CHAPTER -II

ECOLOGY AND SILVICULTURAL ASPECTS

The forest composition and condition of the crop.

The forests are classified according to Champion and Seth's classification. The following records were referred to in this connection;

(i) A revised survey of the Forests' Types of India by H.G.Champion and S.K.Seth.

(ii) A Syn- ecological study of the forests of western Singhbhum by H.F.Mooney, Indian forests records Silviculture. 11 (7).

The following types and sub-types have been recognized in the division: NORTH

INDIAN TROPICAL MOIST DECIDUOUS FOREST.

(1) Moist peninsular valley Sal —Type — *3CIC2e* (iii)

(2) Moist mixed deciduous forests- Type- 3C/ C3.

NORTHERN INDIAN TROPICAL DRY DECIDUOUS FOREST.

(1) Dry peninsular Sal —Type 5B /Ci

(2) Northern dry mixed deciduous forests — Type *5B1C2*.

Ecology of Porahat Forests

NORTH INDIAN TROPICAL MOIST DECIDUOUS FOREST.

Moist peninsular Valley Sal. - The best Sal forests of the division belongs to this type. The quality of Sal forest varies between QI and QIl, while the majority being QIl. This occurs on down- wash from crystalline rocks giving a deep loam soil, which carries moderate shrub growth. The regeneration of sal is excellent. The characteristic composition is given below: Though not as extensive as the A type, some regard this as the most important type in the State. It is mostly confined to the Singhbhum district,.The altitude is between and 1260m . The average rainfall in this type is more than 60 inhes per year and is more favourably. Distributed than in the Dry Sal but there is still a marked dry hot weather. There is heavy dew during 2-3 months of the cold weather.

The better quality foests have very little grass of which Imperata sp. And Anthistiria imberbis, Retz are common . Andropogen contortus, and lschaemum angustifolium occur in the poorer quality crops and indicate dry conditions whereas Saccharum narenga, Wall indicates moist conditions.

Ecologically, Sal forest apprears to be the climatic climax type over the greater part of the stopingareas and does not seem susceptible to the influence of fire. However, on the drier aspects and shallow soils it quite often makes room for dry mixed forest but again returns when afforded protection. On deep moist soils of the sheltered valleys , fine Sal is foud with considerable admixture of other species and it is probable that Sal will be still further displaced if progression is not checked,

(a) **Top Storey** — Shorea robusta, Terminalia tomentosa. T. chebula T.belerica, T.arjuna, Adina cordifolia, pterocarpus marsupium,Anogeissus latifolia, Gmelina arborea, Diospyros melanoxylon, Mitragyna parviflora, Lagerstroemia Parviflora,Madhuca indica,Lannea grandis,Schleichera oleosa.

(b) **Second Storey** — Syzigium cumini, ,ougenia ojeinensis, Bursera, Sterculia urens, Hymenodictyon excelsum,' Bauhinia retusa, porpoise Garuga pinnata, Lannea grandis, Spondias pinnata,Kydia calyciana, Salmalia malabarica, Arthocephalus chinensis, Careya arborea, Bischofia javanica, Artocarpus chaplasajitsea sebifera, Albizzia odoratissima, A. chinensis and procera, Ficus cunia and glomerata and mangifera indica.

(c) **Shrubs —** Clerodendrum viscosem, Moghania chappar, Indigofera pulchella, Strobilanthes spp.

(d) Grasses — lmperata cylindrical, Themeda triandra, lschaemum angustifolium, Polenia spp. Aristida spp.

(e) Climbers — Bauhnnia vahili, Mdlettia auriculate, Butea superba, Dioscorea spp. and Combertum decandrum, Smilax spp.

Moist mixed deciduous forests — This type occurs in the nala beds and on the adjoining lower slopes. These are limited in extent and are usually in the form of narrow strips along the valley bottoms where there is accumulation of water and where protection against exposure is provided for the maintenance of adequate moist condition. With good soil depth trees of large dimensions develop and there is tendency to a semi- evergreen nature of the crop. The characteristic composWon of the crop is given below :-

(a) Top Storey — Salmalia malabartica, Adina cordifolia, Bridelia retusa, DWenia pentagyna, T. belerica,T. tomentosa, T.arjuna, Hymenodictyon excelsum, Saraca indica, Mitragyna parviflora,Syzijium cumini, Albizzia chinensis, Albizzia procera, Mangifera indica, Careya arborea, Bischofia javanica, Litsea sebifera Authocephalus cadamba Artocarpua lakcocha.

(b) **Second Storey** — Kedia calycina, Mallotus philippinensis, Polyalthia cerasioldes, Micromelum pubescens, Alangium lamatckii.

(c) **Shrubs—** Monghania spp. Colebrookia oppositifoli.

(d) **Herbs & grasses** — Themeda caudate, Cauadri valvaris.

[e] **Creapers and Climbera** — Combretum decandrum and Dioscorea app.

NORTHERN TROPICAL DRY DECIDUOUS FOREST.

Dry Peninsular Sal :- This sub-type occurs on shallow soil derived usually from crystalline and metamorphic rocks wherever soil moisture conditions are unfavorable for the development of moist Sal' even in areas of much higher rainfall. The soil often rests directly on hard impervious laterite and is sometimes calcareous. In typical site Quality Ill-IV Sal regeneration is fair but slow .The characteristic composition is described below.

Sal forest is the climatic climax over most of the area in which this type occurs or , (perhaps more usually) either edaphic or biotic sub-climaxes to the Moist Sal climax. But the most important and in places the limiting factor of the distribution of Sal in this type is soil moisture Excessive grazing and repeated burningtend to cause retrogression without Sal

[a] Top storey and second storey — Shorea robusta, Anogeisus latifolia, Buchnania langer, Diospyros melanoxylon. Boswallia serrata, Dillenia aures, Cochlospermum religiosum, Lagerstroemia parviflora, Chloroxylon swietenia, Ouginia — Oojenensis, Hymenodictyon excelsum, Bridelia retusa, Bauhinia retusa, Scmicarpus anacardium, Dendrocalamus strictus, Woodlandia excrta , moringa tinctoria, Emblica officinalis.

(b) **Shrubs —** Woodfordia fruticosa, Growia spp., Phoenix spp. Flacourtia indica, Nyctathus arboritristis, Gardenia spp.

[c] **Herba and grasses-** Blumen spp., Petafidium barilericides. Eleoliopsis binata, Heteropogon contortus, Arundinasia setosa.

[e] **Climbers** — Butea superba, Combretum decandrum, Bauhinia vahlii.

NORTHERN DRY MIXED DECIDUOUS FOREST - type *5B1C2* :- This type is formed by a mixture of trees practically all of which are deciduous , during the dry season, usually for several months though some for a short period only. The number of species is much less than in the foregone types and although a few tend to predominate over any selected area, but generally not gregariously. The upper canopy is light but probably fairly even and continuous in the climax form, the latter is however very rarely encountered and an irregular often broken canopy is usual in consequence, the tree is having a relatively short bole and poor form, and a height rarely over 15m and often much less. The canopy is formed entirely of deciduous trees, most of which extend to moist deciduous forest with far better development. There is considerable inter-mixture of rather smaller or trees which in this type form part of the main canopy though in the moist deciduous they may be in the second storey. There is usually thin shrubby undergrowth. The

feature of the forest is the contrast between the hot weathdr conditions when it is entirely leafless and the soil fully exposed, and the monsoon condition when it takes on an almost luxuriant appearance from the growth of ephemeral herbaceous vegetation coupled with a loafing out of the trees and shrubs. Only one species of bamboo occurs, namely, Dendrocalamus strictest. But it is an 'important feature in this sub-type. It is also leafless during the hot weather. Grass is always present and is nearly always burnt off annually. The characteristic vegetation is described below: -

[a] **Top and second story** — Anogeiasus latifolia, Adinacordifolia, Mitragyna parviflora, Schliechera oleosa, Lannea —coromandelica. Gardenia latifolia. Cochlospermum religiosum, Buchnania- Ianzen, Ougeinia Oojenensis, Sterulia urens, Sterospermum- suaveolens, Erythrina suberosa, Emblica officinalis, Madhuca indica. Vitex peducularia and Dendrbcalamus strictus.

[b] **Shrbs**— Helicteres isora, Strobilanthus auriculatus, Petalidium spp.

[C] **Grasses**— Euliolopsis binata,Eulalia spp.

Ecological Distribution and Situation of Forests Types

Whereas the crop in the reserved forest and in most of the porahat and Anandpur D.P.F. blocks generally adhere to the types described, above barring the areas degraded due to encroachment and continuous illicit felling. The Moist peninsular Valley Sal occurs in the valley of the reserved forests. Sal is at its best in these valley bottoms where the depth of the soil is adequate and moisture conditions are favorable. The general quality is Qil. In Songra the quality deterioration to Qill, in Kundrugutu it generally is Qil *I* Ill. Regeneration is Profuse. Most of the peninsular valley sal forests are deteriorated or destroyed politically motivated.

The Moist Mixed Deciduous forests are very limited in exent and are usually in the form of narrow strips along, and in the lower reaches of the valley bottoms. These occur is Girga, Bera and Kundrugutu blocks. A few occur in Songra and Birda blocks also. Most of these have already been converted into Plantation of teak and simul.

The dry Peninsular Sal forests occupy the middle and upper slopes of many hills and form the greater part of Porahat forests. The condition of the crop in many places is not very healthy. The height growth is poor and there is a tendency towards stag headedness. Sal regeneration is sufficient but most of the areas get burnt very frequently. Considering that this type forms the bulk of our forests, steps have to be taken towards fire-protection and water conservation.

The Northern Dry Mixed Deciduous forests occur extensively on steep slopes and in upper valleys where the soil is scanty. Exposure and soil conditions cause too rapid drying out of available moisture. The latter conditions probably account for the more pronounced concentration of this sub-group in the apidiorite group.

Bamboos occur sporadically mixed with other species both in the Dry Peninsula- Sal forests and the Northern Dry Mxed Deciduous forests.

The general condition of the crops is much below expectation. The percentage of unsoundness is high, the stocking is generally poor and the forests are devoid of trees of any size particularly of Sal. Illicit fellings have taken their toll and high stumps and pollarded shoots abound. Due to dry conditions heavy grazing and repeated fires, natural regeneration is scanty.

SILVICS OF SAL OF SINGHBHUM FORESTS AND PROBLEM OF SAL REGENERATION:

A brief illustration of silviculture of Sal for discussion on problems of Sal regeneration in this region is as follows. Geology and Soil :- Sal occurs on a variety of geological formations. A brief illustration of silviculture of Sal for discussion of problems of Sal regeneration in this division. On the plateau it occurs mainly on gneiss, mica-schist, quartzite, shale, sandstone, laterite and occasionally on lime- stone. It is completely absent from Deccan trap. A notable exception is the good Sal forest on trap formation in Santhal Parganas in Bihar.

Mooney *(1947)* studied the nature of each type of rock before establishing any definite correlation .He concluded that Sal occurs primarily on acidic rocks and if ‘ by erosion the acidic top-soil is washed away leaving behind the basic rock stratum, Sal gradually disappears from the locality. His main emphasis was on the nature of the soil in which the trees take their roots and not on the underlying rock. It duly took frito account the accepted pedological principle that the same type of soil may be formed from a number of varied rocks, under uniform climatic conditions. This explains to some extent, the occurrence of Sal on varied geological formations.

Khan (1953) made a detailed study of,the effects of geological formations on the distribution of Sal with the aid of the Geological survey of India. He infers that no definite correlation between the underlying rocks or their mineral constituents and the occurrence of Sal forests. The faint correlation, as it exists, is only secondary.

Hicock (1931) working in Connecticut, on the relation between the composition of natural mixed hardwoods and the geology came to a similar conclusion. He found no strong correlation between the occurrence of the various species and thesoil forming factors.

Sal is capable of growing on various types of soil provided the soil-moisture content is neither too low nor too high . Within its habitat it avoids soils , which although otherwise thoroughly suitable for its growth, become too dry for its survival in thedry season. The most favourable soil for the growth of Sal is a well-drained, moist, deep sandy loam with good sub-soil drainage. An excess of clay produces stunted and unhealthy growth. It is absent from the Black cotton soils of Peninsular India due of the hygroscopicity of the soil.

Flowering and Fruiting.- Flowering takes place between the end of February and the middle of April. The fruit , which are winged , ripen in June and fall as soon as they ripen. The seed germinates soon after falling provided the moisture conditions are favourable. Sound fresh seed has a high percentage of fertility but it loses its viability very rapidly, and under ordinary conditions will not keep fertile for many days. The most fertile seed is produced at the middle of the fruiting period and less fertile seed is produced t its beginning and end.

Generally, seeding is fairly frequent. When storms hail, or strong dry winds F occur from March to june the flowers and immature fruits, may be blown or knocked down in quantity, and destroys otherwise promising seed crop . Insects at times also destroy a good deal . Severe frost or drought also affects seed production. On the average in three years there will be one good, one average and one poor seed year.

The Seeding — The stem is at first thin and whippy but becomes thick and fleshy when the seedling gets established: After establishment, growth of the seedling is fast. The growth peaks of Sal seedlings occur dung the periods 15th April _15th May: 15th June15th July and 15th August _lS September, the first and the last being more important. (Bhatnagar 1959).

Die-Back : A healthy Sal seedling quickly develops a long stout tap-root which may reach a length of 3' by the end of the first season. If the conditions are unfavourable, thetap-root shows very feeble or no development. The tap-root continues to develop till it reaches the the permanently moist soil layers. It has been observed that seedlings growingin the open have much better root-development than those growing under shade. A large number of seedlings• die-back or die-off every year. This phenomenon is caused during the rainy months of July and August by bad soil aeration and during the hot dry months due to drought. A seedling may die-back several times but during thestruggle, the development of its tap-root is going on steadily. Plants which succeed in establishing themselves cease to die back and start their upward normal growth by producing thick shoots. Dng —back of Sal seedlings is not an inherent characteristic of the species but is cause I by external factors.

Important Silvicultural Charactaristics: Although Sal is able to persist under shade , it is a light demander and its best development is secured by admission of complete overhead light from the earliest stages except where it needs side protection from frost or desiccation. It has a long and stout tap —root which reaches down to starta moist enough to supply the water requirements of the tree. In addition it has also stout lateral roots and fibrous rootlets. Where there is sufficient moisture. It is a strong cppicer and vigorous coppice shàots are produced from stumps up to 3 ft. girth. The coppicing power of Sal trees declines after they are more than 3ft. in girth. Due to its long tap-root , it is not affected by ordinary or moderate drought. But in cases of prolonged and severe drought, it suffers extensive damage and large trees may die off wholesale over patches of considerable extent. Its seedlings and coppice-sale over patches of considerable extent. Its seedlings and coppice shoots are killed off by frost and severe frosts affect moderately sized saplings and poles also . The leading shoots of the poles and saplings are killed, producing numerous epicormic branches along the stem.

Sal is fire-resistant and is able to establish itself in buirnt areas where many other species are unable tosurvive. Fire causes hallowness and unsoundness in trees particularly in forests of the dier types. It also inhibits regeneration of Sal in this type of forest and therefore thebeneficial effects of fire protection is very marked in dry areas.

THE PROBLEM OF SAL REGENERATION

(i) Recruitment — Recruitment of regeneration is primarily dependent upon seedling and germination . As has been stated earlier, Sal seeds quite frequently. But an untimelystorm or an

insect attack may destroy a promising seed-crop. Good seed years occur on an average every third year.Germination of the Sal seed is dependent upon the monsoon. If the monsoon breaks immediately before or after the seed-fall, then germination takes place. If there is a time lag between the two events, then the seeds perish because of the very short period of their viability. If there is a long dry spell after the germination, then also everything perishes. Another factor affecting germination is the physical conditioin of the forest floor at the time of the seed fall. If the forest floor has been trampled or baked hard by grazing or fire , or if there is an accumulation of litter, germination may fails because [of the physical obstruction to the radicle to reach or penetrate the mineral soil. Grifith and Gupta (1948) have found that the maximum accumulation by itself does not appear to be detrimental to Sal regeneration.

It was found that the hardness of the top layer in the area where the regeneration had failed was more than double the hardness is the area where there was good regeneration.

Recruitment fires and excessive grazing are the principal causative factors for the hardening of the forest floor and their exclusion from the forests suggests itself as a long —term solution of this problem. For immediate results, it may be advisable to do soil working in the regeneration areas when a good seed crop is expected. This will provide a good germinatior bed to the seeds

(ii) Establishment. Most of seedlings die or die —back to root revel during the rainy season and of thosde remaining, the majority succumb to drought in the erisuijng summer.

From the stand point of Hole (1914) and Griffith and Gupta (1948) , there could be two possible factors responsible for the failure of Sal regeneration (I Physical condition of the soil: Lack of regeneration is supposed to be due mainly to defective soil aeration. It is not the CO2 in the soil air alone which is so harmful but critical ratio of CO_2 ^{O}**2** of 280/100 at which point Sal plants develop symptoms of die-back.

What might happen in the rainy months in the field is that the CO2 evolved by root respiration does not get a chance to diffuse into the atmosphere due to a preventive film of water in the surface soil .The soil solution gets saturated with CO2 and thus the requirement is killed during the rainy season.

(ii) Disturbance of the Nutritional Balance of Sal Soil. - To study this factor Sal plants were grown in water cultures with specified culture solutions. Experiments on the whole suggested that nutrient deficiency in Sal forest soils could not perhaps be the cause of failure of Sal regeneration.

1. The problem of Sal regeneration is not a problem of soil-aeration alone but also a problem of adequate supply of moisture to the Sal plants in all stages of growth that too without water —logging or stagnation of water.

2. The moisture conditions should be such that water remains in the sub-soil at a level of ‘Field Capacity’ above which there is danger of water-logging.

3. On the other hand if the soil moisture' falls below the limit of the 'Wilting Coefficient' there will be mortality of regeneration due to moisture deficiency. Hang (1958) has remarked that 'Sal though is general an aggressive species illustrates the difficulty of securing establishment in an environment in which frost, over wet periods, recurrent droughts, frequent fires and similar undesirable. Environmental features are coupled with periodic seeding and a limited period of seed viability. This causes difficulty in securing natural regeneration by canopy manipulation and other silvicultural measures at a given time and given place.'

For protection against mortality by drought in the ensuing summer, it is essential for the roots of the Sal seedlings to develop and penetrate quickly and deeply down to the permanently moist sub-soil. Greater overhead light helps quicker Development of the roots. Biswell (1935) found that the rood system of several species of deciduous tree seedling grow larger in full sun than in half-sun.

The direction of root growth is toward soil with greater available moisture . content. Roots will not penetrate dry soil to reach a morster soil beyond, but when dose to moisture they will turn toward or follbw it. Roots will avoid water-logged or poorly aerated soil.

Soil moisture in the top 6 ft. layer of the forest soil therefore, becomes the most important factor for the establishment and growth of a the sal seedlings. Moisture relations are indicated by the soil-type. An apparently moisture clayey soil may be physiologically drier than an apparently drier loamy or sandy soil may be physiologically drier than an apparently drier loamy or sandy soil. At a PF of 4.2, which represents the maximum tension at which plants can obtain water , clay contains about 19 percent moisture; silt loam about 10.5 percent fine sand about 4 percent an quartz sand about 1 percent . The water requirements of forest trees are supplied for the most part from the capillary fringe where water is held at forces between a PF approximately 2.7 to 4.5.

Two factors that have great bearing and influence on the regeneration of Sal are fire and grazing:

(i) Fire:- It is an unfortunate fact that most, of the forests of this State get runt, sometimes even more than once, every year. Efforts to achieve fire —prevention and fire-protection have, so far, not been effective.

Besides causing physical damage to the trees and seedlings due to heat, fires have a more harmful and lasting effect on the soil. The topsoil gets baked and hard. Humus, which would have improved the structure of the soil is burnt and there is loss of nitrogen also. Luiz and Chandler (1946) record that annual burning reduced the infiltration an average of 38 per cent in comparison with that in soils protected for approximately 5-6 years.' The effect of fires in the dry region is pronounced, as the already adverse soil-moisture condition is further aggravated.

(ii) **Grazing —** The forests of this division are subject to a heavy incidence of grazing .The trampling of the cattle tended to destroy the protective litter and humus layers on the forest floor. The compact soil lost much of its ability to absorb rainfall, and flood peaks along with crosion increased sharply. The ground became compacted from the trampling of cattle hooves. The upper 6" of soil, where most of the feeding

roots of the trees are located, lost most of its power to absorb life-giving water- so even the larger trees suffered because their gr,owth too was retarded.'

Having discussed the factors affecting the natural regeneration of Sal , the position of regeneration in each of the types occurring in Bihar can now be reviewed.

TYPE WISE CONCLUSION OF REGENERATION PROBLEM:

B2 (Moist Peninsular) Type.- The position of regeneration in this type in Singhbhum can best be described by the following extract from Mooney's observaion in 1937 in his Working Plan for the Saranda division :-

Sal regeneration probably presents fewer problems in the Saranda division than in most divisions and is seldom difficult to obtain. In all the moderately dry types it is normally abundant, particularly so, in the Ill quality Sal forest on middle slopes with a northerly aspect. In many cases it has been found spreading .into dry mixed forest in the vicinity where it is not unusual to find the ground well stocked with Sal seedlings under a canopy containing no Sal at all. Moderately dry, preferably sheltered localities seem to be most favourable to reproduction although in some of the moister valleys fine results have been obtained.

The practice in the Singhbhum district in forests of this type managed under the conversion to the uniform system is to, clearfell the overwood. Cleaning and climber —cutting for 5-6 years after the clearfelling are essential for the success of the regeneration. Complete Uniformity is not theaim and advance growth of thrifty and healthy poles in patches are retained to form parth of the future crop. Experience is that it is easier to obtain natural regeneration under unevenaged crops than even : aged crops . The want of regeneration in this type of forest in the Palamau district is ascribed to the evenness of the canopy over large areas due to extensive shifting cultivation in the past. The problem there is further accentuated by fire and grazing.

A3 (Dry Peninsular) Type.- Most of the area under this type is regenerated by Coppice with Standard system. But in addition to the coppice, there must be some de novo regeneration also to compensate for stump-mortality and drought morality. Though there are no regeneration stock-maps. Shay *(1955)* after his obserevation, came to the conclusion that these Yorests were not regenerating satisfactorily .As anexample he cited the Horahap R.F. of the Ranchi Divisioin in which there had been no improvement in the canopy density eyen in the second coppice rotation. Chaudhuri (1958) reports similar experience from this type of forest in West Bengal. The status of regeneration by seeds is more or less the same as what Champion (1933) recorded three decades ago, viz., "very poor, largely, owing to excessive grazing and consequent hard, dry soil. It is only where the adverse biotic factors have been held in check (either due to inaccessibility or direct protection) that sites are to be found to confirm his general observations on Dry Peninsular Sal, viz., uregeneratioin is almost invariably deficient, woody seedlings being usually found

Injuries to which the crop is liable —

[i] **DROUGHT.** -- Damage by drought is significant, and top drying of trees in certain localities as noticed in lately is partially attributed to drought. Mortality of Sal regeneration directly related to drought conditions.

[ii] **FROST** -- Frost has been causing lot of damage in clear felled patches In regeneration areas both natural and artificial, need of protective cover is being strongly felt.

[iii] **STORMS** - Damage by storms is negligible. Generally shallow rooted trees on the fringe of the forests are uprooted by storms. These generally occur in April.— May. Due to lagging up of soil, soil emulation and soil erosion, the roots are exposed, which will be uprooted in the storms subsequently.

[iv] **FIRE.** -- Fire causes heavy damage to the forests. Despite fire protection measures taken up annually a lot is however still to be done. Earliest recorded organized distraction has happened in the year in 1964, when communal disturbances swept through Singhbhum the entire area was burnt. The regeneration areas, which are naturally getting the best attention, fare better than the rest of the forests. The sources of forest fires are many. Fires started under the mahua trees when left unattened spread to the adjoining areas. Burning of grasses and shruba in the villagers' fields are another sources. The various paths, which criss — cross, the forests often become sources from which fires emanate. Fire is considered an Inevitable visitor. A detailed scheme for protection from forest fire has been given in Chapter —Il.

[V] **FUNGI.** Fungi damage is significant, particularly in the drier areas. Trametes incerta, polyporus shoreae and Foes tricolor are responsible for heart-rot and root-rot. Hypoxylon annul atum has also been noticed.

[vi] **LORANTHUS LONGIFLORUS** -This Parasite occur sporadically. It [attacks trees of all sizes and species. The quality and quantity of timber production Is affected adversely where the parasite has attacked.

[vii] **CLIMBERS** - Climbers are responsible for considerable damage to the forest crop. They damage young saplings and poles by physical strangulation and by suppressing them. In older trees they cause deformity.

The most common climber bauhinia vahlii. It is also the most pernicious as well as the strongest. Specimens of even up to 8" (20 cm) to 10" (25 cm) diameter have been noticed. It also occurs in thin forms. This climber damages the stem and affects the timber. Its incidence in drier forests is high. Its utility in the economy of the Advise is its use in string and rope manufacture.

Another climber which causes plenty of damage is Militia- stridulates. It is more common in the moister localities. It is gregarious in nature and causes suppression of regeneration.

Combretum decandrum grows in shrubby form. It inhibits regeneration and once it invades an area it is difficult to eradicate.

Other climbers, which are not so common, are butea superba and butea parviflora (Syn.

Spatholobus roxburghii). The damage caused by them is not significant. There are few flowers to match the vividness of the colour of bLitea superba flowers. Dioscorea and Smilax spp. cause little damage and that too to the young crop only.dizoneuron cucullatum etc. are other climbers, the incidence of which is neglible.

[viii] INSECTS - The only pest of importance is Hoplocerambyx spinicornis. Defoliation takesplace in April —May and is sometimes Serious. Biston raturlaid also believed to cause defoliation in sal.

(ix) WILD ANIMALS- The maximum damage, which is done to the forest crop, is caused by the elephant. The elephant delights in uprooting sapling and poles along the roads through which is passes. It however, causes maximum damage to the bamboo clumps: The worked over bamboo clumps suffer most. The elephants pay attention to the paddy crop also and their rampages cause serious loss to the poor villagers. No case of elephants attacking human being has been reported lately but their presence often causes hindrance to movements inside the forests.

No other animals is known to cause any significant damage

(x) **CATTLE** - Whereas enough grazing are available in the village forests left unreserved in most of the areas, in the new protected forests, there is on such buffer none. Some of the old protected Forests Blocks are also becoming vulnerable as the areas of village forests are disappearing. Grazing causes compactness in the soil besides the damage caused by trampling. The number of cattle is very large.

(xi) ANTHROPOGENIC FACTORS- Man is the source of the gravest injuries to the forest crop. Besides causing fire in the forests, man causes wanton destruction by illicit cutting done in unscientific way. It is pertinent to note for the sake of history that earlier in the year 1943-44 it is so happened that in certain compartments, some people were allowed to do temporary cultivation under the Scheme of ‘ Grow-More-Food Campaign “. These settlers, who were supposed to vacate these plots after a year or two, refused to do so. Their eviction was attempted which led to serious agitation. It was therefore decided to create these patches into forest villages and to treat these people as forest villagers. Hence the author of the proce,eding working plan goes to record that the experience gained should teach us to be wary of any such misadventure in future. Organized felling, which was palitically motivated and so called as Jharkhand felling, which was erupted in the year 1975 had seen large scale destruction of certain parts of the forests, especially in the valleys. Detailed study is given in foregoing chapters. Reserved forest blocks in the interior as well as, forests on the fringe suffer from depredations, which are at times organized. Some parts of Birda, Kundrugutu Songra and Girga blocks, which are adjoining Ranchi district, are highly vulnerable. Parts of Songra and Bera blocks adjoining the Chakradharpur — Goilkera rail track also suffor at the hands of thieves. The theft through Bandgaon has, however, reached alarming proportions and needs special efforts to check them. Detailed suggestions are made in Part-II

CHAPTER-III

UTILISATION OF THE PRODUCE.

Agricultural Customs and Wants of the Population

Within and adjoining the forest areas the regular inhabitants belong mainly to the Ho tribal group in the south of the division and to the Munda tribal group in the west and the north. These are the limited number of Hindu settlers towards the main I railway line in the south and in the Anandpur region.

The forest population, barring a few numbers of professional blacksmiths, basket-makers (Turis) and potters (Kumhars), is essentially agriculture based. Wet and dry paddy forms the basic cultivation in the plains and valleys while millets, , oil-seeds, and maize are raised on up- land areas and slopes. Lac and silk — s provide a small additional source of• cultivation. The standard.of cultivation [Is poor; they're being no proper means of irrigation on large scale so far. The . produce from the fields is meager and is insufficient to feed the people just for a part of the year. Traditionally the forest is looked upon as providing them with the means of livelihood to sustain them for the rest part of the year. The edible fruits, roots, flowers and leaves form a substantial part of the food during periods when food grains are scarce. The forest operations, both departmental and of the contractors, have been providing employment to the people throughout the year.

Generally the people have few needs. Their main requirements are for poles for house building and for machans. The villagers have to make machans in their fields to keep a vigil over their crops against the nocturnal marauders. The need for amber is occasional, being only for ploughs and other agricultural implements in small quantities. The forests provide grazing for their cattle. Sabai and fibres for string and rope making, leaves for use as utensils and umbrella and thatch grass for roofing are all obtained from the forests. The forests meet part of their needs.

Traditionally the Turis depended entirely on the forests for their supply of bamboos. The increasing population and dividing forest density is creating a conflict between expectations and supply and population is left with insufficient livelihood.

The species and sizes of timber generally required for the various purposes are given below: -

(i) **For house building:** - Poles 1' to 2'9" [under bark], species in demand sal [,asan (Terminalia tomentosa) ,panjan (Ougeinia oejeinensis), karla (cleistanthus collinus),bija(Pterocarpus marsupium), karam(Adina cordifolia) ,jamun(Syzygium cumini) ,sidha(Lagerstroemia parviflora),and dhaura(Anogeissus latifolia). The two last named are not liked owing to their susceptibility to dry rot.

(ii) For plough: - Poles 1 '-6" to 3'-O" (under ,bark). Species in demand—Sal, panjan (Ougeinia Oejeinensis),asan (Terminalia tomentosa) ,mahua(Madhuca indica) ,kusum (Schleichera oleosa)

(iii) For machans: - Poles 1'-O" to 2'-O" (under bark): Species in demand sal, asan (Terminalia tomentosa),dhaura (Anogeissus latifolia),karla(Cleistanthus collinus),jamun(syzygium cumini),sidha(Lagerstroemia parviflora) kendu(Diospyros melanoxylon)

(iv) For **carts:** - Poles 1'-6" to 2'-6"(under bark). Species in demand-sal,panjun dhaura, asan and arjun.

(v) For bed stead and other crude furniture: -Poles 1 '-3" to 1 '-6" (under bark). Species in demand- dhaura(Anogeissus latifolia),Sal, gamhar (Gmelinaarborea), karam (Adina cordifolia),bija (Pterocarpus marsupium), panjan(Ougeinia oejeinensia),asan (Terminalia tomentosa).

(vi) For tool-handles and banghy —Poles 1 '-0" to I '-3"(under bark). Species in demand —Dhaura(Anogeiassus latifolia),panjan (Ougeinia ojeinensis), gonver(Grewia taliaefclia).

(vii) For oil mills- Trees 4'-6" to 5'-6" (under bark). Species in demand— Kusum (Schleichera oleosa), penman (Ougeinia oejeinensis),mahua(Madhuca indica) and sal.
(viii) For paila - (measuring cup)- Polesl '-3" to I '-6"(under bark) Species in demand- Bhurkund (Hymenodictyon excelsum).

(ix) For addv pounder- Trees 3' to 4' (under bark). Species required kusum (Schleichera oleosa), imli (Tamarindus indica).

(ix) Structural purposes as fencing of court —yards and fields- erecting walls of house for roofs and machans-Species in demand —lcha (Woodfordia fruticosa),karla(Cleistanthus collinus) ,dhaura(Anogeissus latifolia), sal,asan(Terminalia tomentosa) amla(Emblica officinhis).

(xi) Firewood for all kinds.

(xii) Bamboo (Dendrocalamus strictus) for roof battons, house —walls, fencing, fish- traps, baskets, bows and arrows.

(xlii) Ropes and string from sabai grass and the fibre of Bauhinia vehli climber.

(xiv) Thatch grass (Heteropogon contortus) for roofs of houses.

(xv) Date leaves for mats.

(xvi) Broom grass (Thysanolaena maxima and Arundinella setosa) for brooms.

(xvii) Leaves of sal and Bauhinia vahli for making of temporary plates and cups

(xviii) Flowers and fruits of Mahua (Madhuca indica) for food, liquor, cattle food and oil.

(xix) Edible fruits and roots etc. of Species — Mango,Kend (Diospyros melanoxylon), chironji nuts from piyar or char(Buchnania lanzan),jamun (Gardenia gummifra) and latifolia and the roots of many Diosoorea creepers. Besides timber, the following minor forest produce is extracted marketed.

Bamboo: This division was rich in bamboo in the past. In the recent past bamboo were not exploited properly. In the preceding plan has been given on a long lease to M/s Bengal Paper Mills and Indian Paper Pulp co. Ltd. A long lease is conductive to proper extraction of bamboos and results in better silvicuiltural operations thereby improving the forest. Bamboos are also exploited by local (bamboo workers) Tunes who make baskets and mats as cottage industry to earn their livelihood. Moreover many varieties of bamboos used to grow in this division, viz. Bambusa nutans, Bambusa vulgaris, Dendrocalamus longispathus, Dendrocalamus strictus, etc. Through Jharkhand (the erstwhile South Bihar) has been a major bamboo production center in the past, it has ceased to remain so due to cessation of bamboo production activities during the last decade, the extremist activities in such areas have hit it badly as a result of which these areas have degraded leading to deterloation in the economic condition to rural communities. Hence it is high time to take up bamboo, management in the natural forests as well as spreading it in the forest and non-forest areas by undertaking large-scale bamboo plantation. Jharkhand has got great potential for bamboo propagation and productions.

Kendu Leaf: -Kendu leaf is also used in local Bin factories at Chakardharpur and Manoharpur but a major portion is exported to Calcutta and other places. In recent years kendu leaf has been fetching good revenue.

Sabai grass: - In the past the Bengal Paper MIlls Ltd. Used to exploit the sabal areas of Singhbhum. Lately they have not been keen to do so. Sabal is at present utilized by local people only for string making that too it is in short supply with destruction of Porahat Forests.

Other Minor Forest Produce: - There is market also for many other minor forest products like myrabolana (amla, harra, bahera), kusum seeds and mahua seeds honey, wax, tanning bark and other medicinal herbs. No organization however exists for collection of these on economic lines. Bark of Bahunia climber is used for making strings and ropes locally.

CHAPTER-IV

HUMAN RESOURCES OF PORAHAT DIVISION

Staff: - The Poraha(O(visi'on is under t/?e C/78r'8 of a DepL.'ty Conservator of Forests commonalty called as Divisional Forest Officer (D.F.O.), who is assisted by one Assistant Conservator of Forests (A.C.F) in office as well as field work *The following statement shows* the permanent and temporary *divisional staff employed In the division at present:—*

List of Sanctioned Strength under Porahat Division

Name of Post	Sanctioned Post	Working Strenght	Vacant Posts
Divisional Forest Officer	**1**	**1**	**0**
A.C.F.	1	1	0
Range Officer	5	5	1
Head Clerk	1	1	0
Assistant Clerk	9	9	0
Forester	17	11	6
Forest Guard	90	30	60
Jeep Driver	3	1	2
Ordarly Pone	10	5	5
Bangla Chaukidhar	12	6	6
Mali	1	1	0
Amin	1	0	0
Forest Protection Force	5	1	4

Presently there is heavy shortage of forest guards to the tune of 60 and foresters 6.

General Health of the Staff and Labour : This point has already been touched in Chaper I. The main diseases which have to be faced are malaria and various forms of intestinal derangements. The local people of the arca develop fairly effective immunity but the staff from taroff suffer repeatedly. A good health can be achieved by provision for supply of pure drinking water. They should take preventive drugs regularly and also used mosquito nets during the night. The medical facilities in these forests are naturally limited and likely to remain so because of the scattered habitation in this regard . It is suggested that a mobile dispensary should be available at the disposal of the forest department which should be employed in other ivisions also.

It is generally found that Forest guards and Forester are not well versed with a rules and laws and present amendments of forest laws, which is a serious impediment in effective forest protection and management. It is suggested that all the field staff should be trained in different training centers of state and time to time hers course should be conducted to enrich their knowledge.

Also for the betterment of physical ability of the staff, regular medical check must be carried out and permanently disabled staff should be removed from the

Socio Economic Census of Prohat Divison

CD BIok	Area	Population		ST Population	literacy
Golkara	**49,175**	**66,499**	**M**	**28,460**	**9,736**
			F	**27,694**	**2,965**
Manoharpur	**38,472**	**60,617**	**M**	**26,742**	**8,642**
			F	**24,662**	**2,882**
Chakardharpur	**54,923**	**75,253**	**M**	**27,119**	**13,044**
			F	**26,685**	**4,508**
Sonoa	37,757	102,020	**M**	**31,395**	**21,043**
			F	31,483	6,042
Bandgaon	**35,813**	**73,286**	**M**	**24,278**	**14,891**

				24,321	4,878
Total	**316,139**	**304,462**	**-**	**272,839**	**88,631**

Soclo Economics Census of Labour Supply.

C.D.Block	Population		Agriculture Labours	Cultivators	Marginal Workers
Golkara	66,499	M	2,802	14,186	281
		F	8,811	2,972	4,063
Manoharpur	60,617	M	2,748’	15,760	430
		F	7,082	2,654	6,742
hakardharpur	75,253	M	3,426	14,772	231
		F	7,225	3,003	5,584
Sonoa	102,020	M	5,473	16,427	414
		F	6,457	5,508	7,211
Bandgaon	73,286	M	2,987’	13,324	243
		F	6,005	3,235	6,143
Total	304,462	-	34,808	104,212	37,179