CHAPTER-IV

THE REHABILITATION WORKING CIRCLE

4.1 GENERAL CONSTITUTION

4.1.1 The forest blocks allotted to this working circle are those whose forest crops are in various stages of degradation. Degradation of these forests is due to the unrelenting biotic interference such as illicit felling, repeated fires, grazing and encroachments on these forests. Because of these adverse biotic conditions, the topsoil at many places has been washed away and resulted in the exposure of the rocks. On the other hand, these forests blocks still contain enough potential in terms of sufficient rootstock and natural regeneration, which if tended and protected could be converted to high forests. Most of these blocks are in urgent need of attention to arrest the process of degradation. The area allotted to this Working Circle is 32449.4181 ha. in Keonjhar (T) Division and 29228.6177 ha. in Keonjhar (WL) Division. Attempt is to be made to involve the local villagers in rehabilitation of these forests by the formation of Vana Samrakshayna Samities (VSS) as per the JFM Resolution of the Govt. In some of the forest blocks like Kalikaprasad, Balibandha, Ninua, Chemena, Baliposi, Tando etc. the VSS members have started protecting the forests, and as a result the crop condition has improved a lot.

4.1.2 Due to heavy biotic interference, some forest blocks like Sidhamatha, Thakurani, Baitarani etc., have turned to scrub forests during the course of the out going plan. Hence, these forests have been kept under this working circle. Other than these blocks, some other forests like, Santoshpur, Rebena, Palaspal has suffered a lot due to encroachment and illicit felling. Even a major part of Atei RF too has turned to a scrub forest and has also encroachments. Shifting cultivation is massively observed in the forests of B&JP Range. Hence these forests can be restored and restocked through different operations in this working circle. In some of the areas VSS have been constituted and villagers are protecting the forests, which is encouraging. During the course of implementation of this plan the Divisional Forest Officers should take step to allot more areas to VSS for joint protection and management.

4.2 GENERAL CHARACTER OF VEGETATION

4.2.1 These forests can be improved by cultural operations supplemented by artificial regeneration. The forests under this circle are mostly open mixed sal forests. The regeneration is poor because of biotic interference. Still sufficient rootstocks are available at places like Thakurani, Baitarani etc. Normally these forests are found in the close proximity to the human habitation and mines rich areas. Hence, the involvement of the local people through JFM would give a better result to restore the forests.

4.2.2 This Working Circle is the second largest working circle in both the divisions. The degradation in the forests of Keonjhar (WL) Division is more due to heavy illicit felling and encroachment. This Working Circle covers almost 42% of the total forest area of Keonjhar (WL) division. But in case of Keonjhar (T) Division the cause of degradation is mainly because of heavy mining activities and encroachment. This Working circle covers about 25% of the total forest area of Keonjhar (T) Division. In most of the areas of both the divisions, the stems are being removed at every stage of their growth for use as fencing materials and firewood. Even the young sal shoots and their leaves are not spared from being used as tooth sticks and leaf plates. In spite of such regular and heavy biotic oppressions, these forests still have sufficient rootstock and can be successfully regenerated through appropriate silvicultural operations coupled with stringent protection measures.

4.2.3 Since the forests included in this working circle are widely scattered and spread over all the ranges, almost all the forest types occurring in the Divisions are well represented. However, majority of the areas are *3C/C$_2$e (iii) Moist Peninsular Valley Sal*. The detailed description of these forest types and their vegetation has already been dealt in Chapter-2A. The topsoil in these forests has been found disturbed due to uninterrupted heavy biotic interference. The soil types are vividly discussed in Chapter I of Part I. The water retaining capacity of these soils are generally low and they are highly prone to erosion due to steep slopes forming large number of gullies and ravines.

4.2.4 The forest crop is mostly open with poor to deficient regeneration and consists of various species like Sal, Piasal, Sisoo, Asan, Dhaura, Kurum and Kasi etc. These blocks have good rooted wastes.

4.3 SPECIAL OBJECTIVES OF MANAGEMENT

4.3.1 The following special objectives of management are set for the Working Circle, which is within the ambit of the general objectives of management and aims at regeneration and restocking of the degraded forests.

i) To regenerate the degraded forest blocks including the areas once affected by shifting cultivation, by appropriate silvicultural inputs and protection measures with people's participation.

ii) To improve the micro-climate and micro-edaphic conditions though soil and moisture conservation measures.

iii) To increase the biodiversity in forest crop by encouraging natural regeneration.

iv) To meet the bonafide needs of the local inhabitants for fuel wood, small timber, fodder and N.T.F.P. to the extent possible depending upon the productivity of the forests to ensure their participation.

4.4 AREA ALLOTMENT AND TREATMENT SERIES

4.4.1 The area allotted to this WC is 32449.4181 ha. in Keonjhar (T) Division and 29,228.6177 ha. in Keonjhar (WL) Division. To facilitate proper and systematic treatment to the degraded forest, Treatment Series have been constituted in all the ranges. These series have been constituted taking into account of silvicultural operations to be carried out and the administrative feasibility. Care has been taken to restrict the series within the Division/Range jurisdiction to which a particular block belongs. Each Treatment Series is divided into 10 annual coupes to synchronize the Plan period of 10 years. These Treatment series with annual treatment coupes have been shown in the management map.and the forest area allotted to this working circle is depicted in Fig.No. 4.1 The area allotted to each treatment series is give in **Table No 4.1**

Fig.No.4.1 Area allotted to Rehabilitation working circle.

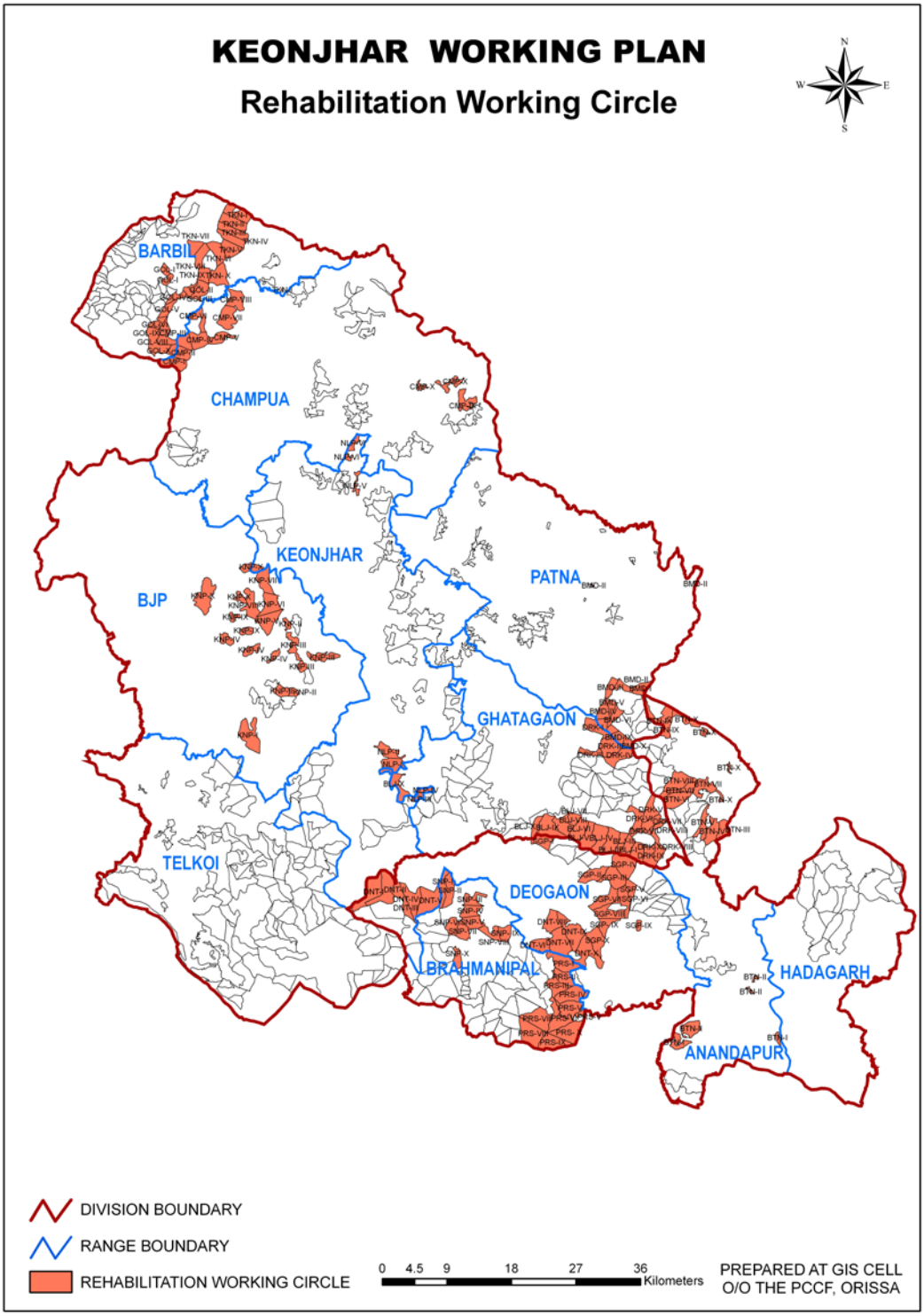


Table No.4.1: Range wise allotment of Forest Blocks in to Rehabilitation Series

Rehabilitation Series	Forest Block	Compt.No.	Total area in Ha.	Treatment area in Ha.
Keonjhar (T) Division				
I. Barbil Range				
Goali	SIDDHAMATHA	01	146.7068	
	SIDDHAMATHA	02	146.0959	
	SIDDHAMATHA	05	163.9613	
	SIDDHAMATHA	06	71.0547	
	SIDDHAMATHA	07	121.0234	
	SIDDHAMATHA	08	72.4696	
	SIDDHAMATHA	22	136.2195	
	SIDDHAMATHA	23	676.9990	
	SIDDHAMATHA	24	285.5610	
	SIDDHAMATHA	25	168.1460	
	SIDDHAMATHA	26	109.6016	
	SIDDHAMATHA	27	99.7584	
	SIDDHAMATHA	27	124.5694	
	SIDDHAMATHA	28	254.0566	
	SIDDHAMATHA	29	435.6620	
	Total Goali RS		**3011.8851**	**3011.8851**
Thakurani	KANDARA-A		6.9457	
	THAKURANI		4455.3067	
Total Thakurani RS			***4462.2524***	***4462.2524***

II. B&JP Range

Kanjipani	KANJIPANI		876.9754	
	DIGACHAMPEI		136.6310	
	GADGADEI		270.6053	
	SUAKATI-II		111.4982	
	CHAMPEI		383.7730	
	SUAKATI-I		332.4047	
	SUAKATI-I		161.1444	
	KHAJURIMUNDI		231.3626	
	LUNAGHAR-I		236.1599	
	LUNAGHAR-II		148.1777	
	GANDHAMARDAN		588.1311	
	GANDHAMARDAN		585.0730	
	GANDHAMARDAN		539.5044	
	SAHRAPUR		622.9937	
	DANLA		170.1682	
	DUMURIDIHA		121.4011	
	AMUNI		311.5335	
	JAGAR		154.8835	
	RAIGUDA		853.3471	
Total Kanjipani RS			***6835.7676***	***6835.7676***

III. Champua Range

Champua	BAITARANI-A		2378.8243	
	BAITARANI-B		1138.8526	
	BARDHANA		819.5084	
Total Champua RS			***4337.1853***	***4337.1853***

IV. Ghatgaon Range

Balijodi	ATAI	40	357.3481	
	ATAI	41	261.2698	
	ATAI	42	597.3774	
	ATAI	43	661.7609	
	ATAI	44	570.9477	
	ATAI	45	514.7474	
	ATAI	46	239.4785	
	ATAI	47	501.6938	
	ATAI	48	713.1204	
	ATAI	49	260.0383	
	NALAPANGA	01	582.2264	
Total Balijodi RS			***5260.0089***	***5260.0089***
Darkhola	ATAI	11	465.5957	
	ATAI	12	611.1346	
	ATAI	13	225.7550	
	ATAI	14	565.2571	
	ATAI	33	454.4065	
	ATAI	32	403.1959	
	ATAI	35	204.9858	
	ATAI	34	364.3664	
	ATAI	36	231.9259	
	ATAI	37	264.0635	
	ATAI	38	450.2263	
	ATAI	39	400.9629	
Total Darkhola RS			***4641.8754***	***4641.8754***

V. Keonjhar Range

Nalapanga	BALABHADRAPUR		868.3102	
	NALAPANGA	02	289.3432	
	RAIKALA		390.1699	
Total Nalapanga RS			***1547.8234***	***1547.8234***

VI. Patna Range

Bhimkind	ATAI	01	300.3758	
	ATAI	02	228.6573	
	ATAI	03	265.4571	
	ATAI	04	541.2066	
	ATAI	05	455.0047	
	ATAI	10	533.2112	
	BARBIL		12.5825	
	PALASPADA		16.1247	
Total Bhimkund RS			***2352.6200***	***2352.6200***

KEONJHAR (WL) DIVISION

Rehabilitation Series	Forest Block	Compt. No.	Total area (Ha)	Treatment area (Ha)
I. Anandapur Range				
Baitarani	GAYALMUNDA		70.7673	
	HATIBANDHA		75.9796	
	KULDIHA		44.9449	
	MEGHANADPAHI		314.5934	
	NUNIAPATNA		81.7307	
	PANASDIHA		92.6973	
	PATILO		449.6679	
	SANTOSHPUR	01	531.0796	
	SANTOSHPUR	02	354.6695	
	SANTOSHPUR	03	245.3584	
	SANTOSHPUR	08	693.0463	
	SANTOSHPUR	09	410.4735	
	SANTOSHPUR	10	583.9218	
	SANTOSHPUR	12	483.6585	
	SANTOSHPUR	15	405.0058	
	SANTOSHPUR	16	503.4337	
	SANTOSHPUR	17	337.2855	
Total Baitarani RS			***5678.3136***	***5678.3136***
II. Brahmanipal Range				
Pravash	BRAHMANIPAL		88.9997	
	REBENA	39	755.9363	
	REBENA	40	422.9636	
	REBENA	41	494.8186	
	REBENA	43	728.7311	
	REBENA	44	639.3568	
	REBENA	45	706.0515	
	REBENA	46	1740.3319	
	REBENA	47	1494.9641	
Total Pravash RS			***7072.1536***	***7072.1536***
Sunapenth	MAHULPANGA		261.2832	
	PALASPALA		2494.9086	
	REBENA	08	373.3860	
	REBENA	09	499.2310	
Total Sunapenth RS			***3628.8087***	***3628.8087***

III. Deogaon Range				
Dantuani	REBENA	01	884.2189	
	REBENA	02	867.3337	
	REBENA	05	522.3051	
	REBENA	06	678.0576	
	REBENA	07	907.8789	
	REBENA	34	447.9162	
	REBENA	35	891.6163	
	REBENA	36	505.6171	
	REBENA	37	868.1494	
	REBENA	38	865.4324	
Total Dantuani RS			***7438.5256***	***7438.5256***
Sagadapata	ATAI	50	428.8921	
	ATAI	55	536.5509	
	ATAI	56	666.0693	
	ATAI	57	809.7075	
	ATAI	65	262.1996	
	ATAI	66	504.6607	
	ATAI	67	576.3350	
	ATAI	68	937.5079	
	ATAI	69	593.5858	
	KADAGOTHA		95.3073	
Total Sagadapata RS			***5410.8161***	***5410.8161***

4.5 ANALYSES AND VALUATION OF CROP

4.5.1 In all the blocks allotted to this Working Circle, the study on vegetation, crop condition and extent of erosion, degradation has been conducted. Detailed assessment of growing stock, biodiversity and regeneration study was carried out in all these blocks. As already mentioned, there exists variation in the crop condition in the various blocks included in this circle. These blocks require treatment to promote natural regeneration and also artificial regeneration in areas where there are permanent blanks. Simultaneously appropriate treatment will be required to conserve the soil and moisture. The enumeration results of Range wise-block wise, is provided in Annexure-XXXIII. The entire working circle has been stock mapped and the stock maps have been attached to the respective Compartment History files. The average density of the crop included here varies from 0.1 to over 0.2. Even in many areas the density is < 0.1.

4.6 SILVICULTURAL SYSTEM

4.6.1 The prime objective is to save these forests from biotic pressure for which these areas have been degraded. There will be no exploitation of mature trees except for removal of dead and uprooted trees. No formal silvicultural system is prescribed. However, to achieve the major objectives, operations like regeneration cleaning, soil and moisture conservation, gap planting, block planting in larger gaps along with tending will be carried out. Along with the said operations stringent steps should be taken by the concerned Divisional Forest Officers to protect these areas from illicit felling, encroachment, grazing with the active participation of the local people.

4.7 REHABILITATION TREATMENT

4.7.1 Demarcation of annual Rehabilitation area: The annual Rehabilitation area will be demarcated during cold weather previous to the year in which it falls due for working. Since these areas are very open and eroded small stone cairons (height not exceeding 0.75 metres) will be erected at a mutually visible distances on its periphery. In case, the rehabilitation area line passes through patches containing dense forest growth the same shall be cleared to a width of 2 mtrs. But care should be taken not to fell any tree on the line. Two coaltar rings should be painted at breasts height on the trees standing on the edge of this line at visible distances. Where the line meets the Reserved Forest boundary lines or a main path, signboards showing the extent of Rehabilitation area, year of rehabilitation and species to be planted should be fixed.

4.7.2 Preparation of Stock and Treatment Map: This Working Circle comprises of degraded and eroded forests of both the divisions where intensive soil conservation measures are barely required. Besides this, where the areas contain small patches of Sal or miscellaneous species, suitable tending operations are required to be done to promote the existing growth. Protective measures are also required to save these forests from biotic interference. For raising plantations in suitable areas, sufficient nursery stock should be raised in advance. Since the area covered in this working circle has reached various stages of degradation, they can be categorized from various angles. A few of them are as below.

Category I: Sal rooted wastes, which are unable to establish due to heavy biotic interference.

Category II: Completely barren eroded and plain areas devoid of forest growth which can be restocked with fast growing species.

Category III: Hill slopes bereft of vegetation or with scanty forest growth where soil conservation measures and massive afforestation is required.

Category IV: Dead mines and mines spoil areas where no vegetation is present will be restocked with the fast growing species.

4.7.3 Treatment plan: The concerned Range Officer shall prepare suitable annual treatment plan showing different categories of areas to be treated on a map in 1:25,000 scale or boundary survey sheet after its proper demarcation on the ground. The preparation of the treatment plan should be done and completed before December of the year prior to the year of rehabilitation. He should submit the plan to the concerned Divisional Forest Officer for approval before 1st January. Such plan should be verified with reference to the field by not below the rank of an Asst. Conservator of Forests. The Concerned Divisional Forest Officer shall then approve the plan after which the advance preparation for rehabilitation measures shall proceed. The plan shall include all vital information like,

a) Site identification i.e. Forest block/ Compartment.No.

b) Area and Treatment Map,

c) Site category (i.e. Category I, II, III & IV)

d) Site characteristics (terrain, slope, drainage, soil type and depth),

e) Vegetation and extent of regeneration,

f) Extent of degradation of site/vegetation,

g) Year of operations (including maintenance, if any),

h) Major operations to be undertaken,

i) Cost norms and a calendar of operations

4.7.3.1 Treatment plan for Category I: Most of the forest blocks in close proximity to habitation have sal-rooted wastes where tending, cleaning and trench fencing can improve the present condition. Elimination of biotic interference and proper cultural operations in right time will boost up the growth of the Sal saplings and improve the forest cover. In the areas where VSS exist, these areas should be handed over to them for the protection. Even in areas, where VSS are not operating, attempts should be made by the concerned Range Officer/ Forester to form new VSS for better protection.

4.7.3.2 Treatment plan for Category II: The first and foremost step is to be taken is to close the area from grazing, fire and illicit fellings. On the fencing line thorny species like Babul, Gohira or Agave shall be planted as line of defense. Thick sowing of Accacia auriculoformis on the ridge may be done. The topsoil in barren and degraded areas is normally hard and having absolutely no humus. Hence, soil working, mulching should be taken up to loosen the top soil before taking up any plantation. The recommended species to be tried are Accacia auriculoformis, Accacia nilotica, Eilanthus and Subabul, Stylosanlly hamata, Stylosanthes mucronate etc. Soil working including mulching shall be done.

4.7.3.3 Treatment plan for Category III: The area covered by this category should be provided with suitable soil conservation measures.

4.7.3.4 Treatment plan for Category IV: The dead mines and the mines wastes are the sorrows of mainly Keonjhar (T) Division. Stringent measures should be taken against the mine owners to restrict them from using the nearby forest areas as dump yards of mines wastes. Simultaneously the concerned Divisional Forest Officers should see that earth-filling work has been taken up by the mine owners before closer of the mines. Immediately after closer of the mines, action should be taken for planting of species like Accacia Catechu, Azadiractan indica, Eilenthus excellensa, Accacia auriculiformis, Pongamina pinnata, Cassia siamia, Terminallia tomentosa, Grevellia pteridophollia etc.

4.7.4 Artificial Regeneration: For the artificial regeneration purpose, the site quality must be observed. The species suitable to the site condition should be preferred for gap plantation and block plantation. However, due importance should be given for fruit bearing species like Mango, Jack fruit, Zizyphus, Tamarind etc. at the village fringe areas. In the comparatively plain areas, importance should be given to NTFP species like Harida, Bahada, Aonla, Chara etc. For completely eroded areas, Quick growing species like Accacia, Chakunda etc. should be preferred and for the gullies and slopes the species like Moi, Bena, Begunia, Ipomia, Kaunsi etc. should be preferred. Babul and Agave shall be tried along bunds. A list of species that can be grown for treatment of different sites in this working circle is presented in **Table No: 4.2** (Source: Handbook of Afforestation technique by Sri R. C. Ghosh)

Table No. 4.2 SPECIES SUITABLE FOR PROBLEMATIC SITES

Site	Measure To Be Taken	Species To Be Planted
Ravine	1. Soil and water conservation measures 2. Full protection from grazing and fire 3. Safe disposal of run off 4. Grassland development 5. Afforestation	*Dalbergia Sissoo, Albizzia lebbek, Prosopis juliflora, Accasia Catechu, Acacia niloteca, Azadirachta indica, Agave americana, Agave sisalana, Eulaliopsis binata*
Laterite Soil	1. Soil and water conservation measures 2. Full protection from grazing and fire 3. Afforestation	*Dendrocalamus strictus, Madhuca indica, Acacia auriculiformis, Bombax ceiba, Soymida febrifuga, Cleistanthus collinus, Albizzia lebbek, Agave spp, Cassia siamea, Hardwickia binata, Azadirachta indica, Acacia nilotica, Acacia leucophloea, Derris indica, Dalbergia sisoo,Tamarindus indica, Eulaliopsis binata, Ailanthus excelsa, Acacia catechu.*
Skeletal Soils	1. Contour bunding, trenching 2. Afforestation 3. Soil and water conservation measures 4. Protection from grazing and fire 5. Showing grasses 6. Seed dibbling / Afforestation	

Water logged areas	1. Preparation of mounds 2. Planting of tall plants 3. Application of anti termite chemicals 4. Early planting 5. Drainage	*Anthocephalus chinensis, Syzygium cumini, Terminalia arjuna, Bombax ceiba, Lagerstroemia speciosa, Dalbergia sisoo, Derris indica, Acacia nilotica.*

4.7.5 Grass and Fodder: Grass planting in the exposed soil should be preferred. The presence of grasses controls soil erosion and increase the water retention capacity of the soil as well. Some local indigenous grasses suitable for plantation are given in Table 4.3.

Table: 4.3 IMPORTANT GRASS SPECIES

Species	Type	Habitat Factor
Aristida setacea	Fodder	Brown soil, Sandy loam with gravel, P_H 7.0
Arundinella bengalnensis	Fodder	Yellowish brown soil, Sandy loam, P_H 6.2
Arundinella nepalensis	Fodder	Slopes having good drainage and permeability, Sandy loam P_H 6.5
Bothriochloa intermedia	Fodder	Grows on a variety of soil in subtropical conditions in level and hilly topography
Cenchrus ciliavis	Fodder	Grows in semi arid zone and sandy soil, P_H 7.5 to 7.7.
Chrysopogon aciculatus	Fodder	It is a creeping rhizome and prefers sandy loam, acidic soils on level or moist slopes, P_H 5.1 to 6.1 Can withstand heavy grazing, cannot survive on dry stones and sandy soils. Promising species for stabilization of embankments
Chrysopogon fulvus	Fodder	Prefers hilly gravely, black cotton soils and red soils and low level of moisture
Chrysopogon gryllus	Fodder	Strong acidic soil on high hills, P_H4.2
Cymbopogon coloratus	Non-fodder	Occurs on a variety of sites of dry areas having gravelly to sandy loam exposed rocks, acidic to neutral soil on hill and plains
Cymbopogon jwarancusa	Non-fodder	Prefers level to hilly topography, sandy and rocky soil, P_H6.5 to 7.5
Cymbopogon martini	Non-fodder	Wide distribution, P_H 5.2 to 7.0
Cynodon dactylon	Fodder	Wide distribution, prefers moist and level land, withstands moderate grazing and trampling
Dactyloctenium sindicum	Fodder	Dry areas, prefers slightly alkaline soil

Species	Type	Habitat Factor
Demostachya bipinnate	Fodder	Prefers semiarid and arid condition, can tolerate P_H up to 9.5
Dichanthium annulaltum	Fodder	A species of level land prefers sandy loam to loamy soil moist areas
Dichanthium caricosum	Fodder	A species of level land prefers sandy loam to loamy soil moist areas
Dimeris fuscescens	Fodder	Prefers good drainage and permeability, P_H4.2
Eleusine compressa	Fodder	A grass of arid region
Eragrostis coarctata	Fodder	A xerophytic grass
Eremopogon foveolatus	Fodder	Grows in skeletal soil, P_H 6.6 to 7.5
Eulalia trispicata	Fodder	Prefers deep soil and low land
Eulaliopsis binata	Non-fodder	Can grow in slopes up to 50% hot dry localities, withstand forest fire
Heteropogon contortus	Non-fodder	Shallow eroded, black or red soil, P_HH 6.8 to 7.0
Imperata cylindrica	Fodder	Prefers moist swampy areas, P_H 4.0 to 7.5
Ischaemum indicum	Fodder	Low lying wet area, heavy black soil, P_H7.1 to 8.5
Ischaemum timorense	Fodder	Damp land
Iseilema spp	Fodder	Low lying area, black soil, P_H 6.1 to 7.4
Lasiurus spp	Fodder	Brown sandy soil, P_H 8.5, cannot stand grazing
Leersia hexandra	Fodder	Prefers low lying lands, semi aquatic condition
Narenga porphyrocoma	Fodder	Level land with good drainage and permeability
Neyraudia regnaudiana		Favors moist sandy loam area, P_H 5.0
Paspalum conjugatum		Moist area
Pharagmites karka		Low lying land, P_H 4.5
Pseudanthistria hispida		Clay soil with good drainage, P_H 6.0
Saccharum spp		Mesophytic habitat
Sclerostachya fusca		Clay soil in depression of Sal forest, P_H 4.75
Sehima nervosum	Fodder	Wide range of soil, deep soil, P_H 6.5
Sporobolus indicus	Fodder	Withstand inhospitable soil, drought, P_H 4.5
Sporobolus narginatus	Fodder	Level sandy tract of arid zone
Themeda triandra	Fodder	Gravelly soil on hills, P_H acidic to neutral
Vetiveria zizaniodes	Non-fodder	Ill drained land where water table is high. Soil sandy loam to clay, P_H 4.0 to 7.5

(Source: The grass cover of India by P.N. Dabadghao and R.A. Shankar Narayan, ICAR)

4.7.6 Silvicultural Treatments: The following silvicultural operation will be carried out in the area as per requirements at the site.

a) High stumps will be cut flush to the ground to encourage coppice shoots.

b) Singling out of multiple coppice shoots to retain the most promising ones

c) Removal of congestion by cleaning operations aimed at encouraging the growth of locally desirable species.

d) Adoption of few seedlings per ha. of locally important and desirable species from the available natural regeneration by giving these species preferential treatment.

e) Removal of invasive weeds

4.7.7 Thinning Operations: Thinning operations should be carried out in the areas having a very congested forest crop. Such an operation would provide enough space to the retained crop and encourage adequate growth to them. It shall be carried out only if the situation warrants. It will be carried out under the supervision of the Range Officer. The VSS members should be involved where present. The following conditions would apply:

a) It should be restricted to the congested pole crop only and limited to the species with girth at breast height less than or equal to 75cms.

b) Marking shall be done on the lines of ‘C’ grade thinning

c) No thinning shall be carried out in open areas

d) Neither any fruit bearing species, nor any NTFP species shall be thinned out

e) Thinning markings are to be done very sparingly and will require the prior approval of the DFO.

4.7.8 Soil and Moisture Conservation Measures: Appropriate soil and moisture conservation measures should be taken up in Category III areas since most of these areas have steep slopes and are affected by soil erosion. These measures shall not only reduce the velocity

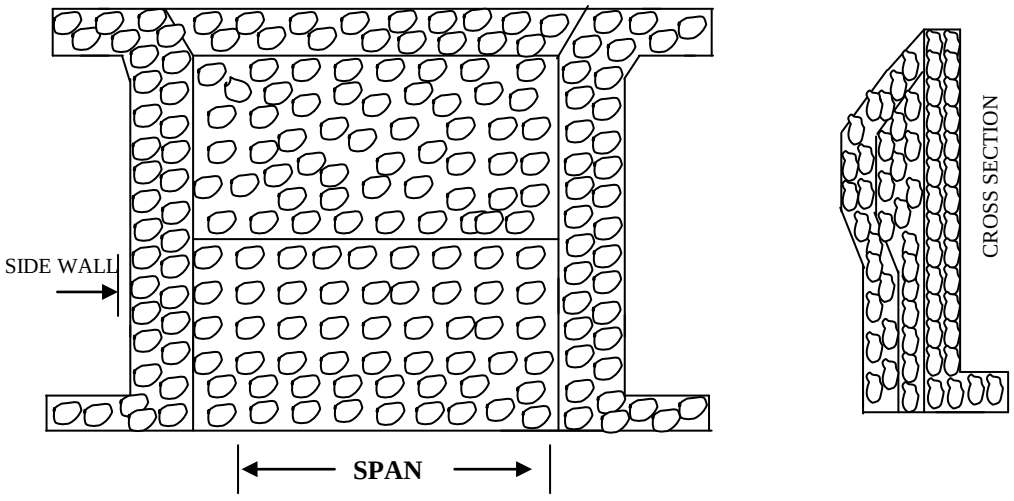
of the water flow but also save the areas from soils erosion. Various measures to check soil erosion in these areas are prescribed as under may be followed.

(i) Tree Plantation as per the land capability: Proper species should be planted in proper areas. Species like Bena, Moi etc. should be planted in sloppy areas whereas species like Asan, Arjuna, Jamu, Gohira, Babul etc. should be planted in damp areas. Species like Chakunda, Accacia, Sisoo, Gambhar, Mango, Jackfruit, Cashew etc. should be planted in plains, which will increase the water retention capacity of the land.

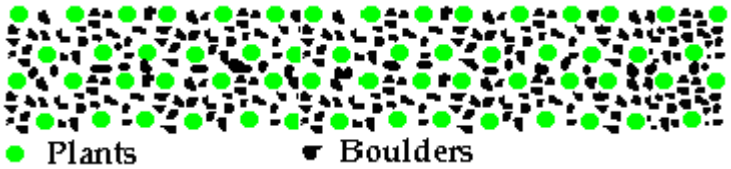
(ii) *Stone Guard wall in the contour line:* Stonewalls should be constructed on the contour lines. These walls would help to check the eroded soil of the hills to concentrate on the contour lines and subsequently help to reduce the erosion process. The water flow, instead of going down and getting wasted, will be absorbed in the soil.

(iii) *Loose boulders check-dam in the gullies*: Because of the sloppy land pattern, creation of gully is natural. However, if they are not attended properly in adequate time, the narrow gullies will be widened and will damage the standing trees. So in the newly born gullies, loose boulders check-dams should be constructed. These dams would check the force of the downward streams and help deposition of soil, which would subsequently repair the gullies in natural process. The pattern of the loose boulder check dam is given below:

DESIGN OF A LOOSE BOULDER CHECK DAM



(iv) *Brush wood check dam*: Alike loose boulder check-dam, Brush wood check dams can help checking the flow of water as well. Side by side, it would help recovery of greenery to the forest. Certain species like Moi, Bena, Begunia, Ipomia, Kaunsi etc. can be grown by planting stems only. The plantation pattern of stems should be as below:



(v) *Diversion drain:* In spite of the various kinds of check dams, still some water would get flown. In order to check the speed of the streams, diversion drains should be constructed. Such drains should be constructed at different parts of the gullies so that the volume of water would go on reducing at different stages. Ultimately, the speed of the water would reduce and the top soil can be conserved.

(vi) *Percolation Tank*: Percolation tanks should also be constructed at considerably plain areas of each gully, which would store the loose soils that flows as silts. Besides this, it would help seepage of water into the soil of that area. These soil and silt would help the surrounding saplings to grow and will create a bushy surrounding. Ultimately the water retention capacity of the soil will increase.

(vii) *Run-off management structure:* The outlet of each gully should be so managed that the force of the water flow is reduced. Simultaneously it would help spreading of water in adjacent areas. There will be well distribution of the wastewater without soil erosion. Watershed management should be adopted in the entire area.

(viii) *Checking of Forest Fire:* Both the divisions are very much susceptible to Forest fire. The causes of forest fire have been discussed in this plan vividly in other chapters. However, the forest fire not only deprives the formation of humus but also makes the topsoil loose. Hence, a slight rain plays a major role for soil erosion. A continuous rain promotes many new gullies in the forest. People should be well educated on the matter through motivation and other sources.

4.8 REHABILITATION CYCLE: The cycle has been fixed at 10 years, which synchronizes with the Plan period.

4.9 CALCULATION OF YIELD: No yield is prescribed.

4.10 DIVISION INTO ANNUAL TREATMENT AREAS

4.10.1 For better treatment and proper execution of the rehabilitation measures, each Rehabilitation series has been divided into 10 annual coupes. The formation of the coupes have been made in such a way that the continuity of the rehabilitation measures is ensured to have sustained efforts.

4.10.2 The annual coupe shall be attended to as per the sequence prescribed in the plan. Table 4.4 gives the annual coupes (rehabilitation series wise) with its number and the year of treatment along with the name of the forest block, its compartment number and area included in the coupe. The annual coupes of all the series have also been depicted in the GIS Management Map layer (scale 1:25,000). The coupe layer has been developed under the assistance of GIS cell of the Pr. CCF, Bhubaneswar and synthesized with enumeration details at NRSA, Hyderabad. The rehabilitation coupe layer with codifications and ID number assigned to each coupe is available at GIS cell of the Pr.CCF Bhubaneswar. The concerned Divisional Forest Officers can utilize these layers to monitor fire, growing stock stem density, and canopy density, which has already been delineated.

Table No. 4.4 Distribution of Annual Coupes

KEONJHAR (T) DIVISION.					
RANGE: -BARBIL					
REHABILITATION SERIES: -GOALI (GOL)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	SIDDHAMATHA	01	GOL-I	146.7068	
	SIDDHAMATHA	02	GOL-I	146.0959	292.8027
2008-09	SIDDHAMATHA	29	GOL-II	435.6620	435.6620
2009-10	SIDDHAMATHA	07	GOL-III	121.0234	
	SIDDHAMATHA	08	GOL-III	72.4696	193.4930
2010-11	SIDDHAMATHA	05	GOL-IV	163.9613	
	SIDDHAMATHA	06	GOL-IV	71.0547	235.0160
2011-12	SIDDHAMATHA	28	GOL-V	254.0566	254.0566
2012-13	SIDDHAMATHA	22	GOL-VI	136.2195	
	SIDDHAMATHA	27	GOL-VI	99.7584	235.9779
2013-14	SIDDHAMATHA	26	GOL-VII	109.6016	
	SIDDHAMATHA	27	GOL-VII	124.5694	234.1710
2014-15	SIDDHAMATHA	23	GOL-VIII	676.9990	676.9990
2015-16	SIDDHAMATHA	24	GOL-IX	285.5610	285.5610
2016-17	SIDDHAMATHA	25	GOL-X	168.1460	168.1460
Total				**3011.8851**	**3011.8851**

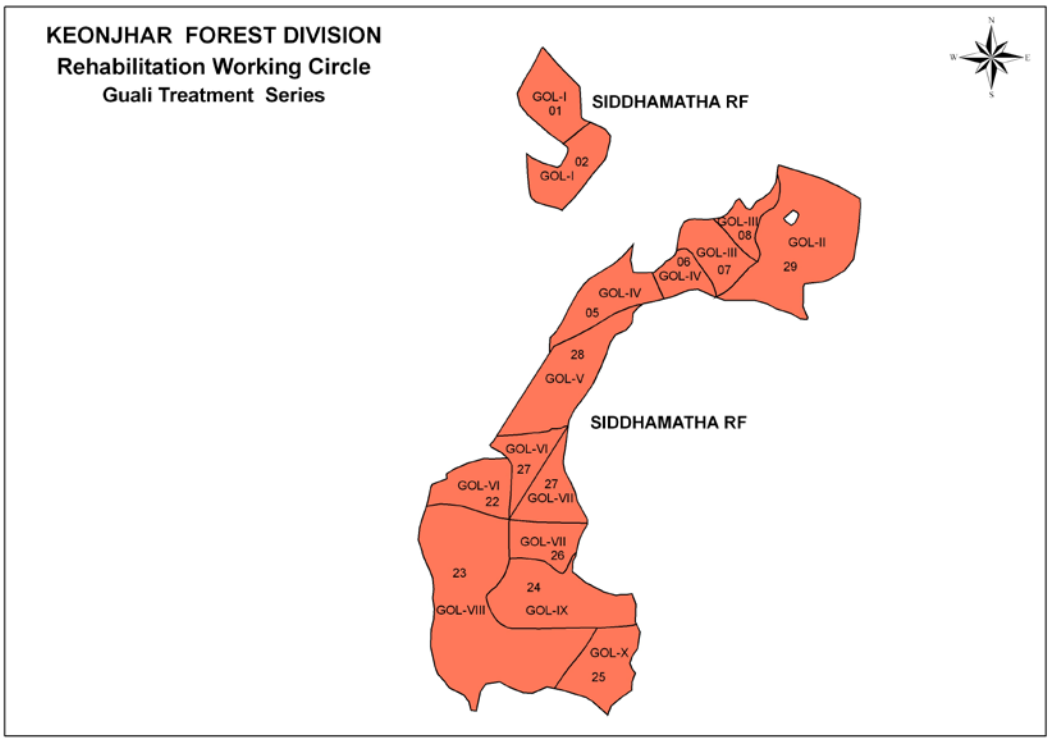


Fig. 4.2 Map of Goali Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -BARBIL					
REHABILITATION SERIES: -THAKURANI (TKN)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	KANDARA-A		TKN-I	6.9457	
	THAKURANI		TKN-I	517.8835	524.8293
2008-09	THAKURANI		TKN-II	522.2707	522.2707
2009-10	THAKURANI		TKN-III	465.3689	465.3689
2010-11	THAKURANI		TKN-IV	408.9985	408.9985
2011-12	THAKURANI		TKN-V	465.7871	465.7871
2012-13	THAKURANI		TKN-VI	478.0264	478.0264
2013-14	THAKURANI		TKN-VII	306.0437	306.0437
2014-15	THAKURANI		TKN-VIII	393.6985	393.6985
2015-16	THAKURANI		TKN-IX	316.2736	316.2736
2016-17	THAKURANI		TKN-X	580.9558	580.9558
		Total		**4462.2524**	**4462.2524**

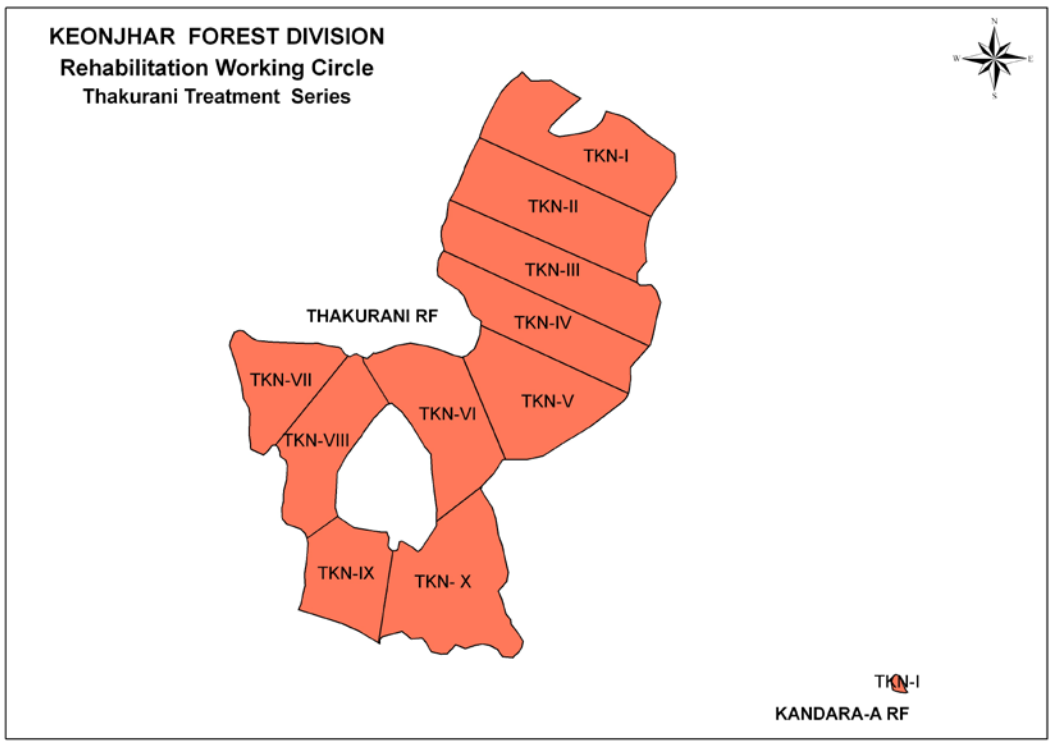


Fig. 4.3 Map of Thakurani Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -B & JP					
REHABILITATION SERIES: -KANJIPANI (KNP)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	KANJIPANI		KNP-I	876.9754	876.9754
2008-09	DIGACHAMPEI		KNP-II	136.6310	
	GADGADEI		KNP-II	270.6053	
	SUAKATI-II		KNP-II	111.4982	518.7345
2009-10	CHAMPEI		KNP-III	383.7730	
	SUAKATI-I		KNP-III	332.4047	
	SUAKATI-I		KNP-III	161.1444	877.3221
2010-11	KHAJURIMUNDI		KNP-IV	231.3626	
	LUNAGHAR-I		KNP-IV	236.1599	
	LUNAGHAR-II		KNP-IV	148.1777	615.7003
2011-12	GANDHAMARDAN		KNP-V	588.1311	588.1311
2012-13	GANDHAMARDAN		KNP-VI	585.0730	585.0730
2013-14	GANDHAMARDAN		KNP-VII	539.5044	539.5044
2014-15	SAHRAPUR		KNP-VIII	622.9937	622.9937
2015-16	DANLA		KNP-IX	170.1682	
	DUMURIDIHA		KNP-IX	121.4011	291.5692
2016-17	AMUNI		KNP-X	311.5335	
	JAGAR		KNP-X	154.8835	
	RAIGUDA		KNP-X	853.3471	1319.7641
Total				**6835.7676**	**6835.7676**

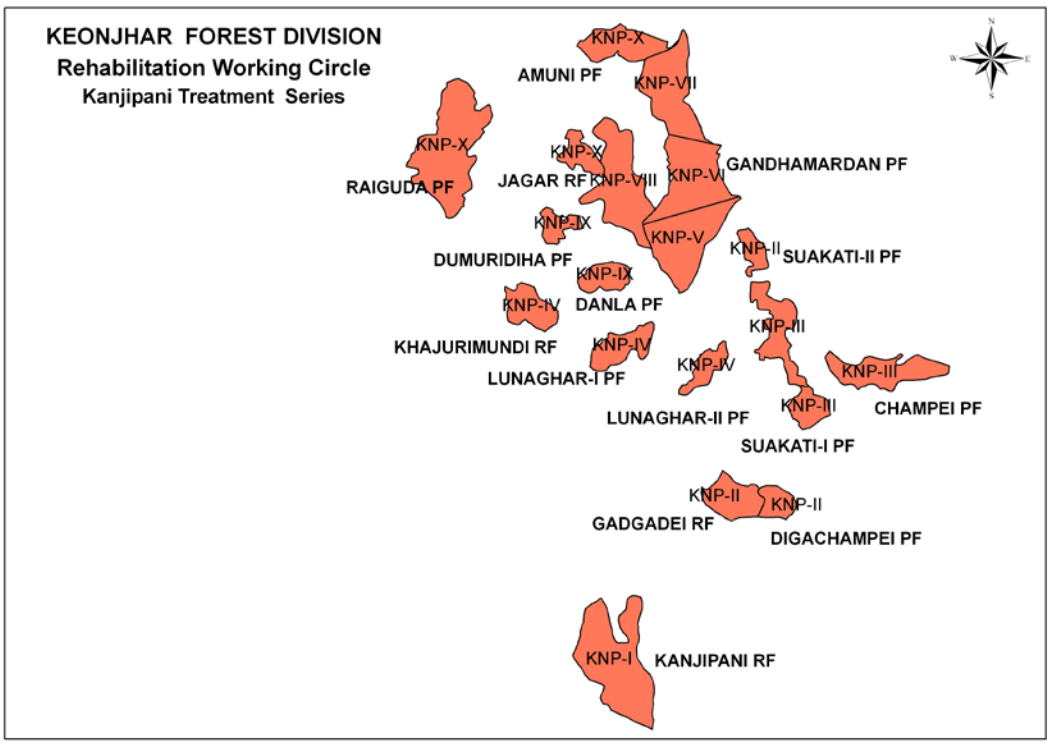


Fig. 4.4 Map of Kanjipani Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -CHAMPUA					
REHABILITATION SERIES: -CHAMPUA (CMP)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	BAITARANI-A		CMP-I	496.3838	496.3838
2008-09	BAITARANI-A		CMP-II	329.9886	329.9886
2009-10	BAITARANI-A		CMP-III	336.8431	336.8431
2010-11	BAITARANI-A		CMP-IV	514.5127	514.5127
2011-12	BAITARANI-A		CMP-V	346.0254	346.0254
2012-13	BAITARANI-A		CMP-VI	355.0707	355.0707
2013-14	BAITARANI-B		CMP-VII	640.1919	640.1919
2014-15	BAITARANI-B		CMP-VIII	498.6607	498.6607
2015-16	BARDHANA		CMP-IX	438.0756	438.0756
2016-17	BARDHANA		CMP-X	286.0015	
	BARDHANA		CMP-X	95.4313	381.4328
Total				**4337.1853**	**4337.1853**

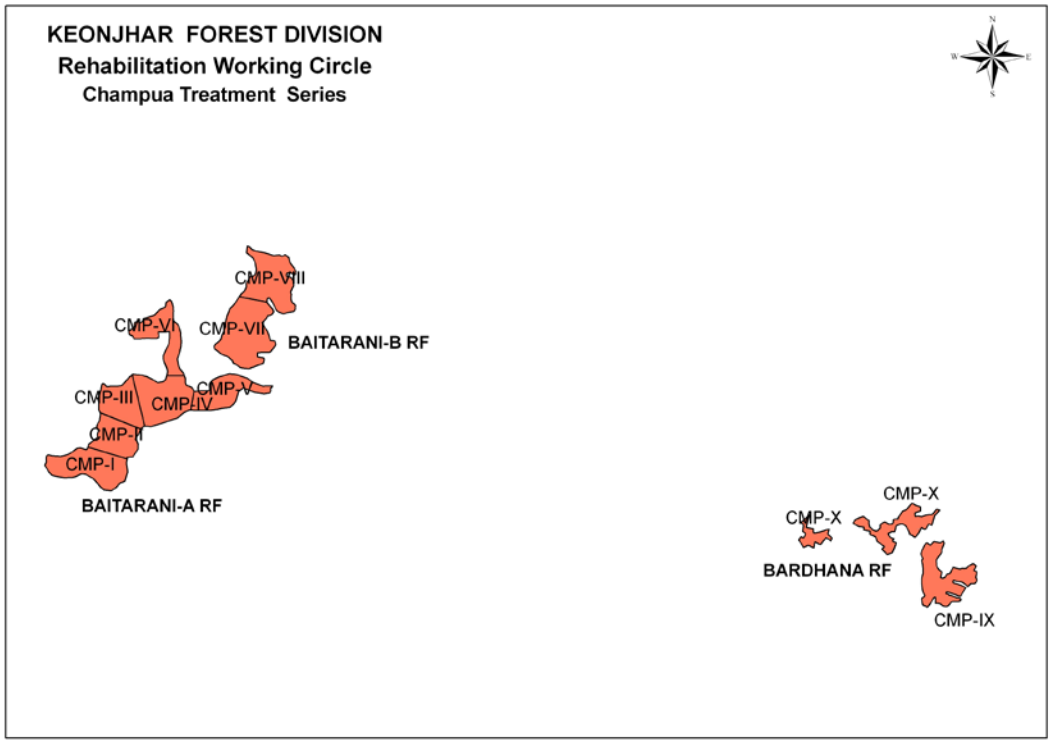


Fig. 4.5 Map of Champua Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -GHATGAON					
REHABILITATION SERIES: -BALIJODI (BLJ)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	ATAI	40	BLJ-I	357.3481	357.3481
2008-09	ATAI	41	BLJ-II	261.2698	261.2698
2009-10	ATAI	42	BLJ-III	597.3774	597.3774
2010-11	ATAI	43	BLJ-IV	661.7609	661.7609
2011-12	ATAI	44	BLJ-V	570.9477	570.9477
2012-13	ATAI	45	BLJ-VI	514.7474	514.7474
2013-14	ATAI	46	BLJ-VII	239.4785	239.4785
2014-15	ATAI	47	BLJ-VIII	501.6938	501.6938
2015-16	ATAI	48	BLJ-IX	713.1204	713.1204
2016-17	ATAI	49	BLJ-X	260.0383	
	NALAPANGA	01	BLJ-X	582.2264	842.2647
Total				**5260.0089**	**5260.0089**

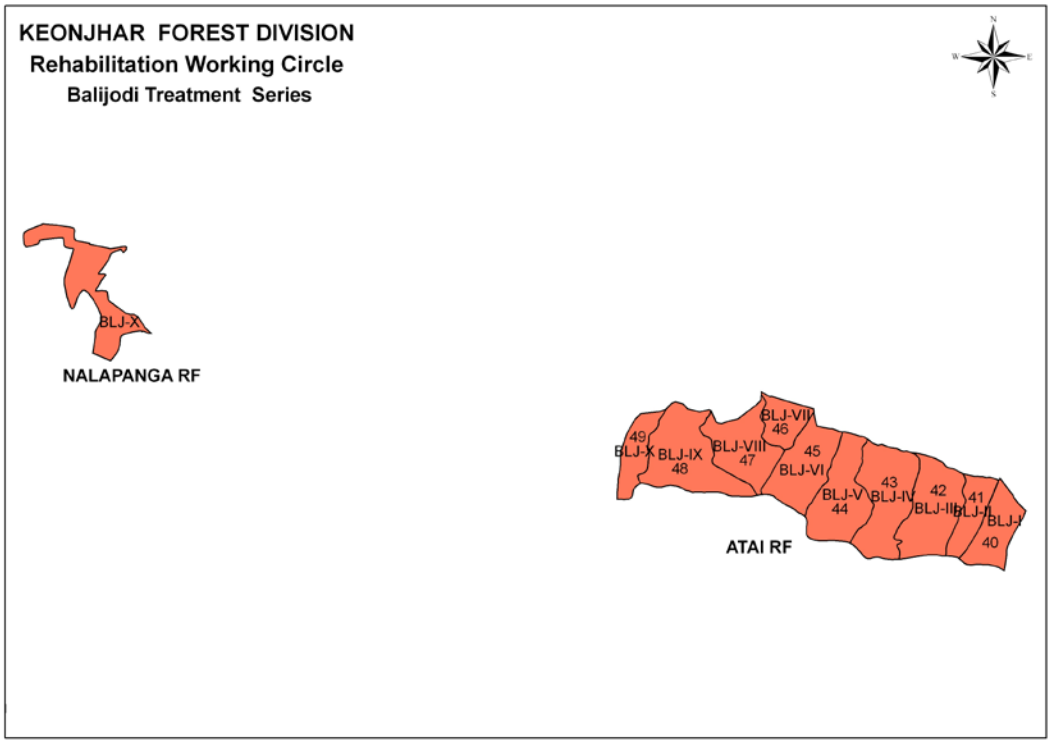


Fig. 4.6 Map of Balijodi Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -GHATGAON					
REHABILITATION SERIES: -DARKHOLA (DRK)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	ATAI	11	DRK-I	465.5957	465.5957
2008-09	ATAI	12	DRK-II	611.1346	611.1346
2009-10	ATAI	13	DRK-III	225.7550	225.7550
2010-11	ATAI	14	DRK-IV	565.2571	565.2571
2011-12	ATAI	33	DRK-V	454.4065	454.4065
2012-13	ATAI	32	DRK-VI	403.1959	
	ATAI	35	DRK-VI	204.9858	608.1816
2013-14	ATAI	34	DRK-VII	364.3664	364.3664
2014-15	ATAI	36	DRK-VIII	231.9259	
	ATAI	37	DRK-VIII	264.0635	495.9893
2015-16	ATAI	38	DRK-IX	450.2263	450.2263
2016-17	ATAI	39	DRK-X	400.9629	400.9629
Total				**4641.8754**	**4641.8754**

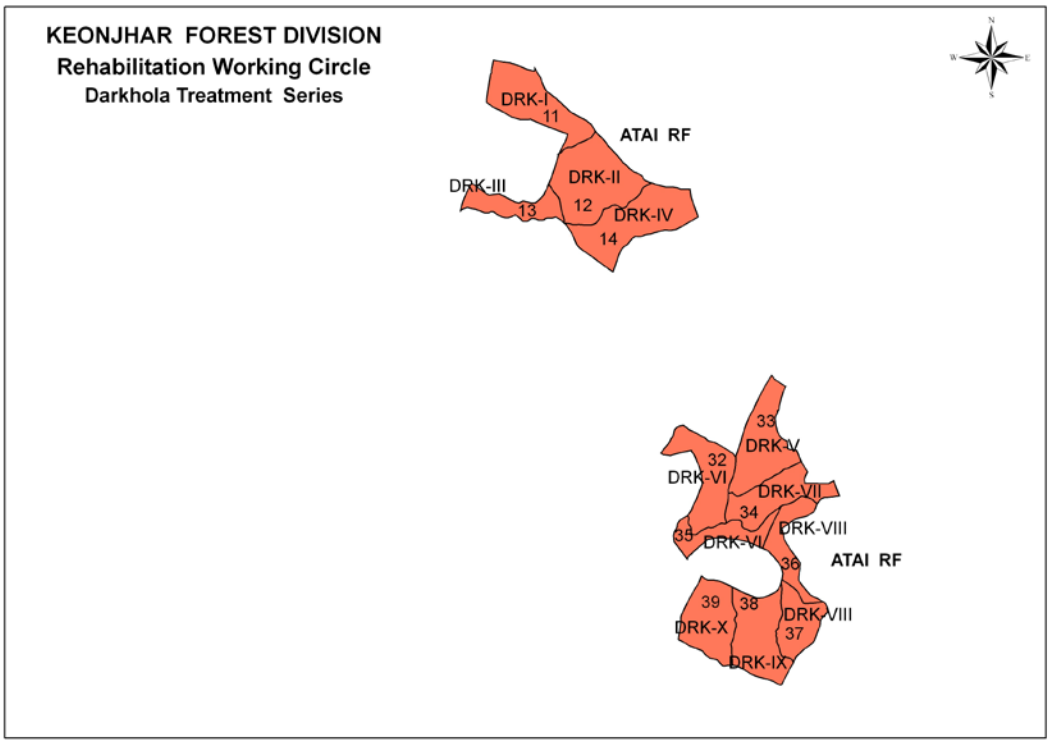


Fig. 4.7 Coupe Map of Darkhola Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -KEONJHAR					
REHABILITATION SERIES: -NALAPANGA (NLP)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	BALABHADRAPUR		NLP-I	458.9912	458.9912
2008-09	BALABHADRAPUR		NLP-II	409.3190	409.3190
2009-10	NALAPANGA	02	NLP-III	138.1692	138.1692
2010-11	NALAPANGA	02	NLP-IV	151.1740	151.1740
2011-12	RAIKALA		NLP-V	135.4129	135.4129
2012-13	RAIKALA		NLP-VI	175.6060	
	RAIKALA		NLP-VI	79.1510	254.7570
Total				**1547.8234**	**1547.8234**

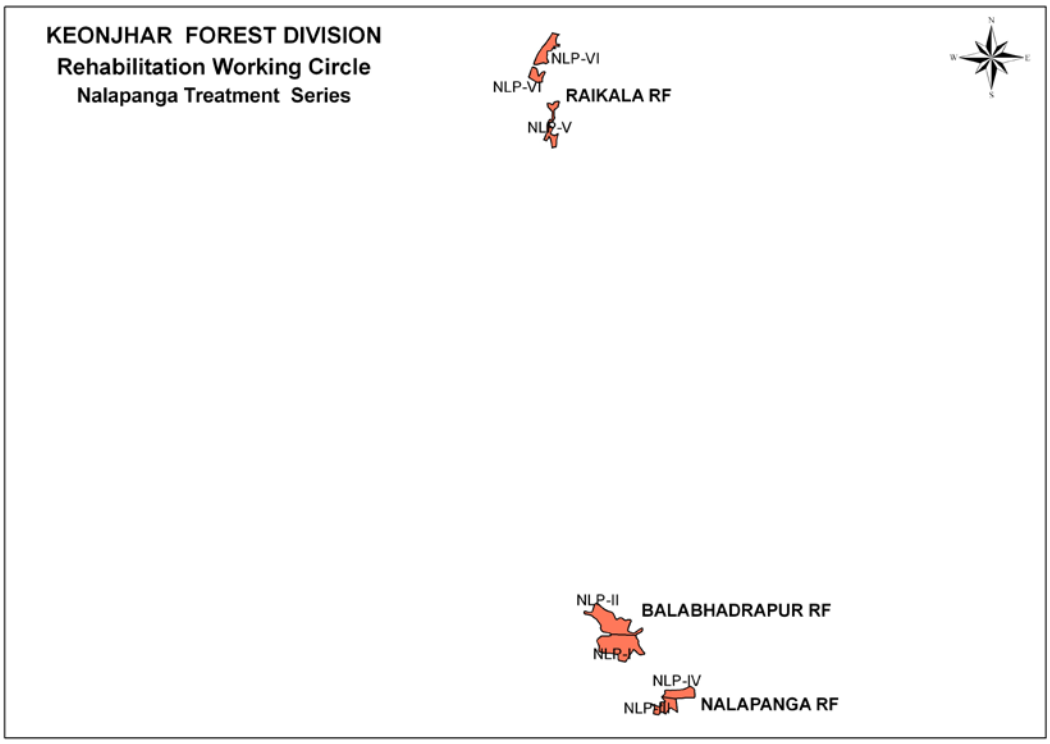


Fig. 4.8 Map of Nalapanga Rehabilitation Series

KEONJHAR (T) DIVISION.					
RANGE: -PATNA					
REHABILITATION SERIES: -BHIMKUNDA (BMD)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	ATAI	01	BMD-I	300.3758	300.3758
2008-09	ATAI	02	BMD-II	228.6573	
	BARBIL		BMD-II	12.5825	
	PALASPADA		BMD-II	16.1247	257.3645
2009-10	ATAI	03	BMD-III	265.4571	265.4571
2010-11	ATAI	04	BMD-IV	344.9619	344.9619
2011-12	ATAI	05	BMD-V	195.3180	195.3180
2012-13	ATAI	05	BMD-VI	259.6868	259.6868
2013-14	ATAI	04	BMD-VII	196.2447	196.2447
2014-15	ATAI	10	BMD-VIII	130.3577	130.3577
2015-16	ATAI	10	BMD-IX	232.5531	232.5531
2016-17	ATAI	10	BMD-X	170.3005	170.3005
Total				**2352.6200**	**2352.6200**

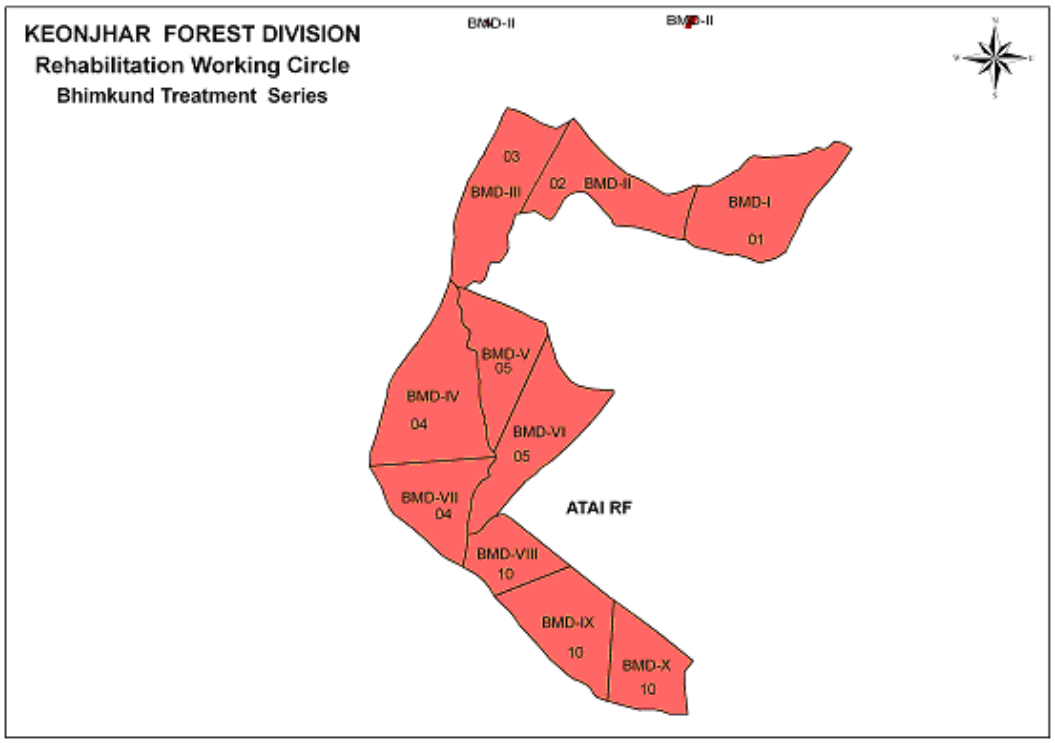


Fig. 4.9 Map of Bhimkund Rehabilitation Series

KEONJHAR WILDLIFE DIVISION.					
RANGE: -ANANDAPUR					
REHABILITATION SERIES: -BAITARANI (BTN)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	MEGHANADPAHI		BTN-I	314.5934	
	NUNIAPATNA		BTN-I	81.7307	396.3240
2008-09	HATIBANDHA		BTN-II	39.9449	
	HATIBANDHA		BTN-II	13.2600	
	HATIBANDHA		BTN-II	22.7746	
	PATILO		BTN-II	449.6679	525.6475
2009-10	SANTOSHPUR	17	BTN-III	337.2855	337.2855
2010-11	SANTOSHPUR	16	BTN-IV	503.4337	503.4337
2011-12	SANTOSHPUR	15	BTN-V	405.0058	405.0058
2012-13	SANTOSHPUR	10	BTN-VI	583.9218	583.9218
2013-14	SANTOSHPUR	09	BTN-VII	410.4735	
	SANTOSHPUR	12	BTN-VII	483.6585	894.1320
2014-15	SANTOSHPUR	08	BTN-VIII	693.0463	693.0463
2015-16	SANTOSHPUR	01	BTN-IX	531.0796	
	SANTOSHPUR	03	BTN-IX	245.3584	776.4380
2016-17	GAYALMUNDA		BTN-X	70.7673	
	KULDIHA		BTN-X	44.9449	
	PANASDIHA		BTN-X	92.6973	
	SANTOSHPUR	02	BTN-X	354.6695	563.0790
Total				**5678.3136**	**5678.3136**

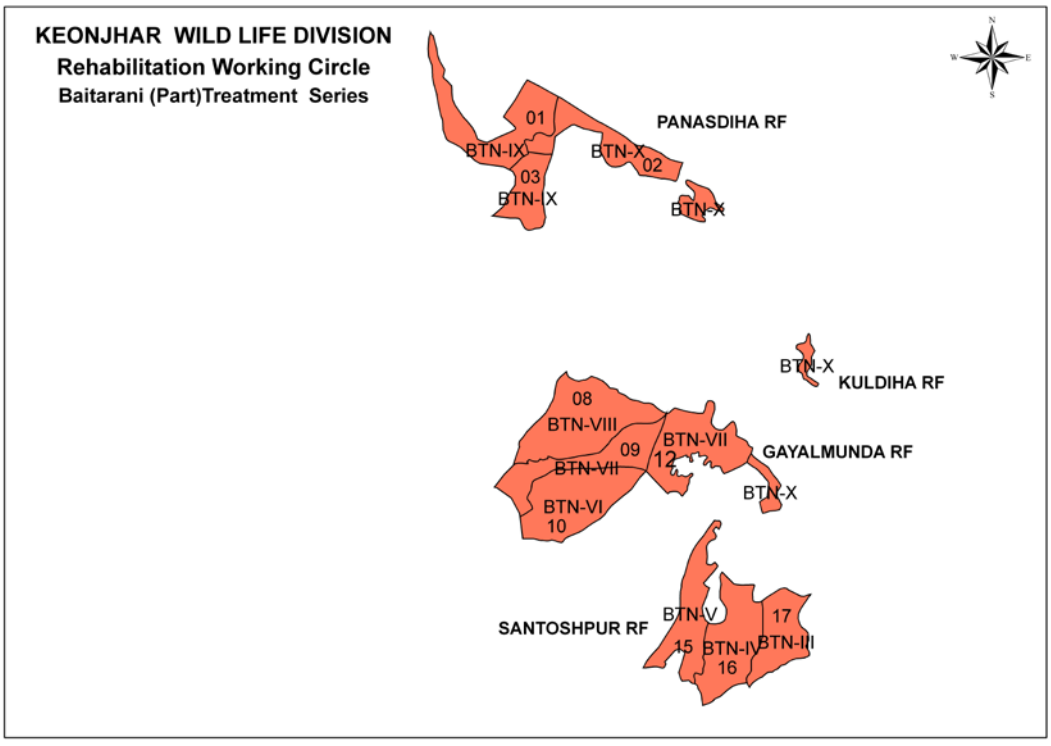


Fig.4.10 Map of Baitarani Rehabilitation Series

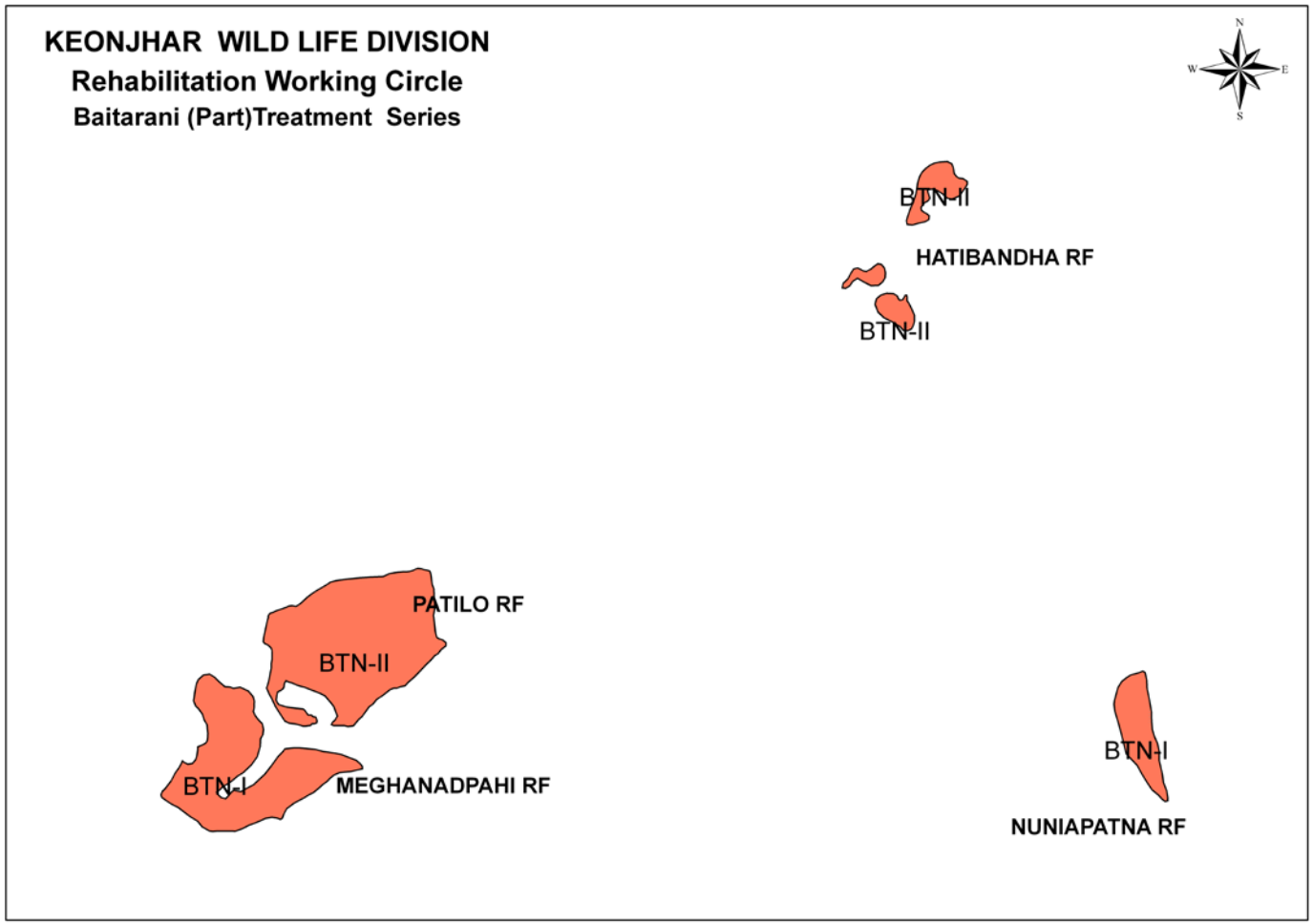


Fig. 4.10 Map of Baitarani Rehabilitation Series

KEONJHAR WILDLIFE DIVISION.					
RANGE: -BRAMHANIPAL					
REHABILITATION SERIES: -PRAVASH (PRS)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	REBENA	39	PRS-I	755.9363	755.9363
2008-09	REBENA	40	PRS-II	422.9636	422.9636
2009-10	REBENA	41	PRS-III	494.8186	494.8186
2010-11	REBENA	43	PRS-IV	728.7311	728.7311
2011-12	BRAHMANIPAL		PRS-V	88.9997	
	REBENA	44	PRS-V	639.3568	728.3565
2012-13	REBENA	45	PRS-VI	706.0515	706.0515
2013-14	REBENA	46	PRS-VII	825.6365	825.6365
2014-15	REBENA	46	PRS-VIII	914.6954	914.6954
2015-16	REBENA	47	PRS-IX	668.9502	668.9502
2016-17	REBENA	47	PRS-X	826.0139	826.0139
Total				**7072.1536**	**7072.1536**

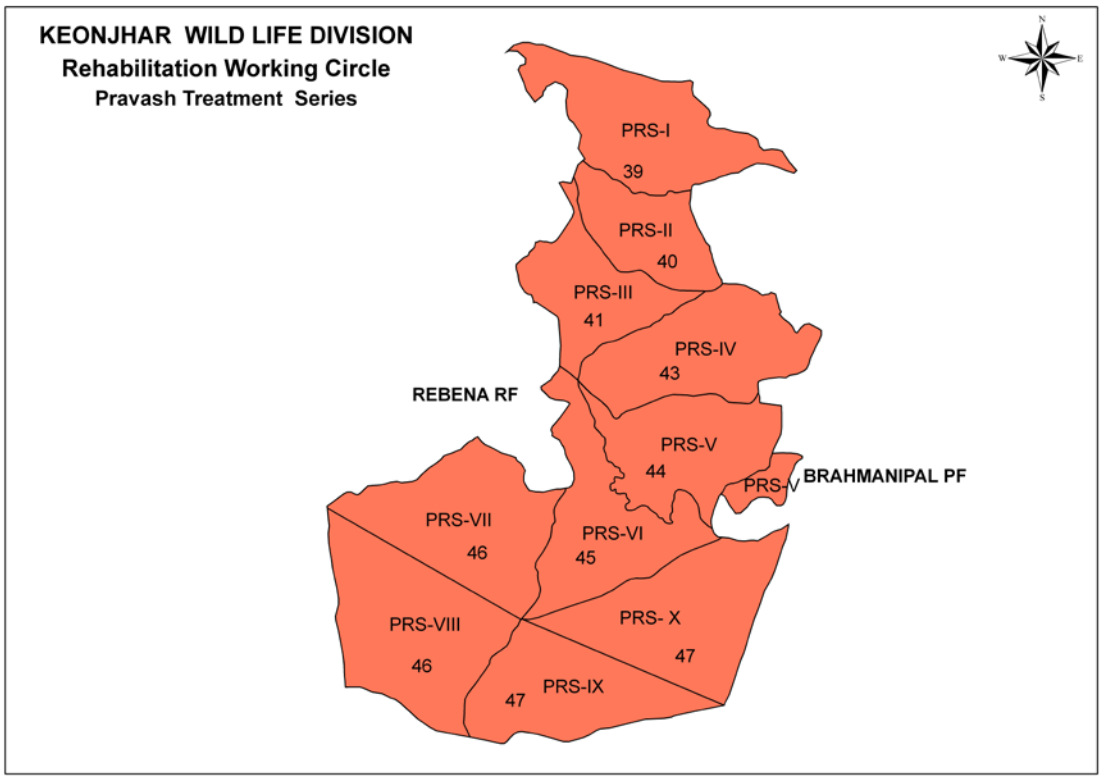


Fig. 4.11 Map of Pravash Rehabilitation Series

KEONJHAR WILDLIFE DIVISION.					
RANGE: -BRAMHANIPAL					
REHABILITATION SERIES: -SUNAPENTHA (SNP)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	REBENA	08	SNP-I	373.3860	373.3860
2008-09	REBENA	09	SNP-II	499.2310	499.2310
2009-10	PALASPALA		SNP-III	342.5759	342.5759
2010-11	PALASPALA		SNP-IV	382.7223	382.7223
2011-12	PALASPALA		SNP-V	415.9136	415.9136
2012-13	PALASPALA		SNP-VI	324.0974	324.0974
2013-14	PALASPALA		SNP-VII	374.9131	374.9131
2014-15	PALASPALA		SNP-VIII	334.5243	334.5243
2015-16	PALASPALA		SNP-IX	320.1620	320.1620
2016-17	MAHULPANGA		SNP-X	261.2832	261.2832
Total				**3628.8087**	**3628.8087**

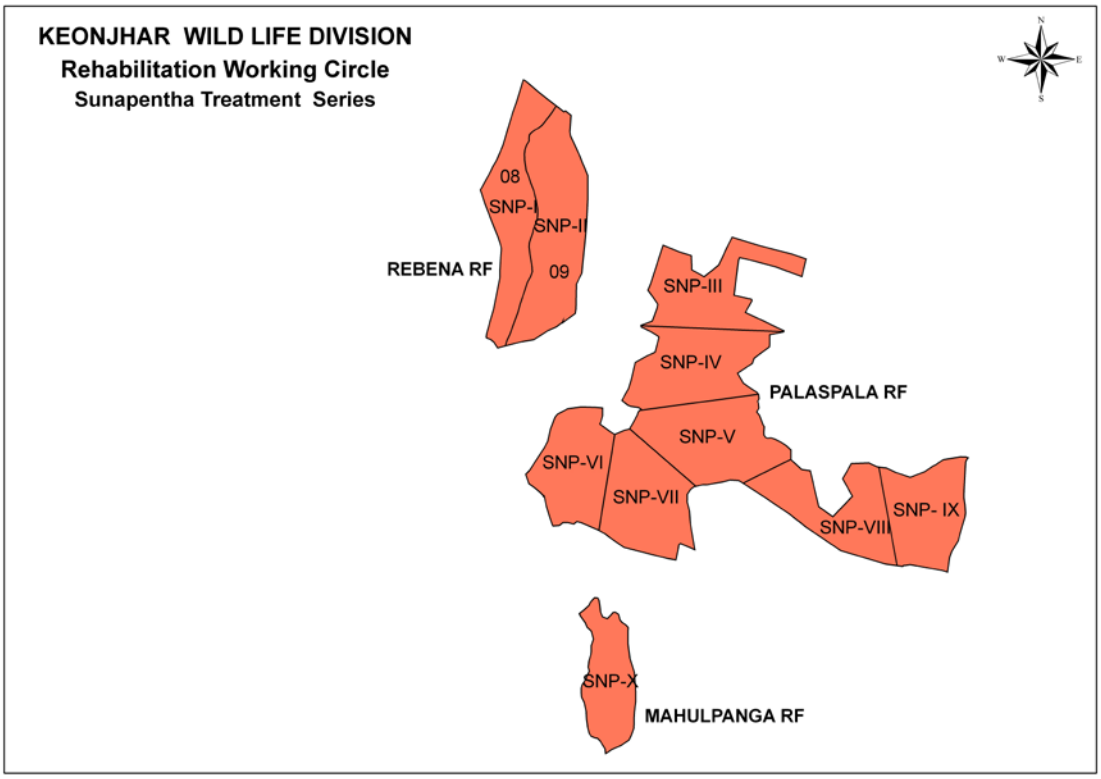


Fig. 4.12 Map of Sunapentha Rehabilitation Series.

KEONJHAR WILDLIFE DIVISION.					
RANGE: -DEOGAON					
REHABILITATION SERIES: -DANTUANI (DNT)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	REBENA	01	DNT-I	884.2189	884.2189
2008-09	REBENA	02	DNT-II	867.3337	867.3337
2009-10	REBENA	05	DNT-III	522.3051	522.3051
2010-11	REBENA	06	DNT-IV	678.0576	678.0576
2011-12	REBENA	07	DNT-V	907.8789	907.8789
2012-13	REBENA	34	DNT-VI	447.9162	447.9162
2013-14	REBENA	35	DNT-VII	891.6163	891.6163
2014-15	REBENA	36	DNT-VIII	505.6171	505.6171
2015-16	REBENA	37	DNT-IX	868.1494	868.1494
2016-17	REBENA	38	DNT-X	865.4324	865.4324
Total				**7438.5256**	**7438.5256**

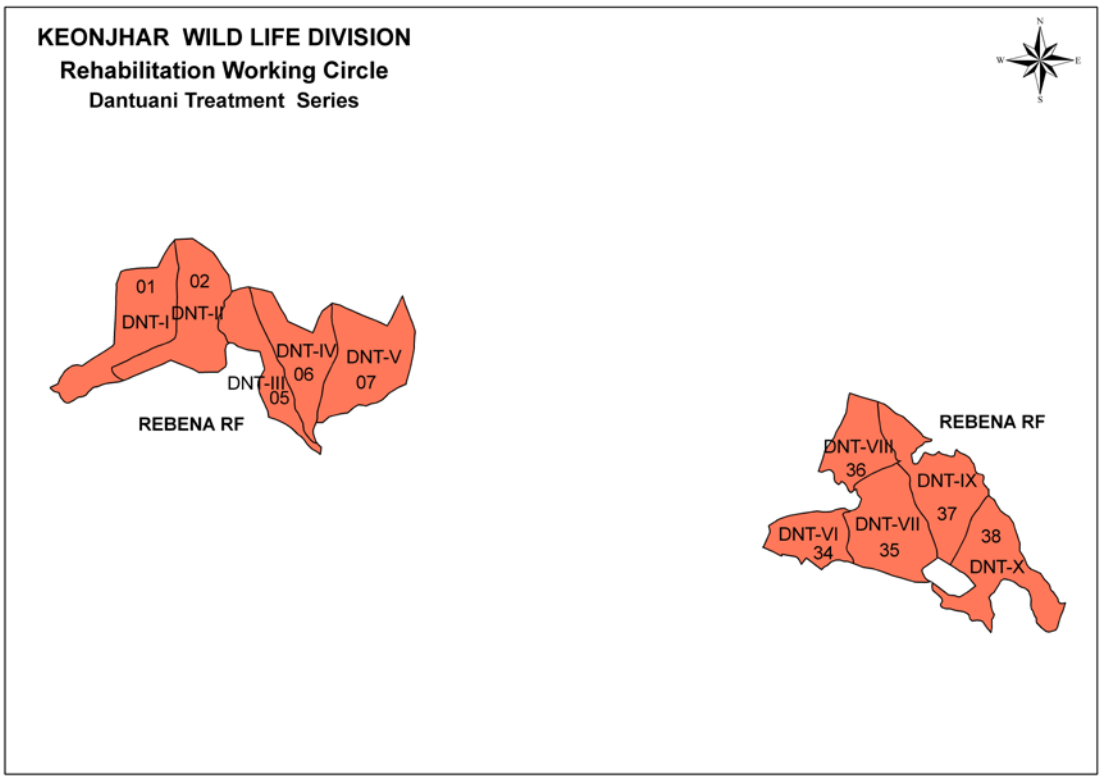


Fig.4.13 Map of Dantuani Rehabilitation Series

KEONJHAR WILDLIFE DIVISION					
RANGE: -DEOGAON					
REHABILITATION SERIES: -SAGADAPATA (SGP)					
Year	**Name of RF/PRF**	**Compartment**	**Coupe**	**Comp. Area**	**Coupe area**
2007-08	ATAI	50	SGP-I	428.8921	428.8921
2008-09	ATAI	55	SGP-II	536.5509	536.5509
2009-10	ATAI	56	SGP-III	666.0693	666.0693
2010-11	ATAI	57	SGP-IV	809.7075	809.7075
2011-12	ATAI	65	SGP-V	262.1996	262.1996
2012-13	ATAI	66	SGP-VI	504.6607	504.6607
2013-14	ATAI	67	SGP-VII	576.3350	576.3350
2014-15	ATAI	68	SGP-VIII	579.0873	579.0873
2015-16	ATAI	68	SGP-IX	358.4206	
	KADAGOTHA		SGP-IX	95.3073	453.7279
2016-17	ATAI	69	SGP-X	593.5858	593.5858
Total				**5410.8161**	**5410.8161**

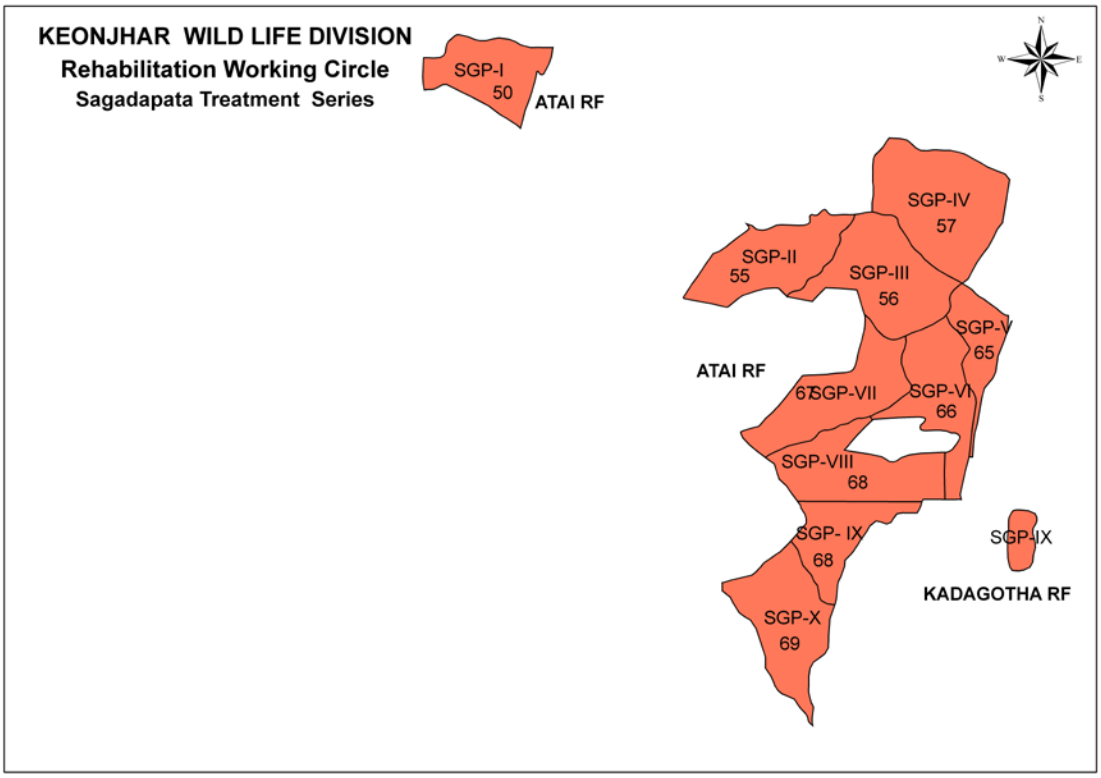


Fig. 4.14 Map of Sagadapata Rehabilitation Series

4.11 REHABILITATION OPERATIONS :

(i) Once the treatment plan has been prepared and approved, the works shall be carried out as per the requirement without any major deviation. As far as possible operations will be carried out in the JFM mode.

(ii) Silvicultural operations shall be carried out in the year of creation and preferably before the onset of monsoon. Dead and fallen trees shall be removed from the annual coupes, if such trees are not required for wildlife purposes.

4.12 RECORD KEEPING

4.12.1 The journal and other records will be maintained for each coupe in accordance with the provisions of the 'Orissa Forest Plantation Manual, 1977'. Annual Rehabilitation journal may be maintained at the Divisional level to keep a track on the rehabilitation work taken up in the division. Necessary entries must be made in the compartment histories about all the works undertaken like soil conservation, plantation, etc.

4.13 MISCELLANEOUS REGULATIONS

4.13.1 The annual treatment areas shall be rigidly protected and closed to grazing up to 5 years. They shall also be protected from fires and illicit felling. The provisions of Rule 283 of the Orissa Forest Department Code and the Orissa Forest Fire (Protection) Rules will be implemented.

4.13.2 Attempt is to be made to involve the local people in protection and management of these forests in accordance with the current policy of the Govt. of Orissa on Joint Forest Management (JFM). Wherever VSS have already been established they shall be directly involved in implementation of the silvicultural operations.

4.13.3 Perimeter barriers to keep off biotic interference in the form of hedge, stone walling or trench fencing should be attempted as far as possible.

4.13.4 The concerned Divisional Forest Officers shall make efforts to secure funding from all possible sources (e.g. non-plan sector, State and Central Plan sector, District Plans Schemes) to ensure proper implementation of the prescriptions of this Working Circle. He shall also include requirement of funds for this purpose in his annual budget and estimates.

4.14 RIGHTS AND CONCESSIONS

4.14.1 Rights and concessions in this Working Circle shall be regulated in accordance with the provisions of the relevant gazette notifications of the respective forest blocks and the Govt. of Orissa policy with regard to JFM. The existing rights and concessions are elaborated in the Chapter 1 of Part I.

4.15 INTERIM REVISION AND COST NORM

4.15.1 No major changes in the prescriptions of this Working Circle are anticipated. However, it may be reviewed if necessary, after five years jointly by the Conservator of Forests, Rourkela Circle and Conservator of Forests, Working Plan. Any deviations suggested shall be subjected to the sanction of competent authority.

4.15.2 The working costs are discussed in detail in Chapter 10 ‘Financial Forecast and Cost of the Plan’.

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