coppice with Reserve Working Circle*.—All exploitable teak forest found in this tract was allotted to this working circle. The general quality is IVb. To suit the condition of forest, the coppice with reserves system was adopted. Teak was the principal species while *tiwasa*, *semal*, *ain* and *salai* were to be favoured in the same order. The forest being of inferior quality, teak was not expected to attain size more than 2' (60 cm.) in girth at b. h. over a greater portion of the forest. The stump analysis carried out, indicated that the 2' (60 cm.) girth at b. h. is attained at the age of 41 years. Hence a rotation of 40 years was adopted. Yield was regulated by areas by laying out 40 approximately equiproductive coupes. Felling rules were :—

1. Dead, dying and overmatured trees were to be felled from the unworkable and protection areas.
2. Dense patches of well grown poles were to be thinned.
3. Improvement fellings were to be carried out in areas having density 0.5 to 0.7.
4. In *salai* forest teak reproduction were to be freed.
5. The remaining areas were to be clearfelled with the exception of well grown advance growth.
6. All climbers were to be cut.
7. Teak plantations were to be carried out on suitable sites.

288. Cleanings were prescribed in the 6th year and thinnings were to be carried out in the 11th year and another in the 21st year of main working.

289. Introduction of Bhathena's Working Scheme marked the beginning of systematic working in these forests since their reservation. The tract is dry and soil is very poor. In spite of the long period of rest, the forest has not shown any striking improvement except that in valleys and shaded localities teak is found encroaching. Similarly, the tract being sparsely populated there is very little demand for the timber and firewood. As such, these prescriptions did not suit the forests. Most of the coupes remained in arrear either being unworkable or very little material was available for extraction. The prescription of carrying out the teak plantation in each coupe, was not implemented. The forests in fact need further rest and strict protection from fire. This period of rest to be utilised to nurse and encourage the valuable existing growth.

290. *Miscellaneous Working Circle*.—The remaining forests were included in this working circle and because of the poor condition of forest, no regular working was prescribed. To improve the stocking of these forests, adequate protection from fire was suggested.

### Section 3: Special Works of Improvement

#### FIRE PROTECTION :

291. Fire protection was introduced in 1870 in the Raipur block of the Biaragarh reserve and by 1872 had been extended to the whole of that reserve. It was commenced in the Gugamal reserve when this reserved in 1876, and was extended in other forests as they were reserved up to 1903. In the reserves created out of C-III forests in 1911, fire protection was introduced gradually to enable the surrounding population to become accustomed to the new restrictions, first in the Tapti reserve in 1911 and subsequently in the Bod, Chithri, Chikhli and Motha reserve in 1914.

292. After the introduction of Dunbar Brander's Plan in 1915, the whole of the High Forest and Coppice with Standards Working Circle and the Chikhali, Hattighat, Mothza, Chandrabhaga, Memna and Dabida blocks of the unregulated Working Circle were under rigid fire protection, while the Chithri, Jhapnadeo, Dahigaon, Popatkhera and Khatkali blocks were protected by early burning and the Rupagarh, Wan and Dhulghat blocks were not protected owing to the poor quality of the forests.

293. As rigid fire protection was costly, it was replaced by early burning over large portion of the tract in 1921-22 and 1922-23, and over the whole of the area in 1923-24 and subsequent years up to 1930-31. The system of early burning should have been stopped from 1927-28 onwards in accordance with the amended fire protection rules issued for the Central Provinces and Berar in 1927-28 as a result of the Conservators Conference of 1926, but as the rules were not properly understood, early burning continued in practice in the Melghat till 1930-31.

294. From 1931-32, early burning was stopped and standard fire protection system as given under paragraph 89 of the M. P. Forest Manual was introduced in Melghat.

295. Under Sharma's Plan, the whole of the tract with the exception of two blocks of 'C' class forest, was completely protected from fire as laid down in paragraph 89 of the M. P. Forest Manual Vol. I.

296. During the period of Stein's plan, the percentage of area protected from fire ranged from 85 to 98 while during Sharma's plan period, the range of success is from 77% to 99.9% as given under Table 13.

TABLE 13  
Fire Protection

Year (1)	Area in sq. km.		Percentage of success (4)	No. of cases of fire (5)	Total cost of fire Protection (6)	Cost of fire protection per sq. km. (7)
	Attempted (2)	Protected (3)				
(A) MELGHAT DIVISION						Rs.
1953-54	..	..	..	..	..	..
1953-54	..	..	..	..	..	..
1954-55	..	..	..	..	..	..
1954-55	..	..	..	..	..	..
1955-56	..	..	..	..	..	..
1955-56	..	..	..	..	..	..
1956-57	..	..	..	..	..	..
1956-57	..	..	..	..	..	..
1957-58	..	..	..	..	..	..
1957-58	..	..	..	..	..	..
1958-59	..	..	..	..	..	..
1958-59	..	..	..	..	..	..
1959-60	..	..	..	..	..	..
1959-60	..	..	..	..	..	..
1960-61	..	..	..	..	..	..
1960-61	..	..	..	..	..	..
1961-62	..	..	..	..	..	..
1961-62	..	..	..	..	..	..
1962-63	..	..	..	..	..	..
1962-63	..	..	..	..	..	..
1963-64	..	..	..	..	..	..
1963-64	..	..	..	..	..	..
(B) EAST MELGHAT DIVISION						Rs.
1964-65	..	..	..	..	..	..
1964-65	..	..	..	..	..	..
1965-66	..	..	..	..	..	..
1965-66	..	..	..	..	..	..
1966-67	..	..	..	..	..	..
1966-67	..	..	..	..	..	..
1967-68	..	..	..	..	..	..
1967-68	..	..	..	..	..	..
1968-69	..	..	..	..	..	..
1968-69	..	..	..	..	..	..
1969-70	..	..	..	..	..	..
1969-70	..	..	..	..	..	..
1970-71	..	..	..	..	..	..
1970-71	..	..	..	..	..	..
1971-72	..	..	..	..	..	..
1971-72	..	..	..	..	..	..
(C) WEST MELGHAT DIVISION						Rs.
1964-65	..	..	..	..	..	..
1964-65	..	..	..	..	..	..
1965-66	..	..	..	..	..	..
1965-66	..	..	..	..	..	..
1966-67	..	..	..	..	..	..
1966-67	..	..	..	..	..	..
1967-68	..	..	..	..	..	..
1967-68	..	..	..	..	..	..
1968-69	..	..	..	..	..	..
1968-69	..	..	..	..	..	..
1969-70	..	..	..	..	..	..
1969-70	..	..	..	..	..	..
1970-71	..	..	..	..	..	..
1970-71	..	..	..	..	..	..
1971-72	..	..	..	..	..	..
1971-72	..	..	..	..	..	..

ESTABLISHMENT OF WIRELESS STATIONS IN MELGHAT FORESTS :

297. Due to the undulating configuration of the tract, the fire aided by high winds during summer, spreads very swiftly sweeping large areas in a short time. A quick communication system to combat the fire menace was considered necessary and a scheme under the five-year plan was prepared for establishing wireless stations in the Melghat. Much of the progress has been made regarding purchase of equipment and accessories and it is expected that the scheme will start functioning very soon.

298. Government of Maharashtra in Revenue and Forests Department decided in 1967 to set up wireless communications in the Melghat forest where there are no telephonic or telegraphic communications to carry out protection effectively of these forests from fire and illicit cuttings. Accordingly, it has been decided to establish, maintain and work wireless stations as follows :—

Location	Fixed/Mobile	No. of Stations
Semadoh, Raipur, Jarida and Harisal in East Melghat Division	Fixed	6
Chikhaldara and Tarobanda in West Melghat Division ..	.. Mobile	3

299. The Wireless Adviser to Government of India, New Delhi, has allotted frequency of 77.05 M c/s and 77.3 M c/s to this department. The details of the wireless stations are as below :—

TABLE 14

Place	Latitude	Longitude	Height of antenna mast from ground level	Height of site above Mean seal level	Ultimate power
(1)	(2)	(3)	(4)	(5)	(6)
			M.	M.	
1. Chikalda .. .. .	21°6'20"N	77°22'22"E	3	1,092.7	50 Watts
2. Sembadoh .. .. .	21°30'16"N	77°19'18"E	30.5	510.8	50 Watts
3. Raipur .. .. .	21°34'3"N	77°18'42"E	30.5	536.4	50 Watts
4. Jarida .. .. .	21°38'20"N	77°29'6"E	30.5	574.8	50 Watts
5. Harisal .. .. .	21°32'8"N	77° 8'40"E	30.5	422.1	50 Watts
6. Tarubanda .. .. .	21°28'00"N	77°11'45"E	30.5	313.9	50 Watts

300. Assistant Wireless Adviser to the Government of India, Department of Communication (W. P. C. Wing), in 1969, has granted permission to pass administrative type of traffic over the proposed VHF Link-work initially for a period of one year with condition that this will be reviewed thereafter in the light of the prevailing land line public communications facilities in that area for which the department was advised to keep in touch with the P. M. G. of the area. The Secretary, Standing Advisory Committee on Radio Frequency Allocation Monitoring Station, Gorai Road, Borivali, Bombay-92 has accepted the proposal for establishing wireless communication at the above 6 places with the condition of providing identification markings on the masts.

301. On the basis of the scheme prepared by the Superintendent of Police, Wireless, Poona in 1964, this method of communication is being established. It has taken proper notice of the high ranges of hills in between the control station (Chikhaldara) and the out-stations. The establishment of wireless network in the Melghat is proposed to be implemented in three stages as below :—

#### STAGE A

- (i) VHF Static Station at places as mentioned above.
- (ii) Mobile Station to be located at Semadoh, it being centrally situated.
- (iii) H. F. Static Station at Chikhaldara for communication with Amravati and elsewhere.
- (iv) Maintenance Workshop at Chikhaldara.

#### STAGE B

- (i) Additional VHF Static Stations at (a) Ghatang, (b) Dharni and (c) Wan.
- (ii) Additional Mobile Station one each at (a) Raipur and (b) Harisal.

#### STAGE C

Receiving (VHF) Stations at important round headquarters. Stations at 6 places are to be selected.

302. It is presumed that with the implementation of Stages A and B all range headquarters will be in two way communication with Chikhaldara. In addition, three mobile wireless trucks will be available for carrying working parties to the scene of fires and the same could provide two way communication with the control and range headquarters. It is proposed to supply dry battery operated transistorised receivers at important round headquarters. These sets will provide up-to-date communication system in Melghat for fire conservancy.

303. It is suggested that normally the wireless stations will work from 08.00 to 20.00 hours on two hourly schedule basis from 16th June to end of February. In fire season from 1st of March to 15th June they will work round the clock.

#### PLANTATION :

304. Plantations were formed in the valley of the Sipna river in Semadoh range between 1869 and 1879, all the work being carried out under the personal supervision of Mr. Ballantyne who served in the Melghat for nineteen years from 1868 to 1887. The sites selected for plantations had previously been under cultivation but had been abandoned for some years and were chiefly grassy areas with a few large *mohuwa* trees and bushes. Most of the plantations were of pure teak but some were of teak and bamboos, principally *Dedrocalamus strictus*, though *katang* bamboos

were introduced on a small area between Semadoh and Pili in 1872, and one small plantation at Kolkaz was stocked in 1876 with *Dendrocalamus strictus* only. The teak seed used was mostly of local origin but small quantities were obtained from Burma, Ahiri in Chanda district and North Kanara. The methods adopted for forming the plantations were transplanting of plants raised in nurseries and sowing in lines or in V shaped notches. Great care was taken in clearing bushes and grass from the sites selected and in preparing them by ploughing and digging pits for the young plants and notches for seed. Sir William Schlich mentions in 1883 that out of total area of 1,998 acres of plantations, 626 acres had been formed by transplanting, 164 acres by sowing in lines and 1,208 acres by sowing in notches.

305. Rats did much damage in the plantations but by 1875-76, it was realised that frost was an even greater danger. In the administration report for 1875-76, the damage done by frost is described in the following terms :

“ Since fire conservancy was commenced, a complete change appears to have taken place in the climate of the Bairagarh reserve. Before the forests were protected, frost were hardly ever heard of; now they are of annual occurrence, and unfortunately they are most severe in low-lying lands in blanks, the very places where plantations are formed. Year by year, thousands of artificially raised plants are killed by frost. It is only, however, in places completely denuded of timber growth that frost are so destructive. Where there are a few trees or even a little scrub jungle, frosts do comparatively little harm, and this would seem to point to the desirability of discontinuing the system hitherto in force of clearing lands of grass and every description of growth prior to sowing or planting, and of only forming plantations in places where there is already some kind of vegetation. Instead, therefore, of making plantation in lines, the plants being at fixed distances from one another, I propose in future planting strong two years old seedlings irregularly in places where there is room for them, and even this I shall only do in localities containing no seed bearing teak trees and that are not likely therefore to be planted up naturally. For where fire is excluded natural reproduction may now be looked on as a certainty if only trees exist in sufficient numbers to shed seed. In future years, then, it is my intention to trust chiefly to natural reproduction for the re-clothing of the forests in the Melghat to cease making pure teak plantations and only to put out strong healthy plants irregularly in places where there are no teak seed bearing trees, but where there is already a scanty growth of other woods.”

306. In 1877-78 and 1878-79 sowings were made in lines under cover of an overwood, and bamboo plants were introduced in intermediate lines, the object of the overwood and bamboos being to protect the teak seedlings from damage by frost. Exceptionally, severe frosts in December 1879 and January 1880 did much damage and the operations were discontinued from 1879-1880, owing to the fear of further damage, and because the most suitable areas for plantations had been planted up and the scanty staff of the division had to take up other forest works such as demarcation of boundaries, fire protection and the construction of roads, which by that time were considered more important than the formation of plantations. Another reason why plantation work was discontinued was that, natural reproduction of teak in the Bairagarh reserve had increased as a result of fire protection. The administration report for 1878-79 describes this in the following words :—

“ The expenditure on plantation is considerably less than in previous years. The natural reproduction of teak in Bairagarh reserve is increasing so rapidly that there is no longer any real necessity for forming artificial plantations and in future our operations will be still more limited and will be confined entirely to open spots containing no seed producing trees.”

307. The report written by Sir William Schlich in 1883 and the administration report for 1882-83 show that the total result of plantation operations between 1869 and 1879 was as follows :—

	Acres
Successful teak, plantations .. .. .	961
Successful teak, bamboos, plantations .. .. .	447
Successful bamboo plantation .. .. .	1
Total ..	1,409
Unsuccessful plantations .. .. .	589
Grand Total ..	1,998

Total cost of plantation operations Rs. 33,840.

308. Though the situation of these plantations cannot now be ascertained exactly it is still indicated approximately by the quality of the growing stock as the plantations now contain some of the finest teak forests of the tract mostly in East Melghat division.

309. Although teak plantations were prescribed under Stein's Plan in good quality areas with deficient regeneration, no plantation was raised during the period 1936 to 1955 because of labour shortage except some trial teak plantations over small areas to assess their success.

310. Under Sharma's Plan too, teak plantations were not undertaken, though prescribed. But under the various 5 Year Plan Schemes, plantations of teak, bamboo and pulpwood species were carried out in suitable areas scattered all over the tract. During the years 1954 to 1972, plantations were done as follows :—

TABLE 15

	East Melghat Division	West Melghat Division
Teak .. .. .	1,162.0	535.1
Bamboo .. .. .	49.4	207.6
Eucalyptus .. .. .	..	1,355.9
Others .. .. .	..	244.9
Rusa .. .. .	..	198.1
Total .. .. .	1,211.4	2,541.6

311. Details of these plantations are given in appendix XV.

#### IMPROVEMENT OF COMMUNICATIONS :

312. No new forests roads were constructed in East Melghat division. Existing roads were maintained and widening and improvement of following roads were carried out :—

1. Bhawai—Chaunkhedi.
2. Raipur—Hastru.
3. Raipur—Dolaram.
4. Jarida—Chunkhedi, and
5. Semadoh—Raipur.

Besides, proposals are in the offing to tar some portion of Semadoh-Raipur road in the near future.

Construction of Chikoriam-Gugamal-Koha road in West Melghat division was started.

#### DISPENSARY AT TAROBANDA :

313. Under the II Five-Years Plan Scheme of improving status of forest labour, the dispensary unit was established at Tarobanda. The construction of buildings etc., was started in the year 1959-60 and completed in the year 1961-62. The unit started functioning from the year 1962-63 with the appointment of Assistant Medical Officer and other staff. The unit comprises the following buildings :—

1. Dispensary with Ward
2. A.M.O.'s quarter.
3. Compounder's quarter.
4. Driver's quarter.
5. Ward Boy's quarter.
6. Midwife's quarter.
7. Sweeper's quarter.
8. Motor garage.

314. The unit was provided with a station-wagon but it was damaged completely during the riots that broke out in August 1968 in connection with the establishment of Agriculture University in Vidarbha when some part of Mechanised Logging Unit at Paratwada was set on fire.

#### FORST REST HOUSES :

315. Almost all the forest rest houses were constructed in the latter part of nineteenth century. The special repairs to the majority of them were carried out during the last plan period, consisting of replacing the thatched roofs and providing sanitary fittings. The forest rest houses at Dhakna and Tarobanda have been renovated. A new four-suited rest house, overlooking the Rakhidoh in Sipna river was constructed at Kolkaz in 1970 to provide living accommodation to tourists desirous of visiting Dhakana-Kolkaz game sanctuary.

#### BUILDINGS :

316. Due to the developmental activities during the Five-Years Plan period, the Staff on all levels increased considerably. Reorganisation of forest divisions also took place during this period. Naturally, the period of Sharma's Plan witnessed the tremendous activity in building construction to house the increased staff and provide accommodation for the new offices. The appendix XVI enlists the existing buildings with their year of construction.

317. The list of existing Wells, anicuts and tanks is given in appendix III.

**Section 4 ; Past yield.**

318. The appendix XVII gives the outturn of major forest produce for the years 1954-55 to 1969-70.

319. Appendix XVIII gives the revenue from the forest produce from 1925-26 to 1969-70.

**Section 5 ; Past revenue and expenditure**

320. Appendix XIX shows revenue, expenditure and surplus for each division from 1900-1901 to 1969-70. The average expenditure and the percentage for each category is shown below for the period 1964-65 to 1971-72.

Category (1)	East Melghat Division (2)		West Melghat Division (3)	
	Rs.	Percentage	Rs.	Percentage
I. Average expenditure—				
B—Conservancy .. .. .	19,12,038	61.9	12,95,299	47.9
C—Establishment .. .. .	6,18,106	20.0	6,76,153	25.0
Plan .. .. .	5,58,806	18.1	7,34,261	27.1
<b>Total</b> ..	<b>30,88,950</b>	<b>100.0</b>	<b>27,05,713</b>	<b>100.0</b>
II. Average Revenue .. .. .	92,28,217		44,52,044	
III. Surplus .. .. .	61,39,267		17,46,331	
IV. Percentage of surplus to the revenue .. .. .	66.5		39.2	

## CHAPTER VI: STATISTICS OF GROWTH AND YIELD

Section 1: *Growth of teak*

## (i) RECORD FROM STEIN'S PLAN :

321. In Stein's Plan the growth data for teak was compiled from the sample plots record and is reproduced below :—

TABLE 16

*Summary of records of diameter increment in the 10 year period 1924-34 in the teak sample plots in the Melghat Division*

Plot No.	C. P. (M. P.) Quality class	Age in 1934	Diameter increment in 10 years (1924-1934)		Average diameter at b. h. in 1934	
			inches	cm.	inches	cm.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	III .. .. .	50	1.9	4.8	7.2	18.3
2	III .. .. .	54	1.3	3.3	8.4	21.3
3	III .. .. .	49	1.4	3.6	6.7	17.0
4	I I .. .. .	50	0.7	1.8	6.1	15.5
5	III .. .. .	30	2.0	5.1	4.2	10.7
6	III .. .. .	30	1.9	4.8	4.8	12.2
7	III .. .. .	55	0.9	2.3	8.4	21.3
8	III .. .. .	55	1.1	2.8	8.0	20.3
9	II .. .. .	55	2.0	5.1	12.3	31.2
10	IVb .. .. .	41	1.1	2.8	5.2	12.2
11	III .. .. .	65	1.2	3.0	[6.7	17.0

## (ii) STUMP ANALYSIS :

322. In Sharma's Plan, stump analysis of 223 teak trees having distribution over sembadoh, Gugama (Tarubanda), Khandu (Raipur) and Chikhaldara ranges was carried out. As 163 trees were selected from open mature crop and 60 trees were from crop of average stocking, the results were computed separately for these two sets and are reproduced below :—

TABLE 17

*Rate of growth of diameter*

Age	Diameter at b. h. (o.b.)			
	I set (163 trees)		II set (60 trees)	
	Inches	Cm.	Inches	Cm.
10	2.6	6.60	1.9	4.83
20	5.1	12.95	4.0	10.16
30	7.8	19.81	5.9	14.99
40	10.8	27.43	7.7	19.56
50	13.5	35.05	9.4	23.88
60	16.0	40.64	11.2	28.45
70	18.4	46.74	12.8	32.51
80	20.7	52.58	14.3	36.32
90	..	..	(15.9)	40.39
100	..	..	(17.2)	43.69
110	..	..	(18.6)	47.24

*Note.*—The figures in brackets have been obtained by extrapolation of the curve.

323. As expected the rate of growth in the first set of trees was very much faster than that in the second set.

## (iii) STEM ANALYSIS :

324. In order to ascertain further reliable rate of growth of teak trees, stem analysis was carried out in the course of preparation of this plan. Data for 104 teak trees, spread all over the area and representative of the average crop was collected. These trees were classified into two sets i.e. I set and II, set corresponding to the All India quality III and IV. The II set corresponds to the Maharashtra quality III to which the crop in Melghat mostly belongs. The data was further scrutinised and trees having abnormal growth behaviour were rejected. The data was then subjected to stem analysis and the results are tabulated below separately for two sets.

325. The curves derived from the stem analysis data, are reproduced in appendix X. The curves indicates that the present rate of growth of teak in Melghat forest is as under :—

TABLE 18

					Age	Height	Diameter at b.h.	Total volume under bark	MAI	CAI
					(1)	(2)	(3)	(4)	(5)	(6)
Years						M.	Cm.	M <sup>3</sup>	M <sup>3</sup>	M <sup>3</sup>
					Set I					
10	..	..	..	..	4.0	7.1	.014	.0014	.0014	.0014
20	..	..	..	..	7.9	15.2	.057	.0029	.0043	.0043
30	..	..	..	..	12.2	21.8	.158	.0053	.0101	.0101
40	..	..	..	..	15.2	26.9	.297	.0074	.0139	.0139
50	..	..	..	..	17.7	31.5	.481	.0096	.0184	.0184
60	..	..	..	..	19.5	36.1	.707	.0118	.0226	.0226
70	..	..	..	..	21.3	39.9	.990	.0141	.0283	.0283
80	..	..	..	..	22.9	43.4	1.273	.0159	.0283	.0283
90	..	..	..	..	(24.4)	46.5	1.571	.0174	.0298	.0298
100	..	..	..	..	(25.3)	49.0	1.859	.0186	.0288	.0288
110	..	..	..	..	(26.2)	51.6	2.122	.0193	.0263	.0263
					Set II					
10	..	..	..	..	3.0	5.8	.006	.0006	.0006	.0006
20	..	..	..	..	7.3	11.7	.034	.0017	.0028	.0028
30	..	..	..	..	11.0	17.3	.102	.0034	.0068	.0068
40	..	..	..	..	13.7	22.9	.209	.0052	.0107	.0107
50	..	..	..	..	15.8	27.3	.345	.0069	.0136	.0136
60	..	..	..	..	17.4	32.0	.523	.0087	.0178	.0178
70	..	..	..	..	18.6	35.5	.702	.0100	.0179	.0179
80	..	..	..	..	(19.5)	38.1	.863	.0108	.0161	.0161
90	..	..	..	..	(20.4)	39.6	.985	.0109	.0122	.0122
100	..	..	..	..	(21.0)	40.4	1.061	.0106	.0076	.0076
110	..	..	..	..	(21.6)	40.6	1.104	.0100	.0043	.0043

Note.—The figures in the brackets are obtained by extrapolation of the curves.

326. The above statements indicate that the MAI and CAI curves for All India quality IV (Maharashtra quality III) intersect at the age of 88 years (Curves Appendix XXI). At this age, the tree attains an average height of 20 m. and girth 124 cms. After this age, the rate of growth for both height and girth declines rapidly and stagnates practically at the age of 100 years. The trees of All India quality III, however, continue to grow with vigour even after the age of 100 years.

327. The rate of growth in diameter for II set is higher in comparison to the rate of growth obtained by stump analysis in Sharma's plan for II set but lower than that in I set.

#### (iv) PLANTATION TEAK

328. Further to know the rate of growth of teak in plantations in Melghat, height and girth measurements of dominant teak were taken in teak plantations of successive years. The curves derived from this data is given in appendix XXI. The rate of growth as read from the curves is given below :—

TABLE 18

					Age in years	Height in metres	Girth in cm.
2	..	..	..	..	..	0.7	3.5
4	..	..	..	..	..	1.6	8.5
6	..	..	..	..	..	2.6	14.0
8	..	..	..	..	..	3.6	20.0
10	..	..	..	..	..	4.7	25.0
12	..	..	..	..	..	5.7	31.0
14	..	..	..	..	..	6.8	37.0

#### Section 2 :—Stocking.

##### (I) ENUMERATIONS :

329-A. *Sharma's plan*.—5 per cent enumerations were carried for the first time in this forest during Sharma's Plan in good quality forests allotted to Selection Working Circle, Teak, *Saja*, *dhaora*, *tinsa*, *bija*, *shisham*, *salai*, *haldu* and bamboo clumps were enumerated individually while remaining species were grouped under 'miscellaneous species' 6" (15 cms.) girth-class was adopted for enumeration for trees above 24" (60 cms.) g.b.h. trees between 9" to 24" (23 cms. to 66 cms.) g.b.h. were grouped under one class. The results are given below :—

##### (a) Number of trees per acre

Girth—class						Mean number of trees
25"—30"	..	..	..	..	..	8.63
31"—36"	..	..	..	..	..	7.62
37"—42"	..	..	..	..	..	5.12
43"—48"	..	..	..	..	..	3.21
49"—54"	..	..	..	..	..	1.49
55"—and over	..	..	..	..	..	2.60
Total	..	..	..	..	..	28.67



(b) Total mean volume of teak (above 25" girth-class) is 235 cft. per acre, (16.5 M<sup>3</sup>/ha.).

(c) *Variation in growing stock with altitude*

330. To determine the variations in the growing stock with the altitude some of the suitable units enumerated were grouped into altitude classes and the percentage of various species in the growing stock was calculated. The results are tabulated below :—

TABLE 19  
*Trees per acre at different altitudes*

Altitude above M.S.L.	Trees per acre									
	Teak	Tinsa	Bija	Shisham	Dhaora	Saj	Haldu	Salai	Miscellane- ous	
1200'—1500'	89.46	4.6	0.11	0.46	2.36	1.79	..	..	45.52	
1500'—1800'	59.53	6.69	0.17	0.7	5.64	3.4	..	..	51.45	
1800'—2100'	35.5	0.04	0.04	9.11	9.8	4.0	1.7	0.07	61.1	
2100'—2400'	62.98	0.04	0.03	11.05	17.2	5.6	2.25	0.03	99.3	
2400'—3000'	35.3	13.1	0.02	0.14	10.6	2.8	1.1	0.2	54.1	
3000'—3300'	25.7	17.4	0.4	8.38	3.25	0.2	..	..	100.73	

TABLE 20  
*Percentage of trees in the growing stock at different altitudes*

Altitude	Percentage of trees in the growing stock									
	Teak	Tinsa	Bija	Shisham	Dhaora	Saj	Haldu	Salai	Miscellane- ous	
1200'—1500'	61.9	3.2	0.07	0.3	1.6	1.3	..	..	31.5	
1500'—1800'	46.6	5.2	0.1	0.5	4.4	2.7	..	..	40.33	
1800'—2100'	38.00	0.03	0.03	7.1	8.2	3.2	1.8	0.04	42.3	
2100'—2400'	31.57	0.02	0.02	5.54	8.63	2.81	1.13	0.02	49.77	
2400'—3000'	29.5	11.2	0.02	0.2	9.4	2.4	0.9	0.02	46.2	
3000'—3300'	16.0	11.3	..	0.3	5.3	2.0	0.1	..	65.0	

331. The interesting conclusions that can be drawn from the above tables are :—

- (i) Teak occurs even at an elevation of 3,300.
- (ii) The percentage of teak decrease with increase in altitude.
- (iii) *Tinsa* occurs in plenty between the elevations 2,400 and 3,300 ft.
- (iv) *Haldu* appears after an elevation of 1,800 ft.
- (v) *Salai* in the areas enumerated appears above an elevation of 1,800 ft. but it is found at lower elevation in plenty in the S. W. of the tract where the rainfall is comparatively less. It seems it occurs here on higher elevation because the soil on those elevations is shallow and the gradient is steep which result in drier conditions of the soil which this species seems to prefer.

332-B. *Current Plan.*—Under the guidance of the Forest Statistician, Poona, enumerations were carried out during 1969 to 1972 by the unit of Forest Resources Survey Scheme, covering all the forests of Melghat. The object of the survey was to assess the total growing stock of all the species. All the species were enumerated separately in 15 cms. girth-classes down to 15 cms. g.b.h. The results were computed separately for each working circle of Sharma's Plan. The extract from the note on the enumeration and its results by the Forest Statistician, Poona, is given below :—

(a) TREE ENUMERATION :

333. The areas covered by the resources survey in the various working circle of Sharma's Working Plan were as follows :

	Area covered (in Hectares)	Intensity of sampling (per centage)
<i>East Melghat division—</i>		
Selection Working Circle	1,19,423	10
<i>West Melghat division—</i>		
1. Selection Working Circle	44,160	5
2. Coppice-with Reserves Working Circle	51,821	2.5

334. The following areas from the working scheme for the unexploited forests of Dhulghat, Dabida, Wan and part of Rupagarh reserves of the Melghat forests by B. S. Bhatena were also covered under the above resources survey scheme:—

	Area covered (in hectares)	Intensity of sampling (percentage)
<i>West Melghat division—</i>		
1. Coppice-with-Reserves Working Circle .. .. .	22,048	2.5
2. Miscellaneous Working Circle (including small area from Sharma's Plan).	31,581	2.5

335. *Sampling Plan.*—The tract to be dealt with for enumerations is very hilly. A method of stratified random sampling by topographical units is adopted here. The sampling plan consisted of treating individual felling series as main strata and within each felling series, sub-strata were carved out on the basis of past working, age of the crop and proximity which ensured as homogeneous blocks as possible. Generally, selected units, had natural features and where not found, other boundaries such as coupe boundaries, forest village boundaries etc., were used. In few cases, artificial straight line boundaries were given. The intensity of sampling varies from 2½ per cent to 10 per cent.

336. The measurements contemplated during the current survey were of two types, namely, quantitative and qualitative. In all the sample units, quantitative measurements of all species were carried out. These measurements consisted of girth classwise enumerations of trees. On the other hand, qualitative measurements were planned on sub-sample of the main sample. Information on such items as regeneration, grasses, soil erosion, illicit cutting, etc. was collected on a sub-sample of the main sample, so as to serve as ancillary data without any material increase in efforts and cost.

337. The voluminous data was analysed by the statistician and estimates of the growing stock of various species, according to girth class, were obtained for each working circle. The estimates of individual important species and remaining species grouped together are given in Statement-I (Appendix XXII). However detailed information in respect of certain economically valuable species is given in Statements II, III and I (Appendix XXII).

338. The statistical analysis for computing the precision of the above estimates was also carried out. For Selection Working Circle of East Melghat division, the estimate of total number of teak trees is calculated at 2.32 per cent standard error. This type of analysis is also carried out for Selection Working Circle of West Melghat division and in that case the total stock of teak trees is estimated with 7.21 per cent standard error. Considering the percentage of area sampled, this can be considered to be satisfactory for the purpose for which the information is meant.

339. The total stocking (*i. e.* all trees put together) for Selection Working Circle is 289 trees per hectare in East Melghat division and 247 trees per hectare in West Melghat division. The species of general utility form more than half of the stock, the most predominant species being teak. The total per hectare of teak trees in East Melghat division is 148 trees as against 100 trees per hectare in West Melghat division. Moreover, percentage of teak trees to total stocking in East Melghat division is 51 as against 41 in West Melghat division. This shows that the total stock of teak trees are better in East Melghat division than in West Melghat division. Moreover, the percentage of big sized teak trees (say, trees above 90 cm. in girth) to total teak trees is about 20 per cent in Melghat forests. Out of other species, only *lendia*, *tiwas* and *salai* are stocked a little better. *Semal*, *shisham* and *bija* form a negligible percentage of the crop. *Tiwas* does not attain big size in both the divisions. These trees are generally under 75 cm. girth. The percentage of *tiwas* trees above 75 cm. in girth to total *tiwas* is only about 5 in East Melghat division and about 9 in West Melghat division.

340. In Sharma's Working Plan all felling series in Selection Working Circle are grouped into two categories. There are 14 felling series in one category, namely, better quality felling series and remaining 6 felling series in other category which is named as low quality felling series. Under the present system of selection working, the exploitable girth for teak trees is 135 cm. for better quality forest felling series and 120 cm. for low quality forest felling series. For better quality felling series, the number of teak trees above 135 cm. girth are 5.79 per hectare and the teak trees in approach classes (*i. e.*, two girth-classes prior to above 135 cm. girth-class) are 11.75 per hectare. The corresponding position for the low quality felling series is as follows:—

(i) Number of teak trees above 120 cm. girth are 4.92 per hectare.

(ii) Number of teak trees in approach classes are 12.13 per hectare.

341. A glance at the girth-class composition of unworked areas throws some light on the future potential. For unworked areas of better quality felling series, teak above 135 cm. in girth is about 5.66 trees per hectare which is 3.37 per cent of the total teak stock. The percentage of teak stock in girth-class 15.30 cms. is about 23.56 to total teak stock. The corresponding picture for low quality felling series is as follows:—

Teak trees per hectare above 120 cm. in girth 5.08, percentage to total teak trees 4.39  
percentage of teak stock in girth-class 15.30 cm.—26.48 per cent.

342. The tree enumerations during Sharma's Plan give total number of trees above 60 cm. at b.h. per hectare as 71.68 while 103.52 are the total number of trees above 60 cm. at b. h. under the current enumeration.

343. In Coppice-with-Reserves Working Circle (of Sharma's Plan), the total growing stock is about 298 trees per hectare out of which teak trees are about 133 (*i. e.*, about 45 per cent of the total stock). Other species like *salai*, *lendia* and *tiwas* form the small percentage to total stocking being 4.86, 3.65 and 3.02 per cent, respectively. The percentage of teak trees to total growing stock in Coppice-with-Reserve Working Circle of Bhatena's Scheme is 33 per cent as against 45 per cent in the areas of Coppice-with-Reserve Working Circle of Sharma's Plan. However, the percentage of *salai* in Coppice-with-Reserve Working Circle of Bhatena's Scheme is more (*i. e.*, 22 per cent) than that of Coppice-with-Reserve Working Circle of Sharma's Plan (*i. e.*, 5 per cent).

344. The percentage of teak in Miscellaneous Working Circle is 27.9.

345. The detailed enumeration results are given under Appendix XXII and the abstract is placed below:—

(i) SELECTION WORKING CIRCLE—

TABLE 21

Girth-class cm.	No. of trees per hectare		
	Teak	Others	Total
15 U 30 .. .. .	34.45	44.82	79.27
30 U 45 .. .. .	26.24	31.22	57.46
45 U 60 .. .. .	18.98	20.60	39.58
60 U 75 .. .. .	15.98	15.69	31.67
75 U 90 .. .. .	14.13	12.07	26.20
90 U 105 .. .. .	10.35	6.87	17.22
105 U 120 .. .. .	6.50	3.82	10.32
120 U 135 .. .. .	3.73	2.16	5.89
135 and over .. .. .	4.84	5.11	9.95
Total .. .. .	135.20	142.36	277.56
Per cent .. .. .	48.71	51.29	

(ii) SELECTION WORKING CIRCLE—

(1) *East Melghat division*.—Enumeration results are recorded under Table 22.

TABLE 22

*East Melghat division*

*Number of trees per hectare—Selection Working Circle*

Name of species (1)	Girth-class in cm.										Total (11)
	15—30 (2)	30—45 (3)	45—60 (4)	60—75 (5)	75—90 (6)	90—105 (7)	105—120 (8)	120—135 (9)	Above 135 (10)		
<b>Group 'A' : Species of general utility—</b>											
1. Ain .. .. .	0.66	0.71	0.66	0.71	0.73	0.51	0.36	0.22	0.69	5.25	
2. Bondara(Lendia) .. .. .	3.00	2.34	1.88	1.64	1.21	0.63	0.29	0.12	0.21	11.32	
3. Kakad .. .. .	0.52	0.52	0.38	0.36	0.36	0.25	0.15	0.08	0.18	2.80	
4. Teak .. .. .	38.15	28.34	20.64	17.30	15.44	11.64	7.43	3.99	5.26	148.19	
5. Tiwas .. .. .	4.54	3.64	1.86	0.88	0.39	0.14	0.05	0.02	0.02	11.54	
Total Group 'A'	46.87	35.55	25.42	20.89	18.13	13.17	8.28	4.43	6.36	179.10	
<b>Group 'B' : Species of special utility—</b>											
1. Haldu .. .. .	0.34	0.32	0.31	0.32	0.32	0.26	0.20	0.14	0.74	2.95	
2. Kalam .. .. .	0.53	0.44	0.43	0.38	0.31	0.18	0.11	0.06	0.22	2.66	
3. Khair .. .. .	0.38	0.29	0.15	0.07	0.03	0.01	0.01	•	•	0.94	
4. Salai .. .. .	0.02	0.04	0.08	0.21	0.36	0.35	0.22	0.11	0.12	1.51	
Total Group 'B'	1.27	1.09	0.97	0.98	1.02	0.80	0.54	0.31	1.08	8.06	
<b>Group 'C' : Other species—</b>											
	38.27	22.33	13.60	9.85	7.17	4.05	2.21	1.12	3.13	101.73	
Grand Total .. .. .	86.41	58.97	39.99	31.72	26.32	18.02	11.03	5.86	10.57	288.89	

\*Negligible.

(2) *West Melghat division.*—Enumeration results are recorded under Table 23.

TABLE 23

*West Melghat division*

*Number of trees per hectare—Selection Working Circle*

Name of species (1)	Girth-class in cm.										Total (11)
	15—30 (2)	30—45 (3)	45—60 (4)	60—75 (5)	75—90 (6)	90—105 (7)	105—120 (8)	120—135 (9)	Above 135 (10)		
<b>Group 'A' : Species of general utility—</b>											
1. Ain .. ..	0.42	0.64	0.70	0.78	0.77	0.45	0.27	0.21	0.51	4.75	
2. Bondara (Lendia)	2.28	2.76	2.20	1.78	1.27	0.51	0.26	0.14	0.14	11.34	
3. Kakad .. ..	0.51	0.63	0.73	0.67	0.60	0.39	0.21	0.15	0.19	4.08	
4. Teak .. ..	24.46	20.56	14.49	12.42	10.61	6.86	4.01	3.03	3.74	100.18	
5. Tiwas .. ..	5.52	6.06	3.95	2.24	1.14	0.37	0.11	0.04	0.02	19.45	
Total Group 'A' ..	33.19	30.65	22.07	17.89	14.39	8.58	4.86	3.57	4.60	139.80	
<b>Group 'B' : Species of special utility—</b>											
1. Haldu .. ..	0.13	0.22	0.26	0.34	0.39	0.25	0.23	0.24	0.83	2.89	
2. Kalamb .. ..	0.09	0.14	0.19	0.19	0.18	0.13	0.06	0.06	0.11	1.15	
3. Khair .. ..	0.14	0.14	0.08	0.04	0.01	0.01	•	•	•	0.42	
4. Salai .. ..	0.03	0.20	0.51	1.37	2.47	1.98	1.10	0.73	0.59	8.98	
Total Group 'B' ..	0.39	0.70	1.04	1.94	3.05	2.37	1.30	1.03	1.53	13.44	
<b>Group 'C' : Other species.—</b>											
	26.40	22.03	15.35	11.74	8.47	4.10	2.17	1.39	2.19	93.84	
Grand Total ..	59.98	53.38	38.46	31.57	25.91	15.05	8.42	5.99	8.32	247.08	

\*Negligible.

(iii) COPPICE-WITH-RESERVE WORKING CIRCLE—West Melghat Division.

13 *Felling Series of Sharma's Plan.*—Enumerated number of trees per hectare are recorded under Table 24.

TABLE 24

*Coppice-with-Reserve Working Circle (All the 13 Felling Series) Working Plan by D. C. Sharma*

*Number of trees per hectare*

Name of species (1)	Girth-class in cm.										Total (11)
	15—30 (2)	30—45 (3)	45—60 (4)	60—75 (5)	75—90 (6)	90—105 (7)	105—120 (8)	120—135 (9)	Above 135 (10)		
<b>Group 'A' : Species of general utility—</b>											
1. Ain .. ..	1.08	0.70	0.58	0.50	0.41	0.19	0.13	0.05	0.16	3.80	
2. Bondara (Lendia)	4.62	2.38	1.72	1.24	0.67	0.16	0.05	0.02	0.02	10.88	
3. Kakad .. ..	0.61	0.58	0.43	0.38	0.35	0.21	0.12	0.07	0.13	2.88	
4. Teak .. ..	46.28	28.09	20.96	16.15	10.79	5.04	2.63	1.39	1.34	132.67	
5. Tiwas .. ..	3.93	2.70	1.32	0.71	0.27	0.05	0.02	0.01	Negligible	9.01	
Total Group 'A' ..	56.52	34.45	25.01	18.98	12.49	5.65	2.95	1.54	1.65	159.24	
<b>Group 'B' : Species of special utility—</b>											
1. Haldu .. ..	0.19	0.16	0.12	0.14	0.17	0.14	0.11	0.07	0.18	1.28	
2. Kalamb .. ..	0.71	0.39	0.25	0.24	0.20	0.12	0.06	0.04	0.07	2.08	
3. Khair .. ..	2.43	1.04	0.39	0.15	0.06	0.01	Negligible	•	•	4.08	
4. Salai .. ..	0.22	0.70	1.66	3.14	3.96	2.30	1.24	0.67	0.61	14.50	
Total Group 'B' ..	3.55	2.29	2.42	3.67	4.39	2.57	1.41	0.78	0.86	21.94	
<b>Group 'C' : Other species.—</b>											
	49.20	29.42	15.27	9.66	6.61	2.81	1.58	0.97	1.54	117.06	
Grand Total ..	109.27	66.16	42.70	32.31	23.49	11.03	5.94	3.29	4.05	293.24	

6 *Felling Series of Bhatena's Scheme*.—Enumerated number of trees per hectare are recorded under Table 25.

TABLE 25

*Coppice-with-Reserve Working Circle (All the 6 Felling Series) Working Scheme by B. S. Bhatena*

*Number of trees per hectare*

Name of species	Girth-class in cm.									Total
	15—30	30—45	45—60	60—75	75—90	90—105	105—120	120—135	Above 135	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<b>Group 'A' : Species of general utility—</b>										
1. Ain .. ..	0.90	1.39	1.52	1.24	0.80	0.31	0.16	0.09	0.12	6.53
2. Bondara (Lendia)	3.73	3.49	3.28	2.06	0.70	0.20	0.05	0.04	0.01	13.56
3. Kakad .. ..	0.17	0.21	0.25	0.17	0.15	0.10	0.09	0.06	0.03	1.23
4. Teak .. ..	28.52	20.39	14.26	11.15	7.16	2.94	1.19	0.58	0.38	86.57
5. Tiwas .. ..	1.40	1.53	0.79	0.36	0.09	0.02	..	..	..	4.19
Total Group 'A' ..	34.72	27.01	20.10	14.98	8.90	3.57	1.49	0.77	0.54	112.08
<b>Group 'B' : Species of special utility—</b>										
1. Haldu .. ..	0.10	0.09	0.30	0.14	0.18	0.09	0.04	0.03	0.07	1.04
2. Kalamb .. ..	0.14	0.14	0.21	0.15	0.11	0.04	0.02	0.04	0.04	0.89
3. Khair .. ..	1.32	0.88	0.43	0.15	0.06	0.01	Negligible	..	..	2.85
4. Salai .. ..	1.12	2.83	6.29	11.95	15.95	9.14	5.01	2.51	1.46	56.26
Total Group 'B' ..	2.68	3.94	7.23	12.39	16.30	9.28	5.07	2.58	1.57	61.04
<b>Group 'C' : Other species—</b>										
	24.41	23.29	15.38	9.99	7.03	2.47	1.19	0.83	0.97	85.56
Grand Total ..	61.81	54.24	42.71	37.36	32.23	15.32	7.75	4.18	3.08	258.68

(iv) MISCELLANEOUS WORKING CIRCLE—West Melghat Division.

Enumerated number of trees per hectare are recorded under Table 26.

TABLE 26

*Miscellaneous Working Circle—Working Scheme by B. S. Bhatena and Working Plan by D. C. Sharma*

*Number of trees per hectare*

Name of species	Girth-class in cm.									Total
	15—30	30—45	45—60	60—75	75—90	90—105	105—120	120—135	Above 135	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<b>Group 'A' : Species of general utility—</b>										
1. Ain .. ..	1.46	1.68	1.36	0.89	0.64	0.25	0.15	0.07	0.02	6.52
2. Bondara (Lendia)	2.06	2.77	1.97	1.13	0.51	0.10	0.04	0.01	Negligible	8.59
3. Kakad .. ..	0.09	0.14	0.27	0.21	0.17	0.07	0.03	0.02	0.02	1.02
4. Teak .. ..	19.27	18.56	13.89	9.30	5.58	2.18	0.87	0.42	0.20	70.27
5. Tiwas .. ..	1.45	1.26	0.63	0.34	0.13	0.02	Negli.	..	..	3.83
Total Group 'A' ..	24.33	24.41	18.12	11.87	7.03	2.62	1.09	0.52	0.24	90.23
<b>Group 'B' : Species of special utility—</b>										
1. Haldu .. ..	Negligible	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.14
2. Kalamb .. ..	0.09	0.12	0.21	0.14	0.13	0.06	0.03	0.02	0.03	0.83
3. Khair .. ..	3.27	1.77	0.36	0.09	0.02	Negli.	Negli.	..	..	5.51
4. Salai .. ..	1.88	7.22	12.50	14.13	12.54	7.60	4.02	2.38	1.35	63.62
Total Group 'B' ..	5.24	9.13	13.09	14.38	12.71	7.68	4.06	2.42	1.39	70.10
<b>Group 'C' : Other species—</b>										
	31.14	27.26	15.97	8.81	4.90	2.01	0.88	0.40	0.49	91.86
Grand Total ..	60.71	60.80	47.18	35.06	24.64	12.31	6.03	3.34	2.12	252.19

## (b) BAMBOO SURVEY :

346. The assessment of bamboo potential in these areas was planned by beginning the survey in April 1969. The survey was, however, restricted to commercial bamboo felling series.

347. *Sampling Plan.*—It has been stated earlier that the terrain of Melghat forests is very hilly. The application of line plot method was difficult to follow in these areas. The method of topographical units was, therefore, employed to select sampling units. Stratification was based on stock-mapped details and compactness. Twenty per cent sampling intensity was followed in the above tract. The clumps were counted on the whole unit. However, clump analysis was carried out on a sub-sample of clumps at the rate of one in twenty or forty depending on the conditions obtaining.

348. The data was processed and analysed in all respects by the Forest Statistician, Poona. The estimated total number of bamboo clumps in each Bamboo Felling Series is given in Statement I (Appendix XXII). The results of detailed clump-analysis giving the number of culms in a clump according to age-classes, being green or dead and commercial or non-commercial size [i. e., above 6' (1.83 M) or below 6' (1.83 M) in height respectively] are also given in case of each Bamboo Felling Series in Statement II (Appendix XXII). The estimated total number of culms, according to above classification, in each Bamboo Felling Series is presented in Statement III (Appendix XXII).

349. The percentage standard errors of the estimates were also worked out. In case of East Melghat division, the number of clumps per hectare is estimated with 5.26 per cent standard error. The corresponding error for West Melghat division is 6.66 per cent.

350. Enumeration results in brief are recorded under Table 27. From this table it is noticed that over 2 years old green culms per clump is less than 8 culms practically in all the felling series.

TABLE 27  
Estimated number of clumps

Division/Felling Series (1)	Area of B. F. S. in hectares (2)	Area of B.F.S. under Bamboo in hectares (3)	Total number of estimated clumps (4)	Mature culms per clump	
				Green (5)	Dead (6)
<b>East Melghat Division</b>					
Khari .. .. .	5,462	1,792	2,87,332	4.99	2.48
Chunkheri .. .. .	7,370	1,110	62,535	6.32	3.75
Rahu .. .. .	5,771	1,986	2,09,527	4.54	2.64
Bordha .. .. .	4,033	1,087	69,123	2.87	3.26
Biba .. .. .	5,862	2,720	6,80,035	4.42	2.88
Mehrium .. .. .	8,486	2,522	4,92,566	4.90	2.34
Rajdoha .. .. .	3,711	1,541	1,54,084	5.76	2.01
Total ..	40,695	12,758	19,55,202	4.75	2.63
<b>West Melghat Division</b>					
Dolar .. .. .	9,397	1,591	1,09,395	7.21	5.01
Dhakna .. .. .	3,493	748	64,043	7.04	4.60
Zira .. .. .	3,940	1,022	29,819	5.62	4.56
Gurgipati .. .. .	7,187	1,635	84,181	8.40	5.77
Dhargad .. .. .	6,150	762	31,599	8.00	7.09
Kund .. .. .	3,201	1,011	52,409	7.21	3.33
Koktoo .. .. .	6,504	969	60,925	6.36	4.91
Koha .. .. .	7,904	1,736	1,29,368	5.42	4.04
Dondharium .. .. .	5,808	565	20,616	6.43	4.94
Total ..	33,584	10,039	5,82,355	6.81	4.79

## (c) LANTANA SURVEY :

351. Lantana has invaded large areas of the forests. It forms a dense cover on the ground and does not permit regeneration of the tree species to get established. It was, therefore, to be eradicated at one time and efforts were also made to that effect in the past. But in the course of time, trials of putting lantana for industrial use showed positive results. The need, therefore, has arisen to have an idea about the lantana potential in Melghat areas. It was, thus decided to undertake lantana survey in Melghat forests. Accordingly, the survey was planned and conducted during October-November 1972.

352. Lantana survey in Melghat forests was the first of its kind. Background information and experience so essential for efficient planning were lacking. However, minimum ingredients of beat sampling have been introduced in the design employed for the purpose. Plots each of 1 chain  $\times$  1 chain were laid out in a sample of topo units. In a plot, area under lantana, No. of bushes and No. of whole sticks in the bush were recorded. A sub-sample of the plots was taken for cutting lantana bushes and obtaining air dry weight of lantana sticks.

353. The following results are obtained :—

- (1) Approximate area under lantana (from Selection and C. W. R. Working Circles)—1,40,678 Hec.
- (2) The estimated weight of the lantana growing in the above area in terms of air dry weight is as follows :—

Diameter Class						Air dry weight	
Cm.						Tonnes	
0.6 to 2.5	..	..	..	..	..	41,805	
Above 2.5	..	..	..	..	..	4,419	
Total						..	46,224

## (II) REGENERATION :

354. At the time of tree enumeration by the Forest Resources Survey Scheme Unit, information for teak seedlings above one metre in height were collected. The results are given below :—

TABLE 28

Division	Working Circle						No. of teak seedlings per hectare
East Melghat	..	..	..	Selection	..	..	14
West Melghat	..	..	..	Selection	..	..	7

It is seen that the regeneration of teak is awfully lacking.

## (III) EXISTING GROWING STOCK :

355. The growing stock of teak is given below for all the felling series of Selection Working Circle, and also separately for good quality 14 felling series.

TABLE 29

*Growing Stock of teak per hectare*

Girth-class	Selection Working Circle				14 Felling Series	
	No. of trees		Total volume	No. of trees		Total volume
(1)	(2)	(3)	(4)	(5)	(6)	(7)
cm.			M <sup>3</sup>			M <sup>3</sup>
15 U 30	..	..	34.45	0.275	36.27	0.290
30 U 45	..	..	26.24	0.970	29.03	1.074
45 U 60	..	..	18.98	1.765	20.91	1.944
60 U 75	..	..	15.98	2.940	17.20	3.181
75 U 90	..	..	14.13	4.239	15.36	4.608
90 U 105	..	..	10.35	5.071	11.45	5.610
105 U 120	..	..	6.50	4.673	7.41	5.328
120 U 135	..	..	3.73	4.117	4.34	4.791
135 and over	..	..	4.84	5.343	5.79	6.392
Total	..	..	135.21	29.393	147.85	33.218

356. The growing stock for teak 60 cm. and over in girth is 26.4 M<sup>3</sup>/ha. while it was 16.6 M<sup>3</sup>/ha. as per enumerations carried out in Sharma's Plan.

(IV) CROP GIRTH :

357. The crop girth which has been calculated on the basis of the enumeration data is 58.5 cm. for teak in the forest allotted to the Selection Working Circle. It corresponds to the age of 33 years.

(V) NORMAL GROWING STOCK :

358. A modest endeavour has been made below to find out how close is the existing growing stock in Selection Working Circle to the normal growing stock. This knowledge will help in bringing the forest as close to the normal as possible by careful manipulation of the crop over long periods.

359. The normality of an uneven aged selection forest is judged by the number of trees in each size class. It must contain more small trees than big ones per hectare. There are two ways of constructing a simple model of normal growing stock. One is by adopting the plantation crop yield table figures and the second method is to follow F. De Liocourt's theory (1898) that the number of stems in a Selection forest lessens from one-size-class to the next larger class in a geometrical progression, so that the ratio of diminution is constant. The better quality selection forest which is comparable to the All-India quality III/IV is considered for the purpose of this exercise. The following normal growing stock model is constructed for All-India plantation teak quality III/IV and Natural teak quality III and given under Table 30.

TABLE 30  
Growing stock Model based on All-India Teak Yield (Plantation) Tables and Natural Teak Yield table

Age	Plantation Teak Q. III/IV			Natural Teak Q. III		
	No. of trees	Reduced No.	50 percent of (iii)	No. of trees	Reduced No.	50 percent of (vi)
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
5	..	..	..	..	..	..
10	..	1,310	82	41	2,174	136
15	..	940	58	29	1,169	73
20	..	678	42	21	785	49
25	..	550	34	17	588	37
30	..	463	29	14	477	30
35	..	395	24	12	394	25
40	..	350	22	11	329	20
45	..	323	20	10	290	18
50	..	297	17.6	9	258	16
55	..	278	16.5	8.25	230	14
60	..	260	15.4	7.7	214	13
65	..	242	14.5	7.25	192	12
70	..	230	13.8	6.9	184	11
75	..	217	13.5	6.5	168	10.5
80	..	205	12.5	6	158	9.9

360. Column (ii) gives number of trees on one hectare of land for 16 ages. Each represents five age gradations. The total of this column represents what could be the crop on 16 ha. of forest land if all the age classes are mixed together. Dividing each figure in column (ii) by 16 gives crop on 1/16 ha. as in column (iii) and the total of column (iii) the crop of 1 ha. with age gradation from 1 to 80. These figures are for a fully stocked area. Since Melghat areas have 51 per cent of the crop as teak, for the sake of comparability, column (iii) figures have to be halved to obtain the number in each age class in a normal selection forest with 50 per cent of the growth in teak.



361. Columns (v) to (vii) give similar information compiled from a yield table for natural teak forests. The basis of information has been secured through the kindness of Shri A. N. Chaturvedi, I. F. S., Mensuration Officer, FRI from an unpublished paper. The natural teak yield tables are reproduced under Appendix XXII a.

362. The four sets of figures (i) Existing growing stock, (ii) Existing growing stock modified on deLiocourt's Theory, (iii) Normal growing stock as per plantation teak and (iv) Normal growing stock from natural teak yield tables is given in table 31. Existing growing stock figures are for size classes, hence the average gae is also given.

TABLE 31

*No. of teak trees per hectare*

Existing Growing Stock				Normal Growing Stock Model			
Size-class	Age	Actual	de Liocourt	Age	(50) per cent stock Plantation teak yield table (6)	Natural teak yield table (7)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
15 U 30	..	34	42	10	41	68	
				15	29	37	
30 U 45	..	26	31	20	21	24	
				25	17	18	
45 U 60	..	19	22	30	14	15	
				35	12	12	
60 U 75	..	16	16	40	11	10	
				45	10	9	
75 U 90	..	14	11	50	9	8	
				55	8.5	7	
90 U 105	..	10.3	8	60	8	6.5	
				65	7.5	6	
105 U 120	..	6.5	5.8	70	7.2	5.5	
				75	6.7	5.2	
120 U 135	..	3.7	4.1	80	6.2	4.9	
135 & over	..	4.8	3.0				
Total	..	134.3	142.9	..	208.1	236.1	

363. From the above figures, it becomes evident that normal growing stock models with 50 per cent stock have a larger number of trees per hectare.

### Section 3: Volume tables

364. The demand for teak is on the increase and now even smaller sizes are saleable. This intensive utilization of teak necessitated the preparation of fresh volume table for teak for commercial outturn. The log outturn for teak from the 'logging registers' were compiled and fresh volume table for utilizable outturn of teak were prepared by the Forest Statistician, Poona. These are given below:—

TABLE 32

## Volume Tables

G. b. h. class	Utilizable outturn	
Cms.	M <sup>3</sup>	
45 U 60	..	0.037
60 U 75	..	0.123
75 U 90	..	0.222
90 U 105	..	0.333
105 U 120	..	0.455
120 U 135	..	0.589
135 U 150	..	0.736

## Section 4: Increment

365. The increment behaviour of the crop can be assessed only by repeated inventories of the crop. In absence of such data the following method was, therefore, adopted to get a fair idea. The CAI put on by each Age/size class was totalled and then, divided by 16 (for Growing Stock models only) to get the annual increment of a normal forest. For actual increment of the existing growing stock (Selection Working Circle) the number of trees in each size class was multiplied by the C. A. I. for that class. The total gave the C. A. I. of the whole crop. The details of calculations are given in Appendix XXIII while following is the summary.

TABLE 33  
Annual increment per hectare in M<sup>3</sup>

All the F. S.	Existing Growing stock		Plantation teak yield Table Model	Natural Teak yield Table Model
	14 F. S.	6 F. S.		
(1)	(2)	(3)	(4)	(5)
0.88	0.98	0.67	1.06	1.18

366. Apparently the increment figures compares well. But the normal growing stock increment is, however from a larger number of trees. The existing number of trees per ha. are less than 50 per cent of the normal growing stock. If prorata reduction on the basis of number of trees is made, the models show an increment roughly 0.75 M<sup>3</sup> for plantation and 0.73 M<sup>3</sup> for a natural crop models. The average of these i.e. 0.74 M<sup>3</sup> appears to be a more rational figure than 0.98 M<sup>3</sup> or 0.88 M<sup>3</sup> which is more likely a result of a rapid diameter growth due to crop being open. 0.74 M<sup>3</sup> increment represents 2.5 per cent annual increase for the existing growing stock of all the felling series [Table 29 Col. (3)].

367. The felling cycle is of 20 years. The annual yield in the form of increment over one hectare would work out to  $(.74 \times 20) = 14.80$  M<sup>3</sup>/ha. whereas the actual removal is 11.84 M<sup>3</sup>/ha. (Table 35 Col. 3).

368. *Increment for forests of Selection Working Circle.*—The results of successive enumerations can be used for assessing the annual increment for the forest. But this increment will be an approximation as the enumeration figures do not pertain precisely to the same area. The increment for the growing stock above 60 cm. girth is calculated because the first enumeration gives the stock above this girth. The following formula gives the annual increment. The workable area of the Selection Working Circle in the last plan is 117,800 ha.

$$I = V_2 + Y - V_1$$

T

Where I=Annual increment for the forest.

V<sub>1</sub>=Volume of teak at the time of first enumeration above 60 cm. girth i.e.  $117800 \times 16.5$  (para 329.b) = 1943700 M<sup>3</sup>.

V<sub>2</sub>=Volume of teak at the time of second enumeration above 60 cm. girth i.e.  $117800 \times 26.4$  (Table 29 Col. 3) = 3109920 M<sup>3</sup>.

Y=Total yield removed  
i.e.  $55175$  (para 352)  $\times 16 = 882,800$  M<sup>3</sup>.

T=Interval between the two enumerations=16 years.

$$I = 3109,920 + 882,800 - 1943,700$$

16

$$= 128064 \text{ M}^3$$

Annually the growing stock was being enriched by the addition of 72,890 M<sup>3</sup>.

## Section 5: Yield

## I. YIELD ON CLEARFELLING PER HECTARE :

369. Areas were clearfelled for raising plantations under various 5-year plan schemes. Marking abstracts for these areas were collected and the commercial yield on clearfelling, separately for East Melghat division and West Melghat division was calculated. The details are given under Appendix XXIV. The abstract is reproduced under Table 34.

TABLE 34  
Commercial yield on clearfelling per hectare

Girth-class Cm. (1)	East Melghat Division				West Melghat Division			
	Teak		Non-teak		Teak		Non-teak	
	No. (2)	Vol. M <sup>3</sup> (3)	No. (4)	Vol. M <sup>3</sup> (5)	No. (6)	Vol. M <sup>3</sup> (7)	No. (8)	Vol. M <sup>3</sup> (9)
15 U 30 ..	81.5	0.65	41.5	0.32	119.7	0.95	120.0	0.95
30 U 45 ..	37.4	0.93	20.0	0.50	40.4	1.00	49.8	1.25
45 U 60 ..	41.2	0.97	16.8	0.62	28.6	1.05	34.7	1.27
60 U 75 ..	38.9	3.82	9.2	1.12	21.0	2.57	29.0	3.57
75 U 90 ..	43.6	8.04	12.9	2.85	16.6	3.67	24.7	5.47
90 U 105 ..	30.5	9.70	5.9	1.97	10.8	3.60	18.1	6.02
105 U 120 ..	25.5	9.74	8.2	3.75	4.5	2.02	15.0	6.85
120 U 135 ..	11.3	7.02	2.9	1.72	2.0	1.20	13.4	7.85
135 and over ..	12.7	7.92	4.0	2.92	1.6	1.15	14.5	10.70
Total ..	322.6	48.16	121.4	15.77	245.2	17.21	319.2	43.93
Grand Total ..	No. of trees	444.0					564.4	
	Volume	63.93					61.14	

## II. PRESENT REMOVAL :

370. The actual removal as per the Working plan prescriptions for making for Selection Working Circle was calculated for 11 felling series (Semadoh, Rangarao, Rahu, Taura, Chunkhedi, Hatru, Butrum, Raipur, Harisal, Anjanjharap and Chaurakund). The average removal per hectare for these felling series is based on the marking records of 66 coupes. The average workable area of a coupe works out to 233 ha. The details are recorded under Appendix XXV and the results are given below :—

TABLE 35  
Removal of teak per hectare

Girth-class (1)	No. of trees (2)	Total volume (3)	Commercial volume (4)
Cm.		M <sup>3</sup>	M <sup>3</sup>
15 U 30 ..	15.7	0.12	0.12
30 U 45 ..	13.9	0.51	0.35
45 U 60 ..	11.0	1.02	0.40
60 U 75 ..	7.0	1.29	0.85
75 U 90 ..	4.3	1.29	0.95
90 U 105 ..	2.8	1.37	0.92
105 U 120 ..	1.3	0.94	0.60
120 U 135 ..	1.0	1.10	0.57
135 and over ..	3.8	4.20	2.82
Total ..	60.8	11.84	7.58

371. Table 29 Column 3 gives the growing stock of the mid period of the felling cycle. Increment for 10 years, therefore, will accrue before the final felling. The total growing stock at the time of final felling thus would be  $(29.39 + .74 \times 10) = 36.79 M^3$ .  $11.84 M^3$  forms 32.1 per cent removal of the growing stock of a coupe.

372. The average workable area of a coupe is 233 ha. Under Selection Working Circle having 20 felling series, 4,660 ha. are under working. Thus the total yield would be  $(4660 \times 11.84) = 55,175 M^3$ . The total growing stock of the Selection Working Circle is  $(118700 \times 29.39) = 3452,42 M^3$ . The yield of  $55,175 M^3$  represents 1.6 per cent removal of growing stock whereas the permissible removal is 2.5 per cent (para 366).

### III. YIELD OF TEAK FROM THE SELECTION WORKING CIRCLE:

373. Brandis method (as suggested by Sagreiya *vide* page 362 of the proceedings of IX Silvicultural Conference) was followed:—

(i) *Exploitable girth.*—120 cm. and felling cycle of 20 years.

(ii) *Felling cycle.*—20 years.

(iii) *Number of teak trees.*—The enumeration for the forests allotted to the Selection Working Circle gives teak trees/ha. as below:—

TABLE 36

Girth-class Cm.	Teak trees/ha. No
15 U 30 .. ..	34.45
30 U 45 .. ..	26.24
45 U 60 .. ..	18.98
60 U 75 .. ..	15.98
75 U 90 .. ..	14.13
90 U 105 .. ..	10.35
105 U 120 .. ..	6.50
120 U 135 .. ..	3.73
135 and over .. ..	4.84

(iv) *Survival percentage.*—The percentage of trees that will be reaching to the Exploitable girth has been calculated on the basis of number of trees that should have been in each girth class if the present stock was evenly balanced. The expected value of trees in an evenly balanced growing stock has been obtained as per the law of de Liocourt. The expected number of trees and survival percentage for each girth class is given under table 37.

TABLE 37

#### Survival Percentage

Girth-class Cm.	Trees according to the law of de Liocourt No./Ha.	Survival percentage
15 U 30 .. ..	42.17	9.8
30 U 45 .. ..	30.55	13.6
45 U 60 .. ..	22.13	18.7
60 U 75 .. ..	15.85	26.1
75 U 90 .. ..	11.35	36.5
90 U 105 .. ..	8.13	50.9
105 U 120 .. ..	5.81	71.3
120 U 135 .. ..	4.14	..
135 and over .. ..	3.00	..

(v) *No. of trees reaching the exploitable girth.*—The Table 38 gives the trees reaching the exploitable size.

TABLE 38

#### Trees reaching exploitable size

Girth-class Cm.	Trees/ha.	Percentage of survival	No. of trees/ha. reaching exploitable size
(1)	(2)	(3)	(4)
15 U 30 .. ..	34.45	9.8	3.38
30 U 45 .. ..	26.24	13.6	3.57
45 U 60 .. ..	18.98	18.7	3.55
60 U 75 .. ..	15.98	26.1	4.17
75 U 90 .. ..	14.13	36.5	5.16
90 U 105 .. ..	10.35	50.9	5.27
105 U 120 .. ..	6.50	71.3	4.63

(vi) *Average annual recruitment.*—The period required for one girth-class to pass over to next girth class is obtained from the stem analysis. Table 39 gives the average annual recruitment to the exploitable girth class.

TABLE 39

*Average annual recruitment*

Girth-class Cm.	Age Yr.	Years required to pass over to the next girth class	No. of trees/ ha reaching exploitable girth class	Average Annual recruitment
(1)	(2)	(3)	(4)	(5)
15 U 30 .. .. .	9 U 16 .. .. .	7	3.38	.483
30 U 45 .. .. .	16 U 25 .. .. .	9	3.57	.397
45 U 60 .. .. .	25 U 33 .. .. .	8	3.55	.444
60 U 75 .. .. .	33 U 42 .. .. .	9	4.17	.463
75 U 90 .. .. .	42 U 52 .. .. .	10	5.16	.516
90 U 105 .. .. .	52 U 64 .. .. .	12	5.27	.439
105 U 120 .. .. .	64 U 81 .. .. .	17	4.63	.272

(vii) *Accruing increment in successive Felling cycles.*—The number of trees that will be recruited during each felling cycle of 20 years is given below :—

Felling Cycle	Total recruitment during the felling cycle	Average annual recruitment during the felling cycle
(1)	(2)	(3)
I	$.272 \times 17 + .439 \times 3 = 5.947$	.2974
II	$.439 \times 9 + .516 \times 10 + .463 \times 1 = 9.574$	.4787
III	$.463 \times 8 + .444 \times 8 + 0.397 \times 4 = 8.842$	.4421

(viii) *Realisable recruitment.*—All the recruitment during the period of a felling cycle is not available for felling as in first year coupe, recruitment of only one year is available and so till the 20th coupe in which all the recruitment for 20 years will be available. The total realisable recruitment is calculated as per Sagreiya's formula.

$$(a) \text{ 1st felling cycle—} = \frac{1}{20} (5.947 - 17 \cdot 2974 - 272) = 2.7576$$

$$(b) \text{ 2nd felling cycle—} \\ (i) \frac{.439}{20} \times \frac{9 \times 9}{2} = 0.8890$$

$$(ii) 10 \left( \frac{.439}{20} \times 9 \right) + \frac{.516}{20} \times \frac{10 \times 10}{2} = 3.2660$$

$$(iii) 1 \left( \frac{.439}{20} \times 9 \right) + 1 \left( \frac{.516}{20} \times 10 \right) \\ + \frac{.463}{20} \times \frac{1 \times 1}{2} = 0.5714$$

$$\text{Total .. } \underline{\underline{4.7264}}$$

(c) 3rd felling cycle—

$$(i) \frac{.463}{20} \times \frac{8 \times 8}{2} = 0.7408$$

$$(ii) 8 \left( \frac{.463}{20} \times 8 \right) + \frac{.444}{20} \times \frac{8 \times 8}{2} = 2.1920$$

$$(iii) 4 \left( \frac{.463}{20} \times 8 \right) + 4 \left( \frac{.444}{20} \times 8 \right) \\ + \frac{.397}{20} \times \frac{4 \times 4}{2} = 1.6100$$

$$\text{Total .. } \underline{\underline{4.5428}}$$

(ix) *Net realisation in a felling cycle.*—In a first felling cycle out of the total recruitment of 5·9470 only the recruitment of 2·7576 is realisable and the balance recruitment of 3·1894 is the accumulated recruitment for the 2nd cycle. This accumulated recruitment in one cycle is realisable in the next cycle along with the latter's realisable recruitment. The net annual realisable recruitment per hectare in each felling cycle is given below :—

TABLE 40

Yield in successive felling cycles

Item (1)	1st F. C. (2)	2nd F. C. (3)	3rd F. C. (4)
a. Total recruitment .. .. .	5·95	9·57	8·84
b. Realisable recruitment .. .. .	2·76	4·73	4·54
c. Accumulated recruitment .. .. . (a—b)	3·19	4·84	4·30
d. Total realisable recruitment in a cycle .. .. . (b+c of previous cycle).	2·76	7·92	9·38
e. Annual average realization in a cycle .. .. .	0·138	0·396	0·469
f. Volume in M <sup>3</sup> —			
(i) Total .. .. .	0·152	0·437	0·518
(ii) Utilizable .. .. .	0·081	0·233	0·276

374. From the Table 40 it is seen that the yield is increasing progressively in successive felling cycles.

375. *Yield in the first felling cycle.*—The existing number of teak trees/ha. above 120 cm. girth is 8·57 which will be liquidated in the first cycle. The annual liquidation will be 428 teak trees/ha. having 0·472 M<sup>3</sup> Total volume or 0·287 M<sup>3</sup> utilizable volume. Thus the annual yield in total volume will be (0·152+0·472)= 0·624 M<sup>3</sup>/ha. which is well within the limits of annual forest increment (para 366.) The utilizable yield will be (0·81+0·287)= 0·368 M<sup>3</sup>/ha. and the estimated annual yield for the whole working circle will be (119,160 (area under teak) × 368)= 43850 M<sup>3</sup> and average yield per coupe will be (43850 ÷ 35)= 1253 M<sup>3</sup>.

376. *Yield from thinnings.*—As the stocking of teak trees is nearby 50 per cent of the desired stocking, thinning in the lower girth classes will be very light. Removal of only dead and dying trees is desirable. Thus no yield is expected from thinnings.

377. *Yield from clear felling.*—Teak plantations at least on 5 ha. will be carried out in coupes of 32 felling series. Annually 160 ha. will be clear felled for planting with teak. As per the present stocking the utilizable yield of teak on clearfelling is 18 M<sup>3</sup>. Only 50 per cent of this yield is expected to be available as the areas having low occurrence of teak are generally to be planted. Accordingly the yield from clearfelling will be (160 × 9)= 1440 M<sup>3</sup>.

378. *Yield from selection working circle.*—

	for W.C. M <sup>3</sup>	Per coupe M <sup>3</sup>
a. Yield from trees of and above exploitable size.	43,850	1,253
b. Yield for clearfelling .. .. .	1,440	45
Total .. .. .	45,290	1,298

## Section 6 : Inferences

379. The inferences that can be drawn from the data given in this chapter, are summarised below :—

(i) The forests are under stocked both in regard to the total number of trees/ha. and number of teak trees/ha.

(ii) The occurrence of teak is above 27 per cent in all the forests.

(iii) The stocking in number of trees as well as volume/ha. particularly of teak has increased during Sharma's Plan period.

(iv) Regeneration of teak is alarmingly deficient.

(v) The rate of diameter growth is higher than that for the corresponding All-India quality.

(vi) The present yield is low.

(vii) The present selection limit of 135 cm. girth is high.

(viii) The calculated future yield is well within the limits of annual forest increment.

(ix) The future yield of teak in selection working circle is progressively increasing in successive felling cycles.

(x) Bamboo Clumps have been overexploited.

## CHAPTER VII: ESTIMATE OF CAPITAL VALUE OF FORESTS

Section 1: *Capital value of the forest*

380. The uneven-aged forests, as in Melghat, are the results of formation over years. In such cases, the land value never exists separately from the timber value unless the stand is all cut, in which case there is no longer any uneven-aged forest. The values of land and timber necessarily go together.

381. Melghat forest is being managed on a sustained annual yield basis. The net annual realisation represents the return on the capital value of the forest. The average net annual income from both the divisions for the period from 1955-56 to 1971-72 is Rs. 37,57,575. At 6 per cent rate of interest the capital value of this net income is Rs. 6,26,26,250 for 303686 ha. Hence per hectare the capital value is Rs. 206.22.

382. The capital value of the growing stock can be determined in another manner. The value is calculated only for the forest allotted to the Selection Working Circle and the following procedure is adopted.

383. Timber is graded according to quality, length and girth class when put to sale at the Paratwada depot. The prices received at Paratwada were averaged (for a period of 10 years and for qualities II and III only) and table prepared which showed the price per M<sup>3</sup> for logs with midgirths of 22.5 Cm., 37.5 Cm., 52.5 Cm., etc. i. e., for meangirths of the standard 15 Cm. girth classes. The production cost per M<sup>3</sup>, which includes all expenditure was then deducted to give the stumpage value for logs of meangirths before felling and conversion. The production cost for Melghat was taken as Rs. 122.30 per M<sup>3</sup>.

384. The second step was to find out the commercial outturn of trees of varying girths. Outturn of 50 trees was recorded from each 15 cm. g.b.h.o.b girth class. The stumpage value of each log was found out by multiplying its volume with the average rate for that particular girth class. The value of the tree was found by adding the values of all logs derived from the tree. (Thus if tree yields, two logs with midgirth 47 Cm. and 32 Cm., their respective volumes were multiplied by the appropriate stumpage rate for the classes 45-60 and 30-45 to get the stumpage values of the tree). A regression equation was then fitted to the tree values to draw a price-size curve. The values for the meangirths of 15 Cm.g.b.H.o.b. classes for standing trees were then read out as "Stumpage rate per tree" [Column (3) of table 41].

385. Table 41 gives the capital value of growing stock on one hectare of forests allotted to the Selection Working Circle.

TABLE 41

<i>Capital value of one hectare of forest</i>				
Girth class	No. of trees	Tree stumpage rate	Total value	
(1)	(2)	(3)	(4)	
15 U 30	.. ..	34.45	Rs. ..	Rs. ..
30 U 45	.. ..	26.24	5.00	131.20
45 U 60	.. ..	18.98	16.61	319.05
60 U 75	.. ..	15.98	42.88	685.22
75 U 90	.. ..	14.13	81.11	1,146.08
90 U 105	.. ..	10.35	131.64	1,362.47
105 U 120	.. ..	6.50	194.60	1,264.90
120 U 135	.. ..	3.73	269.86	1,006.57
135 and over	.. ..	4.84	350.00	1,694.00
		Total or say	..	7,609.49 7,600.00

386. This is the devastation value of one hectare of forests of Selection Working Circle, and for the whole forest it is Rs. 8,952.8 lakhs.

387. There are two other methods of calculating the capital value of a forest apart from the 'devastation' value method employed above. They are (1) replacement cost and (2) costs of formation to date. These procedures are involved and would give us higher capital values. Of the two methods the latter method will give us a lower figure since the costs of formation in the past—whatever they were—must have been much less than what it would cost us now to grow such a crop i.e. the replacement cost.

Section 2: *Profitability of the forest allotted to Selection Working Circle*

388. Hiley (1967) has given two tests of profitability. The first test is the average annual profit which the owner of a forest makes on working them. For this test it is necessary that the woods should be in a productive condition and that the owner should not materially reduce or increase the quality or quantity of the

standing timber during the period when the profit is being measured; this means that the income must be derived from felling annually a volume of timber which is approximately equal to the annual increment. The net annual profit can then be expressed as a rate of simple interest on the capital volume of the forest. The second test is the rate of compound interest which an investor can earn on a single plantation which he initiates, cultivates through a rotation and eventually fells.

389. Melghat forest is a "going concern". At the moment it is not contemplated to convert it to even-aged stand. Its present profitability can be assessed by applying Hiley's first test only. To determine the interest that the annual cut represents it is necessary to find out the value of the annual cut and the capital value of the forest.

390. The exact cut and the sale value of this cut from the coupes of Selection Working Circle is not available. The average rates are, therefore, adopted.

391. Table 35 (para 370) gives the average annual cut per hectare. Using the stumpage rates under Table 41 Column (3) the stumpage value of this cut is given under Table 42.

TABLE 42

*Stumpage value of the annual out/ha.*

Girth class	No. of trees	Trees stumpage rate	Total value
Cm.		Rs.	Rs.
15 U 30 .. ..	15.7	..	..
30 U 45 .. ..	13.9	5.00	69.50
45 U 60 .. ..	11.0	16.81	181.91
60 U 75 .. ..	7.0	42.88	300.16
75 U 90 .. ..	4.3	81.11	348.77
90 U 105 .. ..	2.8	131.64	368.59
105 U 120 .. ..	1.3	194.60	252.98
120 U 135 .. ..	1.0	269.86	269.86
135 and over .. ..	3.8	350.00	1,330.00
		Total ..	3,124.77
		or say ..	3,125.00

392. The total return from the areas under working (para 372) of the 20 felling series would be Rs. 145.63 lakhs. This return is obtained on Rs. 8,952.8 lakhs (para 386) which is the capital value of the forest, and represents a simple interest of 1.6 per cent on this capital.

393. The interest earned is obviously low.



## CHAPTER VIII: WILD LIFE

Section 1: *Distribution of game*

394. Melghat forests are in a huge compact block. They are fairly dense. The terrain is very undulating and most of the areas are very rarely visited by human beings. These forests are, therefore, an ideal abode for wild life. Yet the game is not as plentiful as it should be. The main reason should be shortage of drinking water. There is no perennial stream. Water is found only in few pools here and there for about six months in a year.

395. The following animals are commonly found in the tract.

(1) *Tiger—Sher or bag (Panthera tigris)*.—

It is found throughout the area. The census carried out during the year 1969 indicated the presence of 4 tigers, 18 tigresses and 13 tiger cubs. While the recent census carried out during May 1972 recorded the stock of 19 male, 10 female, 14 sex unknown and 1 cub.

(2) *Leopard—Tendua (Panthera pardus)*.—This is the most common carnivora found all over the tract.

(3) *Wild dog—Jangalli kutta (Cuon alpinus)*—is found frequently in big herds. They are responsible to a large extent for keeping down the number of sambhar and deer in these forests.

(4) *Jungle Cat—(Felis Chaus)*—is fairly common and specimen of all colours are met with.

(5) *Hyaena (Hyaena hyaena)*, Jackal (*Canis aureus*) and Fox (*Vulpes bengalensis*) are found all over the tract.

(6) *Sloth Bear—Bhalu (Melursus ursinus)*. Is found all over the area though not very plentiful. It is very much feared by the aboriginals for the stubborn combativeness.

(7) *Bison—Gaur (Bos gaurus)* is found in good number in Harisal and Tarobanda ranges and is in fair number in other ranges.

(8) *Sambar (Cervus unicolor)* is found all over the area. They are usually seen individually or in pairs but seldom in herds.

(9) *Chowsingha—Ghotari (Tetracerus quadricornis)* is fairly common.

(10) *Barking deer—(Jungli bakri) (Muntiacus muntjak)* is common.]

(11) *Wild Boar—Suar (Sus scrofa)* is found fairly in large number.

(12) *Blue bull—(Boselaphus tragocamelus)* and *Chital (Axis axis)* occur occasionally.

(13) *The red monkey—(Rhesus Macaque)* is confined to the Sirashban valley.

(14) *Peafowl—(Pavo cristatus)* and *Jungli murgi (Gallus gallus and Gallus sonneratii)* are very common especially in lantana infested areas.

Section 2: *Legal Position*

396. The Wild Life (Protection) Act, 1972 enacted by Parliament has come into force in the State of Maharashtra from 1st of June 1973.

Section 3: *Rights and concession*

397. No rights or privileges have been admitted for hunting of wild animals and birds. Person interested in shooting in the forest area is required to obtain regular shooting permit as per the rules in force.

398. However, certain concessions in respect of (i) scientific research, (ii) collection of specimen for Zoological gardens and similar institutions and (iii) killing of such animals and birds as are a source of serious menace of human life and property, can be allowed by the Wild Life Preservation Officer.

Section 4: *Injuries to wild life*

399. Fire and poachers are mainly responsible for the destruction of wild life in Melghat.

400. *Fires*.—Forest fires are of frequent occurrence, particularly, in remote areas which are the ideal abode for wild life. These fires, besides destroying the natural habitat of the forest fauna drive them to take shelter near the human habitation and making them easy targets for poacher's hungry gun and aboriginal's spear. Melghat region is notorious for water scarcity particularly in summer. These fires aggravate the already existing water scarcity and compel them to migrate to the easy localities for food and water and expose these animals to abovementioned risks.

401. *Poaching*.—The Melghat tract is well protected from the southern and eastern side and the menace of poaching from outside the tract is not common. The danger is in fact from the habitants residing in the tract. Fortunately fast moving vehicles and high speed rifles are rare in the area and the poaching is negligible.

Section 5: *Past and Present history of management*

402. Prior to reorganization of States, the wild life conservation in this part was through the implementation of the provisions of the Indian Forest Act and the shooting rules framed by ex-Madhya Pradesh Government as given in appendix of M. P. Forest Manual, Volume II combined with the Wild Birds and Animals

Protection Act, 1912 as amended by the Central Provinces Amendment Act of 1935. By 1927, shooting blocks system was started. Under this system, the Conservator of Forests in consultation with the Divisional Forest Officer and the District Magistrate declares certain blocks of reserved forests with abundant game as open for shooting. Subsequently, a sliding scale of animals to be shot annually, in each block was introduced.

403. The Indian Board of Wild Life was constituted in 1952 with the main object of devising ways and means for conservation of wild life through coordinated legislative and practical measures and sponsoring the setting up of national parks and wild life sanctuaries.

404. The Bombay Wild Animals and Wild Birds Protection Act, 1951 which was considered as the most comprehensive legislation of its kind was made applicable to the Vidarbha region in 1961. Though this Act did not propose a significant change in the management of game in reserved forests, it is important as it operates even in areas outside reserved forests. Under the provisions of this Act arms license-holders for sports have to register themselves with the Wild Life Preservation Officer. Hunting licences are categorised into four kinds—Small game, Big game, Special big game and Pet animals and no person is allowed to carry on trade in trophies without a separate Trophy dealer's licence. The shooting rules as contained in the Bombay Wild Animals and Wild Birds Protection Rules, 1972 which are recently made applicable throughout the State are in force.

405. The Wild Life (Protection) Act, 1972 enacted by the Parliament, has come into force in the State of Maharashtra with effect from 1st June 1973. From the commencement of this Act, every other Act relating to any matter, contained in this Act and in force in the State stands repealed.

406. The Government in Revenue and Forests Department raised the fee for a shooting block permit to Rs. 20 per day subject to a minimum of Rs. 250 and a maximum of Rs. 500 per month for the Indian citizen while for the foreigner the same is Rs. 100 per day, subject to a minimum of Rs. 1,500 and a maximum of Rs. 3,000 per month. In addition, the royalty is also charged for each animal shot, at the rates prescribed for each animal.

407. A separate post of Wild Life Preservation Officer for the whole State was created but later on it was merged with the post of Chief Conservator of Forests when the State of Maharashtra was formed in 1960. The State Government in 1970 have sanctioned a post of Wild Life Warden in the cadre of Deputy Conservator of Forests and two posts of Assistant Wild Life Warden in the cadre of Assistant Conservator of Forests with Headquarter of Wild Life Warden at Nagpur. Out of the two posts of Assistant Wild Life Warden, one is at Nagpur and another at Amravati for Amravati Circle, obviously to look after the wild life management in the Melghat.

#### Section 6 : Measures adopted for protecting wild life

408. The arms and ammunition licensed for the protection of crop and cattle are to be deposited in a Police Station or with a licensed dealer for the period commencing from 20th May to 30th June of each year. This order was issued to check indiscriminate use of these arms resulting in the destruction of wild life.

409. Ban on hunting of tigers and panthers has also been placed. This decision was taken by the State Government after observing the declination in the population of tigers and panthers in the State.

410. Protection to all species coming under deer and antelope family except nilgai continued except in following shooting blocks.

Division	Shooting Block
East Melghat .. ..	1. Ghatang. 2. Taora. 3. Butrum. 4. Jarida. 5. Rahu.
West Melghat .. ..	1. Wan. 2. Golai. 3. Dharni.

41. The whole year has been declared as a close time for shooting bisons except in the following shooting blocks.

Division	Shooting Block
East Melghat .. ..	North Chourakund, South Chourakund, Raipur, Butrum, Jarida, Rahu, Taora and Sema-doh.
West Melghat .. ..	Dhargarh, Koktu.

412. The limit for animals to be shot in a particular block in a year is also fixed and in the event of depletion of wild life, the areas can be closed to shooting. Presently all the shooting blocks in Melghat have been closed for shooting since 1969-70.

413. In 1972, with a view to check illicit shooting of wild game, the State Government sanctioned the grant of rewards to the informants in respect of unlicensed shooting, provided that the information is found to be valid and leads to conviction of the offender. In addition, the State Government has decided to grant reward, equal to 50 per cent of the compensation actually recovered from the offenders for illicit shooting, to the Gram Panchayat or its office-bearers who have rendered co-operation in detecting of such illicit Shikar in the State.

414. The State Government approved the grant of rewards to Shikaris for destruction of wild dogs at Rs. 15 per wild dog.

415. Besides the abovementioned legal provisions for protection of wild life, public opinion for preservation of wild life is being created through the Wild Life Week, which is being celebrated every year since 1951.

#### Section 7: Wild Life captured, hunted or otherwise dead

416. The following statement gives the details of shooting permits issued and game shot thereon since 1955-56.

TABLE 43  
Details of Shooting Permits issued and game shot in shooting blocks

Year	No. of permits issued	Shooting fee recovered	Particulars of Game Shot									Royalty
			Bison	Tiger	Panther	Bear	Sambhar	Deer	Bluebull	Pig	Others	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
		Rs.										Rs.
			<b>Melghat Division</b>									
1955-56	.. 53	1,512-00	..	11	17	4	15	19	17	10	Wild dogs-2	
1956-57	.. 25	1,580-00	..	..	..	2	6	8	..	1	Tigress-1	
1957-58	.. 27	1,280-00	..	5	1	1	4	3	1	6	Tigress-1	
1958-59	.. Not Available	..	..	8	18	3	15	14	..	..	..	
1959-60	.. 50	3,100-00	..	3	8	..	9	8	1	..	Tigress-1	585
1960-61	.. 40	..	..	7	8	1	..	..	..	3	..	2,265 including permit fee.
1961-62	.. 29	1,670-00	..	3	11	2	..	..	1	3	..	220
1962-63	.. 40	3,200-00	..	7	4	1	..	..	1	6	..	320
1963-64	.. ..	..	..	..	..	..	..	..	..	..	..	..
			<b>East Melghat Division</b>									
1964-65	.. 38	2,500-00	..	6	9	5	7	4	..	1	..	530
1965-66	.. 27	1,920-00	..	1	10	2	..	..	..	2	..	160
1966-67	.. 30	2,660-00	2	3	6	8	1	8	..	3	..	750
1967-68	.. 21	4,650-00	3	3	7	4	11	4	..	2	..	1,250
1968-69	.. 17	2,050-00	3	1	4	..	3	4	..	2	..	850
1969-70	.. ..	All blocks were closed to shooting.										
			<b>West Melghat Division</b>									
1964-65	.. 12	1,200-00	..	3	4	2	..	1	5	..	..	275
1965-66	.. 13	650-00	..	1	3	..	..	..	1	..	..	55
1966-67	.. 10	500-00	..	3	2	2	3	3	..	..	..	210
1967-68	.. 17	1,050-00	..	1	2	1	..	3	2	..	..	345
1968-69	.. ..	..	} All blocks were closed to shooting.									
1969-70	.. ..	..										

#### Section 8: Special works of improvement Dhakna-Kolkaz Wild Life Sanctuary

417. This game sanctuary consisting of Dhakna, Tarobanda and Koktoo shooting blocks of West Melghat division and the part of Semadoh shooting block surrounding Kolkaz forest rest house in East Melghat division was established in 1968 vide Government Resolution No. WLP/1965/13090/Y, dated 28th July 1966 under the 5 year plan scheme 'Nature Conservancy' and is being developed as a tourist centre.

418. This sanctuary covers 381.58 Sq. km. of forest area situated in the heart of Melghat forest. Being surrounded by forest on all sides, the game sanctuary provide an ideal abode to the wild fauna as well as to avi-fauna. The wild life in this sanctuary consists mainly of tigers, panthers, sloth bears, gaurs (bisons), sambars, barking dears, hyaenas, wild pigs, black and red faced monkeys, wild dogs, hares and jungle cats. Among the avi-fauna prominent are the national bird peacock, jungle-fowls, Indian cuckoo, hill mynas, green pigeons and scores other.

419. In the sanctuary, at prominent places which towers near Salt-licks created artificially have been constructed.

420. The future works of improvement and development include.

- Construction of anicuts to provide perennial water-supply for the wild life.
- Construction of artificial salt-licks.
- Improvement of fodder supply for the wild life.
- Improvement of existing roads and construction of link roads to build an efficient network of communications.
- Erection of check-posts with cabins to guide the tourists.
- Accommodation for the sanctuary staff.

421. The sanctuary is easily approachable by the B. & C. road throughout the year from Amaravati and Akola, the average distance being 115 km. Besides the existing forest rest house at Tarobarda, Dhakna, Koktoo and Kolkaz, a 4 suited rest house equipped with modern amenities has been constructed in 1970-71 at Kolkaz.

#### TIGER PROJECT

422. In order to ensure the maintenance of viable population of the tiger for scientific, economic, aesthetic, cultural and ecological values a Wild Life Management Plan for the Melgat Tiger Reserve is prepared by Shaikh and Sawarkar in 1973.

## PART II--FUTURE MANAGEMENT PROPOSED AND DISCUSSED.

## CHAPTER I: BASIS OF PROPOSALS

Section 1—*National Forest Policy* :

423. The forest policy of the country was enunciated for the first time in the year 1894 by the Government of India in their resolution No. 22—F, dated October 19, 1894. Later the need to reconcile the National Forest Policy was felt on realising the complementary part of forest in respect of agriculture and its role in maintaining the physical and climatic conditions. Accordingly a revised National Forest Policy for the country was formulated by the Government of India in the Ministry of Food and Agriculture Resolution No. (Agri.) 13th January 1952-F, dated 12th May 1952.

424. As elaborated in the National Forest Policy the following are the paramount needs of the country—

- (1) the need for evolving a system of balanced and complementary land-use, under which each type of land is allotted to that form of use under which it would produce most and deteriorate least ;
- (2) the need for checking :
  - (a) denudation in mountainous regions, on which depends the perennial water supply of the river system whose basins constitute the fertile core of the country ;
  - (b) the erosion progressing apace along the treeless banks of the great rivers leading to ravine formation, and on vast stretches of undulating waste lands depriving the adjoining fields of their fertility ;
  - (c) the invasion of sea-sands on coastal tracts and the shifting of sand dunes, more particularly in the Rajputana desert ;
- (3) the need for establishing treelands, wherever possible, for the amelioration of physical and climatic conditions promoting the general well being of the people ;
- (4) the need for ensuing progressively increasing supplies of grazing, small wood for agricultural implements, and in particular of firewood to release the cattle dung for manure to step up food production ;
- (5) the need for sustained supply of timber and other forest produce required for defence, communications and industry ;
- (6) the need for realisation of the maximum annual revenue in perpetuity consistent with the fulfilment of the needs enumerated above.

Section 2—*Factors affecting the general objects of management* :

425. The main facts influencing the general objects of management are :—

- (i) Melghat is sparsely populated and there is a chronic scarcity of labour for forest works. Labour from outside is available only when they are free from their agricultural work.
- (ii) Local demand for forest produce is negligible in Melghat. Small timber and firewood are slightly in demand only in border areas.
- (iii) Teak in all sizes and *haldu* and *saja* in large sizes are in demand at Paratwada, Dharni and Akot either for local consumption or for export, but mostly for export. Bamboos have good market in the plains. Rusa oil and tendu leaves are increasingly in demand.
- (iv) With the establishment of Integrated Unit at Paratwada the utilization of non-teak species has increased.
- (v) Teak forest covers 1,482.53 sq. km. forming 48.6 per cent of the total forest. The rest is mixed forest.
- (vi) The steep slopes of the higher hills, particularly those exposed to the south-west monsoon, are liable to erosion on account of heavy rainfall.
- (vii) The perspective plan for the State and region envisages large scale plantations of teak and other industrial wood to meet the likely demand of the wood based industries.
- (viii) Area is infested with lantana.

Section 3—*Objects of management* :

426. Taking into consideration the above facts the immediate and special objects of management are :—

- (1) To preserve forests on the steep hill sides and areas stocked with open forest to prevent erosion and rapid run off.
- (2) To satisfy the local demands of forest produce and grazing.
- (3) To ensure the maximum sustained yield of forest produce in demand.
- (4) To increase the valuable growing stock.

Section 4—*Analysis and valuation of the crop* :

## (i) STOCKMAPS

427. During Stein's as well as Sharma's Plan all the 1,086 compartments were stockmapped. Out of these the stockmaps of 711 compartments are revised in this Plan. The stockmaps of remaining 375 compartments are not revised, as these are found fairly accurate. The forests of Dhulghat, Dabida, Wan, parts of Rupagarh

reserves and 'C' Class forests of Dhamangaon and Chichona-Nimkheda blocks, which were not stock mapped during Sharma's Plan, are stockmapped for the first time. All these stockmaps are shown on map sheets having scale 2"=1 mile. The types of forests viz. teak, mixed, salai, unworkable and forests liable to frost damage have been shown on the maps along with occular density. Occurrence of bamboos and lantana and rusa grass was also indicated.

428. The forest having percentage of teak 20 or more in the growing stock has been classified as teak forest while presence of *Salai* 20 per cent or more in a mixed forest is shown as *Salai* forest. The teak as well as *Salai* forest and some of the mixed forest which are stockmapped in this plan are shown into the following quality classes.

- I quality over 27 metres.
- II quality over 21 m. to 27 m.
- III quality over 15 m. to 21 m.
- IVa quality over 12 m. to 15 m.
- IVb quality upto 12 m.

429. The conventional signs used for the stockmaps are given in appendix XXVII.

430. The abstract of stockmapping is given below—

TABLE 44  
Results of stockmapping

Type	Quality	East Melghat Division	West Melghat Division	Total	Per cent to the total forest area
(1)	(2)	ha.	ha.	ha.	(6)
Teak	.. II .. ..	1,770.3	1,203.8	2,974.1	1.0
	.. III .. ..	78,003.1	43,163.8	1,21,166.9	39.7
	.. IVa .. ..	6,244.4	12,908.0	19,152.4	6.3
	.. IVb .. ..	470.5	4,489.4	4,959.9	1.6
	Total—Teak forest	86,488.3	61,765.0	1,48,253.3	48.6
Mixed	.. II .. ..	..	12.0	12.0	..
	.. III .. ..	3,232.5	3,725.3	6,957.8	2.3
	.. IV-a .. ..	801.2	8,787.4	9,588.6	3.1
	.. IV-b .. ..	162.1	692.2	854.3	0.3
	Quality not shown	1,883.6	22,942.3	24,825.9	8.1
Total—Mixed forest	6,079.4	36,159.2	42,238.6	13.8	
Salai	.. III .. ..	..	38.0	38.0	..
	.. IV-a .. ..	11.9	13,998.4	14,010.3	4.6
	.. IV-b .. ..	..	9,142.0	9,142.0	3.0
Total—Salai forest	11.9	23,178.4	23,190.3	7.6	
Plantations Teak	..	1,010.3	504.5	1,514.8	0.5
Other	..	49.4	1,532.3	1,581.7	0.5
Frost liable area	..	12,781.7	5,444.5	18,226.2	6.0
Blank	.. ..	6,611.6	21,046.3	27,657.9	9.0
Cultivation (approximately)	..	9,870.2	10,711.3	20,581.5	6.7
Not stock mapped	..	9,578.5	12,570.2	22,148.7	7.3
Total for Division	..	1,32,481.3	1,72,911.7	3,05,393.0	100.0

431. The results of stockmapping by compartments are shown in Appendix XXVIII. Of the total forest area, teak forest forms 48.6 per cent, mixed forest 13.8 per cent and salai forest 7.6 per cent. Plantations are just on 1 per cent area. 7.3 per cent area was not stockmapped.

(ii) QUALITY

432. The largest area is found under III quality forest having 42 per cent while the least area is under II quality with 1 per cent IVa quality and IVb quality cover only 14 per cent and 4.9 per cent, respectively. The forest that was not classified into quality classes forms 15.4 per cent.

(iii) ENUMERATIONS

433. Fresh enumerations of all the species and a separate enumeration for bamboos were carried out during 1969-72 and 1969-70, respectively. The enumeration results are available according to working circles of Sharma's Plan and Bhatena's Scheme. These are given under Appendix XXII.

434. The analysis of the results of the present and past enumerations indicates that in general the stocking both in respect of number of trees and volume of teak has increased during the span of Sharma's Plan. But it is still below the stocking as discussed under paragraphs from 358 to 363. The occurrence of teak varies from 27.9 per cent in Miscellaneous Working Circle to 48.7 per cent in Selection Working Circle. Teak has, however, slightly more percentage of occurrence in higher girth-classes. Similarly, in respect of teak, East Melghat division is better placed than West Melghat division.

(a) Selection Working Circle—

435. The present stocking for the forest allotted to Selection Working Circle is 277.56 trees/ha. out of which teak trees are 135.20/ha. Table 21, Para 349 (1) forming 48.71 per cent. Considering the stocking in forests allotted to Selection Working Circle separately in East Melghat division and West Melghat division the number of teak trees are 148/ha. and 100/ha. forming 51.3 per cent and 40.5 per cent, respectively. The lowest percentage of occurrence of teak is 38 for 45 to 60 cm. girth class in West Melghat division while the highest is 68 per cent for 120 U 135 cm. girth class in East Melghat division. It means even in the present composition of the stand there is ample scope for manipulation to increase the stocking of teak in all the girth classes.

436. The crop girth of teak in the forest of Selection Working Circle is 58.5 cm.

437. Other species which occur in descending order of occurrence are *tiwas*, *lendia*, *ain*, *haldu* and *kalam* in East Melghat division; and *tiwas*, *lendia*, *salai*, *ain*, *kakad*, *haldu* and *kalam* in West Melghat division.

(b) Coppice-with-reserves working circle—

438. Sharma's Plan.—Total number of trees/ha. are 298.24 out of which 132.67 trees are of teak having 44.48 per cent [Table 24, Para 349 (iii)]. It is seen that with slight variation this percentage of teak has been maintained in all the girth-classes. The actual variation is from 33.09 per cent for above 135 cm. girth-class to 49.98 per cent for 60-75 cm. girth class. Other species which are prominent in occurrence in descending order are *salai*, *lendia*, *tiwas*, *ain*, *kakad* and *kalam*.

439. Bhatena's Scheme.—Out of 258.68 trees/ha., teak trees are 86.57 which form 33.47 per cent [Table 25, Para 349 (iii b)]. The total stocking as well as that of teak is low.

440. *Salai* follows teak and forms 21.75 per cent of the stocking. Other species occurring in decreasing order are *lendia*, *ain*, *tiwas* and *khair*. *Haldu* forms only 0.4 per cent.

(c) Miscellaneous Working Circle—

441. Out of 252.19 trees/ha. teak trees are 70.27 which form only 21.86 per cent [Table 26, Para 349 (iv)], Nearly equal to teak, *salai* has the proportion i.e. 25.23 per cent *lendia*, *ain*, *khair* and *tiwas* are other species in descending order of occurrence. *Haldu* forms a meagre portion of the stock i.e., 0.06 per cent.

Section 5—Functional classification of forests:

442. With the above objects of management in view and in consonance with the general grazing policy of the Government of Maharashtra as laid down under Revenue and Forest Department, Resolution No. MFP-1365/13221-Y, dated 6th December 1968, and the Chief Conservator of Forests, M.S., Poona's No. D-GRS/157/7902, dated 30th March 1972, the forests, based on their functions, are classified as below.

443. (a) *Protection forests*.—The upper precipitous and steep slopes of the main ridge of the Gawilgarh hills and of its subsidiary ranges are included in these forests. The preservation of this class of forest is of paramount importance for soil conservation and reducing rapid run off of water as these forests form the headwaters of rivers, streams and nalas. This category of forests cover 167.81 sq. km. forming 5.5 per cent of the total forest area.

444. (b) *Tree forests*.—In this category, the forests having little local demand for forest produce and capable of producing big size teak timber, are included. These forests cover the areas of Bairagath and parts of Gugamal and Khirpani reserves. The extent of these forest is 1,799.16 sq. km. and forms 58.9 per cent of the total forest area.

445. (c) *Minor forests*.—In this class, the forests having some local demand for forest produce and grazing, and capable of producing small size timber, poles and firewood are included. The forests of Tapti, Chithri, Chikhali, Bod, Jhappadeo, Rupagarh, Wan, Dabida, Dhulghat reserves and parts of Chikhaldia, Kohana, Motad and Khirpani reserves are allotted to this class which measures 1069.89 sq.km. forming 35.0 per cent of the total forest area.

446. (d) *Pasture lands*.—The areas allotted to this class are Dhamangaon and Chichona-Nimkheda 'C' class forest. These forests are open having little tree-growth and are maintained primarily as grazing grounds. The extent of these forests is 17.07 sq. km. which forms 0.6 per cent of the total forest.

447. (e) *Remaining forests*.—(i) *Grass Reserves*.—There are no grass reserves in Melghat.

(ii) *Nature and recreation reserves*.—The forest covered by the 'Tiger Reserve' is allotted to this category. The extent is 1571.74 sq. km. overlapping the areas under Tree forests, Minor forests and Protection forests.

448. A statement showing the classification of forests on functional basis, by compartments and ranges is given in appendix XXX and the abstract is given below to show the comparison with the classification given in Sharma's Plan.

TABLE 45  
Distribution of functionally classified forest

Classification of forest	East Melghat Division	West Melghat Division	Total	Classification under Sharma's Plan
(1)	(2)	(3)	(4)	(5)
	ha.	ha.	ha.	ha.
1. Protection forest ... ..	4,709.8	12,071.1	16,780.9	18,168.4
2. Tree forest .. .. .	1,25,226.4	54,687.9	1,79,916.3	1,77,610.6
3. Minor forest .. .. .	2,543.1	1,04,445.7	1,06,988.8	1,10,023.6
4. Pasture lands .. .. .	..	1,707.0	1,707.0	1,792.4
5. Remaining forest Nature and Recreation Reserve (Overlapping).	97,234.0	59,940.0	1,57,174.0	..

#### Section 6—Method of treatment :

449. The important factors, besides the objects of management, which influenced the choice of the treatment to be adopted are:—

- (i) the situation of the forest.
- (ii) the type and quality of the forest and condition of reproduction of tree species ;
- (iii) the requirements of the population in respect of forest products, and
- (iv) the availability of labour.

450. *Tree forests*.—Teak is the most prominent species in these forests. Teak forests are generally young to middle aged and natural regeneration of teak is inadequate. With dense lantana and heavy grasses as the chief undergrowth in these forests, it is improbable that concentrated teak natural regeneration can be obtained. Considering the changing trends in forest management, creation of series of plantations would have been the ideal proposition. But in view of the great variations in physical condition and shortage of labour it is not feasible at present to resort to a large scale artificial regeneration. Hence the method of concentrated regeneration will have to be deferred till the crop matures and the regeneration can be guaranteed either naturally or artificially.

451. Thus the method of treatment in these forests shall aim to free the whatever existing natural reproduction ; to help the present young stands to grow up ; to harvest available large trees before they deteriorate and to prepare ground for large scale plantations in future by starting systematic plantation on small scale in the beginning. Another object of raising these plantations is to increase the proportion of valuable species particularly of teak in the stocking. In frost liable areas, the presence of other species will be favoured to protect the frost tender teak. The best suited silvicultural system thus will be a selection system for these forests.

452. Grazing will be allowed in these forests but the incidence will not be allowed to exceed 1.2 ha. (3 acres per cattle unit). Area will be strictly fire protected.

453. *Minor forests*.—The forests are easily accessible to neighbouring population and capable of growing small sized timber, being of low quality generally IVa and IVb with occasional patches of quality III. Natural reproduction of seedling origin of tree species is rather poor and existence of forest mostly depends on coppice reproduction. Reservation will be made to avoid the sacrifice of well grown immature crop. Understocked areas will not be worked. Some of these forests which adjoin the populated tract will be worked on a



short rotation mainly for the production of small timber and firewood to meet the local demand and the system will be Coppice-with-Reserves. The stock in the remaining forest will be improved either by carrying out improvement felling or allowing rest.

454. The grazing incidence will be maintained at 0.6 to 0.8 ha. (1.5 to 2 acres) per cattle unit.

455. *Protection forests*.—These forests will not be subjected to any type of regular working as the paramount need in these forests is to preserve tree-growth to conserve soil as well as water. They will be protected from fire and grazing will be completely excluded.

456. *Pasture lands*.—These forests will be maintained as grazing grounds and grazing incidence will be maintained 0.4 ha. (1 acre) per cattle unit.

457. Bamboo bearing forests which overlap the above mentioned forests will be worked to meet the Local demand and surplus bamboos will be sold on commercial basis.

458. Rusa grass available in the forests will be exploited for extraction of soil. Areas containing Rusa grass will be given rest in rotation to allow the grass to shed seeds and to regenerate. Rusa grass plantation will also be raised.

459. Tendu leaves recently came into prominence in these areas. The trade in tendu leaves will be regulated as per the provisions of Maharashtra Minor Forest Produce (Regulation of Trade) Act, 1969. As it is a paying commodity experimental plantations of tendu will be suggested.

460. *Lantana*.—The past experience shows that the complete eradication of lantana is not feasible either by uprooting or by application of weedicides. In fact complete eradication of lantana is not desirable Melghat is a hilly tract. The dense mass of lantana appears to be a good soil binder in checking soil run off. Minimising its interference in the growth of reproduction of valuable species will therefore meet the silvicultural requirement of the crop. Thus repeated cuttings of only interfering lantana will be prescribed.

#### Section 7—Working Circles :

461. In accordance with the considerations detailed above the following working circles have been formed :—

- (1) Selection Working Circle.
- (2) Coppice-with-Reserves Working Circle.
- (3) Improvement Working Circle.
- (4) Protection Working Circle.
- (5) Miscellaneous Working Circle.
- (6) Bamboo Overlapping Working Circle.
- (7) Rusa Grass Overlapping Working Circle.

Table 46 gives the distribution of forests as classified on functional basis, to these working circles.

TABLE 46

*Distribution of functional forest to working circles*

Classification of forest	East Melghat Division					West Melghat Division					Total
	S.W.C.	C.W.R. W.C.	Improvement W.C.	Protection W.C.	Misc. W.C.	S.W.C.	C.W.R. W.C.	Improvement W.C.	Protection W.C.	Misc. W.C.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Protection	..	..	..	4,709.8	..	..	..	..	12,071.1	..	16,780.9
2. Tree	1,25,228.4	..	..	..	..	54,687.9	..	..	..	..	1,79,916.3
3. Minor	..	2,543.1	..	..	..	..	46,582.7	35,925.6	..	21,937.4	1,06,988.8
4. Pasture	..	..	..	..	..	..	..	..	..	1,707.0	1,707.0
Total	1,25,228.4	2,543.1	..	4,709.8	..	54,687.9	46,582.7	35,925.6	12,071.1	23,644.4	3,05,393.0
	1,32,481.3					1,72,911.7					

462. The compartments allotted to these working circles by ranges are given under Appendix XXXI while felling series formed in each working circle are given in Appendix XXXII.

463. The distribution of areas of these working circles by ranges is given under Table 47.

TABLE 47

## Areas of working circles by ranges

Range (1)	Area of working circle in hectare					Total (7)	Bamboo overlapping W.C. (8)	Rusa grass overlapping W.C. (9)
	Selection W.C. (2)	C.W.R. W.C. (3)	Improvement W.C. (4)	Protection W.C. (5)	Miscellaneous W.C. (6)			
<i>East Melghat Division</i>								
1. Jurida .. ..	48,292.6	2,543.1	..	4,709.8	..	5,55,455.0	14,946.4	55,545.5
2. Raipur .. ..	27,946.6	..	..	..	..	27,946.6	5,095.2	27,946.6
3. Semadoh .. ..	21,045.2	..	..	..	..	21,045.2	5,501.3	21,045.2
4. Harisal .. ..	27,944.0	..	..	..	..	27,944.0	7,294.4	27,944.0
Total .. ..	1,25,228.4	2,543.1	..	4,709.8	..	1,32,481.3	32,837.3	1,32,481.3
Per cent to the area of the Division.	94.5	1.9	..	3.6	..	100.0	24.8	100.0
<i>West Melghat Division</i>								
1. Chikhaldara .. ..	3,832.9	5,775.1	..	12,071.2	748.7	22,427.8	2,181.8	22,427.8
2. Tarobanda .. ..	26,886.4	8,889.4	..	..	..	35,775.8	6,772.5	..
3. Akot .. ..	23,968.6	9,382.5	9,238.9	..	958.3	43,548.3	4,611.5	43,548.3
4. Dharni .. ..	..	15,700.5	..	..	..	15,700.5	5,061.2	..
5. Dhulghat .. ..	..	..	13,378.7	..	10,916.0	24,294.7	..	24,294.7
6. Wan .. ..	..	6,835.2	13,308.0	..	11,021.4	31,164.6	678.5	31,164.6
Total .. ..	54,687.9	46,582.7	35,925.6	12,071.2	23,644.4	1,72,911.7	19,305.5	1,21,435.4
Per cent to the area of the Division.	31.6	26.9	20.8	7.0	13.7	100.0	11.2	70.2
Grand Total .. ..	1,79,916.3	49,125.8	35,925.6	16,780.9	23,644.4	3,05,393.0	52,142.8	2,53,916.7
Per cent of the total forests area.	58.9	16.1	11.8	5.5	7.7	100.0	17.1	83.1

## Section 8—Blocks and Compartments :

464. The forest is composed of 15 reserves of 'A' Class forests and 2 of 'C' Class forests. During Sharma's Plan the forest area excluding Dhulghat, Wan, Dabida, 'C' Class reserves and part of Rupagarh reserve was divided into 1,086 compartments. At the time of preparation of Working Scheme for this excluded forest area in 1961, Bhatena divided the 'A' Class reserves into 178 compartments and numbered these compartments serially in continuation of the numbers given in Sharma's Plan. Thus all the 'A' Class reserve forest has now been divided into 1,264 compartments.

465. In 1962, alongwith other areas middle portion of compartment 748 was disforested cutting the compartment into two parts far apart. Hence a larger southern part now is retained as compartment 748 while a smaller northern part is merged with the area of adjoining compartment 734.

466. The 2 'C' Class reserves have also been now divided into 8 compartments which are serially numbered from 1 to 8 and numbered with blue colour on map.

467. The size of a compartment is varying from 708 ha. to 95 ha. the average being 240 ha. Sub-compartments have also been formed in cases where it was found necessary to allot parts of a compartment to different working circles.

468. A map of sampling unit for enumeration and the record of enumeration carried out in it are enclosed with the respective compartment history files.

469. The distribution of compartments by ranges and reserves is detailed under Appendix V C and shown on the 2"=1 mile scale maps prepared with this working plan.

## Section 9—Period of the Plan :

470. The period of the plan is fixed for 10 years from 1975 to 1985 but coupes have been laid down for longer period in all the working circles.

## CHAPTER II : WORKING PLAN FOR SELECTION WORKING CIRCLE

## Section 1 : General Constitution of the Working Circle

471. This Working Circle includes all the important teak bearing forest and practically covers whole of the areas of East Melghat division except southern part of Jarida range and parts of Tarobanda and Akot ranges of West Melghat division. The forest area for which a Wild Life Management Plan has been prepared under 'Project Tiger' has also been covered by this Working Circle. Areas included under the Wild Life Management Plan for 'Project Tiger' is given under Appendix XXIX.

472. The extent of area covered by this working circle is 179,916.3 ha. The allotment is given below :—

TABLE 48  
Allotment of area

Range	Area of the Working Circle in hectare	Per cent to the area of the Range	Per cent to the area of the Division
(1)	(2)	(3)	(4)
<i>East Melghat Division</i>			
Jarida .. .. .	48,292.6	86.9	36.4
Raipur .. .. .	27,946.6	100.0	21.1
Semadoh .. .. .	21,045.2	100.0	15.9
Harisal .. .. .	27,944.0	100.0	21.1
Total .. .. .	1,25,228.4		94.5
<i>West Melghat Division</i>			
Chikhaldara .. .. .	3,832.9	17.1	2.2
Tarobanda .. .. .	26,886.4	75.2	15.5
Akot .. .. .	23,968.6	55.0	13.9
Total .. .. .	54,687.9		31.6
Grand Total .. .. .	1,79,916.3		58.9 ( To the total area)

473. The compartments allotted to this working circle are given in Appendix XXXI.

## Section 2 : Special Objects of Management

474. The Special Objects of Management in constituting this working circle are—

- (i) to maintain and improve the adequate soil cover in the high hills as a safeguard against soil erosion and rapid run off of water.
- (ii) to promote and to tend the available teak reproduction.
- (iii) to increase the stocking of teak, and
- (iv) to obtain a maximum supply of teak timber and consequently the revenue therefrom.

## Section 3 : Character of the Vegetation

475. The general description of the forest allotted to this working circle is given under paragraphs 67 to 75. The forest is generally well stocked and of mostly III quality though few patches of II quality are met with in valleys of Sipna and Kuapati rivers. Teak is the principal species and forms 48.7 per cent of the growing stock by number. Teak appears at its best on gently sloping well drained soils and valleys to the north of main ridge of Gawilgarh hills. It is generally young to middle aged with sprinklings of older trees. Regeneration is very scanty. *Haldu* and *saj* occur in fair quantity. *Tiw* though plenty on higher elevations is generally of small size.

476. These forests were practically under selection working from the beginning and most of the forests have undergone at least 2 or 3 cycles of selection fellings. However, majority of the areas in West Melghat division could not be worked in the past due to the very rough terrain and shortage of labour. These forests are rather dry and poor in stocking of teak as compared to those in East Melghat division.

## Section 4 : Analysis and valuation of the crop

477. (i) *Stockmaps*—The results of stockmapping by compartments are given under Appendix XXVIII. Table 49 shows the abstract of the results of stockmapping for the areas allotted to this working circle.

TABLE 49  
Results of Stockmapping

Forest Type	Quality	Extent in hectare		Total	Per centage to the total area of W. C.	
		East Melghat Division	West Melghat Division		East Melghat Division	West Melghat Division
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Teak	II	1,770.3	1,196.1	2,966.4	1.0	0.7
	III	77,522.7	30,780.0	1,08,302.7	43.1	17.1
	IV-a	5,232.7	2,226.2	7,458.9	2.9	1.2
	IV-b	238.2	193.8	432.0	0.1	0.1
	Total	84,763.9	34,396.1	1,19,160.0	47.1	19.1
Mixed	II	..	8.0	8.0	..	..
	III	3,232.5	2,729.2	5,961.7	1.8	1.5
	IV-a	801.2	1,280.4	2,081.6	0.5	0.7
	IV-b	162.1	..	162.1	0.1	..
	Quality not shown	270.3	6,390.7	6,661.0	0.1	3.6
Total	4,466.1	10,408.3	14,874.4	2.5	5.8	
Salal	IV-a	11.9	..	11.9	..	..
	Plantation—					
	(i) Teak	989.3	265.6	1,254.9	0.6	0.1
	(ii) Other	49.4	134.2	183.6	..	0.1
Total	1,050.6	399.8	1,450.4	0.6	0.2	
Frost	..	12,779.7	2,913.2	15,692.9	7.1	1.7
Blank	..	5,471.7	4,055.5	9,527.2	3.0	2.2
Not stockmapped	..	8,347.2	1,484.9	9,832.1	4.7	0.8
Cultivation	..	8,349.2	1,030.1	9,379.3	4.6	0.6
Grand Total	..	1,25,228.4	54,687.9	1,79,916.3	69.6	30.4

478. Of the total forest allotted to this working circle teak forest covers 66.2 per cent of area. Teak plantation form only 1.6 per cent. Percentage for mixed forest is 8.3. Blanks and cultivation together cover 10.4 per cent area 5.5 per cent area, was not stockmapped. Nearly 70 per cent area is in East Melghat division.

479. (ii) *Quality*.—III quality is predominant in this forest. The extent is 114,264.4 ha. forming 63.5 per cent. Out of this teak III quality is 60.2 per cent and 3.3 per cent is for mixed forest.

480. Forests under other qualities have individual percentage generally less than 5. Quality II area is found only on 1.7 per cent area, all of teak. IVa and IVb qualities of teak just cover 4.1 per cent and 0.2 per cent area, respectively.

481. (iii) *Enumeration*.—In East Melghat division the total stocking is 288.89 trees/ha. while in West Melghat division the same is 247.08 trees/ha. and for both the divisions, it works out to 277.56 trees/ha. Teak

trees in each of this category are 148.1, 100.2 and 135.2 per hectare, respectively. The distribution of teak in girth-classes is given below :—

TABLE 50  
Number of Teak trees per hectare

Girth Class cm.	East Melghat Division	West Melghat Division	Total for Selection W. C.
(1)	(2)	(3)	(4)
15 U 30 .. ..	38.2	24.5	34.5
30 U 45 .. ..	28.3	20.6	26.2
45 U 60 .. ..	20.6	14.5	19.0
60 U 75 .. ..	17.3	12.4	16.0
75 U 90 .. ..	15.4	10.6	14.1
90 U 105 .. ..	11.6	6.9	10.4
105 U 120 .. ..	7.4	4.0	6.5
120 U 135 .. ..	4.0	3.0	3.7
135 over .. ..	5.3	3.7	4.8
Total .. ..	148.1	100.2	135.2
Percentage to the total stocking .. ..	51.3	40.5	48.7

482. The results of enumeration indicate that the stocking of teak is deficient and forms only 48.7 per cent. A study of this stocking *vis-a-vis* that given under Table 31 (para 362) reveals that the present stocking of teak is just 50 per cent. Thus it evident that efforts are needed to built up the teak stock. The actual stocking of all species is given under Tables 21 and 23 (para 349).

483. In both the divisions *tiwas* is next to teak in occurrence and forms 3.99 per cent and 7.87 per cent of the stock in East Melghat and West Melghat divisions, respectively. The next one is *lendia* in both the divisions. In West Melghat division *salai* has more percentage than that in East Melghat division, exact percentages being 3.63 and 0.52, respectively. *Ain* and *haldu* are practically in equal proportions in both the divisions having least occurrence in the lowest girth-class and highest in the highest girth-class.

#### Section 5 : Method of treatment

484. The main object besides freeing the available reproduction, is the production of big sized teak timber which these forests are capable of growing. As the general stocking is less than desired, every effort will be made to maintain and increase the present stocking of teak. Lantana interfering with teak reproduction will be repeatedly cut back. Advance growth of teak will be tended to grow up. In addition, the natural regeneration will be supplemented by artificial regeneration as much as possible. As the purpose of raising teak plantations is to increase the percentage of teak in growing stock, teak plantations even on small scattered patches will be raised. The areas liable to frost damage will either be excluded from working or will be opened up cautiously. These treatments can best be met under selection system.

#### Section 6 : Choice of species

485. Teak is the most valuable species which is in demand universally in all sizes. *Tiwas* is next in demand but found in small sizes. The demand for *haldu* and *saja* is growing. *Bija* and *shisham* though in demand, are found scattered. *Shisham*, *bija*, *tiwas*, *haldu* and *saja* will, therefore, receive preferential treatment next to teak, in the order in which they are mentioned. *Semal*, though a commercially valuable species, is rare and hence will be reserved in all sizes. Similarly *kulu* being a valuable species for its gum will also be reserved.

#### Section 7 : Exploitable girth

486. The exploitable girth is to be decided in relation to teak which is the prominent species and is most in demand. Other species though favoured in the market are not economically as important as teak. The market trend together with the capacity of the site to produce the popular size in demand in a reasonable period, will largely influence the choice of the exploitable girth.

487. (a) *Rate of growth*.—The teak stem analysis as given under paragraph 325 indicates that the maximum volume production is obtained at the age of 88 years when a tree attains an average girth of 124 cm.

488. (b) *Market trend.*—The market trend is reflected in the prices offered for the various sizes. For the timber from Melghat, Paratwada is the main outlet where timber is sold by public auctions periodically. Average prices for teak for various sizes are calculated on the basis of the prices offered during the last 5 years at Paratwada. Further percentage increase of price over the price of previous size is also worked out. The result of this study is given below.

TABLE 51

*Percentage increase of price for teak over the price of previous size*

Girth Class (log)	Average price per M <sup>3</sup>	per cent rise over the previous price
(1)	(2)	(3)
45 U 60 .. .. .	330	..
60 U 75 .. .. .	415	25.8
75 U 90 .. .. .	478	15.2
90 U 105 .. .. .	525	9.8
105 U 120 .. .. .	550	4.8
120 U 135 .. .. .	565	2.7
135 U 150 .. .. .	575	1.8
150 and over .. .. .	580	0.9

489. It is seen that the rise in price for 120—135 cm. girth-class and over is marginal.

490. (c) *Price/age gradient.*—The gross value and stumpage value of a teak tree is determined as per the method described under paragraphs 361 and 362. From these values mean annual price increment and current annual price increment are calculated. The results are tabulated under Table 52.

TABLE 52

*Price/Age gradient*

Girth cm.	Mid Girth cm.	Age Yrs.	Difference in age of successive girth-class from Col. 3	Gross value of a tree	Difference in successive values in Col. 5	Stumpage value of a tree	Difference in successive values in Col. 7	M.A. Price Increment		C. A. price Increment	
								Gross value	Stumpage value	Gross value	Stumpage value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Rs.			Rs.	Rs.	Rs.	Rs.
15 U 30 ..	22.5	12	..	..	..	..	..	..	..	..	..
30 U 45 ..	37.5	21	9	..	..	..	..	..	..	..	..
			8								
45 U 60 ..	52.5	29	..	21.34	..	16.81	..	0.74	0.58	..	..
			9	..	36.58	..	26.07	..	..	4.06	2.90
60 U 75 ..	67.5	38	..	57.92	..	42.88	..	1.52	1.13	..	..
			9	..	50.34	..	38.23	..	..	5.59	4.25
75 U 90 ..	82.5	47	..	108.26	..	81.11	..	2.30	1.73	..	..
			11	..	64.11	..	50.53	..	..	5.83	4.59
90 U 105 ..	97.5	58	..	172.37	..	131.64	..	2.97	2.27	..	..
			13	..	77.88	..	62.96	..	..	5.99	4.84
105 U 120 ..	112.5	71	..	250.25	..	194.60	..	3.52	2.14	..	..
			39	..	91.64	..	75.26	..	..	2.35	1.93
120 U 135 ..	127.5	110	..	341.89	..	269.86	..	3.11	2.45	..	..

491. The curves of values for mean annual price increment and CA I price increment intersect at the age of 84.5 or 85 years at which a teak tree attains 122 cm. girth at b.h.

492. (d) *The present net worth.*—Stumpage values of trees are given under column 7 of Table 52. The present net worth of these values @ 3.5 per cent and @ 6 per cent rate of interest are calculated and given below.

TABLE 53  
*Present net worth*

Girth class	Mid girth	Age	Stumpage value	Present net worth	
				@ 3.5 %	@ 6.1 %
(1)	(2)	(3)	(4)	(5)	(6)
cm.	cm.	Yr.	Rs.	Rs.	Rs.
45 U 60 .. ..	52.5	29	16.81	6.20	3.11
60 U 75 .. ..	67.5	38	42.88	11.78	4.63
75 U 90 .. ..	82.5	47	81.11	16.06	5.91
90 U 105 .. ..	97.5	58	131.64	17.77	4.47
105 U 120 .. ..	112.5	71	194.60	17.51	3.11
120 U 135 .. ..	127.5	110	269.86	6.20	0.54

493. Eventhough the stumpage value of a tree is rising with the increase in girth, its highest net value lies between 98 cm. girth and 113 cm. girth @ 3.5 per cent rate of interest ; whereas @ 6 per cent rate of interest it is between 83 cm. girth and 98 cm. girth.

494. (e) *Marginal cost.*—The marginal annual cost increase in stumpage value of a teak tree has been compared with the annual interest that would be received on the stumpage value at different rates of interest. The details of working are given under table 54.

TABLE 54  
*Marginal Cost*

Melghat—14 F. S.

Girth Class and mid girth	Age in Yrs.	Difference in age of successive girth classes	Commercial volume of a tree	Gross value of a tree	Cost of exploitation of a tree @ Rs. 122.30 per m <sup>3</sup>	Stumpage value of a tree	Difference in successive values in Col. 8	Annual incremental change in stumpage value (9)	Annual change in interest amount for stumpage value at			
									2.0 %	3.5 %	6.6 %	8.0 %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
cm.	Yr.		cm.	Rs.	Rs.	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.
45 U 60 (52.5)	.. 29	29	0.037	21.34	4.53	16.81	16.81	0.58	0.36	0.68	1.45	1.89
60 U 75 (67.5)	.. 38	9	0.123	57.92	15.04	47.88	26.07	2.89	0.93	1.73	3.71	4.79
75 U 90 (82.5)	.. 47	9	0.222	108.26	27.15	81.11	38.23	4.25	1.79	3.39	7.52	9.78
90 U 105 (97.5)	.. 58	11	0.333	172.37	40.73	131.64	50.53	4.59	2.97	5.71	13.11	17.42
105 U 120 (112.5)	.. 71	13	0.455	250.25	55.65	194.60	62.96	4.84	5.82	14.14	55.79	96.50
120 U 135 (127.5)	.. 110	39	0.589	341.89	72.03	269.86	75.26	1.93	..	..	..	..

495. The values under columns from 9 to 13 are plotted against age and 5 curves, one each for value under each column are drawn. The curves are given under appendix XXVI. The curves of values under columns 10 to 13 intersect the curve of values under column 9 as given below.

Rate of interest	Age at the point of intersection	Corresponding girth
(1)	(2)	(3)
	Yr.	cm.
2.0 per cent	.. .. 76	116.5
3.5 per cent	.. .. 61	102.0
6.6 per cent	.. .. 45	79.5
8.0 per cent	.. .. 40	71.5

496. These points of intersection represent the sizes at which the marginal costs, equal marginal income and hence are the optimum sizes upto which trees should be grown depending on the discount rate. Beyond these points, the annual cost of holding a tree exceeds the value it will add. So a net loss will be incurred annually in holding a tree beyond this size.

497. The optimum sizes given by the methods (d) and (e) change according to the rate of interest adopted. These sizes, therefore, can be taken as indications of what the optimum size of exploitation is likely to be. The choice in this respect will also largely depend on the existing condition of the crop. With these sizes as exploitable limits, the removal in term of volume/ha. will be of the following order on the presumption that every tree above these limits will be marked for felling.

Girth	Volume that would be removed per ha.	% of removal to the existing volume
(1)	(2)	(3)
cm.	M <sup>3</sup>	
116.5	10.66	36.0
102.0	17.08	60.5
79.5	23.03	79.2

498. It is evident that even with the exploitable limit of 116.5 cm. girth the removal is 36 per cent of the existing stock and with lower limits of exploitable girth the removal almost amounts to clear felling. It is therefore, clear that these sizes do not suit to the present condition of crop as the removal under these sizes clashes with the primary object of management i.e. to maintain and improve the soil cover.

499. Another object of management is to obtain the maximum supply of teak timber which is in short supply. This object is best achieved by fixing the exploitable limit at 124 cm. girth as given by the method (a). The findings under methods (b) and (c) also indicate the desirable size of exploitation near about 120 cm. girth. The calculation based on the 120 cm. girth as exploitable size (para 353) also give the yield progressively in successive felling cycles. All these indications weigh highly in favour of exploitable limit near about 120 cm. girth. Hence the exploitable girth is fixed at 120 cm. for teak and other species as well.

#### Section 8 ; *Felling cycle.*

500. The felling cycle of 20 years is fixed. It is being followed and is found convenient for working.

#### Section 9 : *Formation of the Felling series.*

501. 24 felling series in East Melghat division and 11 felling series in West Melghat division are formed as given below.

TABLE 55  
*Distribution of felling Series*

Range	Felling series	Area in hectare
(1)	(2)	(3)
<b>East Melghat Division</b>		
Jarida	1. Taora	6,196.6
	2. East Chunkhedi	5,434.8
	3. West Chunkhedi	4,983.9
	4. Khadimal	6,484.5
	5. Jarida	5,995.2
	6. Biba	8,323.3
	7. Rahu	5,410.1
	8. Sumita	5,464.2
	Total	48,292.6



Range	Felling series	Area in hectare
(1)	(2)	(3)
<b>East Melghat Division—contd.</b>		
Raipur	9. North Raipur	4,868.1
	10. South Raipur	4,318.0
	11. North Hatru	4,369.5
	12. South Hatru	4,176.2
	13. West Butrum	5,210.5
	14. East Butrum	5,004.3
	<b>Total</b>	<b>27,946.6</b>
Semadoh	15. Semadoh	6,530.5
	16. Makhala	5,404.2
	17. Pili	4,276.1
	18. Kuwapati	4,834.4
	<b>Total</b>	<b>21,045.2</b>
Harisal	19. Tapti	3,923.0
	20. Rangubeli	4,808.3
	21. North Anjanjharap	4,983.1
	22. South Anjanjharap	4,357.5
	23. Chaurakund	5,105.8
	24. Harisal	4,766.3
<b>Total</b>	<b>27,944.0</b>	
<b>Total for East Melghat Division</b>		<b>1,25,228.4</b>
<b>West Melghat Division</b>		
Chikhaldara	25. Chikhaldara	3,832.9
Tarobanda	26. Rangrao	4,872.3
	27. Koha	4,935.9
	28. Arao	5,920.8
	29. North Dhakna	5,363.7
	30. South Dhakna	5,793.7
<b>Total</b>	<b>26,886.4</b>	
Akot	31. Belkund	5,740.3
	32. Koktu	4,544.6
	33. Gurgipati	4,356.2
	34. Gularghat	4,744.6
	35. Dhargarh	4,582.9
<b>Total</b>	<b>23,968.6</b>	
<b>Total for the West Melghat Divisions</b>		<b>54,687.9</b>
<b>Grand Total for both Division</b>		<b>1,79,916.3</b>

502. The parts of Chikhaldara, Rangrao, Koha, Arao, South Dhakna, Belkund, Koktu, Gurgipati, Gularghat and Dhargarh felling series fall under Sanctum Sanctorum of 'Project Tiger' for which a separate plan has been drawn up.

503. The compartments allotted to felling series and coupes included in the compartment are given under appendix XXXII.

### Section 10 : Regulation of yield

504. The yield is fixed by area and an effort has been made to form the coupes as equiproductive as possible. The fluctuation in yield from coupe to coupe may, however, occur but a little variation in the total yield is expected. As the crop is open, practically no yield is expected in thinning. As given under paragraph 378 the estimated commercial yield of teak is 45290 M<sup>3</sup> for the working circle.

### Section 11 : Agency of exploitation

505. The forests are valuable and under the agency of departmental working, new modern methods of exploitation can easily be introduced. The forests are also being worked departmentally since long. Therefore, the forests will be worked through the departmental agency.

### Section 12 : Method of executing the felling

506. (a) *Demarcation*.—All annual coupes will be demarcated a year in advance of main working as per the procedure laid down under paragraph. 632.

507. (b) *Selection of plantation site*.—Before marking, the coupe will be inspected by a Gazetted Officer who will select the area for clear felling for raising plantation as per section 15. Area selected for raising plantation will be demarcated on the ground. In case there are more than one patches for clear felling, each such patch will be given a serial number.

508. (c) *Marking*.—The marking will be done by an officer not below the rank of R. F. O. as particular attention is needed in carrying out thinning which is to be confined only to the trees belonging to the same girth class and the stocking of teak being poor it is to be carried out only where it is absolutely necessary in favour of teak. For the guidance of a marking officer the following rules are laid down.

- (1) All climbers will be cut.
- (2) *Semal* and *kulu* in all sizes and shape will be reserved against felling.
- (3) All Sound and edible fruit bearing trees like *mahuwa*, *tendu*, *aonla*, *achar* etc. will be reserved against felling.
- (4) No teak tree of pre-exploitable girth class ie. (105 U 120 cm.) shall be marked for felling, unless it is dead.
- (5) All other trees of and above 120 cm. in girth will be marked for felling unless they are required for—
  - (i) Protection from frost.
  - (ii) Protection for site and
  - (iii) Seed production.
- (5a) Felling in a radius of 100 m. from the perennial water hole, nallas and springs, will be prohibited.
- (6) Very light thinning will be carried out in the crop below pre-exploitable girth class. No sound teak tree will be removed unless its removal benefits two other teak trees of the same girth class. Dead and unsound trees will however be marked for felling.
- (7) Groups of teak poles will be thinned. Heavy openings in the canopy involve the danger of encouraging rank growth of lantana and coarse grass, still proper spacing between the poles is very necessary. A guiding principle in adopting the spacing will be the 1/3rd the average height of adjacent trees.
- (8) Marking for clear felling will be carried out in the areas selected for planting.

*Note*.—A tree will be reckoned as unsound if it has—

- (i) an obviously visible hollow.
- (ii) a deep fire scar extending beyond 1.5 m. from the ground level on a hole.
- (iii) a straight utilisable hole less than 2 m. in length.
- (iv) upper half height dried.

### Section 13 : Cutting Back Operation

509. Immediately after main felling cutting back operations will be carried out. It will consist of cutting back all malformed advance growth of teak of 20 cm. in girth at b. h. and below over all the area and removing trees of inferior species and lantana interfering or likely to interfere with the growth of these seedling coppice. These operations will be inspected by a Gazetted Officer after their completion.

### Section 14 : Sequence of fellings

510. Each felling series has been divided into 20 annual coupes and sequence of felling of coupes is given under appendix XXXIII.

### Section 15 : *Plantations*

511. Teak plantations will be carried out over not less than 5 ha. in each coupe except in coupes of Chikhaldara, Koktu and Belkund felling series.

512. At the time of marking, the area suitable for plantation will be selected by a Gazetted Officer and will be marked on the map as well as on the ground. The plantation sites may be in patches. However, a patch should not be less than 2 ha. in extent. As a guide, the following areas may be selected for plantation—

- (i) Mixed crop.
- (ii) Teak crop having proportion of teak less than 50 per cent.
- (iii) Mature crop having no teak reproduction .
- (iv) Crop having poor density if suitable for planting.
- (v) Fire damaged area if suitable for plantation.

513. The technique of raising teak plantation is well established. However, in view of the condition of past plantations, it is again emphasized that the timely operation in plantation is one of the key factors leading to success.

514. The areas of these plantations will be marked annually on a set of maps supplied to Divisional Forest Officers and a copy of the trace will be sent to Divisional Forest Officer, Working Plan for plotting the same on the map sheets of master set. The records of these plantations will be maintained by the Divisional Forest Officers as per the standing orders on the subject.

### Section 16 : *Cleaning and thinning*

515. (i) *Cleaning*.—The following operations will be carried out in the 6th year commencing from the year of main felling. These operations will also be carried out in the coupes worked earlier.

(1) Lantana and other growth of inferior species interfering or likely to interfere with the reproduction of teak and other valuable species will be cut.

(2) All climbers will be cut.

(3) Coppice shoots of teak will be reduced to one well grown shoot per stool. The intention is not to promote the coppice growth but to utilize the existing growth in absence of advance growth of seedling origin.

(4) The established advance growth of teak and other valuable species will be spaced out suitably. In this operation the preference will be given to the advance growth of seedling origin.

516. (ii) *Thinning*.—(1) In the 11th year commencing from the year of main felling the first mechanical thinning will be carried out in the teak plantations carried out under the prescriptions of this plan.

(2) In other areas lantana and other growth of inferior species interfering or likely to interfere with the reproduction of teak and other valuable species will be cut back.

517. A programme of C. B. O. cleaning and thinning is given in appendix XXXIV.

518. (iii) *Thinnings in old plantations*.—The list of the plantations carried out under 5 year plan schemes during the period of the last plan is given under appendix XV.

519. Thinnings will be carried out only in teak plantations and in mixed plantations. No thinning is necessary in pure Eucalyptus plantations. A Gazetted Officer will decide the necessity of thinning or otherwise after inspecting the plantation due for thinning.

520. The Ordinary 'D' grade thinning will be carried out in favour of teak. The guiding principle in deciding the thinning spacement will be the height of a tree. The distance between the adjacent trees will be 1/3 of the average height of these trees.

521. The programme of thinning in these plantations is given in appendix XXXVIII. Care has been taken to coincide this operation either with the main felling or with cleaning and thinning in the main coupe in which the plantation is situated.

## CHAPTER III : WORKING PLAN FOR COPPICE WITH RESERVES WORKING CIRCLE

## Section 1 : General constitution of the working circle

522. The following types of areas have been included in this working circle.

(i) A greater portion of the forests which are capable of producing small to medium sized timber, poles and firewood.

(ii) A few compartments capable of producing big sized timber, which are inextricably mixed up with forests under (i) above.

(iii) A few compartments which could not be included in the protection working circle mainly owing to their scattered nature.

523. These forests occur in Dharni, Chikhaldara and parts of Akot, Tarobanda and Jarida range and cover 49125.8 ha. The compartments allotted to this working circle are shown in appendix XXXI. The distribution of area by ranges is given below.

TABLE 56  
Allotment of area

Range	Area of the W. C. in	Percent to the area of the range	Percent to the forest area of the division
(1)	(2)	(3)	(4)
Hectares			
<i>East Melghat Division</i>			
Jarida .. .. .	2,543.1	4.6	1.9
<i>West Melghat Division</i>			
Dharni .. .. .	15,700.5	100.0	9.1
Chikhaldara .. .. .	5,775.1	25.7	3.3
Wan .. .. .	6,835.2	21.9	4.0
Akot .. .. .	9,382.5	21.6	5.4
Tarobanda .. .. .	8,889.4	24.8	5.1
Total ..	46,582.7	..	16.1
Grand Total ..	49,125.8		16.1 (to the total area).

## Section 2 : Special object of management

524. The special object for constituting this working circle is to obtain the maximum yield of small timber poles and firewood to meet the demand of local population.

## Section 3 : Character of the vegetation

525. The detailed description of forests allotted to this working circle is given under paragraph 76 B. The forests are mostly of low III and IV-a quality. Teak is the principal species and *salai*, *dhaora*, *moyen* and *kakad* are its common associates. *Salai* at places, particularly in Akot range, tends to become pure. There are also numerous patches of mixed forest intermingled with the teak forests. Generally the crop is open and teak is of young age.

526. Since 1912, these forests are under regular working, in the beginning under coppice with standards and later under more elastic system of coppice with reserves. Practically all the forests have been worked at least once completely.

## Section 4 : Analysis and valuation of the crop

527. (i) *Stock map*.—The results of stock mapping by compartments are given in appendix XXVIII. The abstract of the results of stockmapping for the areas included in this working circle is given below :—

TABLE 57  
Results of stock mapping

Forest type	Quality	Extent in hectares			Percent to total area of W. C.	
		East Melghat Division	West Melghat Division	Total	East Melghat Division	West Melghat Division
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Teak .. .. .	II .. .. .	.. .. .	7.7	7.7	.. .. .	.. .. .
	III .. .. .	195.0	11,430.5	11,625.5	0.4	23.3
	IV-a .. .. .	845.6	6,555.0	7,400.6	1.7	13.3
	IV-b .. .. .	89.1	3,086.5	3,175.6	0.2	6.3
	Total .. .. .	1,129.7	21,079.7	22,209.4	2.3	42.9
Mixed .. .. .	III .. .. .	.. .. .	575.2	575.5	.. .. .	1.2
	IV-a .. .. .	.. .. .	1,997.2	1,997.2	.. .. .	4.1
	IV-b .. .. .	.. .. .	203.0	203.0	.. .. .	0.4
Quality not shown .. .. .	.. .. .	740.6	7,586.8	8,327.4	1.5	15.4
Total .. .. .	.. .. .	740.6	10,362.2	11,102.8	1.5	21.1
Plantation—						
(i) Teak .. .. .	.. .. .	8.9	186.3	195.2	.. .. .	0.4
(ii) Other .. .. .	.. .. .	.. .. .	425.8	425.8	.. .. .	0.9
Total .. .. .	.. .. .	8.9	612.1	621.0	.. .. .	1.3
Forest .. .. .	.. .. .	2.0	2,499.8	2,501.8	.. .. .	5.1
Blank .. .. .	.. .. .	661.9	5,515.2	6,177.1	1.3	11.2
Not stock mapped .. .. .	.. .. .	.. .. .	2,909.4	2,909.4	.. .. .	5.9
Cultivation .. .. .	.. .. .	.. .. .	3,604.3	3,604.3	.. .. .	7.4
Grand Total .. .. .	.. .. .	2,543.1	46,582.7	49,125.8	5.1	94.9

Practically entire area of the working circle lie in West Melghat division. Only 5.1 per cent area is in East Melghat division.

Out of the total area the extent of teak forest is 22,209.4 ha. and forms 45.2 per cent. Area under teak plantation is only 0.4 per cent. Percentage for mixed forest is 22.6. Blank and cultivation cover nearly 20 per cent area. About 6 per cent area was not stock mapped.

528. (ii) *Quality*.—Maximum area i. e. 24.9 per cent is clothed by III quality. Next is IV a quality covering 19.1 per cent area followed by IVb quality having 6.9 per cent. The area under mixed forest which was not differentiated into quality classes forms 16.9 per cent. III and IVa qualities together cover 44.0 per cent area.

529. (iii) *Enumeration*.—As per the recent enumeration the species-wise stocking is given under Table 24 and the abstract is reproduced below :—

TABLE 58  
Number of trees per hectare

Girth-class	Teak		Others		Total No.
	No.	Percentage	No.	Percentage	
(1)	(2)	(3)	(4)	(5)	(6)
cm.					
15 U 30 .. .. .	46.28	42.35	62.99	57.65	109.27
30 U 45 .. .. .	28.09	42.45	38.07	57.55	66.16
45 U 60 .. .. .	20.96	49.08	21.74	50.92	42.70
60 U 75 .. .. .	16.15	49.98	16.16	50.02	32.31
75 U 90 .. .. .	10.79	45.93	12.70	54.07	23.49
90 U 105 .. .. .	5.04	45.70	5.99	54.30	11.03
105 U 120 .. .. .	2.63	44.28	3.31	55.72	5.94
120 U 135 .. .. .	1.39	42.25	1.90	57.75	3.29
135 and over .. .. .	0.34	33.09	2.71	66.91	4.05
Total .. .. .	132.67	44.48	165.57	55.52	298.24

530. Above 135 cm. girth teak forms only 33.09 per cent of the growing stock of that girth-class. For other girth-classes the variation in the percentage of teak occurrence is negligible, the range being from 42.25 to 49.98. Over all percentage for teak is 44.48 and next to it is *salai*, having 4.86 per cent. In 15 U 30cm. girth-class *salai* has the least percentage i.e. 0.2. However, its percentage gradually rises with increase in girth class, maximum being 20.88 for 105 U 120 girth class. *Lendia* and *tiwas* form 3.65 percent and 3.02 per cent respectively. Percentage of occurrence for *tiwas* above 135 cm. is, however, negligible. Similarly *khair* which has 1.37 per cent occurrence in the stock is found in negligible number over 105 cm. 1.27 is the percentage of occurrence for *ain* while *haldu* forms only 0.43 per cent of the stock. Excluding teak and *salai*, *haldu* has the highest percentage i.e. 4.45 for 135 cm. and over girth-class, but for 15 U 30 cm. girth-class it is only 0.17.

### Section 5 : Method of treatment

531. The chief object of management of these forests is to produce small to medium sized timber, poles and firewood. The forests allotted to this working circle are capable of yielding such produce. The adoption of the coppice with reserves system which has been in force in these forests, is considered most suitable. The forests vary very greatly in density and growth, and this system treats each patch according to its requirements. Under this system, blanks, nala banks, eroded and very steep slopes will be excluded from fellings. Clear fellings will be carried out in well stocked area, reserving trees of economic and edible fruit bearing trees and well grown poles of valuable species in groups. As the percentage of teak in the stocking is less than 50 the treatment will be in favour of teak to encourage and promote teak advance growth. Lantana interfering with the reproduction of teak and other valuable species will be repeatedly cut back.

### Section 6 : Choice of species

532. In view of its universal demand, teak will be the principal species. *Semal* and *kulu* being species of commercial value will be conserved. Besides, edible fruit bearing trees will be retained. Other important species are *shisham*, *bija*, *tiwas*, *haldu*, *saj* and *dhaora* which will be given preference in the order in which they are mentioned here.

### Section 7 : Rotation

533. The object of management in constituting this working circle is to produce teak small timber and poles of 45 cm. to 60 cm. in girth at mid length and firewood to the maximum possible extent. The most of the forest allotted to this working circle is of comparatively poorer quality and examination of typical areas under exploitation indicates that the percentage of unsoundness increases rapidly in teak trees over 100 cm. in girth at b. h. The rate of growth as given under paragraph 325 indicates that 100 cm. girth is reached at the age of 60 years for Maharashtra quality III. As the forests are of rather poor quality, to obtain 100 cm. girth nearly 90 to 100 years may be required. The reserves which will be generally exploited in the second felling cycle, are expected to attain this size by that time. Hence the rotation of 40 years which is being followed is found suitable and fixed for this plan also.

### Section 8 : Formation of felling series

534. The forests have been divided into 13 felling series of which only one felling series is in East Melghat division and 12 are in West Melghat division. The details are given below.

TABLE 59  
Distribution of Felling series

Range (1)	Name of F. S. (2)	Area in ha. (3)
<b>East Melghat Division</b>		
Jarida .. ..	1. Ghatang .. ..	2,543.1
	Total for East Melghat Division ..	2,543.1
<b>West Melghat Division</b>		
Chikhaldara .. ..	2. Manbhang .. ..	3,163.5
	3. Chandrabhaga .. ..	2,611.6
	Total ..	5,775.1

TABLE 59—contd.  
Distribution of Felling series

Range (1)	Name of F. S. (2)	Area in ha. (3)
Dharni .. ..	4. Patia .. ..	3,267.8
	5. Rajdei .. ..	4,770.0
	6. Dharni .. ..	3,388.1
	7. Bod .. ..	1,167.8
	8. Chithri .. ..	3,106.8
	Total ..	15,700.5
Taroṅanda .. ..	9. Jhapnadeo .. ..	3,850.8
	10. Chikhali .. ..	5,038.6
	Total ..	8,889.4
Akot .. ..	11. Khatkali .. ..	4,694.3
	12. Popatkhedā .. ..	4,688.2
	Total ..	9,382.5
Wan .. ..	13. Rupagarh .. ..	6,835.2
	Total ..	6,835.2
	Total for West Melghat Division ..	46,582.7
	Grand Total for both Divisions ..	49,125.8

535. At the time of reorganisation of divisions, parts of Manbhang felling series and Chikhaldara felling series of Sharma's Plan were included into both the divisions. For the convenience of working the areas of these felling series falling into each division are now readjusted to form one complete felling series, in each division.

The compartments allotted to felling series and coupes included in the compartment are given under appendix XXXII.

#### Section 9 : Regulation of yield

536. The yield is regulated by area making coupes as equiproductive as possible and each felling series has been divided into 40 annual coupes serially numbered in the order in which they are to be worked.

#### Section 10 : Agency of exploitation

537. The coupes are being worked departmentally. The same agency of exploitation will, therefore, be continued.

#### Section 11 : Method of executing the fellings

538. (I) *Demarcation*.—The coupe due for working will be demarcated a year in advance of working as per the procedure laid down under paragraph. 632.

539. (II) *Preparation of treatment map*.—Before marking the coupe will be thoroughly inspected either by a Gazetted Officer or a Range Forest Officer who will prepare a treatment map showing the following areas :—

(A) This category will include—

- (i) Precipitous and very steep slopes,
- (ii) understocked areas with density below 0.4 including 10 metre wide strip of forest surrounding them.
- (iii) eroded areas and areas liable to serious erosion.
- (iv) 100 metre radius from the perennial water holes, nallas and springs.
- (v) areas liable to frost damage.

(B) Patches of young well grown pole crop of teak suitable for retention as future crop. The patch should not be less than a hectare. This category will also include the plantations carried out during Sharma's Plan under 5 year plan scheme.

(C) *Salai* forest of and over 0.4 density.

(D) *Other areas*.—The remaining areas will be included under this category.

540. Only areas of category (A) will be demarcated on the ground as per instructions given under paragraph 632.

541. (III) *Marking*.—At the time of marking climbers will be cut all over the area. The following rules are laid down for the guidance of the marking officer.

1. *Category (A)*.—Only dead trees will be marked for felling. Teak trees of and above 120 cm in girth at b. h. may be marked for felling if silviculturally available. However, the fellings in areas under (A) iv of para 539 will be prohibited.

2. *Category (B)*.—Marking for thinning will be carried out. As a guide for thinning, the spacement will be approximately 1/3rd of the average height of the adjacent trees. All dead, dying, diseased, damaged and malformed poles will be first marked for removal to achieve the spacement.

Teak plantations which were carried out under various plan schemes will also be thinned suitably.

3. *Category (C)*.—No tree is to be removed unless its removal benefits teak and other valuable species as given under para 532—Miscellaneous trees standing over reproduction will be marked for felling. Teak trees over 100 cm. girth at b. h. if not required for soil protection or as seed bearers will be marked for felling. In favour of teak and other important species thinning marking will be done.

4. *Category (D)*.—This category includes all well stocked areas and will be marked for clearfelling with the following exceptions :—

(i) All *semal* and *kulu* trees will be retained.

(ii) All healthy trees of *salai* upto 120 cm in girth at b. h. will be retained if not interfering with the growth of teak.

(iii) All healthy trees bearing edible fruits and flowers such as *mahuwa*, *char*, *aonla* and *tendu* will be reserved.

(iv) Trees required for protection of site and for production of seeds will be reserved.

(v) In blanks, too small to exclude from intensive working, healthy living trees of any shape, size and species will be retained.

(vi) All well grown advance growth of teak and other important species (as shown under paragraph 532) upto 40 cm. in girth will be retained. If congested, thinning will be carried out in favour of teak.

542. (IV) *Method of coppicing*.—The resultant crop will be mainly of coppice origin. Coppice shoots arise from the callus growth and dormant buds on the sides of the stool. Coppicing results in injuries through which the decay establishes in the stools. This infection is carried upward in the coppice shoots. The incidence of decay is found more in case of callus shoots than side shoots. The side shoots which are arising from the dormant buds at the ground level are free from such decay as no connection with the heart wood of the decayed stool exists. Coppicing flush with the ground gives more of callus shoots. Coppicing at 10—15cm height from the ground level is found ideal as it encourages lower side shoots which can be favoured in treatment to grow as future crop. Hence coppicing should not be flushed with the ground level but at 10 to 15 cm. height from the ground level.

#### Section 12 : *Cutting Back Operations*

543. Immediately after the main felling C. B. O. consisting of following will be carried out—

(1) Cutting of climbers all over the area.

(2) Cutting back all malformed advance growth of teak up to 20 cm. in girth at b. h.

(3) Cutting of *lantana*, *bamboos* and inferior species interfering and likely to interfere with coppice shoots and advance growth of teak.

The area will be inspected by a Range Forest Officer soon after the completion of C. B. O.

#### Section 13 : *Sequence of fellings*

544. The sequence of main fellings is given under Appendix XXXV.

#### Section 14 : *Subsidiary cultural operations*

545. (a) *Cleanings*.—In the sixth year of main fellings the following operations will be carried out only in favour of teak and other valuable species. However, climbers will be cut all over the area.

1. Inferior trees, *bamboos* and *lantana* interfering or likely to interfere with the growth of young teak will be cut.



2. Coppice shoots on each stump will be reduced to two well grown shoots.

3. In better quality patches of established reproduction spacing out operations will be carried out. The spacing aimed at will vary from 2 metres to 2.5 metres depending on the height growth.

546. (b) *Thinning*.—Thinning will be carried out in the 21st year of main felling and will be confined to teak areas in favour of teak. *Salai* overtopping teak will be removed. Spacing to be aimed will be 1/3rd of the average height of the adjacent trees. The operation will be carried out in the interest of future crop and is not intended to become a revenue felling.

547. The sequence of C. B. O. cleaning and thinning is given under appendix XXXVI. Coupes worked under previous working plan will also receive these operations.

548. (c) *Thinnings in old plantations*.—Teak plantation carried out under 5 year plan schemes during Sharma's Plan will also be thinned suitably as given under paragraphs 518 to 521. The sequence of thinning in these plantations is given under appendix XXXVIII. Care has been taken to coincide these thinning operations with either the main felling or the subsidiary cultural operation of the coupe in which the plantation is situated.

## CHAPTER IV : WORKING PLAN FOR THE IMPROVEMENT WORKING CIRCLE

Section 1: *General constitution of the Working Circle*

549. This working circle includes all the workable forests of Dhulghat, Dabida, Wan and part of Rupagarh reserves for which a Working Scheme was prepared by Bhathena in 1960 and part of Dahigaon block. The extent of the forest allotted to this working circle is 35,925.6 ha. and is spread over Dhulghat, Wan and Akot ranges of West Melghat division. The compartments included in this working circle are given under appendix XXXI and distribution of area according to ranges is as below :—

TABLE 60  
*Allotment of areas*

Range	Area of the Working Circle	Percent to the forest area of the range	Percent to the forest area of the division
(1)	(2)	(3)	(4)
	ha.		
1. Dhulghat .. ..	13,378.7	55.1	7.8
2. Wan .. ..	13,308.0	42.7	7.7
3. Akot .. ..	9,238.9	21.2	5.3
Total ..	35,925.6	..	20.8

(11.8 To the total area).

Section 2: *The special objects of management*

550. This working circle comprises the forests which are in the interior and are surrounded by thinly populated tract. As such the local demand for forest products on these forests is negligible except for the grazing which is also confined only to the southern fringes. The growing stock consists mostly of inferior miscellaneous species and has been considerably damaged due to periodic fires. The special objects, therefore, in constituting this working circle are :—

- (i) to increase the proportion of valuable species in the growing stock,
- (ii) to improve the condition of growing stock by appropriate tending,
- (iii) to preserve and improve the composition and density of the crop for progressively increasing yield of timber and
- (iv) to safeguard the areas against likely soil erosion.

Section 3: *Character of the vegetation*

551. In general, the forests of this working circle are inferior both in quality and composition. The prevalent quality is IVb. The predominant species is *salai* which in many places grows almost 'pure'. The common associate of *salai* is *dhzora*, others being *lendia*, *tiwas*, *moyen*, *kakad*, *khair*, *mokha*, *palas* etc. Teak occurs in small patches particularly along nala banks and is found invading shady and moisture localities. The general condition is very dry and the crop is open and full stocking is found only on relatively small area. The natural regeneration of *salai* and other species is sparse. Rusa grass occurs in good quantity throughout the forest. Coarse grass is plenty.

Section 4: *Analysis and valuation of the crop*

552. (i) *Stock map*.—The stock map of these forests are prepared for the first time and the results of stock mapping by compartments are given under appendix XXVIII. The abstract of stock mapping for the forests allotted to the working circle is given below.—

TABLE 61  
*Results of stock mapping*

Forest type	Quality	Extent in ha.	Percent to the total area of the Working Circle.
(1)	(2)	(3)	(4)
Teak .. ..	III .. ..	520.0	1.4
	IVa .. ..	2,662.7	7.5
	IVb .. ..	947.2	2.6
	Total ..	4,129.9	11.5
Mixed .. ..	II .. ..	4.0	..
	III .. ..	349.0	1.0
	IVa .. ..	3,241.0	9.0
	IVb .. ..	143.5	0.4
Quality not shown ..		6,773.5	18.9
Total ..		10,511.0	29.3

TABLE 61—contd.  
Results of stock mapping

Forestry type	Quality	Extent in ha.	Per cent to the total area of the Working Circle.
(1)	(2)	(3)	(4)
Salai	.. .. .	38.0	0.1
	III .. ..	9,010.0	25.1
	IVa .. ..	3,425.4	9.5
	Total ..	12,473.4	34.7
Plantation	(i) Teak ..	52.6	0.1
	(ii) Other ..	516.6	1.4
	Total ..	569.2	1.5
Forest	.. .. .	22.0	0.1
Blank	.. .. .	6,057.1	16.9
Not stock mapped	.. .. .	1,268.4	3.5
Cultivation	.. .. .	894.6	2.5
Grand Total		35,925.6	100.0

The results of stockmapping reveal that the *salai* forest is predominant and covers 34.7 per cent. Next is mixed forest and then teak forest. Area that was not stockmapped forms only 3.5 per cent. Percentage under blank is rather high i. e. 16.9.

553. (ii) *Quality*.—The major portion of the area is clothed by IVa quality, having 41.6 per cent. III quality is found only on 2.5 per cent area and IVb quality covers 12.5 per cent area. 18.9 per cent area under mixed forest was not classified into quality classes.

554. (iii) *Enumerations*.—The detailed results of enumeration are given under appendix XXII. The salient features are reproduced below separately for forests included under Bhatena's Scheme and Dahigaon block.

TABLE 62  
Forests of Bhatena's Scheme  
(Dhulghat and Wan Ranges)

Girth class (1)	Number of trees per hectare				Total No. (6)
	Teak (2)	Percentage (3)	Others (4)	Percentage (5)	
Cm.					
15 U 30	28.52	46.14	33.29	53.86	61.81
30 U 45	20.39	37.59	33.85	62.41	54.24
45 U 60	14.26	33.39	28.45	66.61	42.71
60 U 75	11.15	29.85	26.21	70.15	37.36
75 U 90	7.16	22.22	25.07	77.78	32.23
90 U 105	2.94	19.19	12.38	80.81	15.32
105 U 120	1.19	15.35	6.56	84.65	7.75
120 U 135	0.58	13.88	3.60	86.12	4.18
135 and over	0.38	12.34	2.70	87.66	3.08
Total ..	86.57	33.47	172.11	66.53	258.68

TABLE 63  
Dahigaon Block  
(Akot Range)

Girth class (1)	Number of trees per hectare				Total No. (6)
	Teak (2)	Percentage (3)	Others (4)	Percentage (5)	
Cm.					
15 U 30	19.27	31.75	41.44	68.25	60.71
30 U 45	18.56	30.53	42.24	69.47	60.80
45 U 60	13.89	29.44	33.29	70.56	47.18
60 U 75	9.30	26.53	25.76	73.47	35.06
75 U 90	5.58	22.64	19.06	77.36	24.64
90 U 105	2.18	17.71	10.13	82.29	12.31
105 U 120	0.87	14.42	5.16	85.58	6.03
120 U 135	0.42	12.57	2.92	87.43	3.34
135 and over	0.20	9.44	1.92	90.56	2.12
Total ..	70.27	27.86	181.92	72.14	252.19

555. In both the forests miscellaneous species are in preponderance. Teak forms only 33.47 per cent and 27.86 per cent. Among the miscellaneous species *salai* is prominent having 21.75 per cent and 25.23 per cent of occurrence respectively. Next to the *salai* is *lendia* with 5.24 per cent and 3.41. *Ain* has practically the same proportion i. e. 2.52 per cent and 2.59 per cent in both the forests. Percentage of *tiwas* is less than 2 and it is practically absent above 105 cm. girth. *Khair* having percentage 1.1 and 2.18 is found growing only upto 90 cm. girth. *Haldu* has also negligible occurrence.

#### Section 5 : Method of treatment

556. As mentioned earlier the forests are of inferior type and open. Probably this was the condition when these forests were brought under reservation in 1911. It clearly indicates that the period of rest given to these forests was not sufficient to record the significant response. The regular working in these forests was ventured only in 1960 when a working scheme, prepared by Bhathena was introduced. Under this working scheme also, only better quality area was brought under C. W. R. system. Because of the great variations in quality, density, composition, growth and condition, the fellings in practice were of the nature of improvement as very negligible area was available in a coupe for coppicing. It is, therefore, clear that before embarking on a regular working under a more intensive system, a further period of rest to these forests is essential. This period of rest will be utilized for improving and increasing the stocking of valuable species by carrying out improvement fellings and raising plantations of valuable species wherever possible. Percentage of teak in the crop is hardly 30. Hence the existing reproduction of teak will be encouraged and favoured.

557. While carrying out the above operations the legitimate yield of teak will be harvested without further deteriorating the site condition. From the field observation it is seen that trees of teak upto 100 cm. girth at b. h. can grow in these forests without developing unsoundness.

#### Section 6 : Choice of species

558. Teak has a high market value and is in great demand ; consequently, it will be the principal species and will receive the best attention. Other important species such as *semal*, *kulu*, *saja*, *tinsa* and *salai* will receive preferential treatment in the order they are mentioned here.

#### Section 7 : Felling cycle

559. The period of rest for 15 years is considered sufficient for the present. It is also necessary to assess as quickly as possible the response of the forest to this treatment. Hence the felling cycle of 15 years is fixed.

#### Section 8 : Formation of felling series

560. The area has been divided into 7 felling series as given below :—

TABLE 64  
Formation of felling series

Range (1)	Name of felling series (2)	Area in hectares (3)
Dhulghat .. .. .	1. Patulda .. .. .	4,394.7
	2. Dhulghat .. .. .	4,556.7
	3. Dabida .. .. .	4,427.3
	Total .. .. .	13,378.7
Wan .. .. .	4. Somthana .. .. .	4,564.1
	5. Golai .. .. .	4,866.9
	6. Wan .. .. .	3,877.0
	Total .. .. .	13,308.0
Akot .. .. .	7. Dahigaon .. .. .	9,238.9
	Total .. .. .	35,925.6

561. The compartments allotted to these felling series and coupes included in the compartment are given under appendix XXXII.

#### Section 9 : Agency of exploitation.

562. Departmental working will be advantageous from the silvicultural point of view as the works envisaged under the improvement fellings are mostly of the nature of tending. Hence all the works will be carried out departmentally.

### Section 10: Method of executing the fellings

563. (a) *Demarcation*—The coupe due for working will be demarcated a year in advance of working as per the procedure laid down under paragraph 632. The coupe will be inspected by a Gazetted Officer who will select the area for plantation as per the guide lines given under paragraph 565.

564. (b) *Marking*—As these are purely silvicultural operations, marking will be done by a responsible Officer not below the rank of Range Forest Officer. For the guidance of marking officer the following rules are laid down:—

- (1) Climbers will be cut all over the area.
- (2) In patches not less than 0.5 ha. in extent and having teak reproduction in seedling stage, heavy openings in middle canopy by cutting miscellaneous growth will be carried out.
- (3) The existing established teak reproduction up to 20 cm. in girth at b. h. will be freed by marking over wood for removal.
- (4) Malformed advance growth of teak upto 39 cm. in girth will be cut back. The overwood and inferior species likely to interfere with the coppice growth will be marked for felling.
- (5) Thinning, marking will be carried out in favour of teak and other valuable species as given under paragraph 558.
- (6) Dead, dying and seriously diseased trees will be marked for felling if silviculturally available.
- (7) Teak trees of 100 cm. and above will be marked for felling, if they are not required for the protection of site and production of seed.
- (8) Thinnings in the plantations raised in the past will be carried as per instructions given under paragraph 571.
- (9) Felling in a radius of 100 m. from the perennial water holes, nallas and springs, will be prohibited.
- (10) Felling of fruit trees will be prohibited.

### Section 11: Plantation

565. Plantation of teak and other valuable species over an area not less than 2 ha. will be raised in each coupe. The area for plantation will be selected by a Gazetted Officer before marking and will be marked on the map as well as on ground. As a guide, the following areas may be selected for raising plantation:

- (i) Mixed crop of IV (a) and above quality.
- (ii) Crop having less density if suitable for planting.

566. The technique of raising teak plantations is well established. Care, however, should be taken to carry out the operations, particularly stump planting, timely. Plantations of other important species such as *tenda* may be tried on a small scale on experimental basis till the technique of raising such species artificially is well established.

567. The areas of these plantations will be marked immediately on the set of maps supplied to the Divisional Forest Officer, and the trace thereof will be sent to the Divisional Forest Officer, Working Plans for plotting the same on the map sheets of master set. The records of these plantations will be maintained by the Divisional Forest Officer as per the standing order on the subject.

### Section 12: The sequence of felling

568. Each felling series has been divided into 15 annual coupes and the sequence of felling is shown under appendix XXXVII.

### Section 13: Thinnings

569. It is expected that the rate of growth in the plantations that will be raised under the prescriptions of this working plan, will not warrant the necessity of thinnings. However, at the age of tenth year the plantation may be inspected with a view to assess the need of thinning and, if required, the mechanical thinning may be carried out.

570. The plantations raised during the period of Sharma's Plan, however, will need thinnings. These plantations were carried out under five-year plan scheme raising plantations of general utility timber. Teak, Eucalyptus and Bamboos were raised either pure or in mixture. Bamboos failed miserably while Eucalyptus was successful only on well drained, deep soils. From 1970, planting Eucalyptus in these areas was discontinued. The list of these plantations is given under appendix XV.

571. It is expected that the plantations will be due for thinning only after the age of 10 years, when a first mechanical thinning will be necessary in pure teak plantations. In mixed plantations it will be an ordinary 'D' grade thinning in favour of teak. While spacing out the criterion of 1/3rd the height of the adjacent trees will be followed as a guide. Care has been taken to include these plantations in the areas of appropriate coupes so that thinning in these plantations will be carried out at the time of main working of the coupes.

## CHAPTER V: WORKING PLAN FOR THE PROTECTION WORKING CIRCLE

Section 1: *General constitution of the working circle*

572. The upper precipitous and very steep slopes of the main ridge of Gawilgarh hill, falling in the Chikhaldara, Tarobanda and Semadoh ranges are included in this working circle.

573. As far as possible continuous blocks of such forests have been included and where convenient, the compartments have been sub-divided to maintain contiguity.

574. There are numerous other steep areas which should have found place in this working circle but had to be excluded as they are inextricably intermingled with compact blocks of other type of forests.

575. The total area of this working is 16780.9 ha., The compartments allotted are listed under appendix XXXI. The distribution of the area by ranges is given below :

TABLE 65  
*Allotment of area*

Range	Area of the Working Circle (ha.) (2)	Percentage to the area of the range (3)	Percentage to the area of the Division (4)
(1)			
<i>East Melghat Division—</i>			
Jarida .. .. .	4,709.8	8.5	3.6
<i>West Melghat Division—</i>			
Chikhaldara .. .. .	12,071.1	53.9	7.0
Grand Total ..	16,780.9		5.5

Section 2: *The special objects of managements*

576. The areas allotted to this working circle form the head work of important water courses traversing the tract of Melghat. The need is to conserve these forests for the indirect benefits they confer in the prevention of denudation, the protection of stands of commercial timber and the preservation of the water-supply. Financial results are of little or no importance in the management of these forests.

577. To emphasize the above needs this working circle has been specially constituted. The primary object is, therefore, to preserve and improve the existing growing stock in these vulnerable areas for protecting soil and conserving moisture.

Section 3: *General character of the vegetation*

578. The forests of this working circle are mostly of IV(b) quality and composed of species like *tivas*, *kumbhi*, *dhaman*, *jamun*, *amaltas*, *pakar*, *thuar* etc. and scattered teak. The tree growth is stunted and badly formed. The density of the stocking is generally low and varies between 0.3 to 0.5. Regeneration is very scanty.

579. *Stockmapping*.— The type and quality of forests as per the results of stockmapping are given below. Result of compartments are available in appendix XXVIII.

TABLE 66  
*Results of stockmapping*

Forest type	Quality	Extent in ha.			Percentage to the total area of W. C.	
		East Melghat (3)	West Melghat (4)	Total (5)	East Melghat (6)	West Melghat (7)
(1)	(2)					
Teak .. .. .	III	285.4	344.7	630.1	1.7	2.0
	IVa	166.1	738.7	904.8	1.0	4.4
	IVb	143.2	130.6	273.8	0.8	0.8
	Total ..	594.7	1,214.0	1,808.7	3.5	7.2
Mixed ..	Quality not shown	872.7	2,191.3	3,064.0	5.2	13.3
	Total ..	872.7	2,191.3	3,064.0	5.2	13.3
Plantation ..	(i) Teak	12.1	..	12.1	0.1	..
	(ii) Other	..	186.8	186.8	..	1.1
	Total ..	12.1	186.8	198.9	0.1	1.1
Blank .. .. .	.. .. .	478.0	1,514.1	1,992.1	2.8	9.0
Not stockmapped ..	.. .. .	1,231.3	4,076.4	5,307.7	7.3	24.2
Cultivation .. .. .	.. .. .	1,521.0	2,888.5	4,409.5	9.1	17.2
Grand Total ..	.. .. .	4,709.8	12,071.1	16,780.9	28.0	72.0

Forest under teak is only 10.7 percent. Mixed forest covers 18.5 percent while the area that was not stockmapped forms nearly 1/3rd area. Areas having sparse growth form 11.8 percent.

**Section 4 : *Method of treatment***

580. These forests are conserved for the indirect benefits such as check of erosion and floods, conservation of water and its steady supply etc. The forests are either situated on too steep slopes or too understocked to permit any type of regular working. No regular working is, therefore, prescribed for this working circle.

581. The irregular exploitation which has been permitted is given under paragraph 647.

## CHAPTER VI: WORKING PLAN FOR THE MISCELLANEOUS WORKING CIRCLE

## Section 1—General constitution of the working circle

582. The major part of Dhulghat and Wan ranges, part of Dahigaon blocks and Chichona-Chikhaldara C-Class forests of Akot range and Dhamangaon C-Class forest of Chikhaldara range are allotted to this working circle. The total area covered by this working circle is 23644.4 ha. and compartments allotted are shown under appendix XXXI. The distribution of the area is as follows:—

TABLE 67

Allotment of areas

Range	Area of the working circle in ha.			Percentage to the forest area of the range	Percentage to the Forest area of the Division
	A Class	C class	Total		
(1)	(2)	(3)	(4)	(5)	(6)
<i>West Melghat Division—</i>					
Dhulghat .. .. .	10,916.0	..	10,916.0	44.9	6.3
Wan .. .. .	11,021.4	..	11,021.4	35.4	6.4
Akot .. .. .	..	958.3	958.3	2.2	0.6
Chikhaldara .. .. .	..	748.7	748.7	3.3	0.4
Total .. .. .	21,937.4	1,707.0	23,644.4	..	13.7 (7.7 percent to Total area)

## Section 2—Character of the vegetation

583. The 'C' Class forests of Dhamangaon and Chichona blocks are almost devoid of tree-growth. In most of the areas, sheet rock is exposed. There are some patches of open and stunted crop consisting of species like *bhirra*, *salai*, *dhaora*, *dhudhi*, *lendia*, *khair*, *bhosa* and *lokhandi*. Bushes of *bharati*, *nirgudi* and *khirsali* are found scattered.

584. The rest of the forests are also composed of deciduous species such as *salai*, *dhaora*, *anjan*, *moyen* and scattered poor quality teak and saj. The forests are mostly understocked. The undergrowth is formed by dense grasses usually *pochati*, *sainar*, *kusal*, *ondhali* and *rusa*.

## Section 3—Analysis and valuation of the crop

585. (i) *Stock mapping*.—Original stockmaps are prepared for forests of Wan, Dhulghat and Dabida reserves while the existing stockmaps of Dahigaon block are adopted. The results of stockmapping by compartments are given under appendix XXVIII and the abstract is given below :—

TABLE 68

Results of stockmapping

Forest type	Quality	Area in ha.	percentage to the total area of the working circle
(1)	(2)	(3)	(4)
<i>West Melghat Division :</i>			
Teak .. .. .	III	88.6	0.4
	IVa	725.4	3.1
	IVb	131.3	0.6
	Total ..	945.3	4.1
Mixed .. .. .	III	71.9	0.3
	IVa	2,268.8	9.6
	IVb	345.7	1.5
	Total ..	2,686.4	11.4



TABLE 68—*contd.*

(1)	(2)	(3)	(4)
Salai	III	.. ..	..
	IVa	.. ..	4,988.4
	IVb	.. ..	5,716.6
	Total	.. ..	10,705.0
Plantation	(i) Teak	.. ..	..
	(ii) Other	.. ..	268.9
	Total	.. ..	268.9
Forest	.. ..	.. ..	9.5
Blank	.. ..	.. ..	3,904.4
Not stockmapped	.. ..	.. ..	2,831.1
Cultivation	.. ..	.. ..	2,293.8
	Grand-Total	.. ..	23,644.4
			100.0

*Salai* forest has the highest percentage i.e. 45.3. Teak and mixed forest cover only 4.1 per cent and 11.4 per cent of the area. Blanks form 16.5 per cent and area which was not stockmapped has 12.0 percentage.

586. (ii) *Quality*.—The forest is of poor quality. About 1/3 area is under IV (a) and 1/4 under IV (b).

587. (iii) *Enumeration*.—The results of enumeration are recorded under appendix XXII. The stocking in the forest is similar to that given under Table 63. Para. 554.

588. Teak is only 27.86 per cent of the stock. *Salai* is second in order of occurrence having percentage of 25.23. Other species in decreasing order of occurrence are *lendia* (3.41%), *ain* (2.59%), *khair* (2.18%) and *tiwas* (1.52%). The last two species do not occur in sizes above 90 cm. girth. Percentage of *haldu* is very negligible i.e. 0.06.

#### Section 4—*Method of treatment*

589. The forests are unworkable due to remoteness of situation or poor stocking. Hence no regular working is prescribed for these forests and these areas will be given rest to reboise naturally. The irregular exploitation as given under paragraph 647 will be allowed.

590. The protection from fire as laid down in paragraph 651 will be provided to these forests to improve their stocking and composition.

## CHAPTER VII : WORKING PLAN FOR THE BAMBOO OVERLAPPING WORKING CIRCLE

Section 1: *General constitution of the Working Circle*

591. This is an overlapping working circle and covers bamboo bearing forests included under other working circles. The total area covered by this working circle is 52142.8 ha. and compartments allotted are shown under appendix XXXIX. The distribution of area is as follows :—

TABLE 69  
*Allotment of area*

Range	Area of the working circle. (area under bamboo)	Percentage of bamboo area to the forest area of the range	Percentage of bamboo area to the forest area of the division
(1)	(2)	(3)	(4)
ha.			
<i>East Melghat Division :</i>			
Jarida .. .. .	14,946.4	26.9	11.3
Raipur .. .. .	5,095.2	18.2	3.8
Semadoh .. .. .	5,501.3	26.1	4.2
Harisal .. .. .	7,294.4	26.1	5.5
Total ..	32,837.3	..	24.8
<i>West Melghat Division :</i>			
Dharni .. .. .	5,061.2	32.2	2.9
Tarobanda .. .. .	6,772.5	18.9	3.9
Wan .. .. .	678.5	2.2	0.4
Akot .. .. .	4,611.5	10.6	2.7
Chikhaldara .. .. .	2,181.8	9.7	1.3
Total ..	19,305.5	..	11.2
Grand-Total ..	52,142.8	..	17.1 (to total area)

Section 2: *Special objects of management*

592. The special objects of constituting this working circle are :—

- (i) To meet the local need, and
- (ii) to introduce scientific exploitation of bamboos so as to get the maximum sustained yield.

Section 3: *General character of the vegetation*

593. The main species is *Dendrocalamus strictus* which occurs almost all over the area as an understorey. The best growth is found in Semadoh, Raipur, Jarida, Tarubanda and Akot ranges and along Tapti river in Harisal range.

594. *Katang* bamboos (*Bambusa arundinacea*) grow luxuriantly in compartments 105, 117 and 118 along the Sipna river where they were planted between 1869 and 1879. These bamboos flowered in the year 1952.

595. The bamboos are being exploited mostly, by permit holders except from the areas allotted to the paper mills in Jarida range. The permit holders are expected to follow the rules laid down for exploitation. But there being no adequate supervision, the bamboo clumps in areas having easy access have been ruthlessly exploited without any rest to them.

Section 4: *Analysis and valuation of the crop*

596. (i) *Stockmap*.—During the course of stockmapping the bamboo areas have been shown overlapping the other type. Appendix XXVIII indicates the extent of bamboo overlapping areas in each compartment

597. (ii) *Enumerations*.—The results of enumerations are given under appendix XXII. The bamboo enumerations were carried out in areas allotted to Jarida Bamboo Cutting Series of East Melghat division and Dolar, Dhargarh, Koktu and Koha Bamboo Cutting Series of West Melghat division. The relevant abstract of results of bamboo enumeration for both the divisions is given under Table 70 and 71 below.

TABLE 70  
*Number of clumps per hectare*

Division (1)	Cutting series (2)	No. of clumps (3)
East Melghat Division.. ..	Jarida .. ..	153.25
West Melghat Division .. ..	Dolar .. ..	74.15
	Dhargarh Koktoo .. ..	47.06
	Koha .. ..	61.11
Average for West Melghat Division .. ..		58.01

TABLE 71  
*Number of culms per clump*

Items (1)	East Melghat Division (2)	West Melghat Division (3)
<i>I Culms above 1.83 m. (6 feet) in height :</i>		
1. Current year's .. ..	1.61	1.92
2. Previous year's .. ..	3.03	1.58
3. Rest (green).. ..	4.75	6.81
4. Dead .. ..	2.63	4.79
<i>II Culms below 1.83 m. (6 feet) in height :</i>		
5. Current year's .. ..	0.35	0.25
6. Previous year's .. ..	0.59	0.28
7. Rest (green).. ..	0.87	0.86
<i>III Total for current year's culms :</i>		
(1+5).	1.96	2.17
<i>IV Total for mature (green) culms .. ..</i>		
(2+3).	7.78	8.39
<i>V Total for mature culms .. ..</i>		
(2+3+4).	10.41	13.18

#### Section 5: Method of treatment

598. The bamboos are in great demand and will be exploited under periodical thinnings in the clumps. The enumeration results reveal that the number of 2 year old and above green culms per clump are less than 8 culms. It is also observed that the accessible areas are over exploited. Thus, to avoid the over-exploitation of the clumps the probable yield from the coupe will be assessed excluding the yield from the inaccessible areas and permits only to the extent of this yield will be issued.

#### Section 6: Cutting cycle

599. Bamboos will be exploited under a 3 year cutting cycle. Each cutting series is divided into three coupes approximately as equiproductive as possible.

## Section 7: Formation of cutting series

600. The Bamboo area has been divided into 19 cutting series as given below:—

TABLE 72  
Formation of cutting series

Division	Range	Name of cutting series	Area in ha. under Bamboo	
(1)	(2)	(3)	(4)	
East Melghat	Jarida	(1) Jarida	3,073.8	
		(2) Rahu	9,376.9	
		(3) Ghatang	2,495.7	
			Total	14,946.4
	Semadoh	(4) Semadoh	3,316.8	
		(5) Pili	2,184.5	
		Total	5,501.3	
	Raipur	(6) Raipur	1,557.9	
		(7) Hatru	1,289.3	
		(8) Batrum	2,248.0	
		Total	5,095.2	
	Harisal	(9) Rangubeli	4,255.5	
		(10) Harisal	3,038.9	
		Total	7,294.4	
	Total for East Melghat Division			32,837.3
West Melghat	Dharni	(11) Dharni	4,206.5	
		(12) Bod-Chithri	854.7	
		Total	5,061.2	
	Tarobanda	(13) Koha	2,386.6	
		(14) Chikhali	2,265.5	
		(15) Dolar	2,120.4	
		Total	6,772.5	
	Wan	(16) Rupagarh	678.5	
	Akot	(17) Dhargarh	2,219.7	
		(18) Kokru	2,391.8	
	Total	4,611.5		
Chikhaldara	(19) Chikhaldara	2,181.8		
Total for West Melghat Division			19,305.5	
Grand total for both the Divisions			52,142.8	

## Section 8: Calculation and regulation of yield

601. The bamboo cutting rules prescribe the retention of at least 8 green mature culms per clump. The yield calculations given below is based on the presumption that the present level of recruitment of culms of current year would be maintained. In this calculation mature culms below 1.83 m. in height are not considered being defective. The yield is calculated separately for both the divisions for a cutting cycle of 3 years. Table 73 gives the rate of recruitment and mature culms per clump.

TABLE 73

Yield calculation per clump

Year	Rate of recruitment No. of culms	Mature culms	Retention	No. of culms available for removal
(1)	(2)	(3)	(4)	(5)
<i>East Melghat Division</i>				
1	1.96	7.78	..	..
2	1.96	9.74	..	..
3	1.96	11.70	8	3.70 green 2.63 dead
(Year of cutting)			Total ..	6.33
4	1.96	9.96	..	..
5	1.96	11.92	..	..
6	1.96	13.88	8	5.88 green
(Year of cutting).				
Hereafter the yield will remain constant at 5.88 culms/clump				
<i>West Melghat Division</i>				
1	2.17	8.39	..	..
2	2.17	10.56	..	..
3	2.17	12.73	8	4.73 green 4.79 dead
(Year of cutting):			Total ..	9.52
4	2.17	10.17	..	..
5	2.17	12.34	..	..
6	2.17	14.51	8	6.51
(Year of cutting).				
Hereafter the yield will remain constant at 6.51 culms/clump				

602. The Forest Statistician has suggested 33 per cent cut in the estimated yield as a conservative measure. Yield thus works out to 4.2 culms/clump and 6.3 culms/clump, respectively, for East and West Melghat Divisions for the first cutting cycle. From the second cutting cycle and onwards the yield will be 3.92 culms/clump and 4.34 culms/clump, respectively.

603. In the first cutting cycle the yield will be 4.2 and 6.3 culms/clump, respectively, for East and West Melghat divisions. In the first cutting cycle harvesting of all the dead culms is insisted as these are calculated against yield.

604. From the second cutting cycle the yield will be 3.9 and 4.3 culms/clump, respectively, for East and West Melghat divisions.

#### Section 9: Method of executing cutting

605. *Demarcation.*—The coupe due for working will be demarcated by giving three *geru* bands at 15 cm. interval on the trees selected at suitable interval along the periphery of the coupe: The lower band will be at the breast height.

606. For better supervision and control on cuttings, the Divisional Forest Officers will order the successive opening of only one or two compartments at a time in a coupe, so as to ensure proper observance of cutting rules and thorough exploitation. It will be necessary to employ special staff for the purpose of enforcing rigid observance of the cutting rules.

607. The following cutting rules are prescribed.—

1. Bamboo extraction will not be permitted during the monsoon period i.e. from 15th June to 30th September as this is the period of formation of new culms.
2. A clump will not be considered mature for exploitation unless it contains more than 8 mature (more than 1 year old) culms.
3. Dead and decaying culms will be removed from the clumps whether they are mature or not.
4. In a mature clump, the following types of culms (green and living) will be retained :—
  - (a) All current year's i.e. less than 1 year old culms.
  - (b) From the rest, culms equal in number to the current year's (less than 1 year old) culms or eight *whichever is more*.
5. If mature culms are available for retention as per rule 4 (b) in a mature clump, the following culms will be removed, otherwise not.
  - (a) Culms where the growing shoots have been cut to a length of more than 1/3 of the normal length or the culms which are badly damaged.
  - (b) Twisted, bent or otherwise malformed culms.
6. Culms to the extent available for exploitation as per rule 4 above should be exploited in such a manner that the clump is evenly worked throughout and that the bamboos to be retained are evenly spaced out in the clump.
7. The culms on the periphery of the clump will not be removed except where absolutely necessary to facilitate working in the interior portion of the clump.
8. The height at which the culms shall be cut must not be lower than 15 cm. and more than 45 cm. from the ground level but in any case, not higher than the second internode and lower than first internode.
9. In case of flowering clumps exploitation should be deferred till the seeding is completed.
10. The following acts will be strictly prohibited.
  - (a) Digging of rhizomes.
  - (b) Cutting of tops of Bamboos for fodder.
  - (c) Use of tender bamboos for bundling.
11. Use of sharp instruments is insisted upon during extraction.
12. All climbers infesting the bamboo clumps will be removed.

**Section 10 : Sequence of cuttings.**

608. The sequence of cutting is shown by cutting series in appendix XL.

**Section 11 : Agency of exploitation.**

609. The bamboos will be exploited on rated passes or through contractor's agency. Only after meeting the nistar demand of bamboo, the passes should be issued for commercial demand.

## CHAPTER VIII: WORKING PLAN FOR THE RUSA GRASS WORKING CIRCLE

### Section 1 : General constitution of the working circle

610. This is an overlapping working circle covering parts of the other working circles containing rusa grass (*Cymbopogon martini*). Motia variety of grass is mostly found in Chikhaldara, Akot, Wan and Dhulghat ranges. The rusa plantations carried out in the past are also included in this working circle. The details of these plantations are given below:—

TABLE 73 (a)

#### Rusa Plantations

Range	Year	Compartment No.	Area planted in hectares
(1)	(2)	(3)	(4)
Wan	1965	1107	8.0
	1969	cultivation area	12.0
	1970	1109	20.0
	1971	1109	30.0
	1972	1110	70.0
Chikhaldara	1968	45	8.0
Dhulghat	1972	1181	50.0
Total ..			198.0

611. The total area of this working circle is 253916.7 ha. The distribution of areas according to ranges is given below:—

TABLE 74

#### Allotment of Areas

Range	Area of working circle in ha.	Percentage to the forest area of the range	Percentage to the total area of the Division
(1)	(2)	(3)	(4)
<i>West Melghat Division</i>			
Chikhali	22,427.8	100.0	13.0
Akot	43,548.3	100.0	25.2
Wan	31,164.6	100.0	18.0
Dhulghat	24,294.7	100.0	14.0
Total ..	1,21,435.4		70.2
<i>East Melghat Division</i>			
Jarida	55,545.5	100.0	41.9
Raipur	27,946.6	100.0	21.1
Sembadoh	21,045.2	100.0	15.9
Harisal	27,944.0	100.0	21.1
Total ..	1,32,481.3		100.0
Grand Total ..	2,53,916.7		

### Section 2 : Special objects of management

612. Palmarosa oil of commerce is obtained from the flowering tops and leaves of rusa grass which is wildy occurring in Melghat forest. It is the source of the finest commercial geraniol. The *motia* variety contains 80 per cent to 90 per cent geraniol whereas the *sofia* variety contains only 36 per cent to 66 per cent. It is extensively used in perfumery as a base and is being exported. It is, therefore, necessary to introduce a scientific management for extraction of this valuable foreign exchange earner and also to increase its proportion in the grasses. Thus the special objects of management are:—

(i) to increase the proportion of rusa grass, and

(ii) to introduce scientific management for extraction of rusa grass with a view to obtain maximum sustained yield without reducing its present proportion.

### Section 3 : General character of the vegetation

613. Rusa grass occurs in two varieties viz *motia* and *sofia* of which the *motia* variety is valuable having more geraniol contents. These two varieties are morphologically quite similar though an experienced eye can distinguish them in field from their appearance. In odour, however, they differ from each other. The grass is not gregarious in habit and is found in patches in open forests or clearings on dry sunny slopes.

614. Rusa grass is a perennial plant attaining a height of 1.5 to 2.4 m. It is susceptible to frost. The aerial parts die in winter. The root stock sprouts in spring and by middle of October the grass is in blossom. It does not stand stagnant water and prefers a dry, well drained soil of basaltic origin.

#### Section 4 : Method of treatment

615. In order to allow rusa grass to seed, the harvesting of naturally occurring rusa grass will be rotational, with a period of rest for seeding once in 4 years. The grass in plantations, however, will be cut and distilled every year till the plantation is abandoned.

#### Section 5 : Cutting Series

616. The forests allotted to this working circle are divided into 2 cutting series, one in each division.

TABLE No. 75

Formation of cutting series	
Name of the cutting section	Area in hectares
<i>West Melghat</i>	
1. Chikhaldara range	22,427.8
2. Akot range	43,548.3
3. Wan range	31,164.6
4. Dhulghat range	24,294.7
Total	1,21,435.4
<i>East Melghat</i>	
1. Jarida range	55,845.5
2. Raipur range	27,946.6
3. Semadoh range	21,045.2
4. Harisal range	27,944.0
Total	1,32,481.3
Total for both the division	2,53,916.7

617. Each cutting series has been divided into 4 cutting sections and each cutting section will be given rest for one year in rotation after continuous exploitation for 3 years. The cutting section corresponding to a range has been formed so that it will be convenient and easy to close effectively the cutting section for cutting.

#### Section 6 : Sequence of closure

618. The division of rusa grass cutting series into cutting sections and sequence of rotational closure is given under appendix XLI.

#### Section 7 : Rusa grass plantation

619. *Plantation site.*—Ten hectares of rusa grass plantations will be raised annually after selecting suitable area from compartment Nos. 1103, 1104, 1107, 1109 and 1110 in Wan range. Care should be taken to avoid ill-drained soil.

620. The selected area may not be clearfelled. Heavy opening by removing lower and middle canopy should be made. Then the area will be ploughed. Six months to One-year old nursery raised seedlings will be planted at 45 cm. x 45 cm. spacing for which, it is estimated that 2 to 2.5 kg. seed in nursery will be required for planting one hectare. Where irrigation facilities are available nursery sowing may be done in well prepared beds in April-May.

621. *Planting and other operations.*—Transplanting of the grass should be done with first regular outbreak of monsoon. Depending on the intensity of weeds one or two weedings may be carried out in the first year. Hoeing once in winter in each year of the plantation loosens the soil and helps the growth of plants. Application of inorganic manure is suggested to increase the yield of distillable material.

622. *Harvesting.*—The experiments, conducted at the Forest Research Institute and Colleges, Dehra Dun, indicate that percentage of oil is much more in the 1/3rd flowering top than the 2/3rd lower leafy portion. The yield of flowering tops which is about 17 to 28 per cent of the total aerial parts of the grass is maximum in the 2nd and 3rd year of plantation and thereafter, it declines gradually. However, for the exploitation, the plantation is well productive up to 6 to 7 years of age after which the area should be replanted.

623. The grass should be harvested once in a year at full bloom stage (November-December).

#### Section 8 : Agency of exploitation

624. Harvesting and distillation of rusa grass from plantation should be done departmentally if possible and full account of expenditure and yield should be maintained separately for each plantation. Otherwise the right of exploitation of rusa from plantations may be sold by auction separately and details of yield of rusa oil should be maintained separately for each plantation.

625. The exploitation of naturally occurring rusa grass will be done through contractors.



## CHAPTER IX : WORKING PLAN FOR WILDLIFE CIRCLE (A)

### Section 1 : General constitution of the Working Circle

625-a. This is an overlapping working circle and covers the entire area of Melghat forests which are in compact block. The terrain is also undulating. Thus these forests form an ideal abode for wildlife.

'Wildlife Management Plan for the Melghat Tiger Reserve' written by Shaikh and Sawarkar (1973) deals with 1,571.74 sq. km. of well wooded forest. This plan is tiger oriented and for a detailed study a zone of wilderness known as Sanctum Sanctorum measuring 309.15 sq. km. is carved out and further it is divided into two zones viz. (i) Research and Development zone and (ii) Primitive zone. When brought into force, the prescriptions and provisions of this Wildlife Management Plan will be implemented in areas, the details of which are given under appendix XXXI a and b.

### Section 2 : Special objects of management

625-b. This working circle has been constituted specially to achieve the following objects.

- (i) To ensure maintenance of viable population of wildlife, and
- (ii) To preserve, for all times, areas of such biological importance as a national heritage for the benefit, education and enjoyment of the people.

### Section 3 : Distribution of game

625-c. Though the Melghat forests provide everything to form an ideal natural habit at for wildlife, the game is not as plentiful as it should have been. The main reason appears to be the shortage of water which is keenly felt during summer as there are no perennial streams. Water is confined only to scattered few pools which become poacher's favourite hunting spots.

The animals that are commonly found are tiger, leopard, wild dog, jungle cat, hyaena, sloth bear, bison, sambhar, chowsingha, barking deer, chital, blue bull, wild boar, monkeys, peafowl and jungli murgi.

### Section 4 : Legal protection

625-d. Wildlife (Protection) Act, 1972 enacted by Parliament came into force in the State of Maharashtra with effect from 1st June 1973.

### Section 5 : Method of treatment

625-e. The treatment to be prescribed for wildlife will have to be supplementary to the forestry practices prescribed earlier for the forests. The Wildlife will be protected but at the same time some area will be kept open for sports. Natural hiding and resting places of wildlife will be left undisturbed and few such places will be created artificially if required. Block of natural salt will be planted at places frequented by wildlife. To encourage tourism all possible facilities and amenities will be provided to the travellers and pleasure seekers. Watch towers will be erected at suitable places.

### Section 6 : Prescriptions

625-f—A. In the coupes of main felling the following operations are prohibited :—

- (1) Felling in a radius of 100 m. from the perennial water hole, nallas and springs.
- (2) Felling of fruit trees.

B. The following operations will be carried out in main coupes either in main felling or in subsidiary cultural operation :—

- (1) Salt licks will be developed.
- (2) Wildlife watch towers at suitable spots, if available, will be erected.
- (3) Shelters and hiding places, if naturally not existing, will be provided by creating artificially.

C. In the Sanctum Sanctorum of the 'Wildlife Management Plan for Melghat Tiger Reserve' no exploitation work will be carried out.

D. Permit for hunting will be issued for a Shooting Block into which the forest will be divided. Animals to be shot on each permit will be prescribed. Animals in danger of extinction will not be included in permit to be shot.

E. General measures for protection—

- (1) Area should be strictly and effectively protected from fire.
- (2) A vigilant watch should be kept on poachers at gates erected at Behali, Popatkhedā and Dharni.
- (3) During summer the shortage of water drives animals to few water pools exposing themselves as easy prey to poachers including local inhabitants. Such places should be kept under constant vigilance.

- (4) Informers of illicit shooting should be rewarded promptly.
- (5) Hoardings on wildlife importance should be exhibited at strategic places.

**Section 7 : *Game Sanctuary***

625-g. Dhakna-Kolkaz Wildlife Sanctuary established in 1968 covers 381.58 sq. km. of forest area and is situated in the heart of Melghat.

**Section 8 : *Water holes***

625-h. In areas where there is acute shortage of water required by Wildlife, construction of bunds, etc., on nallas at suitable places may be considered so as to provide permanent water holes to the Wildlife.

## CHAPTER X : ESTABLISHMENT AND LABOUR

Section 1 : *Establishment*

626. The recent reorganisation of administrative units for Melghat forest was done in 1964. However, the Jarida range in East Melghat division needs further bifurcation as it is very extensive. The details of existing ranges, rounds and beats are given in appendix XLII.

627. Under the present plan the silviculture works will increase considerably. Besides the regular exploitation of coupes, the plantations will be carried out in most of the felling series and subsequently their tending operations including of those raised earlier will increase the bulk of silvicultural operations. Generally the exploitation of a main coupe should be completed in a year. With this in view the felling series in Selection Working Circle were increased to have coupes of manageable extent. To enforce the bamboo cutting rules effectively a Forest Guard for each coupe is also necessary.

628. The erstwhile forest villages numbering 133 have been declared as *rayatwari*. Their management and maintenance of revenue record for these villages are entrusted to forest officers by appointing them ex-officio revenue officers at appropriate levels. The work involved in maintaining records particularly at the village level, in fact, justifies a full time worker. A forest guard who is supposed to work as Patwari will hardly be able to do justice to this work or to forest work unless the present charges of beats are reduced.

629. For the extraction of bamboos and other forest produce additional vendor's naka at Hatru is essential for the convenience of the local population who otherwise have to travel either at Raipur or Harisal for purchasing the passes.

630. The additional staff, thus required is estimated below.

TABLE 76

*Additional staff*

Item of work	Category of staff	East Melghat Division	West Melghat Division	Total
(1)	(2)	(3)	(4)	(5)
Selection coupe .. .. .	Forester .. .. .	14	6	20
	Forest Guards .. .. .	14	6	20
Bamboo Felling Series .. .. .	Forest Guards .. .. .	11	8	19
Forest Village Patwari .. .. .	Forest Guard .. .. .	40	40	80
Splitting of Range .. .. .	R. F. O. .. .. .	1	..	1
	Range Clerk .. .. .	2	..	2
Rated pass .. .. .	Paid Vendor .. .. .	1	..	1

Section 2 : *Labour supply*

631. The present labour supply is highly inadequate. Possibility of engaging labour gangs comprising outside labour may be explored. Higher wages than those paid to local labour, providing good labour sheds, drinking water facility, easy medical aid, transport facility and provision of consumers shops are some of the measures to attract labour. Without the substantial increase in labour supply, it is not possible to exploit the forests fully. Every source of labour supply should, therefore, be tapped and every possible allurements should be offered to the labour to attract them for forest work.

## CHAPTER XI : MISCELLANEOUS REGULATIONS

## Section 1 : Demarcation

632. Following instructions for demarcation are laid down for the guidance. They may, however, be modified under written instructions from the territorial Conservator of Forests specifying reasons under intimation to the Conservator of Forests, Working Plans. The coupe will be demarcated one year before it is due for working. The method of demarcating the coupe, sections, unworkable areas and clearfelling areas is given below. No tree bearing demarcation bands will be marked for felling.

(i) *Coupe*.—Annual coupe will be demarcated by cutting and clearing 3 m. wide line and erecting stout durable pillars of about 2 m. in length in the middle of the line at suitable intervals (one pillar should be visible from the other), except where the coupe boundary runs along permanent features such as a big nalla, a fire line or a road. The pillars will bear coupe number, name of felling series and working circle on the side away from the area of the coupe.

Trees above 45 cm. in girth, selected at suitable intervals along the coupe boundary will be given two coal tar bands and a geru band in between. Before giving bands, the loose dead bark will be scrapped. These three bands will be 15 cm. apart, the lowest coal tar band being at breast height. Just below the lower coal tar band, coupe number, name of felling series and working circle, will be given on the side away from the area of the coupe.

(ii) *Section*.—Normally each coupe will be divided into four sections to facilitate control over fellings and extraction. The sections will be demarcated by 1.5 m. wide cut lines by clearing brush wood unless the section line runs along a permanent natural feature e. g. nalla.

Trees above 45 cm. in girth, selected at suitable intervals on the inner edge of the 1.5 m. wide cleared section line will be given two coal tar bands 15 cm. apart, the lower coal tar band being at breast height. Just below the lower coal tar band section no. will be given on the side away from the area they would denote.

(iii) *Unworkable area*.—Trees above 45 cm. in girth selected on the periphery of the areas to be excluded from working will be given two geru bands and a cross mark in between on the side of a tree away from the unworkable area. The lower band will be at the breast height and the other geru band at 15 cm. above it. Just below the geru cross mark, the serial number of the patch will be given if the area contains more patches.

(iv) *Clearfelling areas*.—The area will be demarcated by 1.5 m. wide cut and cleared lines. Trees above 45 cm. in girth, selected at suitable intervals on the outer edge of the periphery of the area will be given 3 coal tar bands 15 cm. apart, the lowest being at the breast height and a cross in coal tar on the side of a tree away from the clearfelling area. If there are more than one such patches, these trees will bear the serial number of the patch below the cross mark.

(v) *Bamboo coupes*.—The bamboo coupes will be demarcated by giving 3 geru bands, 15 cm. apart, the lowest being at the breast height, on trees above 45 cm. in girth, selected at suitable intervals on the periphery of the coupe boundary.

## Section 2 : Marginal removal

633. *Marginal timber extraction*.—Table 8 (Paragraph 178) gives the cost of exploitation of timber as Rs. 122.30 per M<sup>3</sup> which include Rs. 50.11 as a direct or variable cost and Rs. 92.19 as a fixed cost. The variable cost is directly linked with the quantity of material extracted and varies proportionately, while the fixed cost which is the expenditure on organisation, remains constant practically. It only increases when the material to be extracted is beyond the capacity of the existing organisation, which, in that eventuality, is required to be expanded.

The demand for firewood is little. It is being sold on rated passes. The schedule of rates fixed for the sale of firewood works out approximately Rs. 15.00 per M<sup>3</sup>. (solid). The expenditure on demarcation, marking and felling is Rs. 1.50 per M<sup>3</sup> which is obligatory in either case of converting a tree into timber or firewood. Now the question is whether the marginal trees are to be converted as timber or firewood. Without incurring an extra expenditure on logging, fashioning, transport, etc. we get Rs. 13.50 (Rs. 15.00—Rs. 1.50) per M<sup>3</sup> as a value for firewood if a marginal tree is converted as firewood. Thus while converting a tree into timber a fact to be borne in mind is that the timber should be able to fetch sale price more than this value plus the variable cost. The minimum selling price thus works out as Rs. 13.50+Rs. 50.11=Rs. 63.61. Any extra amount received over this sale price is a net gain to the department and will eventually reduce the quantum of fixed cost per M<sup>3</sup>.

The above discussion is mostly applicable to the trees other than teak which is being extracted to a smallest saleable size. A look at the auction sale results for miscellaneous timber and poles at Paratwada and other depots reveals that the average price offered for these products is more than the minimum sale price worked out above. Hence every endeavour should be made to extract miscellaneous trees for selling as timber or poles. The minimum price that the miscellaneous timber should fetch can be calculated by the Divisional Forest Officers, if required, every year.

### Section 3 : *Exploitation and disposal of forest produce*

634. *Timber*.—All the timber will be extracted to the established Government timber depots for selling by auction. Paratwada, Akot and Dharni timber depots just on the outskirts of the tract, are situated at different directions along the main roads which are the only outlets for the region. These depots are serving well for the last so many years. A few timber auctions conducted in the recent past at Semadoh which is situated in the tract, indicate the possibility of developing the place into another timber selling centre. Timber coming to Semadoh, would have fed Paratwada depot. Hence, it is suggested that this centre may not be developed into a full-fledged depot by starving the well-equipped and established timber depot at Paratwada where the overhead charges on handling timber may increase.

635. Teak has a keen demand and is saleable practically in all sizes. The possibility of utilizing the large butt-ends of teak trees which are generally left in the coupe because of difficulty in extraction, may be explored. Timber uneconomical to extract and firewood may be sold on rated passes. Care should be taken to extract all the saleable material.

636. *Tendu Leaves*.—With the enactment of "Maharashtra Minor Forest Produce (Regulation of Trade) Act 1969" the trade in tendu leaves has been nationalised. The disposal of this produce will be done in accordance with the provisions of this Act.

637. *Semal*.—All *semal* trees are reserved against felling as *semal* is an economically important species. Its irregular exploitation is, however, allowed at the discretion of the Divisional Forest Officer in the event of its demand.

638. *Rusa grass*.—Rusa grass will be sold by public auction. Rusa grass from the plantation may be distilled departmentally or sold by auction separately to know the profitability or otherwise of these plantations.

639. *Salai Gums*.—Gum-oleo-resin obtained by tapping *Boswellia serrata* is commonly known as Indian olibanum, or salai-guggul and is at present used mostly as an incense and is said to be used in the Indian medicine for rheumatism and nervous diseases. It has the possibility of becoming an important substitute of imported Canada balsam, used as mounting media in the preparation of microscopic slides. *Boswellia serrata* gum is very similar to turpentine oil. Varnish and paints prepared from it have been found to be suitable. It also possesses good drying properties, its volatility being better than turpentine oil. It may be suitable in the manufacture of elastic adhesives, lacquers, oil-cloth compositions, inks and perfumery.

640. Gum-oleo-resin hardens slowly after exudation retaining its golden colour and transparency. It varies in colour from transparent golden brown to dark-brown or dark greenish-brown. The odour is like olibanum, but faint and more terebinthine. It burns readily and diffuses an agreeable odour. Salai gum has the following average composition, moisture 10-11 per cent; volatile essential oil 8-9 per cent; resin 55-57 per cent; gum 20-23 per cent; insoluble matter 4-5 per cent. These constituents can be separated. Its resin is very brittle and is tasteless. It is soluble in most organic solvents but does not dissolve completely in sodium carbonate solution even on prolonged boiling. Its softening point varies from 65° to 72°C and the melting point from 73-78°C.

641. Of lately some entrepreneurs have evinced interest in salai gum from the region. This gum has remained so far untapped and special efforts are needed to bring this gum in market. In view of the likely demand for this gum in future, the tapping method as supplied by the officer in charge of Minor Forest Products branch, Forest Research Institute and Colleges, Dehra Dun, is given below for guidance and the right to collect gum may be auctioned along with other auctions of gum. :—

(1) The tapping season will commence from November to end of May each year. No tree below 90 cm. in girth will be tapped.

(2) Tapping will be confined to the main bole of trees between 15 cm. from ground level to the point from which first branch is given off.

(3) *Blazes*.—The initial blaze of 20 cm. (8") wide and 30 cm. (12") in length or height may be made in November on trees at 15 cm. (6") above ground level with a sharp adze having 7.5 cm. wide blade. Since the mature bark is 1 cm. thick and the pinkish layer of phloem is seen only by going 0.6 cm. deep where gum canals lie, it is necessary to make the blazes 0.6 cm. deep in the bark.

Number of blazes will depend on the girth of trees and initially for a tree of 90 cm. (36") girth, one blaze may be made and for every increase of 30 cm. (12") one more blaze may be added as given under rule 6 below :—

Blazes may be made horizontally leaving approximately equal space between the blazes. The blazes should not have any loose fibre. The lower surface of the blaze should be slightly sloping outwards to avoid lodging of guggul in the blazed pocket in case initial blazing is done by adze. The surface should be smoothed to get pure guggul.

(4) *Freshening of the blazes*.—The guggul starts oozing out soon after blazes are made and may be collected initially after a month, i. e., by about December when the blazes may also be freshened. Subsequent collections and freshenings may be done at fortnightly intervals upto May. Thus 12 freshenings may be required to be done during the year.

In each freshening the lower surface is not to be freshened. The edges may be slightly scrapped so that only 3.8 cm. (1.5") is increased on either side in width at the end of 12 freshenings. This means about 0.3 cm. may be scrapped off on either sides in width in each freshening.

In length or height about 1.6 cm. (0.6") may be freshened every time towards the upper edge. Thus at the end of one season the final size of the blaze in length or height will be 30 cm. + 20 cm. = 50 cm. (12" + 8" = 20"). The surface of the blaze may be slightly scrapped each time taking care that depth is not increased.

(5) Following are the details of space to be covered per blaze :—

Initially—

- (a) in width .. .. . 20 cm. (8").  
 (b) in length or height .. .. . 30 cm. (12").

In subsequent freshenings—

- (a) in width .. .. . 7.5 cm. (3").  
 (b) in length or height .. .. . 20 cm. (8").

Total size of each year's blaze—

- (a) in width or horizontally .. .. . 27.5 cm. (11").  
 (b) in length or height or vertically .. .. . 50.0 cm. (20").

(6) For the sake of convenience the following schedule has been drawn up for making suitable number of blazes in trees of different girth classes.

TABLE No. 77

Schedule of number of blazes as calculated on the basis of girth.

Girth of the tree	No. of blazes	Total space to be covered horizontally by the number of blazes indicated in previous column	Minimum space left unblazed on the tree horizontally	Minimum space available between blazes for tapping in the next cycle
(1)	(2)	(3)	(4)	(5)
90 cm.—140 cm. (36"—56")	1	(27.5 cm. × 1) = 27.5 cm. (11")	62.5 cm. (25")	62.5 cm. (25")
140 cm.—190 cm. (56"—76")	2	(27.5 cm. × 2) = 55.0 cm. (22")	85.0 cm. (34")	42.5 cm. (17")
190 cm.—240 cm. (76"—96")	3	(27.5 cm. × 3) = 82.5 cm. (33")	107.5 cm. (43")	39.0 cm. (14")
240 cm.—290 cm. (96"—116")	4	(27.5 cm. × 4) = 110 cm. (44")	130.0 cm. (52")	32.5 cm. (13")
290 cm.—340 cm. (116"—136")	5	(27.5 cm. × 5) = 137.5 cm. (55")	155.5 cm. (61")	30.0 cm. (12")
340 cm.—(136" and above)	6	(27.5 cm. × 6) = 165 cm. (66")	175 cm. (70")	28.8 cm. (11.5")

Note.—Space between the blazes has been calculated taking the minimum of girth class.

(7) *Blazing in subsequent years.*—For continuous tapping, the bole is divided into 3 zones each one being tapped for one year. Thus the three zones are covered in 3 years. For making another horizontal row of blazes in subsequent years 7.5 cm. (3") space may be left above the blazed portions. The blazes on the subsequent year's horizontal row should be alternating or staggering with the previous year's blazes, i.e., the previous and the fresh blazes will not be in the same longitudinal row. The size, shape, etc., of the blaze before and after freshening may be same as for the first year. Similarly, in the 3rd year the same method will be followed. In the fourth year, the blazing may be continued in the zone where it was done in the first year. But this time the blazes may be in between the previous ones. With this method the blazed region gets complete rest for two years and one year's partial rest. In the 7th year the tapping can be reverted to the blazed area of initial exploitation, i.e., the blazes may be made overlapping the first year's blaze. Thus the blazed portion will get complete rest for six years during which period the wound would get healed up and will resume normal activity.

(8) *Collection.*—After making initial blazes, salai-guggul may be collected after a month. Collection may be done by a scraper keeping a circular tray suitable to be kept around a part of the girth of trees. Subsequent freshenings and collections may be done fortnightly.

642. *Kulu gum.*—Kulu trees are found scattered all over the area but are more concentrated in West Melghat division particularly in Wan and Dhulghat ranges. This tree yields gum tragacanth of commerce and has a large export market. A large number of Kulu trees are seen girdled by deep and repeated tapping, ultimately causing their death. It is, therefore, necessary to tap these trees as far as possible on a scientific basis so that trees retain vitality to produce gum over a longer period. To achieve this, it is necessary to give some rest to trees for recouping. At present, the right to collect the Kulu gum is being auctioned along with

the right to collect other gums and unit of auction is the area of a whole range. It is, therefore, suggested that after continuous three years tapping the right to collect the Kulu gum should not be sold for next three years. Thus the Kulu trees will get a complete rest for three years for recouping after which again the Kulu trees will be tapped and the process will be repeated.

The sequence of working and closure of units for Kulu gum auction is given under appendix XLIII.

643. In view of the importance of the gum the following tapping rules are given :—

(1) Only trees above 90 cm. in girth at b.h. will be tapped.

(2) Each tree will be tapped for 3 years as per rule (5) and will be given a rest for 3 years thereafter. The second tapping cycle will begin in the 7th year after the commencement of tapping and will continue for another period of 3 years.

(3) The lowest row of blazes will be at the level of one meter above the ground level. The next row of blazes will be made at the height of 60 cm. from the lower row i.e., at a total height of 1.6 meter from the ground level. The vertical portion of the blaze of upper row will alternate with similar portion of the row and no two blazes of the two rows will be directly one above the other.

(4) Tapping will be confined to the main bole of the trees and the branches will not be touched.

(5) The number of blazes to be made on each tree will depend on its girth at breast height as indicated below :—

Girth in metres	Number of blazes
(i) 0.9 m. to under 1.3 m. .. ..	2 blazes equally spaced.
(ii) 1.3 m. to under 2 m. .. ..	3 blazes equally spaced.
(iii) 2 m. to under 3 m. .. ..	4 blazes equally spaced.
(iv) 3 m. and above .. ..	1 blaze for every 45 cm. girth.

(6) No fresh blaze will be made on the partially healed up surface or old wounds.

(7) Each blaze will start on a parabola with 2.5 cm. wide base. The curved side of the parabola will be upwards and of not more than 7.5 cm. in height. The depth of the blaze will not exceed 0.6 cm. in the wood.

(8) Each blaze will be freshened fortnightly by scrapping outer bark and wood on the upper covered side of the blaze when collecting gum. The blaze should not be made deeper under any circumstances.

(9) At the end of the season, the height of each blaze should not exceed 12.5 cm. The maximum permissible dimensions of the blaze at the end of the season will be width 10 cm., height 12.5 cm. and depth 0.6 cm.

(10) Since the tapping is to be done for 3 years continuously the total height of the blaze at the end of 3 years of tapping will be 37.5 cm. the width and depth remaining the same.

(11) In the second cycle i.e., in the 7th year (after three years rest) new blazes will be made in the same way in the unblazed portion, in between the blazed portions of first cycle. This blazing will continue for another 3 years in the manner described above and the operations repeated till unblazed portion is exhausted.

644. A strict watch is necessary to enforce these rules to forbid unauthorised tapping of trees and collecting gum during the period of rest.

645. *Other gums.*—The right to collect gum will be by auction.

646. *Other forest produce.*—All other produce, should be sold on rated passes. For this purpose a schedule of rates approved by the Conservator of Forests, will be maintained. The existing pass vendor nakas should be maintained. The list of these nakas is given under appendix IX. An additional pass vendor naka should be opened at Hatru for the convenience of villagers residing along the northern border of Melghat.

#### Section 4 : Irregular exploitation

647. The irregular exploitation of timber and other minor forest produce is prohibited except in the following cases :—

(i) The removal of dry fuel on rated passes is permitted from all parts of the forests.

(ii) The Divisional Forest Officer may order without a previous reference to the Conservator of Forests the felling and disposal of produce along boundaries, road alignments, fire lines, sites for building construction and camping grounds.

(iii) Forest produce required for departmental works and free grants may be removed on the orders of the Divisional Forest Officer upto the limit of his powers, the fellings under this provision, however, must be on silvicultural lines and as far as possible will be confined to the coupe of the year or to the coupe to be worked next. Nevertheless, felling of fruit trees will be excluded and fellings in a radius of 100 m. from the perennial water holes, nallas and springs will be prohibited.

**Section 5 : Maintenance of boundaries.**

648. The clearing of boundaries and repairs to pillars will be carried out under 5-year programme which is given under appendix XLIV. The boundaries of the reserved forest should be maintained as given below :—

“ The width of the cleared areas of outer boundaries of Government forest should usually be 40 feet but this may be increased by Conservator's orders in special cases. Except where natural features form the boundary, demarcation will be by pillars, the form of which will vary with circumstances. As a general rule, pillars shall consist of a central stake of khair heartwood or teak projecting six feet above ground level and should be surrounded by a cairn of stones four feet high and six feet in diameter. Where large slab stones are available on the spot the central stake may be replaced by a slab stone projecting one foot from the centre of the cairn. Where the construction of a pillar of stones necessitates heavy cost in the transport of stones, the cairns should be constructed of mud with a revetment of tatti. Pillars should be erected at each point where the boundary line changes direction, and where there is no change of direction at intervals not greater than 250 yards so that each pillar is clearly visible from the next on either side. Each pillar will bear a serial number a fresh series being given for each adjoining village. The number will be painted with coal-tar on the face of the post or slab stone away from the Government forests, they may be cut or embossed with steel dies into the wood at the discretion of the Divisional Forest Officer. ”

649. The width of erstwhile forest village boundaries will be normally 6 metres. The traces of these villages are supplied by the Land Record Department and are available in the Divisional Offices.

**Section 6 : Fire Protection.**

650. The forests of Melghat are valuable and need careful fire protection over the entire area. Due to fire a considerable damage is caused to the timber besides causing long range effects on the soil fertility, young crops and regeneration. The special and determined efforts are needed to enforce the proper fire discipline which has undoubtedly slackened in recent years. It is expected that a fire protection scheme which has been formulated under 5 year plan scheme as given under paragraphs 297 to 303 will ensure quick detection of outbreak of fire and its control.

651. For the purpose of fire protection the areas are classified as follows :—

**Class I.—Complete Protection**—This class will include :—

- (i) Sample plots, experimental plots and all plantations.
- (ii) All the forests of protection, Selection, C. W. R. and Improvement Working Circles.
- (iii) Such other areas as the Conservator of Forests may for special reasons direct.

**Class II.—General protection**—This class will include all the forests of miscellaneous working circle.

**Class III.—Protection under law only**—This class include all the “C” class forests.

652. Any fire occurring in Class I area will be a calamity and must be reported, whatever the area burnt, with the date of occurrence.

653. All the areas in Class I and Class II will be isolated by means of fire lines and cut guide lines and will be patrolled by fire watchers.

654. The following lines will be maintained as fire lines and will be kept clear of all growth and kept clean of all combustible material during the fire season.

- (i) All the external reserve boundary lines.
- (ii) A fire line 30 metres in width along both sides of railway line.
- (iii) The joint boundary line of Harisal and Semadoh ranges from the Sipna river to the Khapra river.
- (iv) The South-West boundary of compartment No. 528.
- (v) The eastern boundary of the Tapti reserve.
- (vi) The old boundary of the Gugamal reserve where it joins the Jhpnadeo and Dhulghat reserves.
- (vii) 6 m. wide lines around all plantations.
- (viii) 3 m. wide coupe lines for 10 years.
- (ix) 6 m. wide line on both sides of all the roads and cart-tracks passing through the forests, will be kept clear of lantana and other undergrowth.

655. To reduce the possibility of forest fires the following suggestions are made :—

- (i) The burning of fire lines should be completed by the end of February.
- (ii) In order to enthuse the public opinion to make them fire conscious and to enlist their co-operation in extinguishing and preventing fire—
  - (a) audio-visual aids may be employed,
  - (b) suitably drafted hand bills may be distributed in the surrounding villages.

656. In the Divisional Forest Office a fire map of the scale of 1"=1 mile shall be maintained. All the fire lines burnt as well as areas specially protected shall be indicated. Fires occurring in the Class I areas will be marked to scale on it. Serial numbers will be given to the fires in chronological orders. The dates of the fires shall be shown on the map and fires of each year shall have a distinct mark.

657. The correct maintenance of fire map shall be a point for a special scrutiny by the Conservator of Forests during his inspections.



658. A record of fires with the trace will be maintained and filed in the respective compartment history files.

### Section 7 : *Grazing*

659. The grazing in various circles will be regulated as follows :—

#### (1) *Selection Working Circle and Improvement Working Circle.*

660. The coupes under working will be closed to grazing only for the convenience of felling and extraction for a period of 3 years from the commencement of their working. The Divisional Forest Officer can decrease or increase the period of this closure.

#### (2) *Coppice with Reserves Working Circle.*

661. All coupes will remain closed to grazing for a period of 5 years commencing from the year of main felling. The areas recently worked under Coppice with Reserve Working Circle of Sharma's plan and Bhatena's scheme will remain closed to grazing for a period of five year after the main felling.

#### (3) *Miscellaneous Working Circle.*

662. The grazing will be allowed in this working circle, but the incidence will not be allowed to fall below 0.8 ha. per cattle unit.

#### (4) *Protection Working Circle.*

663. No grazing will be allowed in this working circle.

664. The sequence of coupes has been so arranged that grazing facilities will not be seriously affected by closures.

665. The area planted with any species anywhere in the divisions will remain closed to grazing for a period of 10 years

666. The Conservator of Forests may order closure to grazing any forest containing bamboo reproduction.

### Grazing Units :

667. The 'A' class forests have been divided into 19 grazing units. The details of these grazing units, the extent to which the grazing is permitted in each unit and the villages listed to these are given in appendix XLV subject to availability of room in the grazing unit, the cattle of agriculturists of the remaining villages of the Achalpur and Melghat *tahsils* of Amravati district and Akot *tahsil* of Akola district will be admitted for grazing in these forests.

668. The Animal Husbandry Department will continue to exercise the exclusive grazing right in Bod reserve in the Dharni range.

669. The grazing rules and rates as given in the annexure to Government Resolution, Revenue and Forests Department No. M. F. P.-1365/132211-Y, dated 6th December 1968 and Government Resolution No. 1369/63695-Z, dated 2nd August 1971, will be in force.

670. The grazing of the cattle of Chikhaldara Civil Station was controlled by the rules contained in Part II of Chapter VII and X of the Melghat Manual (1931 edition) as it was not desirable that persons possessing large herds of cattle should be permitted to reside at Chikhaldara and Pandri. The grazing concession and rates to be applied will be, now as per the Government Resolution dated 6th December 1968 and 2nd August 1971 stated above. As Pandri is within the Chikhaldara Civil station area the number of cattle which may be owned by residents of Pandri will be counted against the maximum number of cattle which may be kept at Chikhaldara.

670. (a) The grazing settlement which was carried out at the time of Sharma's Plan needs no revision as no change in the grazing facilities and concessions are made in the present plan. The report of the Special Revenue Officer along with the comments on it by various officers is appended as a last appendix to this Revised Working Plan.

671. The grazing of the erstwhile forest village cattle will be controlled by the rules given in the annexure to the Government Resolution, dated 6th December 1968 and 2nd August 1971 mentioned above. It is undesirable to allow the increase in the cattle population of these forest villages. Similarly, the number of goa by these forest villagers will be limited to one animal per house, subject to maximum of eight goats per village.

672. Sheep will be admitted in the Dhulghat reserve only on payment of a grazing fee of Re. 1 per animal per annum as per Government Resolution, Revenue and Forest Department No. 1365/132211-Z, dated 22nd December 1971. The grazing of sheep may be disallowed at any time with the orders of the Conservator of Forests.

673. Goats and ponies will not be admitted in the forest for grazing except those owned by the erstwhile forest villagers and forest subordinates.

674. The cattle covered by grazing passes for any grazing unit of Chikhaldara range may be permitted by the Divisional Forest Officer, West Melghat division, to move for hot weather grazing to any other grazing unit of Chikhaldara and Tarobanda ranges or of Semadoh range with the concurrence of the Divisional Forest Officer, East Melghat division without any extra payment. Such permission should only be given by written order specifying the period for which it is valid and the area in which the cattle may graze. The permission must not include forests containing bamboo reproduction.

675. In the event of failure of rainfall in any particular year and consequent scarcity of drinking water for cattle in any unit the Divisional Forest Officer can permit the cattle of that unit to be shifted to any other unit where there is room to accommodate these cattle without any extra payment. This permission will only be given in writing.

#### Section 8 : *Plantation under 5 Year Plan Scheme*

676. Under various 5 year plan schemes plantations have been carried out in the past and also will be carried out in future. Such plantations in future should be carried out only in the coupe of the year.

677. The area of these plantations will be immediately located on the map sheets supplied to Divisional Forest Officer showing the year of formation and species planted. The traces of these plantations with ancillary details will be supplied to the Divisional Forest Officer, Working Plan for transferring the same on the master-sheets maintained in his office. Records for these plantations will be maintained as per the existing circulars and orders on the subject.

#### Section 9 : *Roads*

678. Intensive forest management and maximum utilisation of forest produce are closely interlinked with internal communications and links to highways and railways. In comparison to other forest areas in the state, this tract is fortunate in having a good road system of forest roads. But further extensions and improvement of the forest roads are necessary in order to achieve the level of standard i.e., 1 km. of road per square km. of forest area. At present only 1,358 km. of roads are serving 3,054 sq. km. of the forest area. This works out to 0.45 km. of road per sq. km. of forest. This clearly indicates the necessity for further expansion of road system in both the divisions.

679. Due to long lead from the market it is desirable to maintain all the existing forest roads in good motorable condition. The widening of roads and easing of gradients at places is necessary. It is suggested that Raipur-Hatru-Rahu-Biba-Jarida-Chunkhedi road, Raipur-Butrum-Chaurakund-Harisal road and Khatkali-Dhargarh road should be upgraded and made all weather metalled roads.

680. The construction of Dolar-Koha road should be completed quickly as it will open up the area of the Koktu Felling Series. A proposal of railway line from Tukaithud to Betul passing through the tract is worth considering.

681. To reduce the dragging and sliding of timber, coupe extraction road should be planned and constructed one year before the coupe is due for working.

682. The existing number of elephants for dragging large logs is rather inadequate. The tractors should be used increasingly for dragging timber.

683. A good system of roads, besides facilitating efficient extraction, serves as internal fire lines to localise the forest fires in the event of their occurrence.

#### Section 10 : *Buildings*

684. A list of existing buildings is given under appendix XVI. All these buildings should be maintained in proper repairs.

685. A programme for housing of staff should be maintained by the Divisional Forest Officers and it is suggested that quarters for staff in the interior should as far as possible be concentrated in a few centres and not scattered in a large number of villages.

#### Section 11 : *Water-supply*

686. Water scarcity is one of the major problems in the tract. It is, therefore, necessary not only to maintain the existing wells and tanks in a proper state of repairs but also to improve the water-supply by constructing new wells, reservoirs and anicuts at suitable places. Temporary *jhiras* should be dug near the coupe under working.

#### Section 12 : *Privileges and concessions for forest produce*

687. *Bamboo*.—Current coupes of Dharni and Bod-Chithri cutting series in West Melghat division will remain open for removal of bamboos for commercial sales only from 1st January to 30th April every year. For the rest of the period of the year these cutting series will remain open for removal of bamboos for domestic consumption on concessional rate. Similarly, the current coupe of Chikhaldara cutting series will remain open

up to 30th of April every year for removal of bamboos on concessional rates for domestic purposes by the residents of Chikhaldara and Pandhari. Thereafter the coupe of Chikhaldara cutting series will be opened for sale of bamboos on commercial rate. Care should be taken to see that these concessions are not misused.

688. All other bamboo cutting series will remain open for commercial sale.

689. The residents of forest villages which have been converted as *rayatwari* villages will be allowed the same privileges and concessions as they were enjoying as forest villagers.

690. The labourers of Building and Communication Department staying at roadside camps in the forest area of Melghat will be allowed free firewood and other material required for erecting a temporary camping shed. These concessions may be withdrawn or modified by the Divisional Forest Officer, whenever he deems advisable.

691. Vide Government letter No. 474-649-XIV, dated 6th July, 1927, the whole of Bod reserve was reserved for the Agriculture Department in 1927 in connection with the cattle breeding farm which was opened at Bod in 1928. Accordingly the Agriculture Department, now Animal Husbandary Department, has the exclusive right of grazing of their cattle in the Bod reserve and will be allowed to fell and remove forest produce from the Bod reserve chiefly for the construction and maintenance of cattle shed or other buildings constructed in this area. The management of the Bod Farm will inform requirement to the Divisional Forest Officer, who will issue them as a free grant and will be removed from the current coupe of Bod Felling Series of C. W. R. Working Circle.

692. Small sized timber for agricultural purposes will be made available to the neighbouring agricultural population at concessional rates to be fixed for each coupe by the Divisional Forest Officer. If no other suitable timber is available the Divisional Forest Officer may allow the removal of teak timber for this purpose.

693. The Government right to the hides, horns and bones of domestic animals which die in Government forest will as in the past, not be exercised and *kamdars* of forest villages will be allowed to collect them if the carcass is not claimed by the owner within 24 hours of the death of the animal.

694. The cow-dung of domestic animals grazing in the forest will be allowed to be removed by the owners of the cattle without any further payment.

#### Section 13 : Forest villages

695. The erstwhile forest villages, though, converted into revenue villages, are still designated as forest villages. Their history is given under paragraphs 192 to 197. In respect of these villages the forest staff is now required to maintain the revenue records as is being done for the other revenue villages. As it will be entirely a different type of work, the frequent supervision and guidance will be necessary till the staff gets conversant with the work. The details of these villages are given in the Appendix XIV.

#### Section 13(a) : Transit of forest produce

696. With a view to facilitate checking of forest produce in transit a system of check gates was introduced in Melghat in 1957 and three such gates were installed at the strategic places situated on the main outlets from the tract.

697. A gate at Popatkhera along the Harisal-Akot road checks the flow of forest produce towards Akot while other two gates at Behali and at Dharni check the forest produce traffic along the Amravati-Burhanpur State highway towards Amravati and Burhanpur respectively. Incidentally these gates proved to be an effective measure in controlling the poaching by outsiders.

698. The Bombay Transit of Forest Produce (Vidarbha Region) Rules, 1960 were notified and made applicable in Vidarbha region by the Maharashtra State Government in April 1960 read with amendment dated 6th November 1961 to intensify checking of forest produce in transit.

#### Section 14 : Changes in the range and divisional boundaries

699. A few changes in the divisional boundary between East and West Melghat divisions have been made for the sake of smooth administration and ease of working. Similarly, changes are also made in the boundaries of Chikhaldara, Tarobanda and Akot ranges to correspond to the boundaries of felling series. The changes made are as follows:

TABLE No. 78

Changes in the boundaries of Division and Ranges

Compartment No. (1)	Transformed	
	From (2)	To (3)
8, 41-A, 42-A and 110-A .. ..	East Melghat Division (Compartment 8 from Jarida range), Compartment 41-A, 42-A and 110-A from Semadoh range.	West Melghat Division (Chikhaldara Range).
53 .. ..	West Melghat (Chikhaldara range)	East Melghat (Jarida range).
225 to 229 .. ..	Semadoh range .. ..	Raipur range.
142 .. ..	Tarobanda range .. ..	Chikhaldara range.
139, 773 to 776 and 819 .. ..	Chikhaldara range .. ..	Tarobanda range.
810, 811, 812 and 863 to 871 .. ..	Akot range .. ..	Tarobanda range.

The constitution of the ranges accordingly is given under Table 2 (paragraph 46).

700. The present Jarida range is rather unwieldy and may be divided into two ranges.

#### Section 15 : Maintenance of maps

701. The fresh sets of stock maps (2 inches to 1 mile scale) have been prepared showing details of felling series and coupes. Afforestation, disforestation, new roads and plantations should be shown on these maps. The distribution of these sets is as follows :—

- (1) One Master uncut set for Divisional Forest Officer, Working Plans.
- (2) One cut set for Conservator of Forests, Amravati Circle, Amravati.
- (3) One cut set covering East Melghat Division for Divisional Forest Officer, East Melghat.
- (4) One cut set covering West Melghat Division for Divisional Forest Officer, West Melghat.
- (5) Ten cut sets—One each covering the area of the range for each Range Forest Officer.
- (6) Ten cut sets—One each covering the area of the range and showing only felling series and coupes for each Range Forest Officer for distributing to Round Officers.

702. In addition, 4 management maps (1 inch to 2 miles scale) also showing grazing units are prepared for the use of Divisional Forest Officer, Working Plans, Conservator of Forests, Amravati Circle, Divisional Forest Officer, East Melghat and Divisional Forest Officer, West Melghat.

#### Section 16 : Rainuage and temperature recording stations

703. The rainfall and temperature data for Melghat tract is woefully lacking. Only rainfall data is available for Chikhaldara and Dharni Stations maintained by the Revenue Department. Rainuages at Tarobanda and Dhulghat were maintained by the Forest Department for few years. It is, therefore, recommended that the simple rainuages should be installed at the following stations and the local forest staff should be entrusted with recording of rainfall data.

Place	Range
Jarida	Jarida
Semadoh	Semadoh
Hatru	Raipur
Rangubeli	Harisal
Tarobanda	Tarobanda
Dolar	Tarobanda.
Khatkali	Akot
Dhulghat	Dhulghat.

704. The temperature recording should be done at Chikhaldara, Dhulghat and Semadoh.

#### Section 17 : Forest based industries

705. The wood processing industries are slowly springing up on the outskirts of Melghat. The Forests Department is running the Integrated Unit to popularise the lesser known timbers. Raw material for establishing forest based industry is plenty in Melghat. Lantana which is in abundance is reported to be suitable for hard boards. The course grasses which are found all over the tract and the firewood left in the coupe will form the additional source of raw material for hard boards. The possibility of establishing a hard board or chip board factory through SICOM needs to be explored.

#### Section 18 : Control and records

706. The Divisional Forest Officer will maintain the control forms and sent them to the Divisional Forest Officer, Working Plans according to the standing orders. The specimens of these control forms are given under the Appendix XLVI. Only these forms will be used for maintaining the record and sending to Divisional Forest Officer, Working Plans. These control forms will be maintained for :—

- (i) Coupes of main felling of all working circles. (Appendix XLVII a).
- (ii) C. B. O. and S. C. O. (Appendix XLVII b).
- (iii) Plantations (Appendix XLVII c).
- (iv) Thinnings in old plantation (Appendix XLVII d).

707. *Compartment history.*—In the compartment history files the following information must be recorded for the areas worked.

- (a) A description of coupe before felling.
- (b) A description of felling and details of costs of marking and felling.
- (c) Outturn of different classes of material.

- (d) For plantations, the details of formation, origin of seed, planting distance, mixture of species, costs etc. should be given.
- (e) Outbreak of fire with the area burnt and damage caused.
- (f) Any other information which will assist forest officers in the future to come to correct conclusions about the results of working should also be entered.

707-A. The copies of the annual compartment history files will be supplied yearly to the Divisional Forest Officer, Working Plans, for filling in the compartment history files maintained in his office.

708. *Divisional note book.*—The matters of divisional importance should be recorded under standard headings. The Divisional Forest Officer must record every year his explicit opinion about the success or otherwise of the application of prescriptions of the working plan without reserve. A brief note on the plantations should also be recorded by the Divisional Forest Officer under the appropriate heads.

## CHAPTER XII.: FINANCIAL FORECAST AND COST OF THE PLAN

Section 1 : *Financial Forecast*

709. Considering the terrain, the climate and edaphic factors of the Melghat Forests, the objects of Forest management have not been emphasised from monetary considerations on the contrary for the better management and working of Forests some additional staff has been provided which may add to the existing expenditure of the Divisions. The prescriptions in the plan provide for annual sustained yield. Nevertheless, Financial Forecast, due to fluctuating and inflated economic conditions, cannot be stated with any degree of accuracy at this stage.

The table below gives in the anticipated revenue from the sale of various forest produce in Melghat Forests.

TABLE  
*Gross Revenue of East and West Melghat Divisions*

Forest Produce (1)	East Melghat Division Revenue (2)	West Melghat Division Revenue (3)
	Rs.	Rs.
(1) Teak Timber (M <sup>3</sup> ) .. .. .	1,05,29,800	60,29,900
(2) Adjat Timber (M <sup>3</sup> ) .. .. .	8,37,760	..
(3) Firewood (Tonnes) .. .. .	2,17,600	43,600
(4) Bamboos .. .. .	1,85,578	1,24,087
(5) Grazing and Fodder grass .. .. .	20,126	53,109
(6) Rusa grass, Thatching grass .. .. .	16,761	3,68,635
(7) Miscellaneous .. .. .	1,22,563	82,564
(8) Tendoo (Page 47, Part II) .. .. .	1,06,270	3,28,746
<b>Total Revenue</b> .. .. .	<b>1,20,36,458</b>	<b>70,30,641</b>

Expenditure under B-Conservancy and C-Establishment in East and West Melghat divisions, which is inclusive of additional staff proposed by this Plan, is given in a table below:—

TABLE

Head of Service (1)	East Melghat (2)	West Melghat (3)
	Rs.	Rs.
'B' Conservancy .. .. .	24,04,641	17,63,368
'C' Establishment .. .. .	10,21,840	11,00,845
<b>Total</b> .. .. .	<b>34,26,481</b>	<b>28,64,213</b>

*Surplus :—*

Divisions (1)	Gross Revenue (2)	Expenditure (3)	Surplus (4)
	Rs.	Rs.	Rs.
East Melghat .. .. .	1,20,36,458	34,26,481	86,09,977
West Melghat .. .. .	70,30,641	28,64,213	41,66,428

Section 2 : *Cost of the Plan*

710. The expenditure incurred on preparation of this Plan is Rs. 3,158-00 for field work and Rs. 2,29,715-00 on staff. Hence the total expenditure incurred on preparation of plan is Rs. 2,32,872-00.

P. P. JOSHI,

Divisional Forest Officer, Working Plans,  
Nagpur Circle, Nagpur.