Chapter - 2

PROSPECTS AND PROBLEMS OF FORESTRY AND TEA INDUSTRY IN THE HILL AREAS OF DARJEELING DISTRICT

The objective of this chapter is to study the prospects and problems of Forestry and Tea Industry, the dominant economic pursuits besides agriculture in the hill areas of Darjeeling district. Alongside this chapter also discusses the implications of the said issues in the name of the impacts on the social and economic life in the hill areas of Darjeeling district.

2.1. Forestry in the Hill Areas of Darjeeling District

2.1.1. Preliminaries

Forests possess great economic importance in the hill areas of Darjeeling district. A remarkable percentage of population in the hill areas of Darjeeling district earn their livelihood engaging themselves in the activities relating to forest conservation. Tea estates also consume large quantities of firewood as well as some timber for box planking. Large quantities of bamboos are used for mats and baskets. The twon and larger part of this region satisfy their requirement for huge supplies of fire-wood and charcoal along with considerable quantities of timber for housing and other constructional purposes from these forests. Moreover a notable percentage of demand for forest produce, related with industry, railway and various constructional purposes in India as a whole is reported to be supplied from forests of the hill areas of Darjeeling district.

Besides local and global economic importance, the forests of this area has a great geophysical importance. These forests serve in conserving the soil locally and preventing fertility deterioration in the plains. Divisional forest officers of Darjeeling and Kalimpong stated in this respect long ago under British rule in the following manner:

"Apart from supplying local needs for forest produce, the forests in the Darjeeling hills have a very great indirect effect on the people of lower Bengal. No year passes without land slips occurring to a greater or smaller extent in this hills. They would have been a more numerous and serious if the hills were completely laid bare of trees. The trees in the forest not only cover the soil and hold the force of the torrential rain but their roots bind the soil and keep it porous thus allowing the droppings from the crown slowly to percolate and feed the springs continuously. Where there are no trees, rain water strikes the ground directly and quickly rushes down the slope. The soil gets hardened, the springs can not be fed due to lack of seepage and consequently dry up as soon as the rains are over. The streams in the neighbourhood are flooded after rain and become altogether dry once the rainy season is over. The surface soil from the cultivated slopes and from the land slips is carried down by rain water and deposited as a fine paste choking all the pores in the bed of the river. In course of time seepage is practically stopped and as further debris is deposited, the bed of the river begins to rise and the volume of water that used to flow down the channel then

over floods the banks causing great damage to cultivation. Further, when the rains are over, the river becomes dry and unnavigable and the country unhealthy. Though the wood-cutter on the hill hardly realises the effect of felling trees and laying bare the hill slopes, people hundreds of miles below suffer hardship. It is a great pity that the indirect effect of the existence of forests was not appreciated in olden days and instead of creating reserves on the hill tops and laying bare the whole hill down below, a more even distribution of the forest was not aimed at to prevent soil erosion and its deleterious effect on the rivers of Bengal. The real measure of the importance of the hill forests should always be in terms of their effect on water-supply to the springs and on their prevention of soil erosion".[1]

"The dangers of soil erosion are becoming more and more evident in those parts of the Kalimpong Khash Mahal which have been given over to cultivation. Partly owing to the steepness of the ground and partly owing to the geological nature of the underlying rock round about Kalimpong town and in the catchments of the Rilli, the Lish, the Chel and their tributaries, erosion is liable to occur here to a greater extent than in other parts of the district. Where the forest has been cleared away in the course of the last 80 years, the protective covering of the deep soil which was the legacy of the primeval forest has now all been washed away, sheet erosion is rapidly taking place and in many places, gullies and landslides have started so that the evils of erosion, at first

insidious, are now forcing themselves upon men's attention. It is a more serious matter than is commonly recognised because the problem affects not only the few cultivators of the actual site of the erosion but also thousands of people in well populated districts such as Dacca and Mymensingh which are served by the rivers of which these hills are the catchments.....

The presence of large trees does not necessarily provide protection against erosion. Indeed a forest consisting of large trees only with no under growth and little soil may actually help erosion by guiding the rainfall along definite channels.

The principal protection is found in the deep and spongy forest soil which results from the decomposition, through centuries, of the leaves, twigs, roots, dead branches and stems of the vegetation, both large and small, of the herbs and shrubs of the undergrowths no less than of the big trees. When rain water falls on a forest, the force of the water is broken, first by the crowns of the trees and then by the litter on the ground. This prevents the raindrops from beating the soil particles into suspension and clogging the pores and reducing percolation. The water, therefore, instead of being washed away along the surface of the ground, largely enters the soil through infiltration. The spongy, soil, again, holds back the greater part of the water only allowing it to pass through in small quantities at a time. This is the reason why the catchment areas of the water supply in hill stations are

kept well wooded. Had this not been done, the rain water would have run off soon after it fell and there would be no water available in the dry season. The presence of the forest ensures a perennial supply. On the other hand, where deforestation has taken place, the soil, perhaps loosened by cultivation, is gradually carried off by rain and sheet-erosion begins. The next layer of soil is less absorbent, the amount of run off increases and the rate of erosion is accelerated. Little by little, the top cover disappears and there being no soil to hold the rainfall, it is immediately carried down into streams and rivers, swelling the rivers into floods perhaps hundreds of miles from the site of the rainfall.

It is an unfortunate fact that although the destruction of a forest and of the resultant soil-covering can be brought about comparatively easily and quickly, the re-establishment of a forest on such eroded land the formation of a depth of soil sufficient to give adequate protection must take many years to accomplish".[2]

Thus it is evident that the forests in the hill areas of Darjeeling district have an intra-regional as well as inter-regional economic and geo-physical importance. Considering this the following sections of this chapter discuss the state of forests in this areas before and after independence in terms of its area over time and the problems confronted. Along with the impacts of the problems on the development of the hill areas of Darjeeling district are also discussed here.

2.1.2 Area under Forests during the British Rule and After:

The area in the present Darjeeling, then known as "British Sikkim" was entirely covered with forest and practically uninhabited. Captain Herbert, the Deputy Surveyor General described, "the mountain in 1830 as clothed with forest from the very top to the bottom". General Lioyd in 1837 similarly described it as "clothed from the top of the hillsto the very bottom of the valleys with a dense forest". The forest existed in rather poor condition as it was subjected to all conceivable forms of maltreatment including shifting cultivation. After British occupation, conversion of these forests into cultivated lands and tea gardens as well as for colonisation rapidly started and there was an influx of settlers. Introduction of cultivation of tea, cinchona, potatoes and orange resulted in the clearance of large tracts of forests at favourable altitudes. Extensive fires raged in the summer months in the Terai and in the outer hills as well as in the Tista and the Great Rangit valleys caused destruction of forests. These fires sometimes originated from uncontrolled fires in cultivated land and then extended into adjoining forests.

Besides, during 1855 and 1861 large-scale felling took place to meet the heavy demand for railway sleepers. Rapid and continuous illicit felling, looping and unrestricted heavy grazing adversely affected the area, quality and density of forests. Owing to the above facts the area under forests in the hill areas of Darjeeling district and the district as a whole did not remain

intact as that was at the time when the British stepped their feet on this land. Overtime the area under forests in this district showed a declining trend, although onwards 1865 the then British Govt. paid attention to reserve the forests for the conservation of timber and water-supply and for protection against erosion and also to eliminate jhum method of cultivation.[3] The declining trend of area under forest in this district may be apparent from Table 2.1.

From Table 2.1 it is evident that before independence, under the British period in 1901, the area under forests was 1554.21 square km. which was 51.54 per cent of the total geographical area of the district. In the year 1911 there was neither any decline nor any rise in the area under forests, while that in the successive years before independence changed in descending order.

The area under forests increased marginally after independence. In the years 1951 and 1961, the area under forest was greater than that in 1941. But in the year 1971 and 1981 the area under forest declined and it became lower than that in 1941. As a result, there was a decline in the percentage of the area under forests to the total geographical area of the district. In 1981 it became 39.78 per cent which was marginally above the international standard of keeping minimum land under forest, i.e., 33.00 per cent of the total geographical area. Table 2.2 may help to understand all the matters stated above.

The above analysis reveals that the periods before independence and after independence are not different in character. The area under forest declined in both the time horizons. But that in the period after independence decreased at a rapid rate. The Table 2.3 may help to understand this. From Table 2.3 it is evident that in the period before independence, during the time scale of forty years, i.e., during 1901-1941 area under forest in the Darjeeling district decreased by 0.23 per cent per annum while in the period after independence during 30 years of time limit, i.e., during 1951-1981, the area under forest in the district reduced by 0.41 per cent per annum. Thus it is clear that in the period before independence the rate of decline in the area under forest was lower. On the other hand in the period after independence the rate of decline in the area under forest was higher.

The cause of the relatively slower rate of decline in the area under forests in Darjeeling district under British rule i.e., before independence and rapid rate of decline of the said area after independence may be attributed to the change in the objective of the forest management policy in the latter period.

2.1.3 Forest Management during the British Rule:

Prior to 1863 very little attention was paid to conservation of forests in Bengal. Forest demarcation and reservation proceeded fast after inauguration of forest conservancy in Bengal, 1964.[4] No systematic attempt could be made due to paucity of fund and technical knowledge, yet after inauguration of forest conservancy.

Originally the forests were worked by selling of trees on permit system. This meant felling of best saleable trees with a fixed girth limit. This resulted in the removal of all the best trees. The hollow and defective trees which should have been removed on silvicultural grounds were allowed to accumulate in the forests. Departmental operations were under taken in the year 1865 and some Katus and Champ timber were sold to Railways for constructional purpose.[5]

Forest reservation received further impetus since 1872-73, when Dr. Schlich joined as conservator of forests. Since 1872-73 practice of forest management underwent a slow but gradual change in the hill areas of Darjeeling district. Selective felling was the system of management to be practised in the hill areas. First working scheme (suggestion) for the hill forests was drawn up by Dr. Brandis in 1879 and revised by Sir William Schlich for the period 1880-1890. The method of treatment prescribed in Schlich's scheme was selective felling above 7500 ft. elevation and practically clear felling below that level. More specifically the method of treatment prescribed in Schlich were retention of all round, fairly straight trees likely to last for another rotation and felling of all other trees for forests above Ghum to Lepcha Jagat road and Rangbi road. It was also provided that the upper part of the ridge should not be cleared altogether and planting to be done in horizontal lines 20 ft. apart and the plants are to be 4 ft. apart in lines. For forests below the roads it prescribed that all

trees should be felled leaving only poles and saplings. Planting should be done in horizontal lines. Clearances were permitted along lower edge of forests, if future treatment as Coppice be desired. It also prescribed that the area, so cleared, should be planted closely in lines not more than 10 ft. apart. But it was found that clearances with a view to coppice along the lower edge of the forests were not made. The forests in the lower edge could not be disposed off due to difficulty of extraction. Thus the scheme did not yield desired results. As on the one hand under this scheme forests on the lower edge could not be felled and on the other hand practically no regeneration could be done as no definite silvicultural principle was followed. This led to the revision of the scheme by Manson.[6]

The problem of getting adequate regeneration received attention of the foresters in 1890's and considerable attention was paid by Manson in his plan, which was hitherto over looked. In Darjeeling hills the practice of selection felling systems did not yield the desired result so far as regeneration was concerned. Manson's working plan for Darjeeling hills for the period of 1892 to 1902 solved this problem to some extent. His plan prescribed a rotation of 160 years in five periods of 32 years, the first for regeneration periodic block and the fifth being closed to grazing. Periodic Blocks II to V were to be worked over by improvement (so called amelioration) fellings at the rate of one block annually in order to bring them into a more normal condition, while periodic

Block-I was to be regenerated by taking out half the crop over one sixteenth of the block annually in a regeneration felling. The remainder was to be left as a shelter wood over the young crop which it was anticipated, would consist of natural seedlings supplemented by sowing and planting. This shelter wood was to be removed later in a final felling.[7]

During the first ten year covered by Manson's Plan, regeneration fellings were done in the first 10 original coupes. But in respect of regeneration, it was successful in some cases whereas it resulted in invansion of inferior species and shrubs in other cases. It was found that partial opening of the soil surface or cover did not result in reproduction of tree species, but in some cases as a result of admission of more light the ground was completely occupied by inferior shrub and weeds. Thus artificial regeneration did yield desired degree of success due to neglect of regular cleaning for subsequent years after planting. It was found out that Manson's plan would have worked fairly well if the regeneration fellings actually had taken out at least half of the original crop including biggest stems with wide spreading crowns. It was actually happened that two third of the original crop was left to be taken out in final fellings and trees at the time of final fellings damaged the existing regeneration on the ground.

Mansons plan was duly undertaken by Osmaston and put in force since 1903. Under it the shelter wood was removed in a final felling from the ten original coupes successively but no new regeneration felling was undertaken. The only alteration in the "amelioration" felling prescribed that only hollow, dead and fallen stems were to be removed, except in periodic Block-V, where fellings approximating to regeneration fellings were allowed owing to the predominance of saplings partly natural and partly planted in blanks under a special provision of Manson plan. The final fellings like regeneration fellings were followed by planting and dibblings on which reliance had to be almost entirely. Osmaston recommended a revision after 10 years at which time it was to be considered whether removal of the whole crop in a single regeneration felling would be wise, seeing that in this case planting would have to be carried out without shelter of any kind.

Manson's plan with Osmaston's revision was in force for 20 years (i.e, for the period since 1892-1912) by which time ten out of sixteen coupes of periodic Block-I had been passed over by a regeneration and final felling, and were on the whole fairly successfully re-stocked. But the manner in which Mr. Manson's plan was carried out was the laying out of the first ten coupes in advance. The practice was not prescribed or even countenanced by the plan. These coupes were generally long narrow strips cut straight down the hill side from the top bottom of a compartment, the shape most liable to land slips and least convenient for inspection. Thus evil effects of laying out coupes down the

hill side from top to the bottom were felt for the first time.[8]

Since 1912 Grieve's plan was introduced mainly with the object of avoiding the second felling which had in so many cases destroyed the regeneration, established after the first felling. His plan was on the following lines : first, all unworkable areas were excluded from the scheme and opened to grazing. Second all areas, previously regenerated under Manson's and Osmaston's plans were kept into a 'plantation' working circle. Even in case of aged trees he was about to propose that they were unsuitable for selection system of felling. Third, the remaining high forest was put into a new working circle.

For the high forest (Darjeeling working circle) Grieve's original intention was to prescribe the selection system on a rotation of 150 years with a 25 years felling cycle; the possibility being determined by the number of trees, for which purpose complete enumerations had been made over the whole working cirlce. During the felling cycle one-half of the class-I trees were to be removed in groups, utilizing advance growth in the main but supplementing it by planting where necessary.

Grieve's working plan worked hardly for there were obvious difficulties. In the first place it was believed that Grieve was far too sanguine about natural reproduction, where as in practice artificial regeneration would have to be resorted to almost entirely. And as a result the selection system whether by groups or

by single trees was not adopted. Secondly, although experimental groups had been made before the plan came into operation where two or three class-I trees happened to be together. In practice the allocation of one half of the trees on a given area into anything that could be called groups would be extremely difficult, because, as calculations showed the over age distance between class-I trees were about 20.17 metres in the best and 32 metres in the worst areas respectively. Lastly, Grieve gave no indication as to the size of 'Group' intended. The use of the word 'group' was unfortunate and proved a stumbling block all through in as much as it was misinterpreted as having something to do with the group system of Europe. Thus it appeared that group felling proposed in Grieve's plan did not produce the desired result so far as regeneration was concerned. The system underwent gradual changes from selection felling by group to regeneration felling by group method and ultimately to some sort of clear felling with artificial regeneration. It was also found that Coppice fellings upto 1917 did not result in sufficient coppice growth to restock the area and thus it became clear that in order to produce a plantation containing a satisfactory proportion of good fuel species, extensive sowing and planting would be necessary.[9]

Meanwhile it was realised that (i) natural regeneration was too, too uncertain and insufficient in quantity for any reliance to be placed on it as the method of regenerating the forests after exploitation, (ii) there was no danger to the forest seedlings raised by artificial regeneration after clear-felling at an

elevation below 7000 feet where forests were never serious, (iii) retention of over wood caused more harm than benefit to the regenerated seedlings at the time of final fellings.

The outcome of all the above findings was Baker's Working Plan for the period 1912-1928. Baker in his plan prescribed clear-felling with artificial regeneration by 'Taungya', wherever possible. The prescription of this plan was carried out almost in full in all felling series except Batasi. The clear-fellings made from 1917 to 1928 resulted in no damage and restocking was generally done successfully. It was also found that problem of regeneration was simplified as a result of introduction of artificial regeneration after clear-felling by taungya. One difficulty of the plan was, however, noticed that the system of clear-felling in the hills across the contour from top to the bottom might lead to landslips.[10]

During the interim period between the ending of Baker's plan and the introduction of the new one, the forests of Darjeeling district would be managed under working scheme prepared by S.J. Curtis, the then Divisional Forest Officer, Darjeeling Division. The main change prescribed in Curtis's working scheme was the contour strip system of felling in the hill forests. Clear-fellings were carried out along contour and in strips not more than three chains in width down the slope on average ground. Shelter belts were retained between strips and also on spurs to provide protection from undue exposure. Curtis in his working scheme had drawn attention to the fact that many younger plantations seemed to take

a considerable time to establish themselves and form a close canopy. This, according to him, might be due to a variety of causes, namely, undue exposure to light frost and wind by clear-fellings being made in large compact areas whose depth down the slope was excessive.[11]

At the end of 1928, the interim period, during which forests of Darjeeling hills were managed under Curtis Working scheme, Choudhuri's working plan was prepared for the period 1929-30 to 1936-37. It prescribed clear felling and artificial regeneration system in all the accessible areas except in the bulk of Tista Valley and Rangit Valley forests. The main prescription for these two areas was the selection felling. Another feature of the plan was the formation of a cryptomeria working circle, confined to the top ridges in the Ghum Simana Range, Topkedara Block spur. But the growth of species in the cryptomeria circle was not substantial due to elevation, poverty of soil and exposure. Again selection felling system did not lead to sufficient regeneration of useful species on the ground.[12]

Next to Choudhuri's working plan Macalpine's working plan was prepared for the period 1940-41 to 1959-60. It followed more or less general pattern of the prescription of Choudhuri's plan except that clear-felling with artificial regeneration was prescribed for the Tista Valley forests and rotation for fire wood species was increased to 60 from 50 years. Cryptomeria was not prescribed at all, its use being restricted to as a last resort or in infellings. Consequently cryptomeria of taungya, was prohibited for more

than two consecutive years in any area and restriction was imposed on the number of taungya villagers that was considered sufficient to regenerate any particular area. Clear-felling in strips along contour was prescribed, the width of each strip not exceeding three chains except where the gradient is easy. There was provision for retention of coppice shoots of species suitable for the objects of management.

On the whole Macalpine's plan was only a slight modification of Choudhuri's plan and its results were as follows:

i) Clear-felling along contour strips in three chains' width resulted in the length of the annual strips in some of the felling-series from one to more than two miles (3.64 kms.) long, covering more than one compartment with the result that the maintenance of boundaries of individual plantation had not been easy with consequent difficulties in management. It was therefore, felt that increase of the width from three to five or more chains might be conveniently done in suitable localities.

ii) The area in the cryptomeria working circle of Choudhuri's Plan was included under the Long Rotation Hill Working circle of Macalpine's plan with the hope of producing timber of a better quality under the Long Rotation. But Cryptomeria plantations were left unthinned for reducing the rate of growth in producing the timber of a better quality and it was found that under existing conditions the marketable sized tree of two feet diameter might be expected to be produced in sixty to seventy years. It was therefore

no longer considered necessary to retain this pure crop of 'Dhupi' under the Long Rotation Hill Working Cirlce.

iii) It was found that the practice of taungya in any area for more than one year had deliterious effect on the forests crop as well as on the soil of hills and necessity for restricting taungya for only one year in any area was felt. It was also felt necessary to make the broken terraced beds on which the forest crop was grown continuous, so that downward flow of rain water might be checked thereby reducing soil-wash.

iv) The inaccessible areas in the Tonglu and Singalila Ranges coult not be worked as provided in the plan due to lack of communication.

v) The coppices of desirable species were not sufficient in the plantations for covering the areas and these of undesirable species interfered with the growth of seedlings of useful species and also increased the stock of inferior species.[13]

The preceding description of the major schemes and plans of forest management in the pre-independence period shows that the broad objective of forest management in the hill areas of Darjeeling district was conservation oriented. Before independence each plan was prepared with the modification of its previous one for tracing out more efficient method of conserving forest resources. But this policy of forest management went under a slow but gradual change after independence.

2.1.a. Forest Management Policy After Independence:

After independence, the abnormal and heavy rainfall in the year 1950 caused serious damage to the forests on the Tista, the Great Rangit and little Rangit valleys and also to the upper hill forests. This necessitated closure of clear felling in several areas. Macalpine's Working Plan was replaced by a new working plan, namely, Ninth working plan. This plan was prepared for the years 1952-53 to 1961-62. It divided the entire forest areas into seven working circles, viz, (i) Fuel-cum-Packing Timber, (ii) Hill Timber, (iii) Cryptomeria, (iv) Selection, (v) Protection, (vi) Senchal Pastur, (vii) Inaccessible. The main prescriptions of this working plan were:

(i) Clear felling with artificial regeneration by taungya method,
(ii) Selection-cum-improvement felling.[14]

The Ninth working plan expired on thirty first March, 1962 and for the following five years, i.e., from 1962-63 to 1966-67 clear felling and other subsidiary operations were carried out in accordance with the working schemes prepared on year to year basis. The working schemes followed the general principle of prescriptions laid down in the Ninth Working plan and clear fellings were prescribed in all the blocks of forests in Tista valleys, Rangit valleys, Jorepokhri, Barasenchal and other blocks were brought under regular felling.[15]

The practice of forest management according to the working schemes prepared on year to year basis was continued no longer after

1967. For the years 1967-68 to 1976-77 a new working plan, namely, Tenth Working Plan was prepared. This Plan abandoned the system of selection cum-improvement felling in case of the forest blocks where it did not lead to proper regeneration of desired species and adopted a regular method of management by clear felling with artificial regeneration for all the blocks of forests. Emphasis had been given in this plan on growing of valuable species like Teak in valley forests and also Teak conservation working circle was formed. For the production of soft wood, suitable for manufacture of pulp, soft-wood working circle mainly for growing long-fibred conifers was formed. Besides stress was also given on growing Cryptomeria Japonica by replacing its, broad leaved species for its very slow rate of growth. Inaccessible forests were tried to bring under regular method of management with the introduction of clear felling with artificial regeneration through the development of networks of communication system in the inaccessible forest areas.[16]

In the year 1972 the National Commission on Agriculture in its report on Production Forestry - Man made Forests recommended: "There should be a change over from the present conservation oriented forestry to a more dynamic programme of production forestry"[17] Clearly the recommendations of the Commission was related with the following concepts:

i) to link up forest resources with the forest based industries on the basis of physiographic, industrial and economic catchment concepts,

ii) to link up forestry as a support of rural economy and to trigger off development through cottage, small, medium and large-scale industries in backward regions where forests happen to be the most important local natural resource;

iii) to develop infrastructure on the basis of developing an area so that cost of development can be shared by various sectors which will benefit from it; forestry is only one of the most important sectors.[18]

In view of satisfying the recommendation related with the above mentioned concepts the commission prescribed that low yielding forest conserved under old policy should be replaced by high yielding forests through clear felling and planting. As a cause behind this prescription it added that high yielding forests would supply high quality of timber and it would develop forest industry.[19] For carrying out the recommendation of National Commission of Agriculture, West Bengal Forest Development Corporation was created on 02.11.1974 and since then the policy vis-a-vis system of management of the forests in the hill areas of Darjeeling district went under complete change from that in the preceding years.[20]

Onwards 1974 working plans to manage forests in the hill areas of Darjeeling district were so prepared that these could maximise revenue and profit. As a consequence the revenue from the forest department increased from Rs. 9.00 lakhs in 1982. Again expenditure on forests in 1931-32 to 1935-36 was to the tune of about Rs. 6.00 lakhs, which in 1976-1977 mounted to Rs. 115.00 lakhs,

while the revenue during this period has shot up from Rs. 9.00 lakhs to about Rs. 500.00 lakhs. This implies that there is a wide gap between revenue and expenditure in forest management and this excess of revenue over expenditure instead of being ploughed back for protection, conservation and creation of forests, i.e., for regeneration and improvement of forest resources is treated as profit. It is worth to be noted in this respect that in order to raise the volume of revenue and profit West Bengal Forest Development Corporation intended to convert 1500 hectare of inaccessible forests annually so as to cover 45,000 hectares of accessible forests within thirty years. As this would give a financial return of Rs. 1.80 crores annually from third year onwards.[21]

Thus from the foregoing discussion it appears that objective and policy of forest management in the hill areas of Darjeeling district have related with a completely new concept, namely, 'Production Forestry' and accordingly gone under complete change since 1974. After independence during the years before 1974 the objective and policy of forest management in this areas of Darjeeling district were alike to those under British rule. Like the British Government during the said years after independence the aim of the government was to conserve forest resources and the policy or system of forest management was tried to be framed accordingly. In spite of this fact following changes in the system of forest management are noticed in the hill areas of Darjeeling district since independence during the years before 1974. These changes are not consistent with the then objective for forest

management but consistent with that after the establishment of West Bengal Forest Development Corporation in the year 1974.

The policy under the British rule about the forests in the upper layers of mountains was to keep intact and the British rulers would not allow to use these forests for commercial as well as for industrial purpose. As they perhaps felt that if forests in the upper layer of mountains were denuded, then ecological balance in these areas would surely be disturbed. But in the post independence period the policy regarding method of exploitation of forests in the upper layer was changed.[22] Although, the objective of forest management during the years before 1974, after independence was conservation oriented, method of exploitation of forest resources changed before the said year especially in the upper layer of mountains. Alike the plan of the West Bengal Forest Development Corporation since 1974 to convert 1500 hectares of inaccessible forest areas at the higher altitude to man-made accessible forest areas annually in order to meet the demand arising from wood based industries in West Bengal, the upper layer of forests, i.e., inaccessible forest areas were taken for commercial cultivation since the inception of Tenth Working Plan in 1967. This may be disclosed from the nature of forest management in the inaccessible forest areas since 1967. Since the inception of Tenth Working Plan, in the year 1967 inaccessible working circle or upper layer of forests were covered by roads and further net-works of communication system were expected to be laid out in these areas during the currency of the Fourth and Fifth Five Year Plans for bringing

these areas under regular management by clear felling with artificial regeneration.

In the British period and also during the decade 1950-1960 Sal and Teak with longer cycles received importance in the plantation programmes in the hill areas of Darjeeling district. But this variety of species were begun to be replaced not only after 1974 but also from the seventy's by quick growing species like Eucalyptus, Conifers etc. As regards, the emphasis on replacing quick-growing species before 1974, it may be quoted from the prescriptions of Tenth Working Plan (1967-68 to 1976-77) as evidence - "(i) It is necessary to provide for production of soft-wood suitable for manufacture of pulp, (ii) Sufficient stress is necessary to put on growing of exotic conifers in the hill areas of Darjeeling district on a large scale in future". And according to the prescriptions given in the Tenth Working Plan soft-wood working circle mainly for growing long-fibred conifers was created immediately after the prescriptions given. The implied result of the creation of soft-wood working circle was the replacement of existing species of slow growing hard-wood namely Sal & Teak. Thus it appears that in respect of the variety of planted trees in the plantation emphasis shifted from hard wood i.e., Sal and Teak to soft wood, Eucalyptus, Conifers like Pinus Patula (in particular), Cupressus Cashmiriana, C. lisitanica etc. since the inception of Tenth Working Plan in 1967 and it was only accelerated since the setting up of West Bengal Forest Development Corporation in the year 1974.[23]

Again a change in the system of forest management after independence is noticed. Similar to the forest management policy under the British rule, after independence during the both time scale before and after the setting up of West Bengal Forest Development Corporation regeneration of forests through replantation in the vacant areas, i.e., through afforestation was one of the major aims of the forest management policies. But the practice regarding afforestation was highly deviated from that before independence. Under the British rule very much high priority was given on afforestation programme in considering the geographical character of the Himalayan Range. At that time it was always tried to cover all the vacant forest areas by the forest species rapidly through natural replantation, artificial replantation with taungya method.

But the period since independence accounts for a wide gap between felling and replantation. Till 1970 only 21.6 per cent of the vacant forest area has been converted into plantation. In order to fill up the gap between felling and replantation 700 hectares should be replanted annually but the actual performance is only 200 hectares are on an average per annum.[24]

The slow pace of replantation unveils the fact that conservation of forest resources through afforestation gets less importance in the post independence period. This lack of importance on afforestation may be obvious from Table 2.4 and 2.5. From Table 2.4 it is observed that out of the total expenditure on forest management only six to eleven per cent was allocated for regenera-

tion and planting during 1951-1965. On the other hand Table 2.5 shows that regeneration and plantation accounted for only four to nine per cent of the total expenditure on forest management during 1975-1981. Thus it is obvious that during 1951-65 and 1975-81 a negligible share of total expenditure on forest management was alloted for regeneration and plantation. This outrighly implies that in the period of independence during the years before and after the establishment of West Bengal Forest Development Corporation out of the total expenditure on forest management only a negligible fraction was allocated for afforestation. Such type of allocational pattern of total expenditure on forest management in the hill areas of Darjeeling district after independence brings to the light the fact that there was given less importance on afforestation through regeneration and plantation of vacant forest areas in the period after independence.

Apart from the above changes in the objective and policy of forest management in the post independence period, the forests in the hill areas of Darjeeling district has been degraded continuously by the increasing pressure of growing population and consequent unemployment. The geophysical condition of the hill areas restricts the extent of areas under cultivation. The pressure of population on land has increased further with the stagnation of tea industry. As a consequence the percentage of marginal farmers and landless labourers has increased remarkably. The increasing number of marginal farmers and landless labourers having no opportunity to employ themselves throughout the year and to earn income as per

their subsistence level of living are engaged in illegal felling of trees from the reserved forests. This is because it fetches a high income from illegal market.[25]

Besides encroaching upon the forest land by marginal farmers and landless labourers of rural areas, professional gang of operators, financed by the merchants cut the trees in the forest illegally. And then they send these products to registered, unregistered and licensed and unlicensed saw mills of Siliguri and Terai areas of Darjeeling district as well as to the distant places of the country. Even the forest guards and other officials of the forest department seems to be involved in the said illegal operation indirectly.[26]

Thus from the preceding discussion it can briefly and clearly be said that in respect of forest management policy in the hill areas of Darjeeling district following changes have taken place in the post independence period:

(i) Inaccessible forests in the upper layer of mountains began to be accessible forests through clear felling and artificial regeneration.

(ii) Emphasis had shifted from the variety of hard wood to soft wood in planting trees.

(iii) The above two changes had accelerated with the change in the objective of forest management policy from conservation orientation to production orientation and revenue as well as profit

maximisation after 1974, when West Bengal Forest Development Corporation was set up.

(iv) Emphasis was given negligibly on regeneration and planting.

(v) Illegal felling of trees by the poverty driven marginal farmers, landless labourers and by the professional gang of operators financed by the merchants reveals the decline of administrative efficiency of the forest department in the hill areas of Darjeeling district after independence. So it can be said that after independence there have taken place five fold changes in respect of forest management in the hill areas of Darjeeling. These five fold changes are namely, (a) change in respect of administration, (b) change in respect of method of exploitation, (c) change in respect of variety of plantation, (d) change in respect of objective, (e) change in respect of regeneration and planting.

2.1.5. Impact of the Change in the objective and policy/system of Forest Management:

After independence the change in the objective of forest management, from conservation orientation to production orientation and revenue and profit maximisation along with the changes in the system of management relating to the different aspects of forest management namely, method of exploitation, plantation, regeneration and planting as well as administration in the hill areas of Darjeeling district has affected the area under forest in the Darjeeling district adversely. The area under forest has declined in the post

independence period than that before independence. From Table 2.1 and 2.2 , it is evident that the area under forest has reduced to 1252.66 square km. in 1981 while that was 1414.05 sq. km. in 1941. As a consequence the percentage of area under forest to the total geographical area of the district has reduced sharply from 45.80 per cent in 1941 to 39.78 per cent in 1981, as evident from Tables 2.1 and 2.2. Furthermore, it is worth to be noted that the aforesaid changes in respect of forest management in the post-independence period resulted in a more rapid rate of decline of forest areas in the post-independence period than that under the British rule. This fact is conveyed in Table 2.3. From Table 2.3 it is evident that under the British rule during forty years from 1901-1941 the area under forest declined by 0.23 per cent per year whereas that during thirty year from 1951 to 1981 after independence decreased by 0.41 per cent per year.

From the wide deforestation in the post-independence period thus resulted in, a number of indirect adverse effects have cropped up in the hill areas of Darjeeling district. In the vegetation map of West Bengal, Darjeeling is the only one where three types of vegetation, namely, tropical, temperate and sub-alpine raising upto an elevation of 12,000 feet are found. This mountainous range is very ideal region in West Bengal and India for botanical exploration and research by the various scientific institutions, universities and colleges in the country. But it is a tragic fact that since long before such botanical variety of this very important Himalayan region of West Bengal and also of India is being wiped out. Wide-scale deforestation has thus caused not only the dis-

appearance of or even extinction of unstudied plants but also of a large number of Himalayan fauna. As the natural habitat of these botanical species has become destroyed, so what was once the "Queen" of the hills is now fast turning into a mountainous desert.

The rapid disappearance of forests due to large-scale deforestation has brought forth ecological disbalance not only in the hill areas of Darjeeling district but also in the plain areas of this district as well as other adjacent districts. The large-scale deforestation resulted in frequent landslides in the rainy season in the hill areas of Darjeeling district. Landslips on the other hand cause denudation of hill slopes, which is the cause of increased water run off in the hills. And this increased water run off creates frequent floods in the adjacent plain areas in the rainy season with a little bit of shower. In the hill areas of Darjeeling it also causes less infiltration, which is the main reason of frequent droughts in the plains now-a-days. Thus deforestation spells ecological disaster in the hill areas as well as in the plain and other nearest districts.

Deforestation in wide-scale leads to the problem of water availability in the hill areas. Apart from protecting soil surface from the direct action of rain, stabilising the hill slopes, reducing the surface and sub-surface run off, regulating water flows, reducing the intensity of floods in the plains and soil wash in the plains and soil wash in the hills, forests provide an efficient mechanism of water management in the hill areas. Deforestation

in the catchment areas of the rivers leads to the drying up of many perennial springs. And due to this shortage vis-a-vis scarcity of even drinking water becomes a acute problem since near past in the hill areas of Darjeeling district.

Apart from the impacts discussed above relating to environment, the spread of deforestation in the hill areas of Darjeeling district gave birth to the following economic problems in the hill areas as well as in the plain areas of the district and in other adjacent districts.

(i) It is seen earlier in the Chapter I that a notable percentage of population in the hill areas of Darjeeling district is mostly used to live on the basis of earnings accrued from rendering their labour in the plantation activity in the forests. Deforestation with a little bit of care on regeneration planting in the hill areas crops up livelihood problem in the face of these population unaccustomed with adapting themselves in alternative profession.

(ii) The destruction of forests reduced the scenic beauty of the hills of Darjeeling district. As a result it has been lossing its power to attract the tourists by little. The number of tourists coming to enjoy the beauty of the hills of Darjeeling district has been going on declining year after year. The inflow of tourists is an important source of money income to a certain percentage of population of the hill areas of Darjeeling district. The shrinkage of the number of tourists causes the reduction of income in the

hands of this section of people and their well being also.

(iii) Denudation of hill slopes from the frequent landslips, resulted from deforestation leads to damage of agricultural crops along with cultivable lands in the hill areas. Frequent floods and droughts in the adjacent plains arising out of the same reason cause again heavy damage of crops in every year.

In addition to these, deforestation also leads to the crisis of fodder required for livestock population. But the rearing of the livestock population has very much economic importance to the hill people in the rural areas as the agriculture in the hill areas is incapable of supporting them alone. The crisis of fodder due to large-scale deforestation has made it difficult to rear various livestock population and thus originated economic hardship to the people of rural areas in the hill areas of Darjeeling district. Above all, these adverse economic effects along with impacts on the ecology and botany arising out of the large-scale deforestation in the hill areas of Darjeeling district are injurious to the health of the economy and ecology of the nation respectively.

2.2. Tea Industry in the Hill Areas of Darjeeling District:

The industry relating to tea plantation is one of the oldest and well-organised industries in India. It has opened the scope of large-scale employment of rural people and given a stimulus to the development of means of communication along with transport. It

plays the role of an instrument of modernisation in the sense that it serves to open up previously backward regions and helps to transform primitive economies into money economies. In Chapter 1, it has already been seen that in the rural areas of Darjeeling hills, tea plantation occupies the most important place in terms of its potentiality to feed the rural people. In the following sections of this chapter attempt has been made to discuss the growth of tea industry in the hill areasof Darjeeling during the period before and after independence and to trace out its problem and the impacts thereof on the rural areas of Darjeeling hills.

2.2.1. Growth of Tea Industry before Independence:

In India Majore Bruce in 1821 and Mr. Scott in 1824 discovered tea bushes in Assam. But it was only in 1833 when emphasis was given to the development of tea industry in India after the loss incurred by the East India Company from its monopoly in China's tea trade. Government itself undertook the formation of plantation in Upper Assam and in the districts of Kumaun and Garhwal. In 1838 private speculation took the field and the Assam Company was formed. Tea cultivation was not confined to Assam only; gradually it spread to other parts of India.

The histroy of tea plantation in Darjeeling is the history of British adventurism and its mastery over the natural challenges. At the time of access of the British, Darjeeling was covered with dense forests, shrubs, thick creepers mounted on tree tops and jungle of thorns.[27] Dr. Campbell who was the maker of modern

Darjeeling brought China tea seeds from Kumaun and planted them at his residence of Darjeeling at a height of 7,000 feet in 1841. But Dr. Campbell's seeds and plants were continually injured by hell, frost, frog etc. others who followed Dr. Campbell at somewhat lower elevation around Lebong succeeded admirably and it was found that tea might be cultivated at a great profit and be of advantage in furthering trade with Tibet.

An account of the report on Darjeeling by Jackson in 1852 said that the reddish clay of the sides of hill of Lebong was more suitable for the plant than the black loam of Darjeeling where there was too much moisture and too little sun which seemed to make the cultivation of tea on a large-scale unprofitable. Nevertheless this objection was not applicable to the lower sides of Pankhabari and Kurseong where plants were in a highly thriving condition. Due to the variety of elevation and other aspects it could safely be presumed that tea cultivation in this tract would be capable to yield profits.[28]

Before 1856 the growth of tea was on an experimental basis in the gardens of Dr. Campbell and other Englishmen. According to Rev. T. Booz tea plants had been successfully grown at Takvar, Kurseong and Hopetown by three Englishmen, namely, Captain Mason, Mr. Smith and Mr. Martin. The year 1856 may accordingly be taken as a date from which the industry became an enterprise. In that year the Alubari tea garden was opened by the Kurseong and Darjeeling

Tea Company and another on the Lebong spur by the Darjeeling Land Mortgage Bank. In 1859 the Dhutaria Garden was started by Dr. Brougham; and between 1860 and 1864 four gardens at Geing, Ambutia, Takdah and Phubsering were established by the Darjeeling Tea Company and the gardens at Takdar and Badamtam by the Lebong Tea Company. Other gardens which were started at that early period are now known as the Makaibari, Pandam and Steinthal tea estates. Gradually the planters turned their attention to the Terai, where the first garden was opened out at Champta in 1862 and by the end of 1866 a few more gardens had been opened out in the Terai.[29]

There had been rapid development in the hills as the suitability of the soil and climate became apparent. Government offered land to investors on favourable terms and by the end of 1866 there were only 39 tea gardens with about 4,000 hectares under cultivation and the annual production of finished tea was 196365.5 kgs. In 1870 there were 56 gardens with 4,400 hectares under cultivation which employed 8,000 labourers and yielded nearly 774578 kgs. In 1874 the number of gardens had increased to 113 with 7552 hectares under the tea which yielded about 1781348 kgs with a labour force of 19,000. In other words, between 1866 and 1874 the number of tea gardens almost exactly trebled, the area under cultivation increased by 82 per cent, while outturn was nearly ten times. In 1905, the area under tea was 20247.2 hectares but the number of tea gardens was reduced to 148 from 186 in 1895 due to the amalgamation of several gardens. The output in 1905 was recorded at 5644941.25 kgs.[30]

Out of 148 gardens in existence at that time, 71 with an area of 10320 hectares under tea were situated in the Darjeeling sub-division, which included the Kalimpong hills to the east of the Tista. The rest of the area of the then district, i.e., the western part of river Tista, was, however, almost entirely closed to tea as the greater part of the tract was a reserve forest and the remainder had been reserved for native cultivation. Nearly 30 square miles had been reserved for tea. But the land was so barren and precipitous that it was unsuitable for the growth of tea plant. Thus notwithstanding the eagerness for the grants of tea lands, little of it had been taken up and a few gardens, 46 with an area of 6760 hectares under tea were situated in Kurseong sub-division, i.e., on the lower hill slopes and 32 estates with an area of 3160 hectares under tea lain within Siliguri thana, i.e, within the Terai.[31]

In 1910 the total area under tea in lease increased to 49541.2 hectares out of which 20512.4 hectares were under tea. In 1920, the area under tea leased became 56860.8 hectares and 23742.4 hectares were under tea. In 1940 the corresponding figures increased to 67188.8 hectares and 25223.6 hectares respectively. In 1943, the area under tea rose to a maximum of 25290.8 hectares and the total area under tea lease was 66272 hectares.[32]

Table 2.6 will help us to understand the development of tea industry during the British rule. The Table shows that there had

been a phenomenal growth of tea industry during the British period. The reasons behind this were : (i) the availability of cheap labour which was mainly due to large-scale immigration of Nepali workers to Darjeeling hills, (ii) the availability of land for tea cultivation as plenty of land was declared by the Government as Waste Lands unsuitable for ordinary cultivation mainly in the western side of river Tista.

It was for the above reasons that the tea industry developed quickly within a very short period in the hill areas of Darjeeling. The capital which was invested in this industry came almost entirely from Europe. This industry was developed by the European ownership and supervision, the difficulties of manufacturing tea and the need of large capital deterred the hill people for plantation of tea on their own account.

With the expansion of tea industry, great economic activities started in the hill areas of Darjeeling as well as in the Dooars. New gardens were added every year and employment began to increase. In this connection it should, however, be noted that the tea industry in the hill areas went through the experience of running the garden by individual lease. But this was a disaster. Inefficient management by the private owners led to a crisis in the period between 1865 and 1868.[33]

2.2.2. Growth of Tea Industry in the Post-Independence Period:

The post-independence period practically records neither any addition to the area under tea nor to the number of new gardens in the tea industry, the engine of development for the hill areas of Darjeeling district. In 1943 there were 25290.8 hectares under tea with a total production of 12674475.00 kgs. and the yield rate was 501.15 kg. but these figures barely declined in 1951, when the area under tea, total production and the yield rate were 16569 hectares, 7838,000 kg and 473 kg respectively. Table 2.7 will help us to understand the nature of development of tea industry during the period 1951-1981. From the table it is evident that area under tea became higher in all the years beyond 1951 and the volume of production and the yield rate crossed the corresponding figures of 1951 and remained higher in all the years after 1951 except 1954. But it is remarkable to note that area under tea all along the period after 1951 upto 1981 was far lower than that of 1943. The volume of production was similarly lower in all the years except 1952, 1960 and 1980. It was only the yield rate which crossed the level of that in 1943 in all the years beyond 1951 except 1954, 1962 and 1966.

The indexes of area under tea, production and the yield rate since 1951 have been shown in Table 2.8. The year 1951 has been taken as the base year and the values of the variables of that year have been taken as 100. From the table, it is observed that the area under tea virtually remained stagnant during the period 1951-1981, while the yield rate and the production increased during the

years 1971 and 1981. But in comparison to all-India levels, the yield rate and the production of Darjeeling tea are observed to be much lower even in the pick production years like 1960 and 1980, which is evident from Table 2.10. The stagnancy of area under tea, at far below the corresponding figure in 1943 and the relatively lower level of the yield rate and production incomparison to the corresponding figures of India as a whole, indicate that there was a depressing state of affair in Darjeeling Tea Industry.

In this context it may be noted that the stagnancy of area under tea was due to the absence of extension of planting. The lower levels of yield rate and production were mainly caused by the prevalence of old and aged plants.

As regards the age of tea bushes it is held that tea plants in the Darjeeling gardens by and large crossed the age of full bearing, which is evident from Table 2.10. It is seen from Table 2.10 that the total area under tea bushes aged over 50 years constitutes about 81.75 per cent of the total area at the end of the year 1985. Another 6.61 per cent is observed to be in the categories of 31 to 50 years. The percentage of tea bushes which crossed the mid point of their economic life was 88.36. It indicates an alarming state regarding the age of tea bushes in the Darjeeling Tea Industry.

Theoretically, a tea bush in a garden may live indefinitely if sufficient food, water and air are made available and adequate pest and disease control measures are applied carefully. In practice,

however, tea bushes of an age beyond a certain limit can rarely be of economic value and their existence might have only academic interest. Thus, the old and upproductive plants are responsible for the relatively lower yield rates in Darjeeling tea gardens.[34]

Besides some other factors namely the existence of vacancy ratio as high as 15 per cent to 20 per cent, the substantially lower average plant population compared to other tea industries - the lower average application of nitrogenous fertilizers, pesticides and insecticides, the higher proportion of China variety bearing negative correlation with yield rate are coupled with the age composition to effect lower yield rate in this regard.[35]

The problem relating to the stagnancy of area under tea and lower level of yield rate and production can be removed by the measures as follows:

(i) Increasing the application of nitrogenous fertilizer over the existing average level.

(ii) Using correct weedicides and pesticides.

(iii) Using more irrigation and proper drainage system.

(iv) Reducing the vacancy ratio through regular infilling programmes.

(v) Adopting scientifically tested modern farm management methods like clonal propagation and high density planting.

(vi) Applying the rejuvenation programme i.e., the programme involving heavy pruning with intensive block infilling.

(vii) Uprooting the existing bushes with lower productivity and replanting new ones with increased plant population.

(viii) Replacement planting with increased plant population per hectare.

(ix) Changing the existing uneconomic age-mix of plants to more economic proportions by (i) bringing new areas under tea and (ii) extending the size of plantation with increased plant population per hectare.

The first three measures will not bring about any qualitative change in the bush-mix at all. They merely act as a booster to the existing yield rate and production in the short-term. Measures (iv) to (ix) will change the bush-mix of the tea gardens with the use of different plant breeds with intrinsically higher yield rate and better quality potentials. Measures (viii) and (ix) require the availability of fresh land for the plantation, although measure (viii) would not increase total hectarage under tea.[36]

But the lack of interest to invest in the above programme is a problem. It is mainly owing to the fact that the Darjeeling Tea Industry has been incurring negative profit over a decade as shown in Table 2.11, though it had a better price realisation compared to that of Assam valley mainly because of its unique flavour.

The negative profit has resulted from a relatively higher average cost of production confronted by the industry. The relatively higher cost of production was due to its nature. The nature of average cost of production in Darjeeling Tea Industry was such

that it assumed a break-up of 70 per cent : 30 per cent between the fixed and variable components. Nearly 40 per cent to 45 per cent of the average fixed cost was in the form of "man-power cost", i.e. wages, salaries, benefits to workers and staff, cost of providing amenities like hospitals, schools, food stuff etc. As 70 per cent of the cost of production in the Darjeeling Tea Industry was of a fixed nature and a major portion of this cost was in the form of man-power cost, average total cost of production per kg. of the increased at a lower level of production and sales which was again due to yield rate. Among the items constituting variable cost, cost on fuel, cost on transporting the made tea to Calcutta and levies imposed by the Government explained the higher average cost. Darjeeling Tea Industry was afflicted with the problem of huge transport cost of fuel, i.e. coal. It is reported that the garden located in high altitude hilly terrain had to pay over Rs. 480 per M.T. of coal whose pit head price was around Rs. 80/- (since increased considerably). Thus the transportation cost of coal raises the average total cost of production.[37]

Unlike Assam almost all Darjeeling tea is sold at the Calcutta auction, which is evident from Table 2.12. This is a problem which is beyond the control of Darjeeling Tea Industry. But it certainly inflates its cost of production by adding a higher transportation cost than Assam Tea Industry.

In addition, the Darjeeling Tea Industry had to pay a number of tax levies per unit of output. Table 2.13 will help us to understand it for the fiscal year 1978-79. These tax levies excluding

tax on profits inflated per unit cost of production approximately to the extent of Rs. 2.13 per kg. in the fiscal year 1978-79.[38]

These levies are fixed irrespective of the price of made tea. The price of tea is determined through the auction system by the forces of international demand and supply. There is no method by which tea producers in Darjeeling can simply determine the price on a cost plus mark-up basis, thereby passing tax on to the consumer. This is quite unlike other manufacturing industries where any increase in the tax structure is passed on the consumer forthwith. This depresses the profit margin by increasing the average cost per kg.

Besides the above levies in the indirect form, the Darjeeling Tea Industry has to pay a variety of direct taxes, viz. Income tax and agricultural income tax. The rates of these two taxes went up steeply after 1974-75. The increased rates of the said taxes affected adversely the development of the industry.[39]

Besides the negative margin of profit explained by higher cost of production in comparison to corresponding level pf prices, the Darjeeling Tea Industry entered in a disadvantageous position in respect of the nature of ownership and type of management which were also responsible for the decline of area under tea, yield rate and production.[40]

The history of tea industry in India was originally associated with the British enterprise who established Sterling companies

registered in the United Kingdom. A Company located in London employed agents or secretaries in Calcutta to implement the policies and programmes formulated by the Board of Directors. Besides, some Companies had visiting agents who were experienced planters and they submitted reports regarding the existing position of the tea estates. In the subsequent periods these sponsored tea estates were registered in India with rupee capital in order to purchase some of the Sterling tea estates or to start a new one of their own. Thus there grew a large number of Rupee Companies managed by some managing agents who looked after the interest of the Sterling estates. In this way Indian business house began to participate in the tea plantation industry.[41]

The ownership pattern of tea industry underwent certain changes when the Great Depression of 1929 reduced tea consumption. The market was so depressed that it became unremunerative to all these who were engaged in tea industry. In this situation, some of the foreign tea companies were sold out to Indians.[42] Changes in ownership pattern got further impetus after the termination of the World War II when the government set up a number of Reconstruction Committees to plan for the post war development. The reports on the progress of Reconstruction Planning in 1944 advocated the policy that profit motive might be harnessed to social needs.[43]

The Capital issues (control) Act, 1947, imposed restrictions on all Companies registered in India or abroad in respect of bonus, issues of all types of securities (shares and debentures) etc. The

foreign tea companies were thus compelled to take permission to declare bonsus. Besides, they were also adversely affected by the acts, the Foreign Exchange Control Act of 1947 and the Import - Export Control Act of 1947. These acts, therefore, helped to secure the domestic market for local producers and to utilise the foreign exchange in national manner. The foreign tea companies thus experienced difficulties in expanding tea cultivation and they sold out their tea estates to Indians.[44]

The changes which thus came in the ownership pattern in Darjeeling Tea Industry between the years 1947 and 1970 is manifested in Table 2.14. It appears from the Table 2.14 that the proprietory estates declined and private and public Limited Companies increased in number during the period from 1947 to 1970. The British - proprietory estates virtually disappeared and their positions were taken over by Indian proprietors.

The increasing rate of Indian participation since 1947 and the simultaneous gradual disappearance of the Sterling Companies brought forth unsafe condition in the administration of tea gardens. Before independence the ownership and the control of the tea gardens were mainly in the hands of the British. But since independence, the ownership pattern had showed some changes in favour of the Indian community. Tea gardens were purchased by local tea traders or money lenders like the Goenka family in Kurseong or the Bhojraj family of Gangtok. Some Kanjee banias from Uttar Pradesh also purchased a few gardens.[45] These new owners of tea gardens were

neither planters nor industrialists. They came into the business either as outsiders or as money lenders or as suppliers of commodities. Some of them were speculators in real estate. Most of the owners used the gardens as a source of short-term profit. Under the new ownership gardens were neglected and it brought about a deterioration in the age composition leading to the downward trend in the productivity of the Darjeeling Tea Industry.[46]

The pattern of sale of tea under the new ownership is that the owners sell a part of their produce directly to the retail shop keepers without coming into the auction market. In this way the new owners are evading tax and deprive the small tea share holders of their profit and the government of its revenue. Moreover, the new owners completely changed the quality of management of the gardens. In the last two decades there had been a phenomenal increase of salary of the managers of tea gardens all over India except Darjeeling. The salary of managers in the tea gardens in Darjeeling Hill Areas is much lower on an average than that in the tea plantations of Assam and other areas. Within Darjeeling also the salary of the managers of Indian owned gardens is lower than that of the British owned FERA or Sterling Companies. The relatively lower salary of the managers in the Darjeeling Tea Industry probably makes the quality of management poor.[47]

With the poor management there came a centralised policy of management of tea gardens. Tea companies which are owned by Indian Directors try to control the management of the gardens from

a distance. This centralisation often goes beyond reasonable limits. The local managers are not authorised to take any decision regarding reinvestment and replantation, because Indian Merchant Directors are not accustomed to delegate powers to their local managers. Managerial talent in the Darjeeling Tea Industry, particularly in proprietory or partnership estates is not utilised properly for the long-term development of the industry due to the fact that the owners usually follow the policies for solving the short-term problem.[48]

Since the sixties, the new owners of the tea gardens systematically stripped the gardens of their assets, drained off the surplus and siphoned it to other industries situated in Bombay, Delhi or in Rajasthan.

The British management never declared dividends of more than 20 per cent and the surplus was either kept in reserve funds or invested in the gardens. But under the new management dividends are declared at high rates in favourable conditions and no provision is made for the long-term development of the gardens. No resources are kept for the future development and for the maintenance of health of the gardens.[49]

The type of management discussed above has affected Darjeeling Tea Industry in such a way that the gardens under this industry had been sick in the early part of the seventies. The size of the 'sick' gardens, in terms of planted area, varies from 29 hectares to 30 hectares at that time. It means a total loss to the industry of 1669 hectares, constituting about 10 per cent of the total

hectarage under tea. Again this sickness means a loss in terms of production of at least 0.48 million kgs. of tea in a year which is about 5 per cent of the total production of tea.[50]

Apart from the bad management aggressiveness of the trade unions has increased. This is very much likely when the workers feel that the wealth of the gardens has been diverted to other places. But the leadership of the trade union movement can not channelise its organisation towards the healthy growth of the tea gardens. The leadership of the movement is mainly given by outsiders. The "peak" season of the union activities begins during the Durga Puja (from the last week of August) season with the demand of bonuses. After that they leave the gardens and the 'dull' season of the union activities starts. The trade union movement which gained momentum after independence did nothing subsequently on issues relating to social life of the workers in Darjeeling Tea Industry. Trade unions have failed in giving the labourers a proper role in the context of the sickness of the gardens in Darjeeling Tea Industry.[51]

Thus the inadequacy of re-investible surplus due to negative profit accrued to Darjeeling Tea Industry, the change in the objective of the ownership and management after independence, employment of substandard managers, centralised policy of management, draining surplus and siphoning it to other industries in other industrial zone of India, misplay of trade unions and labour unrest are observed to stand in the way of the short-term as well as long-term development of the Darjeeling Tea Industry and responsible

for its depressing condition after independence.

2.2.3. Impact of the Sickness of Tea Gardens on Rural Areas:

With the declining trend of tea industry, the pressure of population on land increased. The land-man ratio deteriorated further. More and more land was fragmented and more families fell from the status of the "middle farmers" to that of the "marginal farmers" which meant average land holding was less than 2.5 acres. This would better be understood from Table 2.15.

The increasing pressure of population in the rural areas due to the growth of population could not be accommodated further in the tea gardens of the hill areas. Hence more and more people are concentrated on the same piece of land. But it is known that fertile land is not easily available in the hill areas. In the absence of any other employment opportunity, a large number of people take recourse of cultivation for their livelihood which implies poverty of the rural people.

Plantation industry is the most important sector in the hill areas of Darjeeling. About 46 per cent income is generated from plantation and forestry. During the British period, the expanding tea industry offered scope for employment to the hill people in the plantation sector and served as an important vehicle of economic development. The economic condition of the hill people was much better than that of the plain areas at that time. But after independence due to the stagnation of tea industry the hill people are

getting less and less employment opportunity in the plantation sector and they are over-crowding the existing land. There is hardly any scope for bringing more land under cultivation. Consequently, a large number of people became agricultural labourers which was almost absent during the British period.

With the downward movement of tea industry the problem of unemployment becomes acute in the hill areas of Darjeeling. In the earlier censuses of 1931 and 1941 the entire population in the age group 15-59, were found to be engaged in some kind of work. The unemployment problem during that period was not remarkable. But the situation changed after independence. The size of non-working population increased abruptly overtime. This can better be understood from Table 2.16.

It appears from the table that the proportion of non-working population to total working population in the age group 15 to 59 is increasing over the decades after independence and is higher in all the urban and "tea areas" than the agricultural areas (i.e., Kalimpong I & II and Garubathan blocks) except Mirik Block in 1961. This means that a large number of people remained unemployed in tea areas. The proportion of non-working population in the employable age 15-59 is low in Kalimpong rural areas but it is high in urban and tea areas. This is because, a large number of people somehow got opportunities in the agricultural land which

simply helped to raise the number of working people by increasing the number of disguised unemployment. But at the same time it should be remembered that except tea, there is no other major or minor medium-sized industry which can absorb the surplus agricultural labour in the hill areas of Darjeeling district.

Table : 2.1

Areas Under Forests in the Hill Areas of Darjeeling District before Independence

Years	Areas Under Forests (in sq. km.)	Percentage of Forests to Total Geographical Area of the District
1901	1554.21	51.54
1911	1553.98	51.54
1921	1481.31	49.13
1931	1427.23	45.47
1941	1414.05	45.80

Source: West Bengal Forests : Centenary Commemoration, Volume D-25, Calcutta, 1964.

Table : 2.2

Areas Under Forests in the Hill Areas of Darjeeling District After Independence

Years	Areas Under Forests (in sq. km.)	Percentage of Forests to Total Geographical Area
1951	1430.34	46.03
1961	1432.65	46.07
1971	1286.42	41.83
1981	1252.66	39.78

Sources: (i) West Bengal Forests : Centenary Commemoration, Volume D-25, Calcutta, 1964.

(ii) Roychoudhury, P.K., "Watershed Management/Protection of Environment" in The Eastern Himalayas: Environment and Economy ed. by Sarkar, R.L. & Lama, Mahendra P. (Atma Ram and Sons: Delhi, 1986).

(iii) Government of West Bengal, Census 1971: West Bengal District Census Hand book, Darjeeling, Series 22.

Table : 2.3

Rate of Decline* of Forest Area Per Year in the Hill Areas of Darjeeling District during the period before and after Independence

Periods	Time-Scale	Rate of Decline per cent/per annum
Before Independence	1901-1941	0.23
After Independence	1951 to 1981	0.41

Source: Compiled from Tables 2.1 & 2.2

*Note : Rate of Decline = Absolute Value of Negative Rate of Growth,

Where Rate of Growth is defined as

$$r = \frac{1}{T-1} \times \frac{(x_T - x_1)}{x_1} \times 100$$

Where T is the end point of the time period.

1 is the beginning point of the time period.

x is the magnitude of variable.

Table : 2.4

Percentage Share of Expenditure Under the Head 'Regeneration and Plantation' in the Total Expenditures Incurred by the West Bengal Forest Department for Forest Management During 1952 to 1965 in the Hill Areas of Darjeeling District.

Years	Percentage Share of Expenditure on Regeneration and Plantation
1952	8.94
1953	8.10
1954	9.12
1955	9.79
1956	7.46
1957	6.86
1958	7.36
1959	8.64
1960	8.27
1961	7.20
1962	7.32
1963	7.34
1964	7.85
1965	11.12

Source: Compiled from the Source, Government of West Bengal, Directorate of Forests, Tenth Working Plan For the Darjeeling Division Northern Circle, 1967-68 to 1976-77, Volume-I.

Table : 2.5

Percentage Share of Expenditure Under the Head Regeneration and Plantation in Total Expenditure Incurred by the West Bengal Forest Development Corporation for the Forest Management in the Hill Areas of Darjeeling District during 1975 to 1981

Years	Percentage share of Expenditures on Regeneration and Plantation
1975	7.67
1976	7.93
1977	7.35
1978	7.93
1979	8.52
1980	6.68
1981	4.45

Compiled From the Source: Government of West Bengal, Forestry: in West Bengal - An Appraisal 1977-1982.

Table : 2.6

Number of Tea Gardens, Area under Tea, Total Production and Yield rate of Tea in the Hill Areas of Darjeeling District Before Independence

Year	No. of Tea Gardens	Area Under Tea (in Ha.)	Total Production of Tea (in kg.)	Yield rate of Tea in kg/Ha)
1866	39	4000.00	196365.50	49.09
1867	40	3685.60	262188.00	71.14
1869	44	4026.80	383197.05	95.16
1870	56	4400.00	774578.00	176.04
1872	74	5801.20	1322381.70	227.95
1873	87	6278.00	1330519.50	211.93
1874	113	7552.00	1781348.00	235.88
1885	175	15399.60	4090500.00	265.62
1895	186	19476.80	5271525.00	270.66
1905	148	20247.20	5644941.25	278.80
1910	148	20512.40	6361875.00	310.15
1915	148	21609.60	9137025.00	422.82
1920	148	23742.40	6907500.00	290.94
1925	148	23742.40	8429625.00	355.05
1930	148	23742.40	9391725.00	395.57
1935	148	23742.40	9461700.00	398.51
1940	142	25223.60	16074675.00	637.29
1941	N.A.	N.A.	N.A.	N.A.
1942	N.A.	N.A.	N.A.	N.A.
1943	N.A.	25290.80	12674475.00	501.15

Sources: (i) Dash, A.J., Bengal District Gazetter: Darjeeling (Alipore : Bengal Government House, 1947)

(ii) Hunter, W.W., A Statistical Account of Bengal: Vol. X (Delhi-35 : D.K. Publishing House, 1974).

Table : 2.7

Area Under Tea, Production of Tea and Yield rate of Tea in the Hill Areas of Darjeeling District during 1951 and 1981

Year	Area under Tea (in Ha)	Production of Tea (in kg.)	Yield Rate (in kg/Ha)
1951	16569.00	7838000.00	473.05
1952	17623.00	12758170.85	723.95
1953	17523.00	9940797.90	567.30
1954	17123.00	6308626.89	368.43
1955	17223.00	9373617.75	544.25
1956	17323.00	9739510.29	562.23
1957	19211.22	10801508.44	562.25
1958	19284.77	11594389.41	601.22
1959	19368.90	12558020.00	648.36
1960	20240.66	13228890.56	653.58
1961	18605.00	10107000.00	543.24
1962	18359.00	9149000.00	498.34
1963	18337.00	10038000.00	547.42
1964	18517.00	10021000.00	541.18
1965	18381.00	9589000.00	521.68
1966	18357.00	8716000.00	474.81
1967	18462.00	10449000.00	565.97
1968	18559.00	10089000.00	543.62
1969	18253.00	9530000.00	522.11
1970	18067.00	10058000.00	556.71
1971	18245.00	10293000.00	564.15
1972	18204.00	11477000.00	630.47
1973	18173.00	11344000.00	624.22
1974	17679.00	11543000.00	652.92
1975	17940.00	10687000.00	595.71
1976	17958.00	11344000.00	631.70
1977	18134.00	11577000.00	638.41

Contd..

Table : 2.7 (Contd..)

Year	Area under Tea (in Ha)	Production of Tea (in kg.)	Yield Rate (in kg/Ha)
1978	18151.00	11529000.00	635.17
1979	18360.00	10812000.00	588.89
1980	19248.00	12689000.00	659.55
1981	19239.00	12226000.00	635.48

Sources: (i) Tea Statistics, 1961, Published by Tea Board, India Collected from Census 1961 : West Bengal District Census Hand Book, Darjeeling,

(ii) Tea Statistics : 1982-83, issued by the Tea Board of India, Calcutta-1.

(iii) Tea Statistics : 1985-86, issued by the Tea Board of India, Calcutta-1.

Table : 2.8

Indices of Growth of Area Under Tea, Production and Yield Rate of Tea in the Hill Areas of Darjeeling District, during 1951 and 1981

Year	Indices of Area	Indices of Production	Indices of Yield Rate
1951	100	100	100
1952	106	163	153
1953	106	127	120
1954	103	81	79
1955	104	120	115
1956	105	124	119
1957	116	138	119
1958	116	148	127
1959	117	160	137
1960	122	169	138
1961	112	129	115
1962	111	117	105
1963	111	128	116
1964	112	128	114
1965	111	122	110
1966	111	111	100
1967	111	133	120
1968	112	129	115
1969	110	122	110
1970	109	128	118
1971	110	131	119
1972	110	146	133
1973	110	145	132
1974	107	147	138

Contd..

Table : 2.8 (Contd..)

Year	Indices of Area	Indices of Production	Indices of Yield Rate
1975	108	136	126
1976	108	145	134
1977	109	148	135
1978	110	147	134
1979	111	138	124
1980	116	162	139
1981	116	156	134

Source: Indices are calculated on the basis of data present in Table 2.7 earlier.

Table : 2.9

Production & Yield Rate of Darjeeling Tea Industry Expressed As Percentage of Corresponding Figures in India As a Whole during 1951 to 1981

Year	Tea Production in Darjeeling (in million kg.)	Yield Rate in Darjeeling (in kg/Ha)	Tea Production in India As a Whole (in million kg).	Yield Rate in India as a Whole (in kg/Ha)	Percentage of Tea Production in Darjeeling to All India Level	Percentage of Yield Rate in Darjeeling to that in All-India Level
1951	7.84	473	285.40	901	2.74	52.50
1960	13.23	653	320.50	969	4.13	67.39
1961	10.11	543	354.40	1070	2.85	50.75
1971	10.29	564	435.47	1214	2.36	46.46
1980	12.69	659	569.17	1494	2.23	44.11
1981	12.23	635	560.43	1461	2.18	43.46

Sources: (i) Tea Statistics by J. Thomas & Co, Calcutta.

(ii) Tea Statistics by Tea Board, Calcutta

Collected from Techno-Economic Survey of Darjeeling Tea Industry : Tea Manufacturing and Marketing Consultants, prepared by TM & MC Pvt. Ltd. (Calcutta-17, October, 1979), p. 11.

Table : 2.10

Distribution of Area Under Different Age Group of Tea Bushes on the Hill Areas of Darjeeling District as on 31.12.1995

Age Groups of Tea Bushes	Area under Tea Bushes (in Ha.)	Area under Tea Bushes (in per cent)
≤ 5 years	502	2.88
5-10 years	292	1.67
11-20 years	533	3.06
21-30 years	703	4.03
31-40 years	520	2.98
41.50 years	634	3.63
50 ≤	14260	81.75
Total	17444	100.00

Source: Tea Statistics 1985-86, issued by the Tea Board of India, Calcutta-1.

Table : 2.11

Average cost of Production, Price and Profit Margin per kg. of Darjeeling Tea

Year	Price in Calcutta Auction (in Rs.)	Average cost of Profuction (in Rs.)	Profit Margin (in Rs.)
1970	12.23	11.65	+0.58
1973	14.23	15.00	-0.70
1975	17.22	19.30	-2.08
1980	28.37	30.15	-1.78
1981	26.38	32.00	-5.62
1982	28.22	35.00	-6.78

Source: Memorandum to the Commerce Minister, Government of India, by the Tea Association of India, dated 20.12.82.

Table : 2.12

Volume of Sale of Darjeeling Tea and Assam Tea in Calcutta, Gauhati and Siliguri Auction Markets

Years	Darjeeling Tea (Combined) Volume of Sale in : (in thousand kg)				Assam Tea (Combined) Volume of Sale in : (in thousand kg)			
	Calcutta Market	Gauhati Market	Siliguri Market	Total	Calcutta Market	Gauhati Market	Siliguri Market	Total
1973	10028 (99.96)	4 (0.04)	-	10032 (100.00)	123360 (86.37)	19470 (13.63)	-	142830 (100.00)
1976	10856 (100.00)	- -	- -	10856 (100.00)	129968 (82.13)	28282 (17.87)	-	158250 (100.00)
1980	7608 (99.70)	23 (0.30)	-	7631 (100.00)	100672 (67.03)	49522 (32.97)	-	150194 (100.00)
1981	9396 (99.99)	1 (0.01)	-	9397 (100.00)	114631 (68.00)	53952 (32.00	-	168583 (100.00)
1982	8466 (92.57)	1 (0.01)	679 (7.42)	9146 (100.00)	76998 (53.69)	66141 (46.12)	269 (0.19)	143408 (100.00)

Contd..

Table : 2.12 (Contd..)

Years	Darjeeling Tea (Combined) Volume of Sale in: (in thousand kg)				Assam Tea (Combined) Volume of Sale in: (in thousand kg)			
	Calcutta Market	Gauhati Market	Siliguri Market	Total	Calcutta Market	Gauhati Market	Siliguri Market	Total
1983	9437 (93.08)	- -	701 (6.92)	10138 (100.00)	74513 (52.96)	65809 (46.77)	374 (0.27)	140696 (100.00)
1984	9646 (95.20)	1 (0.009)	485 (4.79)	10132 (100.00)	101153 (57.15)	75496 (42.66)	351 (0.20)	177000 (100.00)
1985	9774 (94.10)	- -	612 (5.90)	10386 (100.00)	134029 (57.37)	99337 (42.52)	239 (0.11)	233605 (100.00)
1986	8335 (95.70)	- -	375 (4.30)	8710 (100.00)	102396 (46.90)	115682 (52.98)	258 (0.12)	218336 (100.00)

Source: Tea Statistics : 1985-86, issued by the Tea Board of India, Calcutta-1, pp. 28, 41, 53

Note: The figures in the parentheses are the respective percentages.

Table : 2.13

Incidence of Taxes on the cost of Production of one kg. of Tea of Darjeeling Tea Industry in 1978-79

Types of Taxes	Tax Levies on the cost of production of one kg of Tea (in Rs.)
1. Land Rent & Cess	0.25
2. Entry Tax	0.14
3. Excise Duty	1.25
4. Special Duty (Central)	0.06
5. Cess	0.08
6. Electricity Generating Duty	0.03
7. State & Central Sales Tax on Stores Item	0.32
Total	2.13

Source: Techno Economic Survey of Darjeeling Tea Industry: Tea Manufacturing and Marketing Consultants, Prepared by TM & MC Pvt. Ltd. (Calcutta-17), October, 1979, p. 70.

Table : 2.14

Change in Ownership Pattern of the Tea Gardens Under Darjeeling Tea Industry

Patterns of Ownership	Ownership in 1947		Ownership in 1970	
	Indian	Non-Indian	Indian	Non-Indian
1. Proprietory	31	8	32	-
2. Private Limited	1	-	12	-
3. Public Limited	21	10	41	-
4. Sterling	-	30	-	16
Total	53	48	85	16

Source: Das Gupta, M, "Sickness of Darjeeling Tea Industry" in North Bengal Economics [redacted], Vol. 1, No. 8-9, published from Alipurduar, District-Jalpaiguri.

Table : 2.15

Size-wise Percentage of Households Cultivating Land in the Hill Areas of Darjeeling District in the Year 1961, 1971 & 1981

Size of Holding	Year								
	1961			1971			1981		
	Darjeeling/ Sadar Sub-division	Kurseong Sub-division	Kalimpong Sub-division	Darjeeling Sub-division	Kurseong Sub-division	Kalimpong sub-division	Darjeeling Sub-division	Kurseong Sub-division	Kalimpong Sub-division
Upto 2.5 Acres	26.70	44.00	17.45	43.40	51.51	45.62	83.07	81.38	47.95
2.5 to 5 Acres	16.30	14.00	16.40	36.40	24.78	24.68	10.57	9.51	22.92
5 to 10 Acres	20.60	18.00	31.60	14.90	18.46	21.54	4.31	6.21	20.52
10 Acres & above	36.40	24.00	34.55	5.30	5.23	8.16	2.05	2.90	8.61
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Das Gupta M., "An Audience Profile : Darjeeling District", A Paper submitted in the Media orientation Workshop in Mirik on dated 2nd-7th April, 1986, organised by United Nations International Children's Fund.

Table : 2.16

Number of Non-Working Population and Its Percentage to Total Working Population in the Age Group 15 to 59 in the Hill Areas of Darjeeling District in 1961 and 1971

Name of the Blocks/ Towns	No. Total Working Population (Age Group 15-59)		No. of Total Non-Working Population (Age Group 15-59)		Percentage of Non-Working Population to the Total Working Population (Age Group 15-59)	
	1961	1971	1961	1971	1961	1971
Darjeeling Town	23525	24778	10885	13501	46.27	54.49
Kalimpong Town	14498	13246	6205	7340	42.80	55.41
Kurseong Town	7244	9186	3653	5379	50.43	58.56
Darjeeling-Phulbazar Block	34664	43560	7737	14350	22.32	32.94
Sukhiapokhri-Jore Bunglow Block	30089	37809	6687	14766	22.22	39.05
Rangli-Rangliot Block	19764	28267	4691	10031	23.74	35.49
Kalimpong Block (I & II)	37743	44651	7404	14221	19.62	31.85
Garubathan Block	13521	17132	1776	4329	13.14	25.27
Kurseong Block	23735	29580	7025	12054	29.60	40.75
Mirik Block	10996	14867	1754	5012	15.95	33.71

Source: (i) Government of West Bengal, Census, 1961, West Bengal : District Census Hand Book, Darjeeling.

(ii) Government of West Bengal, Census, 1971, Series 22, West Bengal, District Census Hand Book, Darjeeling, Part X-C.

NOTES & REFERENCES

NOTES:

Artificial Regeneration: When a forest is under-stocked, or contains many mal-formed trees of several species only a few of which are utilisable as timber, and these are slow-growing or when on clear felling the existing growth of a new crop of the desired species does not come up naturally, the forest is regenerated artificially. Sometimes seed of valuable species is broadcasted in the forest if there is a reasonable chance of its germination. This is called artificial regeneration.

Natural Regeneration: It implies the alternation of desired species through studying the ecological conditions obtained on the forest floor to such an extent that regeneration is induced and then it survives and gets established.

Thinning: When plants of the principal species reach the sapling stage, competition intersets in and felling are needed to reduce congestion. The best stems are retained and given the optimum freedom for development. This operation is called 'thinning'. Technically it is defined as a felling made in an immature form for the purpose of improving the growth and form the trees that remain, without permanently breaking the canopy, viz., the cover of branches and foliage formed by the crowns of trees in a wood. Technically speaking, thinning is a felling made in an immature stand, beyond the sapling stage, for the purpose of improving the growth and form of the trees that are left without permanently breaking the canopy.

Pruning: This is removing live or dead branches or multiple leaders from standing trees for the improvement of the tree or its timber.

Girdling: It is cutting through the bark and outer living layers of wood in a continuous incision all round the bole of a tree. It is also sometimes called ringing.

Selection System: Extraction of trees economically from the forests in remote areas containing many species only a few of which are of large sized.

Felling Cycle: As the entire forest can not be gone over for removing marketable trees every year, it is generally divided into a number of sections, 15 to 30, one of which is worked in a year. This practice is called 'felling cycle'.

Selection-cum-Improvement System: Sometimes, besides the removal of marketable trees it is considered desirable to improve the condition of the forest to promote the development of younger trees of valuable species or to induce regeneration of these species. With this object in view of certain trees of lesser value, interfering with the growth of value species, are also removed. This is referred to as the 'selection-cum-Imrpvement System'.

Shelterwood Compartment System: When regeneration of the principal species is induced and established under the existing maturing crop by opening it gradually for say X years, so that eventually on clear-felling the Overwood, a crop varying in age from one to X years is obtained, the system is known as the 'Shelterwood Compartment System'.

Artificial Regeneration through Taungya: An agri-silvicultural method to reduce the cost of artificially restocking an area as also to produce some agricultural crop, as long as this can be done without interfering with the forest species. This is also used to wean the tribals of the baneful practice of shifting cultivation.

Vacancy Ratio: The ratio of the difference between the optimum number of plants per hectate and the actual number of plants per hectare to the optimum number of plants, i.e.,

(optimum No. of plants per hectare - actual number of plants per hectare)/ ÷ (optimum number of plants per hectare)

Replacement Planting: The process of extending tea cultivation on fallow land of the tea estate through replanting the tea plants from the tea fields of the estate concerned with higher number of plant population than the optimum number.

Fixed Cost : Typical fixed cost in any tea estate is constituted by wages to permanent workers, salaries to monthly staff, cost of cultivation, depreciation, fixed factory and administrative overheads.

Variable Cost: Typical variable cost items in any tea estate are plucking cost, excise, special duty, cess, tea chests, power and fuel, transport, brokerage and sampling.

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