

REPORT OF COMMITTEE
ON
ORIENTATION OF FOREST EDUCATION
IN INDIA



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF HOME AFFAIRS
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P R E F A C E

Tribals are a distinct social group who are usually confined in definite areas, speak a common dialect, have cultural homogeneity and a unifying social organisation. They form a sizeable percentage of total population in certain regions of India, such as the North-Eastern region, portion of Bihar, Orissa, M.P., A.P., Maharashtra, Gujarat, Rajasthan and Andaman and Nicobar Islands. Irrespective of their location, they are people with abundant self-respect, who are conscious to preserve their social and cultural identity. On account of various pressures exerted on them they retreated into forests and hill tracts, over the centuries. They are simple as they are fascinating, as sincere as they are innocent, as colourful as they are hospitable and as lively as they are lovely. Majority of them are poor and lead a hard life but not a discontented one. They are physically tough and suit the rugged terrain, which they inhabit. Civilisation has not spoilt them, sophistication has not polluted them, violence has not encroached upon the peaceful pursuits to which they are dedicated. Their wants are primarily basic needs of life like food, shelter and clothing.

(ii) Forest have been their well-loved home through generations. It is abode of their mother deity and represents whole way of life, a home, culture, worship, food and wherewithal, employment and income. The tribal communities could subsist for thousands of years with reasonable standards of health, and abode mainly because forests provided them food, water, shelter, clothes, medicine and employment.

(iii) The overwhelming majority of the population living in forests are tribal communities. They have evolved a way of life, which, on the one hand, is woven around forest ecology and forest resources and on the other, ensure that forest is protected against depredation by man and nature. Thus, the local tribal communities have a symbiotic relationship with forests and the existence of both is mutually beneficial.

(iv) However, with the passage of time their own untrammelled peaceful world has been disturbed. The balance between these forest dwellers and nature has tilted due to extraneous pressure of burgeoning population and entry of outsiders in their otherwise peaceful home.

In the past this disturbed situation has resulted into discontentment and at times even in minor revolts. While the forest department, with its limited resources has shown concern for tribals, the instances like opposition of plantations of Teak by Hos, Oraons and Mundas of Santhal-Parganas and that of tropical Pines by the Gonds of Bastar area are recent examples which call for developing a better understanding and communication between forest development and tribal welfare activities. Problem of settlement of displaced persons from National Parks like Gir, Bharatpur and Corbett Park etc., bonded labourers, exploitation of tribals by forest contractors, forest villages etc. has to be tackled with sympathy and respectful considerations of social and cultural milieu of tribals. While the legislators, planners, administrators and people at large have to be educated and enlightened regarding tribal ways of life, the forest officials have to be trained with a special orientation to develop proper understanding of social customs, taboos, beliefs, myths, laws, justice and code of conduct in day-to-day life of these forest dwellers.

(v) The education regarding the intricate ways of tribal life outside the forest department can be imparted through schools, colleges and universities by making suitable additions in the syllabi. The education and training of forest personnel is the responsibility of the Central Government and the Directorate of Forest Education (F.R.I. & Colleges) maintains the uniform standards of training at all the Forest Colleges. Forestry and Tribal Development is desirable to be included as a subject at all levels of training of professional foresters. The suitable amendments in the syllabi can be made to incorporate it as a subject for the training in the Forest Colleges run by the State Governments and the others run by the Centre. The number of lectures allotted to each subjects can be reviewed and by nationalisation it is possible subject within the existing duration of training.

(vi) Before independence, the Britishers followed a policy of isolation of tribals from the main-stream of national life. This was the direct offshoot of the exploitations of tribal communities by non-tribals resulting in tremendous tribal discontent and agitations all over the central India tribal belt.

(vii) The spread of Christianity was due to help which tribals got from the missionaries in fighting their land-alienation cases and in matters of education and health.

(viii) However, the tribals could not be contained and the change was perceptible in the form of Tanabagats of Bihar, who under the influence of Mahatma Gandhi became total prohibitionists and several voluntary organisations led by devoted people like Thakkar-Bapa etc

(ix) Since Independence, the problem of development of the tribal regions and amelioration of the condition of the tribal population has received the active consideration of the Government of India. The Constitution of India provides several protective measures in the fifth and sixth schedules to safe-guard the interest of tribals. However, for the first time Pt. Jawaharlal Nehru, the then Prime Minister, enunciated the five fundamental principles of tribal development known as *Tribal Panchsheel* and his approach can be quoted in following words--

“Our people should know more about this problem and should develop affection and respect for these fine people. There should be no attempt to impose other ways of life on them in a hurry. Let the changes come gradually and be worked out by the tribals themselves”.

“We should avoid over-administering these areas and in particular, sending too many outsiders into tribal territory. The over-tones of development should be pursued within broad frame-work of *Five Fundamental Principles*—

- (i) People should develop along the lines of their own genius and we should avoid imposing anything on them. We should try to encourage in every way their own tradition and culture;
- (ii) Tribal rights in land and forests should be respected;
- (iii) We should try to train and build-up a team of their own people to do the work of administration and development. Some technical personnel from outside will, no doubt, be needed especially in the beginning. But we should avoid introducing too many outsiders in tribal territory;

We should not over-administer these areas or *overwhelm* them with multiplicity of schemes. We should rather work through and not in rivalry to, their own social and cultural institutions; and

- (v) We should judge results not by statistics or the amount of money spent, but by the quality of human character that is evolved.

(x) This approach has been endorsed through all these years of planned development of the tribal areas. However, it was little unfortunate that certain important considerations like developing them along their own lines of genius, optimum utilisation of available natural resources in the form of land and forests was not given due consideration. Consequently, the investment could not generate a chain of self-sustainable goods and services and thus, majority of the tribals could not be brought above the poverty line. Till late, the emphasis was more on giving monetary help rather than using their traditional skills and available natural resources. From the sixth five year plan onwards, this realisation has dawned, the emphasis has rightly shifted to these two important ingredients of development in tribal areas. Considering this aspect, the forests and the tribal skills in use of forest resources in various ways have tremendous potentiality in formulating and implementing forest and tribal development plans which can be successfully interlinked to serve both. The best protective device for the existing forests and creating of new forests is to foster an interest of the local community in the adjoining forest wealth. In other words, the tribal community should be accepted as partners in the local forest development in each area.

(xi) Some of the tribals are totally dependent on forests. The Andamanese, Onges, Jarwas, Shompens and Sentinelese depend on fruits, seeds, leaves, tubers and bark etc. of forest trees and a few like Birhors have specialised in rope-making and charcoal manufacture, Khairwais in Katha manufacture etc. Similarly, the shifting cultivation is practised by over 2.6 million tribals (Dhebar Commission report, 1961) in almost all the North-Eastern States and parts of Assam. The traditional graziers, like Todas, Baigas etc. and nomads like Gujars and Gaddies etc. are directly dependent on forests to a great extent for their fuel-wood and fodder as well as for the timber of agricultural implements. The Hari Singh Committee stated that about sixty percent tribals live inside the forests and thirty percent are on the fringes and they also depend on forests to a great extent.

(xii) The forest area of India is 74.74 million hectares, which is 22.7% of the total land area. According to the National Forest Policy of 1952, it is prescribed to be 33%. The average per capita holding of forests is 0.109 ha. as against 1.0 ha. of the world. The total growing stock of the country's forests is 1997 million m³ (r) of wood with recorded annual production of 27.72 million m³ (r) during 1977-78 as against a demand of 60.3 m³ (r). The rising demands for goods and services due to rapidly increasing human and live-stock population, growing competition of land for agricultural and urban use coupled with low productivity has caused India to be classified on the world's map of forest resources as belonging to a “*Forest deficit zone*”.

(xiii) At the global, national and local levels, the forests have to serve three sets of needs, (a) ecological security, (b) fuel fodder, food, fibre and building material and (c) needs of cottage, smallscale, medium scale and large scale industries. The rural poor will continue to look to forests to provide much of their basic requirements. It will be a major challenge to development to meet the constantly effective demand

of rural communities for forest products. The most hopeful strategy in assuring supply lies in social forestry, community forestry, forest farming in which forests are managed by and for the local people. It is a gigantic task which needs strengthening forestry by rationalising the operations, larger investments and use of new technologies and, last but not the least, the people's motivation and investments with forestry programmes.

(xiv) The forest departments manage 1/5th of the land areas of the country by handful of people-where-as 4/5 of the country land is managed by around 70% of its population (around 500 million people). There is no nodal department to see and coordinate, that about 13.6% of the land area i.e. 43.6 million ha. land should be available for plantation in the form of degraded forests, ravines, alkaline soils, roadside plantations, canal banks, farm-roads, village ponds, community lands, water logged areas and wastelands etc.

(xv) In terms of capital assets and future potentialities of expansion and development, forestry is the biggest public sector which is largely labour intensive and has tremendous potentialities of generating a self-sustained economic system for the rural masses. In order to harness this vast potential the people have to be considered as potential allies in the battle for reforestation and afforestation and they have to be fully equipped to combat it. Thus, it is imperative that forestry and its education must reach the masses. To accomplish this objective, forest education in schools, colleges and universities brooks no delay. The forestry profession will have to enlarge its vision to the growing of trees in collaboration with local people. Suitable technology and production can bring the tribal masses above grinding poverty lines. To meet the needs of the farmers, suitable policy, technology and service package forestry extension may be ensured to make the country green, besides meeting demands of forest products. Forestry development should be treated as an essential ingredient of tribal development plans and should ensure socio-economic development of under-privileged communities for which nation has shown so much concern. Like all developmental activities of electricity, road, irrigation and education etc. forestry development should also be treated as a basic infra-structural requirement for the tribal community.

(xvi) It is a very fortuitous coincidence that practically wherever there are concentration of tribal population, there happens to be sufficient forest area nearby. It is not, therefore, difficult to comprehend that if the forest resources are managed with a view to benefit the local tribal people, forest-dwellers and the poor people within the reasonable reach of the forest areas, all such people who are at the moment below the poverty line can be raised above it. Schemes like extension of Tusal-rearing, Collection of Sal seed for oil extraction, Collection and processing of bidi-leaves from Tendu leaves, Collection and processing of medicinal herbs, Collection and processing of various gums, resins and barks etc. for commercial uses etc. can be prepared for individual families or for a group of families or even for a village as a whole. But this will be possible when both the foresters and the tribals have full sympathies for each other. It is really a tragedy that while the average tribal and forest dweller is immensely interested in preserving the forest wealth because he realises that his entire source of living depends on the forest and yet, there are instances that the forest wealth is being destroyed by people with impunity, leading to all round deterioration not only in the environment but ultimately to his own source of living. The foresters are also equally interested in preserving the forest wealth and managing it scientifically on the principle of sustained yield basis in perpetuity. Thus, both the tribal people and the foresters have ultimately the same common aim of preserving and augmenting the forest wealth. How strange is then, that in many places, the foresters and the tribal people do not see eye-to-eye with each other and occasionally come into a conflict. Such a situation is definitely due to lack of communication between the foresters, on the one hand, and the tribal and the forest dwellers, on the other hand. In some places the tribal people think that the forest, does not belong to them but to the State and, therefore, it is not their property and so they can indulge in its destruction without any damage to themselves. The foresters probably think that the forests are not necessarily meant only for the tribal people but also for making available raw-materials to far-off places to meet requirement of the society through the wood-based industries. If, some-how, they understand that they are the real partners in the management of the forests, very likely the antagonistic feeling from their minds will disappear. This is only possible when there is close communication between the foresters and the tribal people and the forest-dwellers. It is true that in the past, particularly during the British administration, there used to be considerable gap between the ruler and the ruled but now after Independence, under democratic system, the ruler is basically the servant of the people. If this idea is inculcated fully by those who are responsible for the administration of the forests, I am sure, the tribal people and other forest dwellers will become sympathetic to the cause of forest preservation. But this can not be achieved by mere rhetoric. It has to be translated into action, and the best way to achieve it, will be to earmark sufficient areas of forests through the scientific management of which enough income could be generated for the tribal people living in a particular area. We may go to the extent that even if such forest produce has been utilised in some industry, a part of the profit of the industry should be made available to the tribal village/society for their general development. The management of the forests must be for the satisfaction of the day-to-day needs of the tribals and the forest dwellers in respect of firewood, leaf-fodder, small timber, edible fruits, leaves, gums, resins etc. Where there are no such forests, the Forest Department should raise plantations of suitable species to meet the day-to-day demands of the tribal people. If there are suitable blank areas, then plantations of Arjun trees may be taken up for tusal development. If there are other

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suitable areas, where mulberry can be grown, silk industry could be started by the tribal people. There can be several other small rural cottage industries based on the local forest produce that can be established for the tribal people. Once such an approach is adopted by the Forest Department, there is no reason why the tribals and the forest-dwellers do not become a friend of the forests and the foresters. In fact, we would like to train our foresters in a way that they may consider their primary duty to initiate programmes of forestry development in such a way that no tribal may remain below the poverty line in a given period of time.

(xvii) Here, I would like to remind the foresters of what Gandhiji said that "while taking decisions of public interest, one must remember the face of the "Daridranarayan". If our foresters inculcate this motto in their day-to-day practice, in their decisions regarding the management of the forests in the vicinity of the tribal people, I am sure, the economy of the tribal people is bound to be improved through judicious decisions for the management of forests. In fact, I believe that the time has come to incorporate in the forest policy that the 23% of the land area under forests shall be dedicated for the people living below the poverty line. If such a policy is implemented in the States, the battle of poverty in respect of people living below the poverty line will have been won to a great extent.

(xviii) However, to achieve the above goal, it will be possible only when we impart a course of education especially tailored to bring home the above objectives, amongst not only the foresters but also the policy makers, legislators, administrators, the tribal people and all other people of the country. It is, therefore, imperative that suitable course of instructions should be devised for different categories of the persons mentioned above. The committee has been precisely ceased of this problem.

(xix) Extension training in forestry should be imparted to the tribals, farmers and village headmen also to enable them to appreciate the multi-faced aspects of forests in their day-to-day life. All officers and subordinates of forest department should be imparted training about tribal life, their economy and the various modes of their dependence on forest. Similarly, the tribals and people at large must be educated to bring about a harmonious synthesis between the forests, the forest-dwellers and the managers of forests.

(xx) Fortunately, our Prime Minister, the Ministers of Home Affairs, Agriculture and Education have shown personal interest in expanding the scope of forestry, so that it encompasses various spheres of tribal, rural and every citizen's life. In fact, it is the only panacea for the perpetual solution to the present day malady of crumbling village economy and forestry has to be a concern of the masses; education of the people regarding its various roles and training of forest officials to meet their demands calls for drawing out suitable syllabi for all levels urgently.

(xxi) In pursuance of decision of the Conference of Tribal Members of Parliament held on 30-10-81, the Government of India, constituted a committee under the Chairmanship of President, Forest Research Institute and Colleges as per Annexure 16.

(xxii) The syllabi in "Forestry and Tribal Welfare" have been drawn out for schools, colleges and universities. Similarly, a course content has also been prescribed for the proper orientation of legislators, administrators, engineers, bank-personnel, village headmen and other district level officials. For the officials of forest department detailed syllabi have been framed to cover the various levels of trainings meant for forest guards, foresters, rangers, State Forest Service and the Indian Forest Service Officers.

(xxiii) This committee had many deliberations on this issue and the report has been possible due to the high expertise and keen interest of various members of the committee and sub-committees. The untiring zeal of Shri D.N. Tewari, I.F.S., the Member-Secretary was always spontaneous and deserves a special mention.

(xxiv) The recommendations of this Committee are likely to generate a conducive atmosphere for creating and using the forest resources for tribal development. It is expected that the Ministry of Home Affairs, Agriculture and Cooperation and Ministry of Education, will kindly agree to the recommendations and take suitable measures to introduce these syllabi at various levels.

(K.M. TIWARI)

President

F. R. I. and Colleges



A tribal girl engaged in planting a teak seedling



Tribal women engaged in afforestation activities

CHAPTER I

FOREST

General :

The forest is a biological unit having a vast social organisation of living communities at work. To this special organisation belong not only the trees but also innumerable other living organisms from the plant world *viz.*, shrubs, herbs, mosses, lichens, algae, fungus and bacteria and from animal kingdom—mammals, birds, reptiles, insects and protozoa. The mineral complex has its place in the soil and is the bedrock of the forests. Time does not stand still in a forest as is popularly imagined and there is continual action and reaction amongst the members of these communities belonging to one or more of natural kingdom involving both cooperation and conflict and producing change. Nature resolves such conflicts, if any, in her own inexorable way by weeding out the weak and the inefficient and producing an 'equilibrium' which we call as "Nature's balance".

2. Forests have had a very vital role in maintaining a balanced ecological system. The forests have preserved the soil, and their heavy humus has acted as porous reservoirs for retaining water and gradually releasing it in a sustained flow over a long period of time to feed the low lying agriculture areas. The trees draw water from the bowels of the earth and release it to the atmosphere by process of transpiration and this is got back as rain as a result of condensation of clouds formed out of atmospheric moisture, and thus, the cycle continues. Trees also purify the air by utilising the poisonous carbon dioxide and releasing oxygen to the atmosphere by the process of photosynthesis.

3. Shri K. M. Munshi summarised the role of forests in his own inevitable way. There is a balance on earth between air, water, soil and plant. Forests have a great place in the economy of nature. They hold up the mountain cushion, the rain and storms. They discipline the rivers and control the floods. They maintain the springs, they break the winds; they foster the birds; they keep the air cool and clean. They are the guardians of perennial springs of water. They are the natural defenders of dust storms. They prevent erosion by wind and water and they preserve the fertility of the soil".

4. Experts recognise the following three different stages in the march of man from the dawn of civilization to modern times with regard to the extent of impact of forests on civilization :—

- (i) Civilization dominated by forests;
- (ii) Civilization overcoming forests;
- (iii) Civilization dominating forests.

5. Our country is now passing through an acute phase of the third stage wherein civilization is dominating forests to the point of destroying them and destroying itself in the process.¹

6. According to the Sixth Five Year Plan document (1980—85), "The 1952 National Forest Policy recommended coverage of one-third of the total land area (33-1/3%) under forest but it is only 22.7 per cent and not more than 40—50 per cent of this has good forest cover. The remaining areas have been degraded and depleted due to demographic and commercial pressure. Efforts made in the past for rehabilitation of degraded forest areas have met only with limited success".

7. The President of India in his address to Parliament (budget session in 1980) called for urgent action in the area of afforestation, flood control, soil conservation and preservation of flora and fauna.

8. Smt. Indira Gandhi, Prime Minister in her several letters indicated "while planning for tomorrow, the true development consists of building our capital measured not only in financial and physical terms but in terms of Nature". She also stressed, "The importance of preserving our forests is being increasingly highlighted by the behaviour of monsoons, the severe soil erosion leading to depletion of productivity, silting of rivers etc. Much more attention must be given to the afforestation of catchment areas, hill slopes, vacant land within or outside the forests and even in urban areas".

Existing Forests :

9. With 2% of earth's land area, 1% of its productive forest area, 15% of world's population and 10% of world's live-stock population, India stands classified on the World map of forest resources as belonging to deficit zone. India's forest area is 74.74 million hectares (22.7% of the land area of the country as against 33% prescribed by 1952 Forest Policy Resolution) yielding per capita forest of 0.109 hectare as against world average per capita forest of 1.0 hectare.²

10. Of these 74.74 million hectares, 35 million hectares are well-wooded, 25 million hectares contain in only sparse growth and the remaining 14.74 million hectares are unproductive. The average growing stock on our forests is only 26 m³ per hectare as against the world average of 110 m³ per hectare. The average annual increment is 0.5 m³ per hectare as against the world average of 2.00 m³ per hectare.

11. The State-wise forest area, total population and per capita forest area are as per Table 1. The forests

(1) Key note address in National Seminar on Forests & Environment, Bangalore 12—31st December, 1981.—N.D. Bachketi, Inspector General of Forests, Govt. of India.

(2) India's Forest—1980—compiled by Central Forestry Commission, Ministry of Agriculture, Govt. of India.

TABLE 1
State-wise Population & Forest Area

| State/U.Ts. | Total population (1981 Census) | Forest area in the year 1980 (in million hectares) | Per capita forest area (in hec.) |
|----------------------------|--------------------------------|--|----------------------------------|
| STATES | | | |
| Andhra Pradesh | 53,405,119 | 6.4092 | 0.1280 |
| Assam | 19,902,826 | 3.0708 | 0.1543 |
| Bihar | 69,823,154 | 2.9232 | 0.0419 |
| Gujarat | 33,960,905 | 1.9525 | 0.0575 |
| Haryana | 12,820,902 | 0.1637 | 0.0127 |
| Himachal Pradesh | 4,237,569 | 2.1190 | 0.5001 |
| Jammu & Kashmir | 5,981,600 | 2.1886 | 0.3659 |
| Karnataka | 37,043,451 | 3.7866 | 0.1022 |
| Madhya Pradesh | 52,131,717 | 15.3890 | 0.2932 |
| Maharashtra | 62,693,898 | 6.4078 | 0.1022 |
| Manipur | 1,433,691 | 5.5154 | 1.0570 |
| Meghalaya | 1,327,874 | 0.8548 | 0.6437 |
| Nagaland | 773,281 | 0.2876 | 0.3719 |
| Orissa | 26,272,054 | 6.7673 | 0.2576 |
| Punjab | 16,669,755 | 0.2428 | 0.0145 |
| Rajasthan | 34,102,912 | 3.4913 | 0.1024 |
| Sikkim | 315,682 | 0.2600 | 0.8230 |
| Tamil Nadu | 48,297,456 | 2.1791 | 0.0450 |
| Tripura | 2,060,189 | 0.5932 | 0.0464 |
| Uttar Pradesh | 110,858,019 | 5.1392 | 0.0464 |
| West Bengal | 54,485,560 | 1.1837 | 0.0212 |
| UNION TERRITORIES : | | | |
| A & N Islands | 188,254 | 0.7145 | 3.7954 |
| Dadra & Nagar Haveli | 103,677 | 0.0199 | 0.1920 |
| Arunachal Pradesh | 623,050 | 5.1540 | 8.2064 |
| Delhi | 6,196,414 | Neg. | Neg. |
| Goa, Daman & Diu | 1,082,117 | 0.1053 | 0.0973 |
| Mizoram | 487,774 | 0.7127 | 1.4611 |
| | 683,810,051 | 74.7432 | 0.1095 |

* Reserved Forest Area only.³

as they exist today are confined mainly to certain tracts of the country such as upper regions of Himalayas and the foot-hills, Central Indian Plateau, the higher ranges of the Eastern and Western ghats and the North Eastern region. The most densely populated plains of the country, are bereft of vegetation, and so are the vast hot desert in the West and cold desert in North Himalayan region. This imbalance in spatial distribution of the existing forests has given rise to serious socio-economic problems and has also created serious environmental instability.

12. The extensive dispersion of forests over the sub-continent is accompanied by great diversity in their specific composition. Accordingly, the forests of the

country have been divided into 16 Type-Groups ranging from Tropical Wet Evergreen Forests to Alpine types: the tropical deciduous types (both moist and dry) constituting the bulk (70%) of the forests (Table 2).

TABLE 2
Forest area under different Forest types

| Type-Group | Area (million ha.) | %age of the total |
|--|--------------------|-------------------|
| Tropical wet evergreen | 4.5 | 6.0 |
| Tropical semi-evergreen | 1.9 | 2.5 |
| Tropical moist deciduous | 22.4 | 30.0 |
| Litteral and swamp | 0.7 | 0.9 |
| Tropical dry deciduous | 29.4 | 39.6 |
| Tropical thorn | 5.2 | 6.9 |
| Tropical dry evergreen | 0.1 | 0.1 |
| Subtropical broadleaved hill | 0.3 | 0.4 |
| Subtropical pine | 3.7 | 5.0 |
| Subtropical dry evergreen | 0.2 | 0.2 |
| Montane wet temperate | 1.6 | 2.0 |
| Himalayan moist temperate | 2.7 | 3.6 |
| Himalayan dry temperate | 0.2 | 0.3 |
| Sub Alpine forests, Moist Alpine scrub, Dry Alpine scrub | 1.8 | 2.5 |

13. Whereas high mountainous areas carry relatively pure forests of coniferous species 4.76 million ha.; (6.4 per cent of the total forest area) and there are extensive gregarious forests of *Shorea robusta* (16 per cent), *Tectona grandis* (13 per cent) and a few other species of local occurrence, the moister semi-evergreen and evergreen forests are composed of a large number of species. Bamboos (including plantations) occur over an area of 9.57 million ha. (12.8 per cent). Consequently, the utility of different species and their value in the context of present use as well as future utilization varies enormously from region to region. Most of our forests are natural and although over 100 years of conservancy and protection have improved their stocking to a considerable degree, the overall stocking of these forests is by no means optimum.

14. Forest ecosystems in India have been providing a variety of forest products and services since long. But the rising demands for these goods and services due to rapidly increasing population, increasing livestock population, growing competition of land for agricultural and urban uses coupled with the low productivity has caused India to be classified on the world map of forest resources as belonging to a deficit zone.

15. Total growing stock of the country's forest is estimated around 1966 million m³ of wood with annual recorded production of 27.32 million m³ during 1977-78 against projected demand of 60.5 million m³ in that year. The acute shortage of fuelwood, fodder and timber are a source of great concern to the nation⁴.

(3) Source : Development of Forest & Forest Products—Ministry of Agriculture, Department of Agriculture & Cooperation Forestry Division, July, 1981.

Neg.—Negligible.

(4) Plan Development Programmes in Forestry Sector—1951—85. Govt. of India, Ministry of Agriculture Publication—1981.

16. The total bamboo bearing area in the country is about 9.57 million hectares with total growing stock of 45 million tonnes of bomboos. The present annual production of bamboo is around 3.0 million tonnes of which 2.14 million tonnes is being utilised by the pulp and paper mills.

17. Minor Forest Produce (MFP) which include all forest produce other than wood have potential to bring about an economic revolution of the forest-dwellers. Estimated potential and actual collection of MFP are as per Table 3.

TABLE 3

Few items of Minor Forest Produce : Potential & Collection

| Item | Potential (million tonnes) | Annual collection (million tonnes) |
|-------------------------------|-------------------------------|------------------------------------|
| Tendu leaves | 15 (million standard bags) | 6.11 (million standard bags) |
| Bauhinia Vahilae leaves | 1.0 | 0.04 |
| Oil seeds | 7.6 | 0.4 |
| Tannin extract | 0.5 | 0.017 |
| Gums & Resins | 0.4 | 0.109 |
| Lac | 0.065 | 0.02 |
| Bamboo | 5.0 | 3.4 |
| Grasses | 8.0 | 2.2 |
| Canes | 0.07 | 0.005 |
| Tassar | 0.008 | 0.0005 |

Constraints in Forest Development

Loss of Forest Area:

18. (i) Till very recently forest area was being diverted without careful regard to conservation of forests for non-forest purposes such as agriculture, industry irrigation & mining projects, road etc. During the period 1951—80, a total area of about 4.328 million hectares forest was diverted for such non-forestry purposes as per Table 4.

TABLE 4

Forest area lost between 1951—1980

| Purpose | Forest area in million hectares |
|--|---------------------------------|
| Agricultural activities | 2.623 |
| Irrigation & River Valley Projects | 0.502 |
| Industries & Township | 0.134 |
| Transmission lines, roads etc. | 0.061 |
| Miscellaneous uses | 1.008 |

(ii) Due to implementation of Forest (Conservation) Act 1980, the deforestation has come down to

an average of about 3000 hectares per annum as against average annual deforestation of 0.143 million hectares in the past.

(iii) Large areas of forests are under encroachment throughout the country. The area under encroachment is over 3.5 lakh hectares. Large number of poverty stricken people have encroached such land and unless alternative economic means are provided to these people, they have no other source of sustenance. A Committee is already going into the question of identifying beneficiary programmes in forestry sector, which is likely to provide alternative source of sustenance to the poor people.

(iv) Large tree cover areas (in rural & urban areas) which are not under the control of the Forest Departments but were generally under Revenue Departments were liberally deforested due to lack of proper management and control. Such forests were close to villages and they provide the fuel, fodder, timber to the villagers and pasture to the cattle. These areas are now treeless and are great risk to the environment. Besides afforestation, it is necessary to regulate tree felling in these areas. At present, State laws exist in some States such as Uttar Pradesh, Karnataka, Gujarat and Himachal Pradesh but these have not been adequately effective.

Increasing Demand for Forest Produce:

19. (i) As per the National Commission on Agriculture, the projected demand for industrial wood in the year 2000 AD is of the order of 47.18 million m³. As against present requirement of 26 million m³ of industrial wood, the production is just about 12 million m³. Increased area of man-made forests (about 1.5 million hectare annually, and concentrated natural regeneration of indigenous forests may satisfy the projected industrial demand.

(ii) Existing local needs of rural population has been projected as about 12 million m³ of small timber and 133 million tonnes of fuelwood. Very often, the local people meet their requirements by illicit removal from the forests. Shortage of timber and fuelwood and consequent rise in their prices have resulted in increased incidence of illicit cutting and smuggling of valuable forest produce.

Excessive grazing:

20. (i) The number of cattle in the country is much more than what could be supported (10% of the world's livestock population) on the basis of carrying capacity of the grazing areas. The villagers in and around forests maintain a large number of scrub cattle which are let loose in the forests inspite of existing regulations for grazing in the forests. This excessive and uncontrolled grazing has resulted in compacting of soil and damage to young seedlings resulting in lack of regeneration of tree species.

(ii) The problem of grazing may be tackled by (a) introduction of stall feeding, (b) reduction in number of cattle specially by promoting export of

meat, (c) introduction of mandatory rotational grazing schemes, (d) discouraging migrational grazing and (e) formulation and implementation of "National Grazing Policy".

Fires:

21. (i) Fires kill young seedlings and damage large trees. Damage by fire is seldom properly assessed in its entirety. Causes of fires are both intentional as well as accidental.

(ii) Fire posts, telephones and proper fire extinguishing machinery should be installed to ensure that fires do not take place and if they occur early action is taken to extinguish them. The various measures required to be taken are :

- (a) a system of award and incentive to local people for ensuring their cooperation for fire protection needs to be evolved.
- (b) Fire affected areas must be closed to grazing for the following season. This is necessary to discourage firing by local people for getting new flush of leaves and grasses and exudation of gums.
- (c) Fire fighting techniques should be fully developed and comprehensive training should be imparted to forestry personnel.
- (d) Forest staff should not be deployed for election and census during the fire season.

Shifting Cultivations

22. (i) According to a recent study under FAO/UNFPA Project (RAS/77/P09) on "Population Data regarding Forest—communities practising shifting cultivation" it has been estimated that, 9,89,600 hectares are under shifting cultivation in the country in any one year and 2.676 million people are involved, most of them being tribals for whom it is the traditional way of life. The cumulative effect of this practice is felt in progressive loss of productive soil and increase in flood hazards apart from loss of valuable forest wealth leading to ecological/environmental disturbance.

(ii) Various programmes have been taken up by North-Eastern Council and Government of India to wean away people from shifting cultivation practices. Till 1981-82, 6443 families were settled under the States and central sector programmes. The problem is serious and needs to be tackled within the existing social frame-work in the best interest of individual family, the community and the ecology.

(iii) The Board on shifting cultivation in its third meeting recommended following measures for effectively tackling the problem :—

- (a) The central sector scheme of 'Pilot Project for shifting cultivation', which was transferred to the States after 1978-79, should be revived.
- (b) Specific programmes for "Jhum" (shifting cultivation) control should be drawn up with family oriented approach.

(c) Suitable legislative measures may be promoted to control shifting cultivation. Guidelines for "Jhum cultivation" should be issued by all States/U.Ts.

(d) Mobilization of funds may be given top priority to solve the problem within a stipulated period. Institutional finance may be attracted by establishing "Jhum Control Corporations".

(e) Constitution of a high level committee in each State with stipulation that the committee shall meet atleast twice in a year and review the programmes and progress.

(iv) The practice of shifting cultivations is widely prevalent in 12 States/Union Territories whose details are as per Table—5. It is necessary to regulate, contain and eventually replace the shifting cultivation practices which are mostly attempted in mountainous areas. However, the problem has social and cultural overtones and therefore, motivational approach through introduction of alternative programmes is advisable.

TABLE 5

Shifting Cultivation Details by States/Union Territories

| Sl. No. | States/U.Ts. | Area under cultivation in a year (hectare) | Shifting cultivation cycle (Year) | Estimated total area under shifting cultivation (in hectares) |
|-----------------------------|-------------------|--|-----------------------------------|---|
| 1. | Arunachal Pradesh | 70,300 | 4 | 281,200 |
| 2. | Assam | 70,000 | 7 | 490,000 |
| 3. | Manipur | 50,000 | 6 | 300,000 |
| 4. | Mizoram | 60,000 | 8 | 480,000 |
| 5. | Meghalaya | 76,000 | 6 | 456,000 |
| 6. | Nagaland | 73,000 | 9 | 657,000 |
| 7. | Tripura | 17,000 | 8 | 136,000 |
| Total North-Eastern States: | | 416,300 | | 2,800,200 |
| 8. | Andhra Pradesh | 17,300 | 6 | 103,800 |
| 9. | Bihar | 16,200 | 6 | 97,200 |
| 10. | Kerala | 1,900 | 6 | 11,400 |
| 11. | Madhya Pradesh | 8,100 | 6 | 48,600 |
| 12. | Orissa | 529,800 | 7 | 3,708,600 |
| Total Southern States : | | 573,300 | | 3,969,600 |
| TOTAL INDIA | | 989,600 | | 6,769,800 |

Excessive Area Under Agriculture:

23. (i) India has 326.8 million hectares of area of which as much as 47 per cent is cultivated. This is a far higher percentage than the optimum for any country because normally a country should have only one-third of its area under agriculture, leaving the rest for forest and other activities.

(ii) India is far behind others in terms of productivity. Here one hectare of land on the average produce 1977 kgs of paddy compared to 6166 kgs in Japan,

4495 kgs in U.S.A. and 4029 kgs in Soviet Union. This abnormal difference in productivity is also noticed in wheat. While in India, it is 1387 kgs per hectare, in the USA 2058 kgs and USSR 1484 kgs.

(iii) Total net area under agriculture in 1950 was 118 million ha. but by 1978-79 it has risen to 143 million ha. This increase of 25 million ha. of land under agriculture has mainly come from waste land forests in the vicinity of villages etc. These areas were mostly marginal lands and constituted main source of fuel wood, fodder and pasture for cattle. Reduction of such areas has caused enormous pressures on the forests.

Inadequate Financial Outlays:

24. (i) Forests cover more than one fifth of land surface area and occupy important position in the protection of environment, production of energy, generation of employment to the rural masses particularly tribals and supply of raw-material to forest industries. The forestry sector is not being provided with adequate financial outlays which is apparent from Table 6.

(ii) Research and education which orient the production system also remained largely neglected in financial outlays. During the sixth plan period, Agriculture—Research & Education received an allocation of Rs. 340 crores for the Centre as against Rs. 12 crores for Forestry Research & Training. Forest Education has yet to be introduced in the schools, colleges and universities of the country.

TABLE 6
Plan Financial Outlays in Forestry Sector

| Plan Period | (Rs. in crores) | | |
|-----------------------|---------------------|-----------------|------------|
| | Total public sector | Forestry Sector | Percentage |
| First Plan (1951-56) | 1960 | 7.64 | 0.39 |
| Second Plan (1956-61) | 4600 | 21.21 | 0.46 |
| Third Plan (1961-66) | 8576 | 45.85 | 0.53 |
| Fourth Plan (1966-74) | 15778 | 84.42 | 0.54 |
| Fifth Plan (1974-79) | 40650 | 208.84 | 0.51 |
| Sixth Plan (1980-85) | 97500 | 692.49 | 0.71 |

(iii) The outlay to forestry sector is only 5.38% of the total outlay for Agriculture & Allied Programmes in the Sixth Five Year Plan which is quite inadequate and needs upward revision. Sector-wise allocation is as under :—

| Item | Percentage of Sixth Plan Outlay |
|-----------------------------|---------------------------------|
| Agriculture & Land Reforms | 16.88 |
| Minor Irrigation | 14.00 |
| Soil and Water Conservation | 3.31 |
| Forests | 5.38 |
| Animal Husbandry and Dairy | 6.60 |
| Fisheries | 2.89 |
| Community Development | 2.74 |
| Cooperation | 7.10 |
| Rural Development | 31.84 |
| Others | 9.10 |
| Total | 100.00 |

(iv) During Sixth plan period, the target for plantation has been fixed as 2.15 million hectares at a cost of Rs. 452 crores. According to an estimate, nearly 100 million hectares land is crying for afforestation. Even if annual target for afforestation is fixed as 4 million hectares, an outlay of Rs. 6000 crores would be needed during Seventh Five Year Plan as against a meagre provision of Rs. 452 crores during 1980—85.

(v) Foreign aid has upto now been of little magnitude in forestry sector. Social forestry projects have been drawn up for 12 States with a total investment of about Rs. 500 crores. Eight of these projects are already under implementation while 4 are in the pipeline. The donor agencies have got to display more imagination in forestry sector on the pattern of projects already implemented in Agriculture sector.

(vi) There is an urgent need for tapping institutional finance for innovative programmes such as minor forest produce—collection, processing and marketing, settlement of shifting cultivators and development of forest industries etc.

Non-Involvement of People :

25. (i) The State owned forest constituted 77.2% of the total forest area in 1949-50, rising to 92.3% during 1967-68 and 95.2% in 1973. Only 3.1% forest area is owned by Corporate bodies and 1.7% by private owners in the country. The change in ownership pattern due to nationalisation and take over of private forest areas, discourage the people to practice forestry as an avocation.

(ii) A measure of the important role which social (community) forestry may play in the future was the emphasis given to this strategy at the Eighth World Forestry Conference held in Jakarta in October, 1978. This meeting followed the Expert Consultation on Forestry for Local Community Development, also held in Indonesia in December, 1977 (FAO 1978). The FAO, World Bank and other donor agencies project evaluation teams have also emphasised the place of community forestry in development planning. Similar recommendations were also made by the National Commission on Agriculture.

(iii) Social forestry programme, was considered as a programme of the people, for the people and by the people. The role of the forest department and other administrative bodies was to fully cooperate with people. The role of the forest department and other by providing technical and other services needed.

(iv) It has to be realised that in poor rural communities, beset by poverty and without any outside assistance, the forest will be used to provide basic needs to the point where the forest is destroyed. To conserve the forest so as to provide both forest products for local consumption and other values, including clean water, soil erosion control and flood mitigation, the local people must be involved in forest management. With a modest government subsidy the provision of sympathetic technical assistance and partnership in resources created the cooperation of local population can be secured in forestry sector.

(v) Mankind has used firewood to cook food and for warmth from times immemorial. This situation is

not likely to change for many people particularly the tribals even in near future. The forested land is already under great pressure and all the evidence points to a continued decline in productivity from over-use and exceedingly wasteful and destructive harvesting methods. People must be assisted to grow trees and make the most economic use of fuelwood available to them.

Damage due to Mining, Irrigation and Other Projects:

26. (i) In the mining work, earlier concern was mainly from the point of view of mine safety and conservation. Only of late, the damage caused to the ecology and environment has been brought to sharp focus. Reclamation of mining area should be a condition in the mining lease. A number of inadequacies have been found in the working MMRD Act of MCR. The State Governments should prepare a time-bound reforestation plan in respect of abandoned mines.

(ii) Fresh grant of mining lease or renewal of the existing ones falls in the forest area, whether private or classified, should require approval of Ministry of Agriculture, Government of India, under the forest (Conservation) Act, 1980. This provision should be strictly adhered to eliminate mining in vulnerable areas.

(iii) A technical cooperation project has been approved by the F.A.O. costing \$ 1,50,000 for providing technical expertise and preparation of projects for restoration of mined areas in Goa. F.A.O. and other International agencies may be approached to approve a similar Technical Cooperation Project for other mining areas in the country.

(iv) The State Governments should prepare a time bound reforestation plan in respect of abandoned mines and implement it without any loss of time.

Damage due to Irrigation and Other Projects:

27. (i) While forest areas have been the sites of many reservoirs for irrigation purposes, the benefit of irrigation have gone to the plains for reasons of geography and perhaps politics. Similarly, the hydroelectric projects in hill areas have generated power which has flown to distant industrial centres in the plains, at the same time sub-merging the most productive forest areas. Displacement of wild-life and people by sub-merging of lands in river valley projects is one of the most acute problems in the hills. Lack of proper drainage in the irrigated areas has also led to problems of water-logging, salinity and large scale mortality of tree vegetation. It is, therefore, necessary to examine each irrigation or multipurpose project in respect of whether alternative projects involving lesser damage and displacement can be taken up or whether an alternative strategy would not be more desirable. The committee is in favour of small-scale more carefully planned projects both from environmental and social point of view. They would lead to less massive submersion of productive fields and forests, and to much more manageable problems of displacement of people and wild life. It is necessary to associate foresters and sociologists at the stage of formulation of projects to avoid wrongful selection of site.

(ii) The growing network of roads, the establishment of individual and other projects have done immense damage to tree-vegetation and tribals. With the entry of army of outsiders, the tribals and forests are finding it difficult to survive.

(iii) The tree-less revenue lands have been the greatest eye-sore in the country's land-landscape. Approximately 6265 sq. km. in the hills of U.P. are classified as "Civil Soyam Forests" and the control over such areas is of the revenue officials. In certain hill districts, the extent of such forest lands is more than the reserved forest land. They have been subjected to destruction in the past.

(iv) Few people realise that this destruction of vegetation in the hills of U.P. has been one of the major factors, responsible for denudation of slopes of U.P. hills. These must be brought under Forest Department for proper development, afforestation and management. There is immediate need to enact a separate law prescribing *inter-alia* a single regulating authority in each State with the main objective of regulating the cutting as well as the replanting of trees in urban and rural areas outside the notified forest areas.

Absence of "Nodal Agency":

28. (i) Prime Minister has expressed great unhappiness at the senseless destruction of trees and mountain sides in Mussorie region. She observed that several authorities seem to be involved in the process of approval for cutting trees. She has enquired why there should not be one nodal point at the Central Government level to deal with matters relating to the preservation of forests and environmental protection. As far as forest area is concerned there is only one agency which is directly responsible for any cutting or felling and this is the Forest Department of the concerned States/U.Ts. In the non-forest area of the country (which is about 77.3% of the total geographical area of the country) there is multiplicity of agencies involved in cutting of trees and there is no single agency which is accountable for tree preservation and environmental protection.

(ii) The tree-less revenue lands have been the greatest eye-sore in the country's land-landscape. These must be brought under Forest Department for proper development, afforestation and management. There is immediate need to enact a separate law prescribing *inter-alia* a single regulating authority in each State with the main objective of regulating the cutting as well as the replanting of trees in urban and rural areas outside the forests.

Delay in Settlement, Demarcation & Working Plans:

29. (i) Settlement and demarcation of forest lands has been in progress in several States but it has been rather slow. Working plans cover only 69% of the forest areas. For ensuring effective management of forests, it is necessary that all forest areas throughout the country should be covered by working plans and these should be strictly implemented.

(ii) In order to stop denudation of forests in hill areas as also in regard to matters like operations for raising plantations and management of forests, it is necessary that Central Government should constantly monitor and render necessary guidance to the States.

Unfavourable Service Conditions:

30 (i) The existing charges of Divisional Forest Officers, Rangers and Forest Guards are generally very large with the result that close vigilance which is necessary in view of onslaughts on the dwindling forest resources is not possible. There is obviously the need for strengthening of the Forest Department at the base level and properly equipping them to make more effective in supervision of such areas. In one of the letters Prime Minister has suggested that Guards should be provided vehicles to enable them to protect their forest beats averaging 20 square kilometers in area.

(ii) The factors responsible for loss and impoverishment of Forest cover are too deep-rooted and are beyond the control of any one department or any one class of people. The forest services have often been blamed for indifference or insufficiency or, even connivance but it has to be appreciated that the odds and constraints are too many and have multi-dimensional overtones. In spite of all this, these services have, tried to do their best to preserve the forests at the risk of unpopularity and even lives. Non-appreciation of their difficulties has often resulted in demoralization and discouragement.

(iii) It is on record that over thousand foresters have given their lives in protection of forest areas without any reward or recognition. Fortunately, the Prime Minister has felt the necessity of rewarding and insulating and protecting Forest Officers and Guards from the pressure of local politics. However, service conditions, both of Indian Forest Service and the State Services do not take into consideration the specially hard and risky work involved in the protection and development of forests. In the interest of national ecological security the Forest Service should not be relegated to a third grade service. It should be atleast equivalent to Police Service at every stage to enable it maintain ecological security and economy of the country.

(iv) The Forest Service should be given its independent status, so that it can withstand the public pressure with confidence. As productive service and as a custodian of vast national resources the Indian Forest Service must be granted parity with Indian Administrative service at all stages of scales and promotions.

In a comparative study regarding the promotional avenues of the three All India Services I.A.S., I.P.S. and I.F.S., the following percentage of posts to the total cadre strength have been found :—

| Pay Scales | I.A.S. | I.P.S. | I.F.S. |
|------------------------|--------|--------|--------|
| Rs. 2,000 to Rs. 2,500 | 11 | 11 | 1.7 |
| Above Rs. 2,500 | 13 | 2 | 1.7 |

Thus, it is apparent that in the pay scale above Rs. 2000 per month the cadre posts in I.A.S. and I.P.S. are 24% and 13% respectively, whereas in I.F.S. it is only 3.4%. This creates many administra-

tive problems to attract better talents and to provide more promotional avenues. Independence in working is absolutely essential to bring parity in scales.

Effective Role to be played by Central Government:

31. (i) Central and State Governments are responsible for improving the environment and safeguarding the forests and wild-life of the country. However, at present, the Centre has played mainly its advisory role in management of forests. In view of the degradation caused to forests under the control of States it is necessary that Centre should discharge its responsibility by adopting following measures :—

- (a) In order to preserve the entire eco-system of flora and fauna of forests, it is very urgently required that at the Centre, Forests & Wild-life should be brought under one department for comprehensive planning, monitoring and evaluation of forest and wild-life projects. Preferably, a separate forest department should be created at the centre for effective monitoring of different programmes.
- (b) Contractor system should be eliminated from all forestry operations. All cutting and conversion work must be done through Forest Corporation by involving Forest Labour Cooperative Societies. The forests and wild life cannot exist separately. The habitat restoration is the only panacea to conserve the wild life.
- (c) In many States, the waste land forests and civil forests are being recklessly destroyed which is causing great damage to the environment and besides tree planting activities are now spread over revenue lands administered by Deputy Commissioners. Therefore, it is desirable that in the annual confidential role of the revenue officers of various levels the entry may be made to the officials of the Forest Department with respect to co-operation extended in tree plant preservation of tree lands and waste land forests.
- (d) Shifting cultivation to be regulated by starting a Central Sector Scheme and by establishing 'Jhum Control Corporation', in this regard.
- (e) Felling of trees must be banned in vulnerable and over-felled areas such as areas with steep slopes, weak geological formations, high altitude etc.
- (f) A national grazing policy is to be evolved and implemented.
- (g) Minor Forest Produce regeneration, collection, processing and marketing to be effectively organised for upgrading the economic condition of tribals and other rural population.

First Forest Policy :

32. (i) The first forest policy for the country was formulated in 1894 during the British regime. It has the following objectives:

- (a) Promoting the general well-being of the country.
- (b) Preserving climatic and physical conditions of the country.
- (c) Fulfilling the needs of the people.
- (d) Subject to the above, permanent cultivation to come before forestry and needs of local population to be satisfied at low prices if not free of cost and only thereafter realisation of maximum revenue to be guiding factor.

(ii) In due course, the implementation of the policy had revealed several deficiencies. Important of them were :

- (a) No minimum area for forest cover was prescribed.
- (b) No restraint was exercised against diverting forest land to agriculture and other use.
- (c) No mention of concept of sustained yields which formed the main plank of scientific forest management.
- (d) The question of wildlife protection/preservation also did not figure.
- (e) There was no mention of private forests, forest education and training etc.

National Forest Policy 1952 :

33. (i) During the early part of the twentieth century the general scene of the forests did not change much. However, the pressure of population gradually increased and by the mid-twentieth century, the increase was more than 40 percent. The two world wars affected the economy in many important ways and drew heavily on the valuable forest resource-base for meeting defence requirements. After independence, the national leadership decided to make a determined effort for fast economic development necessitating a second look at the forest policy. The value of forests came to be recognised not only in conserving moisture, preventing soil erosion but also in the economic field such as agriculture, industry and communication, in catering to the defence needs of the nation as disclosed by the two world wars; and in promoting the post-war reconstruction schemes, industrial expansion, river valley projects etc.

(ii) The forest policy was revised in 1952. It laid the following basic principles for proper management of the forest of the country to derive from them the maximum benefits, direct or indirect :—

- (a) Forests are valuable not only in the physical field such as prevention of soil erosion and

conservation of moisture, but also in the economic field such as development of agriculture, industry and communications.

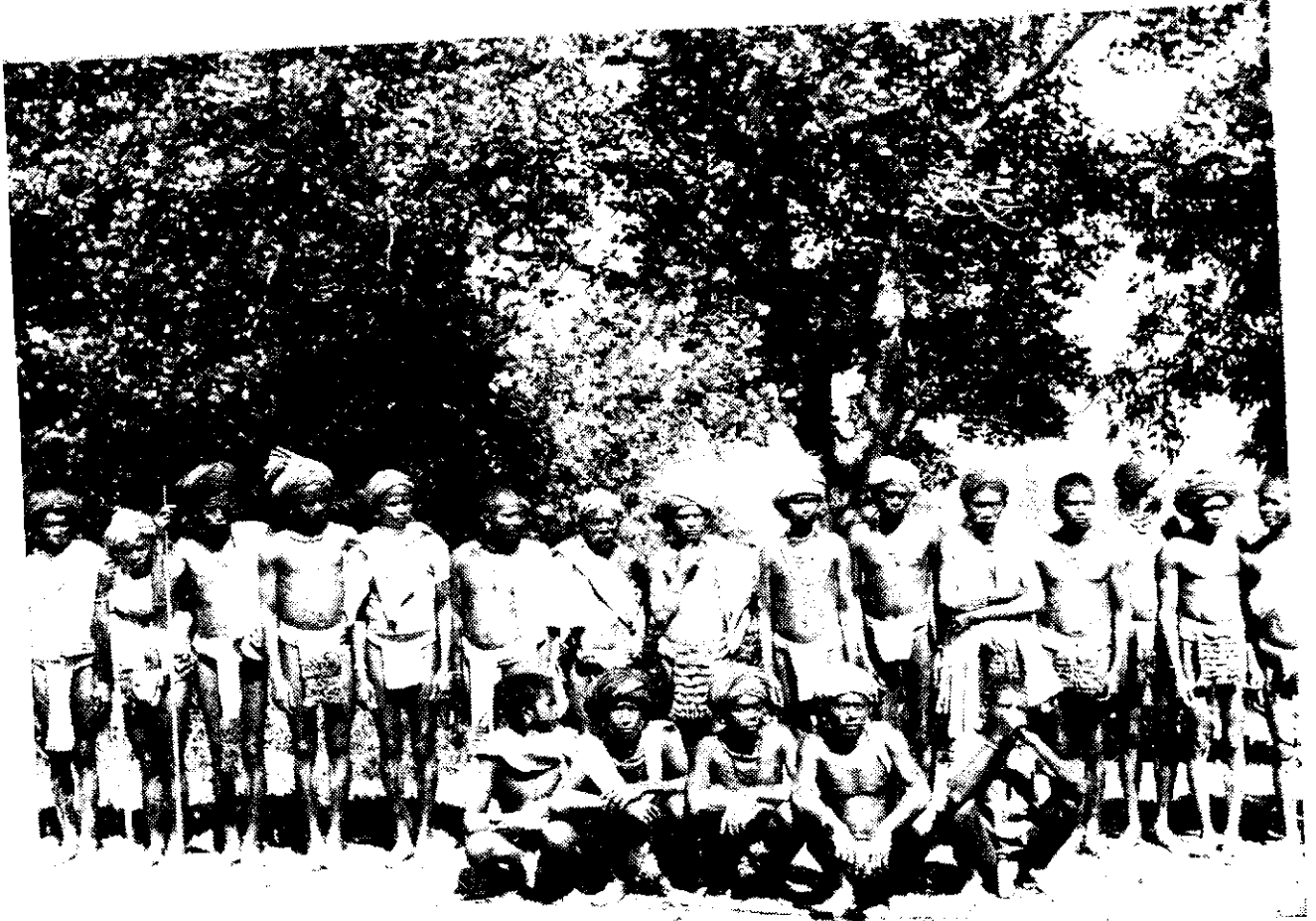
- (b) For purpose of management, forest should be classified according to the primary functions, a role a particular forest has to fulfil.
- (c) Uncontrolled and excessive grazing is incompatible with proper growth of trees and fodder grasses and must be regulated.
- (d) It is necessary to evolve a system of balanced and complementary land-use under which each type of land should be allotted to that form of use under which it will produce the most and deteriorate the least.
- (e) Tree-lands should be established wherever feasible to promote the general well-being of the people.
- (f) Indiscriminate extension of arable land by extension of forests should be discouraged, as this not only deprives the land of its natural defence against dust-storms, hot-winds and erosion but the local population of their indispensable needs of wood, grass, etc.
- (g) The notion widely held that forest as such has no intrinsic right to land, but may be permitted on sufferance on residual and not needed for any other purpose, must be combated.

(iii) The National Forest Policy, 1952, emphasised on following issues :—

- (a) It laid stress on retaining under forest cover 60% of geographical area in hilly regions and 20% in plains so that 1/3 of total geographical area is under forests.
- (b) The forests are to be classified by function it has served such as "Protection forests", "National forests" and "Village forests".
- (c) It subordinated the claims of the community to national interests.
- (d) It placed an embargo on indiscriminate extension of agriculture.
- (e) It advocated legislation where it did not exist, on establishment of facilities for professional education and training; on earning goodwill of people; on establishment of cooperatives of forest workers; and avoidance of intermediaries etc.

Need for a Revised Policy :

34. (i) Since the enunciation of the 1952 forest policy, developments of far-reaching consequences have taken place in the economic, social and political fields and there has been growing awareness and concern about the ecological effects of accelerated destruction of forest tree-lands and tree growth of all kinds.



A group of 'Savaras' tribe of Orissa

There is greater appreciation of economic and social benefits accruing to the community from forest.

(ii) The Estimates Committee (1968-69) of the Fourth Lok Sabha in its 76th Report recommended that the National Forest Policy 1952 should be reappraised to make it more purposeful, realistic, effective and operative for the development of forest and forestry in the country.

(iii) The National Commission on Agriculture (1976) summarised the failure or inadequate implementation of 1952 policy as under :—

“As administration of forests vests entirely with the States they are the ultimate authority to implement a policy decision. The provisions in the policy have not been fully implemented by them for various reasons. The functional classification provided for in the policy statement could not be implemented. No systematic programme was drawn up to extend existing tree-lands and establish new ones on lands belonging to defence, railways, public works departments, universities and colleges and other local authorities etc. Relinquishment of forest land continued to occur for various purposes and the notion that forestry might be permitted on sufferance on residual land not required for any other purpose continued to hold sway. No concerted efforts were made to bring the recommended 60 per cent of the area under forests in the mountainous tracts liable to erosion and 20 per cent in the plains. Hardly any of the principles on forest grazing was implemented”.

(iv) The National Commission on Agriculture recommended revision of 1952 forest policy by incorporating significant shifts and stress in the forest policy arising out of the recommendations of the Central Board of Forestry in its xv meeting in 1976. The approved draft of forest policy by Central Board of Forestry was also examined by a sub-committee of Indian Board for Wild-life from the angle of wild-life and environment. Subsequently, the draft was revised by incorporating suggestions offered.

(v) The revised draft while retaining all the important features of the existing policy it introduced certain new elements. The important changes proposed to be introduced are :—

- (a) Provision for prior approval of Central Government before taking up deforestation or diversion of forest lands to non-forest use.
- (b) Preventing and evicting encroachments of forest lands.
- (c) Protecting wildlife and creating national parks, sanctuaries, biosphere reserves, wilderness areas etc. to conserve national heritage.
- (d) Safeguarding against monoculture practices in raising forest plantations so that preser-

vation of habitat of natural flora and fauna is ensured.

- (e) Minor Forest Produce development for improving the rural economy particularly tribals who largely depend on it.
- (f) Encouraging large-scale industrial plantations to foster growth of forest industries.
- (g) Shifting cultivation to be gradually replaced by providing alternative living.
- (h) Underlining the scope of employment potential in forestry for rural communities.
- (i) Emphasising the need for extension work and professional training facilities.
- (j) Advocating free flow of institutional finance to forestry sector.
- (k) Emphasising increased allocation of funds for special areas of attention like watershed protection, nature and environment preservation, development of production forestry and management of forests for meeting local needs of the people.

(vi) The revised draft may incorporate the following elements :

- (a) The people oriented policy which call an immediate moratorium on all tree felling on steep slopes and this to remain in effect till all degraded forests are effectively afforested.
- (b) The problem of forest conservation and protection should not be separated from the life style of tribals. The approach must shift from dependence on law and bureaucracy to dependence on the conscious and voluntary participation of the masses. This pre-supposes education of masses as well as re-education of forest employees.
- (c) The avarice of the forest contractor and purchaser-agent system in nationalised items of minor forest produce must be recognised and dealt with firmly.
- (d) Meeting day-to-day needs of forest produce of forest dwellers, tribals and villagers living in adjoining area of the forest to be given priority.
- (e) Programmes for development of forest villages to be prepared on priority basis by ensuring tenure rights on lands under their cultivation.
- (f) Family oriented programmes may be identified in forestry sector to improve the economic condition of the rural population.

Forest Legislation :

35. Forest legislation dates back to 1865 when the Indian Forest Act was enacted for the first time. It was replaced by and more comprehensive Indian Forest Act formulated in 1927. In the meantime, the Madras

Presidency enacted its own Act—Madras Forest Act, 1882. At the time of enunciation of the National Forest Policy in 1952, the forest legislation comprised the Indian Forest Act, 1927, and the Madras Forest Act, 1882, so far as the forests under the Control of the Central Government and of the Part A States were concerned. In some of the Part B States, forest regulations having force of law existed and in some Part C States, forest law did not exist at all.

36. After the National Forest Policy was announced in 1952, some States enacted their own Forest Acts, and some others, where the Indian Forest Act was already in force, locally amended to suit their needs.

37. The primary object of the forest law is to protect the forests from criminal interference. The various provisions of Indian Forest Act (IFA) aim at this. However, with increased accessibility to forests and demand for forest produce, the smuggling from forest has increased several fold. The forest law in force in the States has undergone several amendments to strengthen the existing provisions to meet their local needs. Such changes, however, are not uniform all over the country. The Central Board of Forestry (CBF) had from time to time recommended that there should be uniformity of forest legislation. The National Commission on Agriculture (NCA) in its report on forestry also suggested an enactment by Parliament. The utility of uniform approach which is possible only under an All India Act can be illustrated by the problems of smuggling of red sandalwood and sandalwood (a type of valuable wood available in certain localities of South India). In the States of their origin, law provides for deterrent punishments, but across the State borders there are no stringent provisions for this class of offence. As such smuggling thrives. These difficulties were often highlighted before the CBF both by the Governments of Andhra Pradesh and Karnataka. Karnataka Government proposed this issue for discussion before Southern Zonal Council also.

38. In certain matters concerning the States, like licensing of saw mills, for example, there has to be statutory coordinating authority between neighbouring States so that there is no scope for conflict about establishing saw mills at the boundary of forests of another State, which can be taken advantage of by a smuggler who may transport illicitly removed timber across the border, process it quickly into products and obliterate the identity of origin and thereby render verification of bonafide origin impossible.

39. The NCA has given thought to the principles which should govern provision of forest legislation, and recommended the following to be adopted :—

- (i) There should be uniformity in forest law so that incompatibility in forest laws among the States is removed and there is no multiplicity of legally sanctioned authorities concerned with forestry matters.
- (ii) It should be possible to tackle specific problems in different parts of the country through subsidiary rules and regulations.

- (iii) A development approach should be followed.
- (iv) There should be stringent preventive and punitive provisions, so that when a resource is allocated for development in a certain direction, it is not wasted.

40. Besides, the N.C.A. report which listed out several subjects of the Union List which would have a bearing on forest management particularly in the light of programmes recommended by them on production forestry, export promotion, soil conservation, etc. These are :—

- (i) Trade and commerce with foreign countries.
- (ii) Inter-State trade and commerce.
- (iii) Establishment of standards of quality of goods for export or inter-State commerce.
- (iv) Forest based industries like panel, pulp and paper and rayon, and
- (v) Reclamation and development of inter-State river valleys.

41. At present the State Governments look after protection and management of forests. The revision of Forest Act does not propose to alter this arrangement. However, it is necessary for the Central Government to have powers (to meet constitutional obligation) to give directions to the States in the implementation of the provisions of the Act and also on management of forests as a resource. Such power will be useful to ensure that the objectives of management are not confined to serve only narrow local interests.

42. In view of the foregoing facts it was considered desirable to have a uniform Forest Act for the country. The Working Group set up for the purpose had consulted the State Governments and prepared a draft which was placed before the CBF for its consideration. The CBF got this reviewed by a sub-Committee. When this draft came before the CBF in August, 1980, it had suggested that some time be given to the States who did not get enough opportunity to study the proposals.

43. In the meantime, there emerged a progressively growing volume of concern in the country over the decline in the forest wealth, demand for more forest products (fuel wood, timber, fodder and industrial wood), deterioration of environment/damage to ecology and so on. Most important among them all, was the concern to protect tribal interests *vis-a-vis* forests. Some of the important points raised were as follows :—

- (i) Forest should be properly conserved. Total protection should be given to catchment areas of rivers and highly erosion-prone Himalayas in particular.
- (ii) Forest Management must have its primary concern for the protection of environment, ecology, wildlife, flora and fauna and primitive tribes.
- (iii) Tribal interests over forests should be given priority in the management plans.

- (iv) Involvement of people in protecting and managing forests should be given consideration.
- (v) Production from forests should be increased several-fold to meet the fuel-wood needs of the people and industrial demands in general.
- (vi) Wider power to officers are liable to abuse causing grave harm to local (illiterate) people and tribals while the commercial interests, who are mainly responsible for destruction of forest, may go untouched.

44. The forest legislation should contain suitable provisions in respect of :—

- (i) The *nistar* rights of tribals on forest produce should be duly recognised and there

should be provision for creating *nistar* forest.

- (ii) There should be provision in the Act to eliminate the contractor agency from forest working.
- (iii) The Act should delete "Purchaser-Agent" system from the trade of nationalised items of minor forest produce.
- (iv) There should be provision to provide tenurial rights on land (heritable but inalienable) which the forest villagers cultivate.
- (v) Regulation of fellings in private, rural and urban areas should be simple; punitive element should be minimum and it should provide only a broad frame-work.

CHAPTER II

WILD-LIFE

45. Wild-life in India comprises an estimated 350 species of mammals, 2,100 species of birds and more than 20,000 species of insects. Out of these, 66 species of mammals, 38 species of birds, 18 species of amphibians and reptiles (including all the three species of the crocodillions) have been declared as endangered species. India has a long history of conservation oriented traditions. Accordingly, wild life management forms an integral part of Forest Management in the country.

46. An Expert Committee constituted by the Government of India to suggest measures for safeguarding wild life had *inter alia* recommended that a minimum of 4% of the country's geographical area should be set apart for National Parks & Sanctuaries. There were till 1980, 19 National Parks (6471.22 km²) and 202 Sanctuaries (69292.01 km²) aggregating 75763.22 km² area or 19% of the reserved forests area and 2.3% of the total geographical area of the country. Some of these areas have been specifically created to protect rare and endangered species, notable among which are the Gir National Park and sanctuary for the Asiatic Lion, Kaziranga National Park for the Great Indian Rhinoceros, Dehigam Sanctuary for the Kashmir Stag, Keibul Lamjo National Park for Thamin and Velavadar National Park for Blackbuck. The Keoladeo National Park is world famous for avifauna.

Projects for Endangered Species :

46. A number of special projects have been launched in the past one decade to save some of the more endangered species. These projects are; the Project Tiger, the Crocodile Breeding and Rehabilitation Project and the Gir Lion Sanctuary Project. The success of these projects has been acclaimed all over the world.

Project Tiger :

48. Project Tiger is inspired by an approach which not only aims at saving the tiger as an endangered species but as a means of preserving with equal importance biotopes of sizeable magnitudes. Eleven reserves extending over an area of 15800 km² in 10 States have been created till 1981. An ecosystem approach of overall development of the total habitat has been adopted and which has added a new dimension in the field of wild-life management. Comprehensive programme for the observations, investigational and monitoring research of immediate relevance have been taken up. The population of tigers in 1981 as compared to the base year of 1972 has nearly doubled.

The Gir Lion Sanctuary Project :

49. The Gir forest is the last strong-hold of the Asiatic lion in the country. The originally notified

Sanctuary area of 1265.01 km² in 1962 was increased in 1974 by 147.00 km². A central core zone extending over 258.71 km² was declared as a National Park in 1978. The total assistance from the Centre including protection, improvement of the habitat etc. amounted to Rs. 15,84,500 by 1980. The success of management is evident from the increase in the number of prey animals from 6,502 in 1970 to 21,859 during 1977. Population of lions increased from 180 in 1974 to 205 in 1979.

Crocodile Breeding Project :

50. The Government of India/FAO/UNDP Project came into being during April, 1975 for the management and rehabilitation of the three species of crocodillions in India viz. the salt-water crocodile, the fresh water mugger and the gharial. Crocodile husbandry has achieved noteworthy success. Upto 1980, 2,700 Gharials, over 600 salt-water crocodiles and over 900 muggers were raised. Upto 1979, 324 gharials; 168 salt-water crocodiles and 218 muggers from among those raised in 16 husbandry units were released in the wild. Ten sanctuaries were declared for crocodile management between 1975 and 1979. In the year 1978, the Government of India set up the Central Crocodile Breeding and Management Institute at Hyderabad to specifically impart practical knowledge of crocodile management to selected trainees. A general training in sanctuary and wild-life management is also imparted.

Project Hangul :

51. The project has resulted through consultation of experts within India, IUCN/WWF. The management plan envisages among other prescriptions the total protection of habitat against lives'ock grazing, habitat destruction, improvement of fodder and immunity from diseases.

Conservation of the Himalayan Musk Deer :

52. As a part of the threatened deer programme of the IUCN/WWF the project No. 1328 was launched with the cooperation of the Central Government and Uttar Pradesh State Government (Forest Department) in Kedarnath Sanctuary in U.P.

Manipur Brow-antlered Deer :

53. Thamin is perhaps the rarest and most localised mammal sub-species in the world, now endemic to Kelbul Lamjo, constituted to a sanctuary over some 20 km² in 1954. In 1977, the total population of the thirty two and around fifty in the year 1980. The Government of India upto 1980 released Rs. 7,19,000

under Central Assistance scheme for the development of this area. Fencing and cattle proof trenching was envisaged around the vulnerable/perimeter sections of the sanctuary. Important areas of research have been recognised.

Wildlife Legislation & Trade :

54. A comprehensive Central legislation was enacted in 1972, called the Wildlife (Protection) Act for providing special legal protection to wild-life and endangered species of fauna in particular. This act has been adopted by all the States of the country and Union Territories except Jammu and Kashmir. Jammu and Kashmir have enacted their own legislation largely on the same lines as the Central Act.

55. Forests and protection of wild animals and birds have been included in the Concurrent List in the Constitution of India by the 42nd Amendment in 1976. By virtue of this provision, not only can Central Government control the preservation and protection of the Forest Ecosystem, but certain forests and sanctuaries of national importance can be acquired by the Central Government under the powers of acquisition of property (Entry 42 of the Union List).

56. In order to control the global, legal and illegal trade in endangered species of flora and fauna, India became a party to the International Convention of Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1976.

57. India for the first time hosted a meeting of the parties to the CITES—the 3rd meeting was held at New Delhi between 25th February to 8th March, 1981.

Wildlife Education and Research:

58. With the object to equip professionals to deal with specific managerial implications related to wild-life a specialised training course was started in wild-life management at the Forest Research Institute and Colleges in the year 1970. Upto the year 1974-75, forty seven officers were trained in six batches. The course was upgraded to a Diploma course in the duration of one academic year or 10/12 months in the year 1977 under separate Directorate of Wild-life Environmental Research and Education.

59. Till the year 1981-82, officers were awarded diplomas in Wild-life Management under 3 completed courses. The fourth Diploma Course was presently underway with 18 officers taking the course of instructions. The maximum intake per course is of 20 officers.

60. *Inter-alia* the objectives of the Directorate is also to establish a sound research base and to develop techniques for wildlife research, management and teaching. All this involves pioneer nature of work as the necessary technology does not exist in the country. While considerable progress has been made in the area of technique in teaching and some research base will take some time to develop depending upon the strength of technical personnel and acquisition of considerable modern facilities.

61. Recently, a Workshop on techniques in Wild-life Research and Management was held at Kanha National Park, Madhya Pradesh during January, 1982. Staged on behalf of the Government of India in collaboration with the United States Fish and Wildlife Service and the Madhya Pradesh Forest Department, the workshop with a panel of 19 American scientists and 14 Indian counterpart scientists presented a package of the most modern techniques in 15 major subject areas of wildlife management. Fifty Indian participants and five from foreign South-East Asian countries were benefited from the workshop.

Wildlife Directorate :

62. The Directorate has secured active collaboration from organisations such as the Indian Veterinary Research Institute, the Zoological Survey of India, Institute of Forest Management, Bhopal and Drugs Laboratory, Baroda, The Project Tiger Organisation, various State Forest Departments, Zoological Park and the National Information Centre within the Electronic Commission, Government of India, in matters of imparting training in specialised areas to the Diploma trainees. Collaboration was also established with the United States Fish and Wildlife Service to organise special course in Chemical immobilization techniques, radio tracking and also field necropsy techniques for animal health care and diseases control during the year 1980.

63. The Directorate has encouraged the cause of wild-life research by granting fellowship through various universities leading to the award of Ph. D. Degrees. Nine fellowships were in operation during the Fifth Five Year Plan.

64. A National Wildlife Research and Training Institute is planned to be set up with FAO-UNDP assistance.

Creation of Wildlife Wing in the States/U.Ts.:

65. The need for a separate set-up for specialised wildlife management, specially for the National Parks & Sanctuaries, was initially put forward by the Prime Minister (Smt. Indra Gandhi) in 1973. Detailed guidelines were formulated by the Central Government and circulated to all the States for setting up separate Wildlife Wings under the State Forest Departments.

66. A recent review has revealed that implementation of these guidelines has not been done properly in most of the States. Main deficiencies found in the working of the Wild-life Wings of the States may be summarised as under :—

- (i) A separate Wild-life Wing, even within the Forest Department, has not been established.
- (ii) A separate post of Chief Wild-life Warden of the rank of Addl. Chief Conservator of Forests or above has not been created. Where this has been done, the concerned officer is used for other work, thus minimising attention to wild-life work.

- (iii) The post of Chief Wildlife Warden is not being manned by officers specially selected for the post on the basis of aptitude, interest, etc.
- (iv) The management of the national parks and sanctuaries is not completely with the Wildlife Wing headed by the Chief Wildlife Warden.
- (v) In a number of wildlife reserves, commercial exploitation is being allowed, whereas actually no exploitation is permissible at all in any national park under the Wildlife (Protection) Act and in sanctuaries all forestry operations should be under the control and direction of the Chief Wildlife Warden with the main emphasis on practices which promote wildlife conservation.
- (vi) Check posts and mobile squads with wireless sets have not been set up to control poaching.
- (vii) Officers and staff posted in the Wildlife Wing are not being identified on the basis of suitability and aptitude. Even officers trained in wildlife management are not being utilised for wildlife work.
- (viii) Transfers of officers and staff are done frequently and the 'rejects' of the department are posted to the Wildlife Wing.
- (ix) Incentives in the form, of special pay, free accommodation, etc. are not being given or are inadequate. Posting in wildlife assignment are considered to be 'punishment' postings and good officers are not posted.
- (x) The facilities for training being provided by the Central Government are not being utilised.
- (xi) Protection of wildlife in areas outside the national parks and sanctuaries is not being given adequate attention by involving the entire Forest Department and the local administration as a whole.
- (xii) No efforts are being made to initiate research and studies.
- (xiii) Adequate funds are not being allocated to make the Wildlife Wing operational and for the proper development of the national parks and sanctuaries.

Constraints in Wildlife Development:

67. The Indian Board for Wildlife has expressed concern about the lack of attention by the State Governments to the formation and working of separate Wildlife Wings in the States. Time and again, Prime Minister has reminded the State Governments for taking concrete action but wildlife development could not receive desired attention.

68. To ensure scientific management of wildlife, this Division (which was with the Ministry of Agriculture) has since been transferred to Department of Environment. There is strong demand that even forestry should be removed from Agriculture.

69. Prime Minister while addressing State Forest Ministers' Conference in October, 1982, stressed, "the feeling that wildlife is only a matter of curiosity can be preserved through ecological parks must go. Wildlife has to be wild and it has to survive. I would like to say that I am quite unhappy at the way, for instance, the Gir Lions are treated. They have become quite tame and are no longer wild. They are fed and now they have no capacity to hunt for themselves. That is not anybody's concept of wildlife nor of a sanctuary".

70. In this Conference the Prime Minister also observed "It is distressing that many people still treat the Wildlife Wing in a perfunctory manner. All posts where important work has to be done relating to working plans or wildlife are not filled up by highly motivated officers with good experience on the subject. If State Forest Ministers and senior officers of the Forest Department devote time to wildlife management only on symbolic occasions like the wildlife week we cannot ensure survival of important species."

Future Strategy for Development :

71. India is one of the very few countries of the World which enshrined in its constitution a commitment to development of flora, fauna and weaker sections of human society. Article 46 enjoins on the State to promote the educational and economic interests of scheduled castes and scheduled tribes, protecting them from social injustice and all forms of exploitation. As per Article 48-A, the State should endeavour to protect and improve the environment and safeguard the forests and wild-life of the country. The scheduled tribes live most in forest areas, hence compliance with these two principles of the constitution is mutually reinforcing.

72. The new 20-Point programmes in item 12 refers to the need to pursue vigorously programmes of afforestation, social and farm forestry and development of bio-gas and other alternative sources of energy. As a policy it has been accepted to evolve programmes by which forest cannot only co-exist but be enlarged side-by-side with the growth of agriculture and industry and the three together should help all the people to raise their standard of living.

73. In order to save the flora, fauna and primitive tribes from becoming extinct the main thrust on forestry development programme should be not only to increase the production of wood but also contribute to food production, whether directly by root, rhizome, flower, fruits, nuts or fodder trees or indirectly by giving shelter from wind and sun, restoring nutrients from deeper layers and increasing nitrogen fixation. For raising such crops people need extension help, training, technological demonstrations and other inputs.

74. In the past forest, wildlife and tribals lived happily due to lesser biotic pressure on the ecosystem. As a result of large scale deforestation and indiscriminate shooting and illicit poaching tribals have been deprived of their basic requirement of animal protein and other forest foods.

75. In order to save the primitive tribes from extinction, Ministry of Home Affairs recommended establishing of game farms for gradual harvesting to meet their protein requirements. Game farming is an accepted principle in wild-life management even under strict conservation ideas. For game farming a total domestication of wild animals are not necessary but under prolonged captive condition they tend to become domesticated as there will be constant human contact. The practice of game farming was first tried in South Africa and many developing countries are following them as a successful industry.

76. China has raised 55 million hectares of plantations during the last 30 years through communes with massive participation of the local population. Plantations raised by South Korea, Philippines & Papua New Guinea etc. in the last decades have been extensive with massive participation of the local populations. As against this India has raised only 3.5 million hectares of man-made plantations during the last 35 years. Without genuine involvement of people no strategy of development and protection of forest can succeed.

77. The wild-life conservation and protection strategy has not paid adequate attention towards tribal development. This has resulted in a great deal of bitterness among the tribals and they feel that Government have greater concern for wild animals than for

themselves. A rational approach is necessary to achieve integrated development of forests, wildlife and tribals.

Dependance of Tribals on Wildlife:

78. (i) Wildlife is a major source of animal protein to tribals. The annual hunt of Santhals is a great festive occasion known all over the country. Even the other communities have been thriving on Rodents, jackals, wild boars, porcupines and deers etc. They hunt mostly for their pot, and do not indulge in wanton destruction of wild animals. As they carry only traditional arms like bows and arrows, spears etc. there is no possibility of causing large scale killing, and each hunt involves strenuous exercise which kept them physically tough and fit to bear the rigours of forest life.

(ii) With the enforcement of the Wild-life Preservation Act (1972), there can be no exception and tribals have been deprived of this traditional right, which they have been enjoying for many generations. Left to themselves the tribals do not need much, but again the exploitation of tribals by the non-tribal, outsiders create the administrative bottleneck which impedes any decisions to grant concession to tribals to the extent of their traditional needs. It can be done by sympathetic understanding of their needs at local level and by taking a little rational view of the situation. Instances have come to light where killing of vermins was also not allowed and the innocent tribals were penalised and harassed. All this calls for better understanding of tribal ethos, beliefs and practices. It is a two way process where tribals have to be educated about role of wild animals and forests, and the foresters and people at large have to be educated to develop respect for the tribal way of life and love for these simple people. Wherever necessary game farms of sufficiently large area may be created.

CHAPTER III

FORESTS AND TRIBALS

Tribal Situation:

79. It is estimated that at present there are approximately two hundred million tribal people or roughly four per cent of the world's population. They are found in all regions of the world and they number among the poorest of the poor.

Characteristics of Tribal Groups:

80. More specifically, the tribal people may be hunter-gatherers, shifting cultivators, herders, simple farmers or fisherfolk. Tribals exhibit many, if not most, of the following characteristics:—

- (i) Geographical isolation or semi-isolation.
- (ii) Demographically concentrated in contiguous areas.
- (iii) Economic base more tightly dependent on their specific environment i.e. forest and land.
- (iv) Ethnic distinctiveness from the national society.
- (v) Non-literate: not possessing a written language.
- (vi) Love for freedom and respect for self-identity; and
- (vii) Non-monetised or partially monetised economy.

81. As per 1971 census, the scheduled tribe population numbered 38 million constituting about 7% of the country's total population. With the Amendment Act of 1976, doing away with area restriction within a State, the number is estimated to have nearly reached 40 million constituting 7.5% of the country's total population. Details are as per Table—7.

82. In the States of Meghalaya, Nagaland and the Union Territories of Dadar & Nagar Haveli, Lakshadweep, Mizoram and Arunachal Pradesh the proportion of scheduled tribe population is more than 79% hence all planning for the State is mainly for the scheduled tribes.

83. Two third of the total population of scheduled tribes is concentrated (as per 1971 census) in Madhya Pradesh (98.15 lakhs), Orissa (50.57 lakhs), Bihar (49.33 lakhs), Gujarat (37.57 lakhs) and Rajasthan (31.35 lakhs). The other States having scheduled tribe population are Andhra Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Sikkim, Tripura, Uttar Pradesh, West Bengal and Union Territories of Andaman and Nicobar Islands and Goa, Daman and Diu.

84. There are about 250 scheduled tribe communities speaking about 105 languages and 225 subsidiary languages. Amongst them are groups as large as about 5 million and as small as 26 Great Andamanese. Each community irrespective of its numbers has come to occupy a place of its own in national life, retaining its own identity and culture.

85. Scheduled tribe occupy 18.74% of the total area of the country, mostly living in remote hilly to forest regions of 19 States and 6 Union Territories.

TABLE 7

State-wise population of Scheduled Tribes

| Sl. No. | State/Union Territory | Total population (1971) census | Scheduled Tribe Population | | Revised population as per the constitution order (Amendment) Act 1976 | Percentage to total population (Col. 6 to 3) |
|---------|-----------------------|--------------------------------|----------------------------|--|---|--|
| | | | As per 1971 Census | Percentage to total population (Col. 4 to 3) | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Andhra Pradesh | 435.03 | 16.58 | 3.81 | 22.26 | 5.12 |
| 2. | Assam | 146.25 | 16.07 | 10.99 | 16.07 | 10.99 |
| 3. | Bihar | 563.53 | 49.33 | 8.75 | 49.33 | 8.75 |
| 4. | Gujarat | 266.97 | 37.34 | 13.99 | 37.57 | 14.07 |
| 5. | Haryana | 100.37 | — | — | — | — |
| 6. | Himachal Pradesh | 34.60 | 1.42 | 4.10 | 1.42 | 4.10 |
| 7. | Jammu & Kashmir | 46.17 | — | — | — | — |
| 8. | Karnataka | 292.99 | 2.32 | 0.79 | 2.62 | 0.89 |
| 9. | Kerala | 213.47 | 2.69 | 1.26 | 1.93 | 0.90 |
| 10. | Madhya Pradesh | 416.54 | 83.87 | 20.13 | 98.15 | 23.56 |
| 11. | Maharashtra | 504.12 | 29.54 | 5.86 | 38.41 | 7.62 |
| 12. | Manipur | 10.73 | 3.54 | 31.13 | 3.34 | 31.13 |
| 13. | Meghalaya | 10.12 | 8.14 | 80.43 | 4.14 | 80.43 |
| 4. | Nagaland | 5.16 | 4.58 | 88.76 | 4.58 | 88.76 |
| 15. | Orissa | 219.45 | 50.72 | 23.11 | 50.75 | 23.13 |
| 16. | Punjab | 135.51 | — | — | — | — |
| 17. | Rajasthan | 257.66 | 31.26 | 12.13 | 31.35 | 1817 |
| 18. | Sikkim | 2.10 | .. | — | — | — |
| 19. | Tamil Nadu | 412.60 | 3.12 | 0.76 | 4.50 | 1.09 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|-------------------------|---------|--------|-------|--------|-------|
| 20. | Tripura .. | 15.56 | 4.51 | 28.98 | 4.51 | 28.98 |
| 21. | Uttar Pradesh | 883.41 | 1.00 | 0.23 | 1.99 | 0.23 |
| 22. | West Bengal | 443.12 | 25.33 | 5.72 | 26.03 | 5.87 |
| 23. | A. & N. Islands | 1.15 | 0.18 | 15.65 | 0.18 | 15.65 |
| 24. | Chandigarh .. | 2.57 | — | — | — | — |
| 25. | Arunachal Pradesh .. | 4.68 | 3.69 | 78.85 | 3.69 | 78.85 |
| 26. | Dadra & Nagar Haveli .. | 0.74 | 0.64 | 86.49 | 0.64 | 86.49 |
| 27. | Delhi .. | 40.66 | — | — | — | — |
| 28. | Goa, Daman & Diu .. | 8.58 | 0.07 | 0.82 | 0.07 | 0.82 |
| 29. | Lakshadweep | 0.32 | 0.30 | 93.75 | 0.03 | 93.75 |
| 30. | Mizoram .. | 3.32 | 3.43 | 94.28 | 3.13 | 94.28 |
| 31. | Pondicherry .. | 4.72 | — | — | — | — |
| | INDIA .. | 5481.60 | 380.15 | 6.94 | 411.48 | 7.5 |

86. The scheduled tribes generally live in inhospitable terrain where the productivity of the soil is low. Shifting cultivation and dry upland cultivation are traditionally the most important sources of livelihood for many of the tribal communities.

87. Their low rate of literacy makes them vulnerable to exploitation by money-lender, excise and forest contractors. Land alienation is rampant. Infrastructure is extremely poor in the tribal area. The barter system of services and commodities still exists in many areas.

Pre-independence Tribal scheme:

88. The British came in contact with tribal communities at a latter stage and experienced greater resistance in these areas. In the first instance, the British attempted to super-impose their conventional administrative pattern, directly or through intermediaries. This led to hostility, discontentment and sometimes rebellions. This policy was reviewed and subsequently a policy of non-interference was adopted.

89. August Cleveland laid the foundation of policy embodied in Regulation 1 of 1876 when he was deputed to handle the revolt of Paharias of the Rajmahal district in Bihar and, as time went on, the idea that distinct and special arrangements were necessary for the tribal regions gained general acceptance.

90. After 1876, the Government of India Act, 1919 vested powers in the Governor-General in Council to direct by notification that any act of the Indian Legislature would apply to backward tracts subject to such exceptions or modifications as he thought fit. The Governor-General was also authorised to give similar directions as regards Acts of local legislatures.

91. Sub-section (i) of Section 92 of the Government of India Act 1935 is the next landmark providing for the administration of the "excluded areas" and the "partially excluded areas". The "Excluded areas" were frontier and border regions in Assam, Lakshadweep and Lahaul Spiti District of Himachal Pradesh and the "Partially excluded areas" broadly comprised that are now described as scheduled areas. Section 92 (i) provided that "No act of the Dominion, Legislation or of the Provincial Legislature shall apply to "excluded areas", "partially excluded areas" unless the Governor by public notification so directs. Under section 92(2) of the Act 1935, the Governor-General was empowered to make regulations for the peace and good government of any area of the province which was, for the time being, an excluded area or partially excluded area, and any regulation so made might repeal or amend any action of Federal Legislature or of Provincial Legislature or any existing law which was, for the time being, applicable to the area in question.

92. Gandhiji reacted sharply to the segregation of various communities, particularly the tribals. In strategically situated Assam in 1946 he reminded the people that, "It was their shame that the Adivasis should be isolated from the rest of the nation of which they were an inalienable part".

93. On the event of the transfer of power the most scathing indictment of the colonial policy of isolation and *status quo* for tribals came from the last British Government, T. G. Rutherford of Bihar :

"While we (the British) have been in power we have not done much for them beyond certain amount of protective legislation which functions effectively when the officers responsible are really sympathetic and, largely with the aid of missionaries—we have done a little to educate them. The tendency, on the whole, has been to treat them as delightful primitives whose simplicity and customs are a welcome relief from the sordid details of administration among the ordinary Hindus and Muslims".

Tribal Development after Independence :

94. The process of decolonisation which began after the transfer of power involved enfranchisement and grant of full citizenship rights to the tribal communities and setting up of democratic institutions. This resulted in the curtailment and abolition of the power of the tribal chiefs who had acted as the natural leader of the community. The chief enjoyed a great deal of power in the Mizo and Khasi Hills, and they encouraged anti-national forces in early 1950s, while the educated tribal elite favoured union with India. In Central India, tribal chieftainship was abolished with the Zamindari and intermediary interests in the first flush of land reforms.

95. Jawaharlal Nehru's philosophy and vision shaped the tribal policy in 1950s. Nehru was of the view : "I am alarmed when I see not only in this country but

in other great countries too—how anxious people are to shape others according to their own image on liveness, and to impose on them their particular way of life—I am not at all sure which is a better way of living. In certain respects I am quite certain their is better. Therefore, it is grossly presumptuous on our part to approach them with an air of superiority or to tell them what to do or not to do. There is no point in trying to make them a second rate copy of ourselves.”

96. Therefore, it was agreed that while tribal identity should be preserved, tribals should develop in their own way without let or hinderance. As Nehru admitted, these reactions were, to begin with, instinctive and not based on any knowledge or experience. Gradually and towards the close of 1950s, outline of a policy emerged as under :—

- (i) People should develop along the lines of their own genius and we should avoid imposing anything on them. We should try to encourage in every way their own traditional arts and culture.
- (ii) Tribal rights in land and forest should be restored.
- (iii) We would try to train and build up a team of their own people to do the work of administration and development. Some technical personnel from outside will no doubt be needed specially in the beginning. But we should avoid introducing too many outsiders into the tribal territory.
- (iv) We should not over-administer these areas or overwhelm them with a multiplicity of a scheme. We should rather work through, and not in rivalry to their own social and cultural institutions.
- (v) We should judge results not by statistics from the amount of money spent, but by the quality of human character that is evolved.

97. Soon after launching of the Five Year Plans' and inauguration of the Community Development Projects, special programme for the tribal areas were taken up and Special Multipurpose Tribal Blocks were established. Additional outlays were provided for these areas so that the pace of development could be quickened and the gap between the tribal areas and the advance regions could be narrowed. With the conversion of the Community Development Projects into Community Development Blocks, another scheme, for tribal areas was also prepared in the form of Tribal Development Block. These schemes continued till the end of Fourth Five Year Plan. By that time, 506 Tribal Development Blocks had been established covering all areas with more than two third tribal concentration.

98. The Scheduled Areas and Scheduled Tribes Commission (1961) evaluated the working of constitutional safe-guards for the tribal and tribal development programmes. It noted the changes of far-reaching character introduced in tribal areas by the development process. The Commission also observed that

“the problem of problems is not to disturb the harmony of tribal life and simultaneously work for its advance; not to impose anything upon the tribals and simultaneously work for their integration as members and part of the Indian family.” The Commission made wide-ranging recommendations involving protection of tribal's land, of their right in forest, their rehabilitation, etc.

99. A study team appointed by the Planning Commission headed by P. Shilu Ao opined that, “the aim of tribal welfare policy should be defined as the progressive advancement, social and economic development of the tribals with a view to their integration with the rest of the community on a footing of equality with-in a reasonable distance of time. The period has necessarily to vary from tribe to tribe, while it may be five or ten years in the case of certain tribes, more particularly the tribes who have already come into contact with the general population living in plains, it may be two decades or more in case of tribals who are still at food-gathering stage”.

100. As early as 1969, the Renuka Ray report emphasised that while each aspect of development was important in its own place, integrated programmes based on agriculture, forestry, hand crafts and village industry were needed, the degree of emphasis upon each of them being determined by a systematic survey of the needs and possibilities in each area.

101. A review of the problem and performance of the tribal development from First Plan to the Fourth Plan reveals that the problem of development of tribal areas is primarily linked with the backwardness of these areas, poverty of the people and the problem of integration of tribals with the rest of the population. Some of the weaknesses in policies and programmes of tribal development noticed were :—

- (i) All sectoral programmes depended on small outlays under the special sector of development of Backward Classes and not on the general sector outlays.
- (ii) Specific problems of the tribals as primitive methods of agriculture, land alienation, indebtedness, adverse effects of industrialisation, low rates of literacy, poor health and nutrition, etc. have not been solved.
- (iii) The efforts made for social and economic development of scheduled tribes did not bring about appreciable changes in their condition.
- (iv) One of the important factor for lack of impact so far, is that the development of scheduled tribes and tribal areas has been looked upon as a problem of “welfare” as distinguished from ‘development’.
- (v) There has been tendency to rely on schematic pattern in Tribal Development Block programmes in place of adopting a flexible strategy suiting the needs of each specific area.

- (vi) The administrative structure in tribal areas has continued to lack simplicity and thereby defying comprehension of the tribals and has failed to evoke any response from them.

102. The formulation of Fifth Five Year Plan showed perception of (a) the deliterious effects of the disturbed environment, consequent upon the intensive exploitation of the natural resources of tribal regions, on the tribal communities; (b) the growing incidence of exploitation of the tribal people, their loss of land, their indebtedness, their transformation from peasant into labour, particularly in the zones of intensive industrial activities and (c) the diversities of tribal situation which called for a more area specific approach to planning and development. This means a gradual moving away from the schematic pattern of the earlier plan and formulation of a more integrated approach to the tribal problem.

103. The tribal development scene was critical on the eve of Fifth Plan. The problem of tribal development was broadly classified into two categories (a) areas of tribals concentration and (b) dispersed tribals. In case of the former, it was decided to accept an area development approach with a focus on tribals. For dispersed tribals, it was decided that family oriented programmes would be taken up. Special strategy was adopted for development of primitive tribes. Thus, the strategy of tribal sub-Plan for areas of tribal concentration was evolved in the Fifth Plan and implemented in the 16 States and 2 Union Territories. Later on, Sikkim was added in the list.

104. The tribal sub-Plan concept was launched in the beginning of the Fifth Plan period 1974—79. Development Blocks with more than 50% of tribal population have been located in States and Union Territories where they are in a minority but inhabit geographically compact areas. 622 full and 283 part development blocks have been identified in 21 full and 81 part districts. The development blocks have been grouped into Integrated Tribal Development Projects (ITDPs) which number more than 180 in the country. The underlying idea has been to adopt a project approach in the ITDP. The total population covered by the ITDP is 4.19 crores out of which the scheduled tribes population is 2.35 crores constituting about 62% of the total scheduled tribe population in the country. In the sixth plan period, the coverage is being extended by identifying additional tribal pockets.

105. According to the national Sixth Plan 1980—85 document, an analysis of investments made in the Fifth Plan shows that out of the States' share of funds, larger outlays have gone into infrastructural schemes and only 5% of the investment was for beneficiary-oriented schemes. It goes on to say that though the allocation for infrastructural programmes might help create employment and build facilities, there would be a long time-lag between the infrastructure facilities being created and utilisation by tribals. To expand it, it is necessary that the planning process be oriented in favour of family-oriented schemes with a sharper focus on the target groups.

106. The working Group on Tribal Development during 1980—85 summed up the objectives during the Sixth Plan as follows :—

- (i) Raising productivity levels in the fields of agriculture, horticulture, animal husbandry, forestry, cottage, village and small industry, etc. so as to create economic impact of an order which will enable a targeted number of families (say 50% in the tribal sub-Plan area) to cross the poverty-line. With the household as the basic unit of planning, in poverty reduction the poorest and then the poor should be taken up on a progressive scale.
- (ii) Apart from the effort in the core economic sectors indicated in (i) above, education should become the key sector in the Sixth Plan period.
- (iii) The attainment of the objectives in (i) and (ii) above would vitally depend on an adequate infrastructure for the creation of which there should be commensurate financial and physical effort.
- (iv) Concomitant with the aforesaid three-fold aims and, perhaps, the most important, assiduous exertions are necessary to eliminate exploitation of tribals in the field of alienation of land, money-lending, debt bondage, trade, excise, forest, etc.

107. The tribal sub-Plan approach envisages projected development effort with resources pooled from (i) outlays of the State Plan, (ii) investment from Central Ministries, (iii) special Central assistance and (iv) institutional finance. The Working Group has estimated an outlay of Rs. 4000 to Rs. 5000 crores in the sub-Plan areas during the Sixth Plan period. The total number of scheduled tribe families in the tribal sub-Plan is estimated to be about 47 lakhs. To enable 50% of them or say 23.5 lakh families cross the poverty-line with an investment of Rs. 10,000 per family, the total requirement would be Rs. 2,350 crores. It is contemplated that 50% of this requirement would be met from public sector and the balance 50% from the institutional finance. The requirement of infrastructure would be met out of the balance of the total outlay of Rs. 4000 to Rs. 5000 crores.

108. A plethora of legislation has been enacted to prevent alienation of land, regulate money-lending, abolish bonded labour system, eliminating the contractor agency from all forestry operations and organised labour. The new package of programme seeks to tackle more effectively on a wide front the programmes of credit and marketing, application of a simple and relevant technology to agriculture, development of a programme of a social forestry and agro-forestry under which a tribal could become the partner or owner rather than remaining worker in forest and further development of minor forest produce trade, communication, health, education and drinking water which have already made an impact.

109. The resources being mobilised for the development of tribal regions from many sources, outlay in the State plan, investment of the Central Government Ministries, special Central assistance from Ministry of Home and institutional finance has reached an all time high and the per capita investment is evident from Table 8 :—

TABLE 8
Per capital investment on Scheduled Tribes
(Rs. per capita)

| Sl. No. | Plan | State | Centre | Total |
|---------|-------------------------|--------|--------|---------|
| 1. | First Plan | 10.43 | — | 10.43 |
| 2. | Second Plan | 12.49 | 9.98 | 22.47 |
| 3. | Third Plan | 9.95 | 7.01 | 16.96 |
| 4. | 1966—69 | 3.21 | 7.63 | 10.84 |
| 5. | Fourth Plan | 8.84 | 12.17 | 21.01 |
| 6. | Fifth Plan (1974—79) .. | 227.94 | 50.77 | 278.71 |
| 7. | 1979-80 | 109.78 | 20.04 | 129.82 |
| 8. | Sixth Plan (1980—85) .. | 911.65 | 133.47 | 1045.12 |

Constitutional Provisions :

110. The provisions in the Indian Constitution relating to the scheduled tribes can be divided into four categories : protective, developmental, reservation and the rest. It is apparent that the framers of the Constitution had deep insight about the condition of scheduled tribes and were anxious to ensure their betterment. Article 46 which is a part of the chapter on the Directive Principles of the State Policy runs :

“The State shall promote with special care the educational and economic interests of the weaker sections of the people, and, in particular, of the Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation”.

111. This single Article epitomises the policy the State (the Central and the State Governments both) has to follow. In fact, many of the other constitutional provisions flow from this Article.

112. It is noteworthy that even provisions relating to Fundamental Rights have been qualified with “reasonable restrictions” in favour of scheduled tribes. Article 15 prohibits discrimination against any citizen on grounds of religion, race, caste, sex or place of birth, but clause (4) thereof enables a State Government to make special provisions for advancement of members of scheduled castes and scheduled tribes. Article 16 provides for equality of opportunities for all citizens in matters relating to employment or appointment to any public office; but the State has been empowered to make reservation in appointments or posts in favour of scheduled tribes. Article 17 grants the rights of freedom of speech, assembly, association, union, acquisition and disposal of property,

practice of any profession, occupation, trade or business, movement throughout the country and residence in any part of the country; but laws placing reasonable restrictions on the exercise of any of the rights conferred for protection of the interests of scheduled tribes are permitted. Article 23 prohibits traffic in human beings, “Begar” and other forms of forced labour; this has special relevance for scheduled tribes. Thus, even some of the Fundamental Rights have been sought to be abridged to the extent it may be felt necessary to extend protection to the under-privileged communities i.e. the scheduled castes and scheduled tribes.

Developmental Provisions :

113. The second category of provisions relating to the developmental aspects of scheduled tribes can be divided further into three parts. The first relating to policy matters issues from Article 46 itself. The policy is to carefully promote the economic and educational interests of the weaker sections of the people, particularly the scheduled castes and scheduled tribes. Such a policy demands planned development aimed at furthering their interests. Planned development calls for financial resources and executional machinery. For financial resources Article 275 and for the latter Article 244 and the Fifth Schedule of the Constitution have relevance. These and the other relevant provisions in the Constitution of India for Scheduled Tribes ensure their development. The first Proviso of clause (1) of Article 275 makes it incumbent to set aside funds out of the Consolidated Funds of India for being given to the States so that the cost of schemes of tribal development and raising the level of administration in Scheduled Areas can be defrayed. Thus, there is no stint on financial resources, except as may otherwise be necessary relative to overall availability. Article 244 is the fount of the Fifth Schedule which incorporates extraordinary provisions for administration of Scheduled Areas. Scheduled Areas encompasses all areas which the President of India notifies under the Fifth Schedule. In practice, the Scheduled Areas have been made more or less coterminous with those areas (administrative units like development blocks) which have majority of scheduled tribe population. Clause (1) of para 5 of Fifth Schedule thereof confers wide amplitude of powers on a Governor of a State in as much as he can exclude from application to a Scheduled Area any particular Act of Parliament or of the State Legislature, can modify an enactment, can subject its application to exceptions etc. It is further remarkable that the Governor has been given powers for retrospective effect of the provisions. Clause (2) empowers the Governor to make regulations for the peace and good government of a Scheduled Area, in particular for preventing alienation of tribal land, allotment of land to members of scheduled tribes, regulating the business of money-lending etc. Clause (4) and (5) indicate the procedure to be followed by the Governor : he has to consult the Tribes Advisory Council of the State and obtain the assent of the President before a regulation can become operative. In the earlier part, the Fifth Schedule contains provisions for the constitution of Tribes Advisory Council and casts on the Governor the duty of making a periodical (say annual) report to the President regarding administration of Scheduled Areas.

114. It is worth noting that para 3 of the Fifth Schedule speaks expressly of the executive power of the Union Government extending to giving of directions to the State as to the administration of Scheduled Areas. The Centre enjoys residuary powers of legislation, but that the founding fathers thought it fit to include here such a power should not escape observations. We may juxtapose with it Article 339(2) containing a similar provision for directions for drawing up and execution of welfare schemes. It is reproduced here :

“The executive power of the Union shall extend to the giving of directions to a State as to the drawing up and execution of schemes specified in the direction to be essential for the welfare of the Scheduled Tribes in the State”.

115. There cannot be any doubt that the Constitution invests in the Centre supervisory and interventionist roles. But a federal constitutional structure generally calls for a careful and delicate equilibrium of powers and forces. Investiture of a certain prerogative need not invite its exercise, *ipso facto*. It is relevant that the Centre has not taken recourse to these two provisions even once in these thirty odd years and relied more on persuasion and negotiation in Centre-State relations. The distinction between the two clauses should not be lost. The former refers to directions in respect of administration of Scheduled Areas and the latter in respect of execution of schemes essential for the welfare of Scheduled Tribes both in the Scheduled Area in a State and outside such Areas. More or less, the two are complementary to each other.

Reservational Provisions :

116. Attention may be turned to the third category i.e. reservational provisions. We have seen how Article 16 guaranteeing equality of opportunities in matters relating to employment, allows reservations in favour of any backward class of citizens like scheduled castes and scheduled tribes. In consideration of the low educational and economic levels of the scheduled castes and scheduled tribes, reservation of seats for these two communities has been provided for on the basis of population in the House of the People as per Article 330, Legislative Assemblies of the States as per Article 332 and in public services and posts as per Article 335. The founding fathers thought that these provisions were necessary for a certain length of time in the course of which members of these communities would be able to attain sufficiently high standard and the need for reservations, particularly in legislature, would disappear altogether. In 1980, their tenability was extended by another decade. Considering the present pace of progress, it does not seem likely that it would be feasible to dispense with reservation in the course of this century. The concept of reservation was subject to the criticism, made even at the time of the debates in the Constituent Assembly but persisting throughout, that it hampers self-sustaining growth encouraging reliance on artificial crutches. It has to be remembered, however, that but for reservation in legislatures, the voice of these two weak communities would have remained muffled all these years. The reservation in educational institutions and public services has enabled members of these communities to register rise in the percentage

of posts they have filled. Obvious examples are that in 1944 when the post-matric scholarship scheme was introduced for these two communities, the number of scholarship-holders was 114 among scheduled castes and nil among scheduled tribes. In 1981 it rose to about half a million among scheduled castes and a hundred thousand among scheduled tribes. Similarly, in 1960 about a quarter million members of scheduled castes were drawn into government posts rising to about half a million in 1980; the corresponding figures for scheduled tribes are about 35,000 and over a hundred thousand.

117. It might be useful to take a peep into the way these provisions have been operating. Reservations relating to Parliament and State Legislatures have been based mostly on demarcation of seats reserved for scheduled castes and scheduled tribes depending on concentration of their population. The matter has been simpler in the case of scheduled tribes on account of the more or less exclusive areas they have occupied; it is possible to identify and plot on the country's map distinct areas (particularly in the States of Madhya Pradesh, Orissa, Bihar, Gujarat, Maharashtra, Rajasthan and West Bengal) where they predominate. In consequence, delimitation of seats for them offers little difficulty. The question of delimitation of seats both in Parliament and State Legislatures for scheduled castes is beset with some problem as they live inter-mixed with the other population. However, the Election Commission and the Delimitation Commission have devised a methodology for demarcating seats even for scheduled castes. The system has been working satisfactorily in the past three decades and the scheduled caste and scheduled tribe members have become a force to be reckoned with in some State Legislatures.

118. The operation of reservation in services has been a more difficult affair on account of their structural complexity. The hierarchical tiers in which services are arranged, the varying methods of recruitment (direct recruitment, promotion, selection, transfer), the diverse civil and defence services built into the administrative system, are factors not easy to contend with for reservation. Nevertheless, here also methodologies have been devised. Some State Governments like West Bengal and Orissa have made status for enforcement of reservations, but some others and the Centre have been able to operationalise them through executive orders. There has been a considerable upswing in the representation of scheduled castes, though not as much in the case of scheduled tribes.

Miscellaneous provisions :

119. In the fourth category of constitutional provisions are a miscellany, in which the most important is the one relating to specification of scheduled tribes in Article 342. This empowers the President to denote the tribes or tribal communities to be deemed as scheduled tribes. The provision is fundamental. Pragmatic criteria have been evolved for determination as to which group could be regarded as a scheduled tribe community :

“Primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large and backwardness”.

Dependence of tribals on Forest :

120. The tribal communities in India largely occupy forested regions where for a long period in their history, they have lived in isolation but in harmony with nature. They draw their sustenance largely from the forests. The forests not only provide them food, material to build houses, fuel for cooking, light and warmth, fodder for their cattle, but also satisfy the deep-rooted sentiments. Tribal life is connected one way or the other with forests, right from birth to death. In times of distress like famine, forests are their last succour. Even in areas where forests do not exist, the tribals still visit distant forests periodically and try to get their traditional requirements from there, however, insignificant they may appear to others.

121. Forests occupy the central position in tribal economy. Tribal life is profoundly affected by whatever happens to the forest. Forest represents for them (tribals) a whole way of life; a home; a culture; worship; food and other wherewithal; employment and income. Since tribals mostly live in the forests their development cannot make much headway without contribution of forestry sector.

122. The tribal communities could subsist for thousand of years with reasonable standard of health and abode mainly because forests provide them food, water, shelter, clothes, medicine and employment. A variety of new forces have arisen in the forest area which have disturbed this balance.

123. The tribals have a very close linkage with their forest habitat which they regard as their mother deity. It has been found that the tribal people are not only familiar with number of biological species around them but also possess some understanding of ecological inter-relationship of the various components of forests. Appropriate use of knowledge of tribals in forestry operations and minor forest produce may add a significant dimension to the developmental activity in these fields.

124. The benefits accruing to tribals from forests are various and derived in a variety of ways. The tribals are so accustomed to these benefits that they have become a part of their daily routine. In areas where forests exist, not only the able-bodied worker but also the old and infirm as well as children bring something, however modest it may be to the household, whereby they have the satisfaction of having contributed their mite.

125. Tribals have always been sentimentally attached to the forests and considered them to be nature's gift. Their folklore is full of references to the forest. There are several rites and rituals where some forest produce is used one way or another. Many of the leaves, climbers etc. needed in magico-religious rites are procured from these forests. Many trees in the indigenous forests are considered to be abode of deities and are worshiped as such.

126. Tribal knowledge encompasses the ecosystem in its entirety, of the interdependence of floral and

faunal species, of the specificities of micro-zones and their interforces, of seasonal and long term variations in plant and animal life, reproductions, growth, movement and productivity, these aspects of tribal knowledge are almost always ignored or disregarded. Tribals are in the forefront of knowledge of the management of marginal environment and can therefore contribute to the national society. The preservation of these groups is a significant economic opportunity for the nation.

127. With the increasing demand of industry and commerce for forest produce and with development, the "outsiders" have penetrated into the tribal habitats. Dams, Power Stations, steel, copper and aluminium plants, mines, railway and tele-communication installations and related township and rehabilitation of refugees from various countries have brought in armies of skilled workers, with engineers and managers, administrators and policemen, traders and supporting services. In all this activity, the tribal has been a very small participant or beneficiary. On the contrary, he has become an outsider in his own home exploited by others and alienated.

128. The problem of forest conservation and protection cannot be separated from the lives of forest dwellers and local population. A new understanding and programme that develops new and healthier relationship between the Forest Department and the masses must be evolved to avoid tribal movement which spread in the past. The local tribal community, which has symbiotic relationship with the forests, should be accepted as partner in the local forestry development efforts in each area. Unless this promise is accepted and built into the system, it may not be possible to avoid conflicting situation at the local level. The best protective device for the existing forests and new additions is to create an interest of the local community in the forest wealth.

129. The leaders of freedom struggle in the tribal regions had mobilised the tribals by focussing on their rights in forest being eroded through its commercial exploitation. Forest, next to land, was the most important resource on which the tribal subsisted. A series of forest *satyagrahas* were launched in 1930s by the Indian National Congress to demand restoration of tribal's customary rights to extract timber and collection of minor forest produce for their consumption and sale. The freedom movement aroused expectations among the tribals that days of their oppression were numbered and that the era of *Swaraj* which would lead to the restoration of their rights in land and forests would dawn.

130. After independence while the forests area started shrinking, the increase in human and cattle population caused tremendous pressure on the limited forest resources. This resulted in stricter enforcement of rules and thereby the tribals felt that their rights and concessions in forest and forest produce have been curtailed.

131. The situation was further aggravated as the increasing demand for timber and scarce supply resulted in the entry of middle men who exploited the

simplicity of tribals by purchasing the timber given to them for their own domestic use as a right in the forest. They also forced the tribals to demand more and more share of timber as right which these profiteers started buying at nominal rates from tribals and selling the same in market at fabulous prices and in turn making enormous profits. Thus it became a vicious circle where the non-tribal outsiders, prompted the tribals to assert for their rights in forests for their own money making. This is a common practice all over the tribal areas which forced the forest department to the brink and quite often it resulted in the criticism of the department. In fact, the genuine demand of tribals is not much and there can be no difficulty in meeting the same, but the entry of outsiders and exploitation of tribals by them is the real difficulty that needs to be tackled.

132. A reaction against the Congress rule set in the mid of 1950s. The stage was thus set for the commencement of *satyagraha* concerned mainly with the free utilisation of forest produce and extraction of timber without any payment.

133. The tribes of Madhya Pradesh were the first to strike. In 1957, a forest movement developed with Khobi village (Ambikapur-Surguja) as the base, involving the Kharwar tribe, who were led by their leader Chuni who was influenced by the Gond preacher, Rajmohini Devi. Tribals were advised not to pay land revenue and forest dues since in their view "*Jungle and Zamin Azad Hai*" (forest and land are free). However, in an encounter with Police on December 18, 1957 two persons died and several others were injured and the movement fizzled out. Similar movement died down after a bloody conflict on February 1, 1958 in Palamau District of Bihar.

134. Restriction of their rights in forest has continued a burning issue in Gond community since 1940 onward. The "Babajari revolt" is well-known in the history. The Gond *darbar* held on February 6, 1981 at Kosalpur declared that the problems of the tribals had come to boiling point. The Gonds prevented the demarcation of land for afforestation. On April 20, 1981 a conference was planned by CPI (ML) at Indervalli. The meet was banned and the tribals were persuaded not to assemble there. However, they took out a procession which came into conflict with a police force. About 15 tribals lost their lives and many were injured.

135. In 1978—82, as the Jharkhand movement was intensified the forest question loomed large. The issues agitating the tribals in this connection were: (i) payment of remunerative price for lac and minor forest produce; (ii) payment of compensation for the damage done to the crops by elephants; (iii) generation of adequate employment and payment of appropriate wages for labour in the forests and (iv) recognition of their traditional rights to reclaim lands outside the reserved and protected forests. Resistance to the plantation of Teak became symbol of the movement. Tribals *gheraoed* and assaulted the forest officials, breached forest roads, destroyed bridges and culverts and burnt down many forest buildings. An

area of 18,770.19 acres of best forest was illegally felled by the agitationists and large forest area was reported to be damaged in a short span of 4½ years. Bihar State Govt. subsequently introduced a number of measures viz., (i) Teak plantation has been stopped; (ii) contractor agency has been eliminated; (iii) minor forest produce collection rates were increased substantially (for example Sal seed collection rate is now Rs. 0.73 per kg. as against Rs. 0.55 in 1981); (iv) Forest Department encouraged forestry as an avocation for tribals by providing inputs and subsidy; and (v) employment generation has been increased manifold.

136. Tribal movement of 1981-82 in Bastar disturbed the complete departmental working of timber coupes for some time. They were agitating for gainful employment, elimination of contractor agency from minor forest produce, collection and establishment of forest industries in Bastar area itself. Similar tribal movements are becoming rampant and unless corrective measures are applied immediately it may be difficult to save the forests.

137. The approach must shift from dependence on law and bureaucracy to dependence on the conscious and voluntary participation of the masses. This presupposes forestry education of the masses as well as re-education of forest employees. In the words of Prime Minister, Smt. Indira Gandhi, "People can be taught to live in peace with nature and themselves only if they are assured of water, shelter and work". "Tribals, the poorest among the poor, are agitating only for their survival and better living and they will never like to deforest any area" was stated by an eminent tribal leader.

138. Forest destruction will not stop unless the problem of scarcity of fuel is tackled and forest dwellers are lifted up from the ditch of poverty and backwardness. Report of the Fuelwood Study Committee recommended inclusion of fuelwood in the "Minimum Needs Programme". Prime Minister also desires introduction of individual beneficiary programmes in forestry sector to enable the poor families to cross the poverty line.

Forestry for the poor people :

139. To-day it is possible by choice of a suitable technology and production pattern that any piece of land, about a hectare or so, can make a family economically viable. The choice can be as wide ranging as the capital intensive: Coffee plantation on the one hand, through plantation of fruit-bearing trees, host plant for tassar to plantation of fodder-trees linked to animal husbandry and plantation on the other.

140. Forest farming (Tree and Bamboo plantations) has been carried out successfully by number of farmers in different parts of the country. Wherever they have done so their costs are half or less than those incurred by the Government, and the productivities of their plantations are five times or more. Even on marginal and sub-marginal areas, successful afforestation has been done which upgraded the economy of individual besides improving the ecology of the area.

141. Chinese have raised successfully new forests over an estimated area of more than 45 million hectares in the last 25 years i.e. on an average 1.8 million hectares on yearly basis. Their slogan is, "forestry support to agriculture and animal husbandry". The villagers are intimately associated with the entire programme. Every individual participant is assured of a share in the forest produce.

142. In India, about 100 million hectares land is reported to be crying out for afforestation. During 1977-78, 48% of the people were estimated to be living below the poverty line. Of the total number of 303 million people living below the poverty line in 1977-78, 252 million were in rural areas. The total population of scheduled tribes is about 40 million (as per 1971 census) or say 8 million families living below the poverty line whose economic upgradation largely depends on forestry. For afforesting 100 million hectares within a period of 25 years the annual target has to be kept as 4 million hectares which will generate gainful employment to 16 million people.

143. At present an experiment of the Gujarat Forestry Department is being widely applauded. It has involved schools in raising seedlings and tribals under social security plantations. Efforts of other State Governments restrict mainly to free distribution of seedlings. At present, there are no schools or extension centres in the villages to show the people better way of cultivating trees and bamboos crops. "Resource literacy" is yet to be created in the country. In the words of Pt. Jawahar Lal Nehru, "No country can improve its quality of life and standards of living unless its human resources are wedded to its natural resources". This can be achieved only through forest education which is yet to be introduced in the schools and colleges.

144. Gandhiji's concept of work oriented education gave preference to preservations and propagations of native crafts viz. carpentry, wood-warecraft, handicrafts, bee-keeping, sericulture etc. For the first time Mahatamaji set up a committee for science for villages which included Sir C. V. Raman the Nobel laureate. This committee suggested forest farming techniques to be taught to the students and people. Gandhiji was keenly aware of the depth of Indian poverty and firmly believed that for the poor even God came in the form of food and food came for work which was generated in the process of resource creation or development, or destruction.

145. The schemes of farm-forestry, Van-mahotsava, Pasture-development, settlement of shifting cultivation, were capable of upgradation of economic standards of poor but failed mainly because existing system of education could not motivate the people to take up these schemes as useful economic programme. Since production of tree crop and preservation of environment coincide with interests of masses, strong extension forestry education is the need of the day and brooks no delay.

146. The current world strategy for development of forestry in the rural areas of a developing country need a strong extension and research support for tackling the following priorities :—

- (i) Eradication of poverty on the basis of greater access of the rural people to benefits generated by forestry activities.
- (ii) Equitable participation of rural people in forestry and forest based industries.
- (iii) Integration of the precepts of wise environmental forest-resource management and performance of the base required to secure optimal flow of benefits for the present and future.

Recommendations for Integrated Forest and Tribal Development :

147. It is significant to note that part IV of the Constitution contains two Directive Principles of State Policy. Article 46 enjoins on the State to promote the educational and economic interest of particularly the scheduled castes and scheduled tribes, protecting them from social injustice and all forms of exploitation. As per Article 48A, the State should endeavour to protect and improve the environment and safeguard the forests and wild life of the country. The scheduled tribes live mostly in forested areas. Hence, compliance with these two principles of the Constitution is mutually reinforcing.

148. Dhebar Commission (1961) recommended that "the Forest Department could be deemed to be charged as a branch of the Government, with the responsibility of participating in the betterment of tribals side-by-side with the development in forest. Government should accept as a policy that, as far as possible it will take steps to eliminate the middle-man between the inhabitants of the forest and exploitation of the forest". The commission felt that "very little attention has been paid to the processing side and the produce is sold in the raw form. The price line between the raw and processed articles are sometimes as great as one to three. Processing can be great source of employment for the tribal people"¹.

149. The Committee on Tribal Economy in forest areas, (Hari Singh Committee) (1967) observed that "for the tribals living in forests, the mere subsistence on part time agriculture and seasonal employment in forest cannot ensure sustenance throughout the year. The best way of diverting the tribals from denuding the forest for the purpose of cultivation is to provide them employment in major and minor forest produce, harvesting and collection by eliminating contractors. In pre-dominantly tribal areas forest must be managed not basically for protection or only for conservation but for furthering tribal interest. This means the revenue will not be the most important consideration but the welfare of the inhabitants of these areas"².

1. Report of the Scheduled Areas and Scheduled Tribes Commission appointed by President of India. Chairman—U.N. Dhebar presented the report.

2. Report of the Committee on tribal economy in forest areas under the Chairmanship of Shri Hari Singh, presented to the Govt. of India in 1967.



A 'Kotwalia' engaged in basket making in
Dangs area of Gujarat

150. The Central Board of Forestry in 1954 recommended greater attention to be paid to tribal welfare. In the ninth meeting held at Ranchi in 1965 and in several meetings including 18th held in 1980, the Board reiterated that early steps should be taken to eliminate the forest contractor from forest working under a time-bound programme.

151. The National Commission on Agriculture (1976) bestowed their attention on the inter-relationship of forest economy with tribal economy and urged rationality in forestry operations and better utilisation of forest produce. The main recommendations included involvement of tribals in afforestation programme and training them for absorption in all skilled forestry jobs³.

152. The Conference of State Ministers of Forest and Tribal Welfare on the "Role of forest in tribal economy (1978)" recommended that forestry development instead of being planned in isolation should become an integral part of comprehensive Plan for the area in which the needs of local economy should get high priority and consequently influence the choice for associating tribals in big plantation programmes giving individual rights on the trees and their usufruct. The conference underlined the need for establishment by Tribal Development Department of a strong co-operative base in conjunction with Forest Department. It also recommended that the tribals in forest villages should be given heritable and inalienable rights over the land which they cultivate without any further loss of time⁴.

153. National Seminar on Economic Development of scheduled tribes (1979) recommended that tribals are ecologically adapted to a forest environment hence a gainful occupation should be in forestry sector.

Prime Minister, Smt. Indira Gandhi, in her letters addressed to the Chief Ministers suggested following actions :—

- (i) "In areas where tribals depend heavily on forest for their livelihood, they should be involved in replanting the species that they are already exploiting. A scheme of forest farming should be undertaken".
- (ii) "The scheme for contracting away forest area should be replaced or modified to see that every tree should be replaced by another one if not more".
- (iii) "A special drive may be launched for purchase of minor forest produce collected by the tribals through cooperatives and State Organisations, so that they are adequately compensated".

- (iv) "Programmes such as a tree for every child, nutrition gardens, forest farming, the raising of energy plantations are all of potential valuable mass movement, provided they are formulated thoughtfully and implemented with the involvement of the local population"⁵.

154. The Working Group on Tribal Development during Sixth Plan (1980—85) has recommended that the local tribal community, which has symbiotic relationship with the forest, should be accepted as partners in the local forestry development efforts in each areas. Unless this promise is accepted and built into the system, it may not be possible to avoid conflicting situation at the local level. The best protective device for the existing forest and the new addition is to create an interest of the local community in the forest wealth⁶.

155. "Report of the Committee on forest and tribal development in India" recommended integrated development of forests and tribals. The main recommendations are :—

- (i) In forest-rich regions (forest area 30% or more) forestry-oriented tribal development programmes should be framed. For such Integrated Tribal Development Projects (ITDPs), separate working (management) plans would be necessary for linking forestry programmes with economic development of tribals.
- (ii) In forest-rich ITDP's landless people should be provided gainful employment in forest working and in forest industries so that tribal migration is prevented.
- (iii) Through selection of suitable technology and production pattern, land about a hectare or so can make a family economically viable. Hence choice should be made from capital-intensive coffee plantation: plantation of fruit-bearing trees, host plants for tusar, plantation of fodder trees, linked to animal husbandry, fuel-wood plantation etc. Tusar cultivation with plantation of host trees is important since the tribal area has good potential for sericulture.
- (iv) On the pattern of Gujarat social security plantation schemes, tribal families may be involved in plantation work. They may be paid wages during the gestation period and subsequently profits from the usufruct may be shared on fifty-fifty basis between them and the Forest Department.
- (v) Tribal farmers should be encouraged to take up farm-forestry and agro-forestry under which production and fertility of soil and environment improve.

3. Report of the National Commission on Agriculture—Part IX—Forestry—1975-76.

4. Conference of Ministers incharge of Forests and Tribal Welfare on the "Role of Forests and Tribal Economy" inaugurated by the Prime Minister of India at New Delhi—1978.

5. The Prime Minister of India letter dated 30-9-80 and 25-3-80 addressed to the Governors and Chief Ministers of the States.

6. Report of the Working Group on Tribal Development during Sixth Plan 1980-85 submitted to the Planning Commission of India

- (vi) Some of the cottage, small and medium forest-based industries e. g. saw-milling, furniture making, toy-making etc, should be locally established to generate employment for tribals.
- (vii) Bullock-carts should be provided to individuals assigning them transportation work of forest produce on an average for 150 days in a year. These bullock-carts may also be engaged in transportation of seedlings from nursery to the planting sites and consumer goods from market to tribal areas.
- (viii) Beneficiary-oriented programmes in forestry sector should be executed under IRDP, NREP, DPAP, DDP, Hill Area Development Plan, Tribal sub-Plan, etc.

Programmes for Forests and Tribal Development

Afforestation :

156. According to an estimate nearly 100 million hectares of land is crying for afforestation. Social forestry and farm forestry should be considered as a programme of the people, for the people and by the people. The role of forest department and other administrative bodies should be to fully cooperate with people and support the development of forest resources by providing technological, service and subsidy packages. Tribals hesitate to take up agro-forestry programme with the fear that their land may be taken over by the forest department. A proper strategy has to be evolved to allay their fear.

Minor Forest Produce (MFP) :

157. Several studies have indicated that collection and sale of MFP form the major economic activity of livelihood for majority of tribals. The National Commission on Agriculture held that MFP possesses the potential of an economic revolution among tribals. MFP collection, processing and marketing can generate gainful employment of 10 million standard person year.

Family Beneficiary Schemes in Forestry :

158. There are about 908 development blocks in tribal areas where forestry sector has to play its major role in providing economic activities for increasing income and employment. Family beneficiary schemes may be identified as :—

- (i) Land based activities.
- (ii) Forest development based activities.
- (iii) Minor Forest Produce based activities.

Small Industries :

159. Honey, lac, tendu leaves, extraction of oil from oilseeds of tree origin, tassar, rope and basket making, wood-based industries etc. have good scope in tribal areas. Tribals possess the skill and raw-material is available in plenty but without marketing assistance these industries cannot develop.

Forest Villages :

160. There are about 5000 forest villages where more than two lakhs tribal families reside. At present, Plan development benefits could not be extended to these families. The tribals living in these villages may be provided heritable but in-alienable rights over the land which they cultivate besides developing suitable schemes for their socio-economic upgradation.

Shifting Cultivation :

161. According to a recent estimate 2.65 million tribals (0.6 million families) are involved in shifting cultivation extending over 2% of the total area of the country. Since shifting cultivation is a primitive form of agro-forestry in the sense that agriculture and forestry go by rotation, but both are left to nature. Tree species selected for rehabilitation of shifting cultivation areas should be quick growing, be such that will enrich the soil, provide the tribals with their basic requirements of forest produce, and more importantly provide them a supplementary means of income. Shifting cultivation has become a way of life of the tribals. As such, change from shifting cultivation to settled cultivation has to be gradual in a planned manner.

Forest Labour Cooperative Society (F. L. C. S.) :

162. Serious efforts need to be made to ensure that the entire working of forest should be planned and executed through the cooperatives. So long as the individual tribal remains a casual forest wage-earner, he is bound to seek a base in agriculture or other activity. Further, forestry management should be able to resolve the problem of seasonal employment against the desideration of sustained regular employment through practice of intensive forestry through cooperatives. Some of the salient points to be kept in view are :—

- (i) Forestry operations should be executed through cooperatives of forest labourers. The agency of contractor should be eliminated. Cooperatives may be organised and encouraged by the Forest Department both for economic benefit of the tribal and as a protective device for the existing forest. They should be given share in profits from those operations.
- (ii) Cooperatives should organise labour teams for working in regions which may be outside the reach of an individual. Regularity and productability of wage employment should help to stabilise local economy. Cooperatives should ensure reasonable wage for their labour.
- (iii) FLCs should venture into the field of haulage of forest material making it over to the Forest Department in depots located on the periphery of the forest. As much as possible, haulage in forest area should be done through animal-powered vehicles rather than through automobiles to provide employment to tribals and effect POL saving.

CHAPTER IV

EXISTING FOREST EDUCATION AND TRAINING

Forest Education :

163. Forest Education in India started in a small way in 1878 when the North-West province (Now Uttar Pradesh) established a Ranger's College at Dehra Dun. This Ranger College in course of time became the nucleus for the whole forestry training in the country. The school was taken over by the Government of India in 1884 and with the addition of six research departments it took the shape of Forest Research Institute and Colleges (F.R.I. & Colleges) in 1906. The FRI & Colleges, Dehra Dun, is a leading Institute of Forestry Training and Research in the world. It was recognised by the Food and Agriculture Organisation (FAO) of the United Nations as a Centre for research and training in forestry in the South East Asia region in 1951.

164. The education and training of officers at the superior level and to some extent at the level of the Range Forest Officers is the responsibility of the Union Govt. Forest Education in the Govt. of India is dealt with, by the Central Board of Forestry (CBF) which is the supreme body to advise and make recommendations to the Government on matters relating to forestry training and research. A council for Forestry Research and Training has also been constituted under the Chairmanship of Union Minister for Agriculture. The Council is broad-based body and provides for working committee to deal with various aspects of forestry research and training.

165. To date there is one Indian Forest College for imparting training to officers recruited to Indian Forest Service, three State Forest Service Colleges at Burnihat, Coimbatore and Dehra Dun imparting training to the officers recruited by the State Governments. The Indian Forest College, Dehra Dun has a capacity to impart training to 120 officers annually and the State Service Colleges together have a capacity of 160 trainees. These colleges are under the administrative control of the FRI and Colleges, Dehra Dun, under the auspicious of which diplomas are awarded to the successful trainees in the forest colleges.

166. Training is also imparted to the persons recruited as Range Forest Officers. For this purpose five Forest Ranger Colleges have been established at Chandrapur, Balaghat, Dehra Dun, Coimbatore and Kurseong under the Forest Research Institute and Colleges. Few State Governments have established their own Forest Ranger Colleges which are functioning at Haldwani, Rajpipla, Angul, Jabalpur and Chikalda. The intake capacity of all these colleges is around 800 trainees per year.

Training of Subordinates :

167. Training of the lower subordinates i. e. forest guards, foresters, Deputy Rangers, is mainly the responsibility of respective State Forest Departments. The State Governments have established number of training schools for this purpose.

Forest Logging Training :

168. With the assistance of UNDP/FAO a logging project was started in 1961 and this has led to the building of a cadre of trained loggers to minimise the present wasteful (40%) logging practices for handling newly introduced equipments and machines. Till 1981, 3000 logging instructors have been trained. In addition, 800 forest workers have also been trained in modern methods of logging in the country from 1977 to 1981.

Wild Life Education and Research :

169. With the object to equip professionals to deal with specific managerial implications related to wild life a specialised training is imparted at F.R.I. & Colleges, Dehra Dun. Till the year 1981-82, 48 officers were awarded diploma in wild life management under three completed courses. The fourth diploma course was under way. The maximum intake per course is of 20 officers. Short-term orientation have also been conducted for school children from Ramjas Foundation, Delhi. The National Wild Life Research and Training Institute is planned to be set up with FAO-UNDP assistance during 1982-83.

Forest Education in Universities and Schools :

170. Forestry as a subject has also been introduced in some universities. Some State Education Boards have also introduced Forestry at the higher secondary level. The F.R.I. & Colleges have been recognised by the Indian Universities as a centre for research, leading to doctoral degree for students holding the first post-graduate research degree from any of the universities of Agra, Aligarh, Anamalai, Varanasi, Bombay, Calcutta etc. The Punjab University has recognised the F.R.I. & Colleges for the post-graduate degree (M. Sc.) also.

Creation of Social Forestry Directorate and Van Vigyan Kendras :

171. During the Sixth Five Year Plan, setting up of a Directorate of forestry extension and *Van Vigyan Kendras* are in progress for imparting training to the people in the techniques of raising trees on their farms. Six *Van Vigyan Kendras* will be established on the lines of *Krishi Vigyan Kendras* to educate

the rural population in modern forestry and agro-forestry technology. Creation of a National Institute of Social Forestry is also under active consideration of the Government.

172. The schemes of farm-forestry, Van-mahotsava, Pasture-development, settlement of shifting cultivation, were capable of upgradation of economic standard of poor but could not yield expected results mainly because people could not be motivated to take up these schemes as useful economic programme. Since production of tree crop and preservation of environment coincide with the interest of masses, strong extension forestry education is the need of the day and brooks no delay.

Recommendations made in the Past :

173. Dhebar Commission (1961)¹ recommended that 'with a view to consolidate and develop the economy of tribals the forest department should undertake various forest activities of promoting skills of tribals through intensive training and education'.

174. Hari Singh Committee (1964)² recommended that, 'benefits should flow to the tribal people by imaginative forestry programmes and conservation and re-organisation of their traditional skills'.

175. The National Commission on Agriculture (NCA) referred that due to the State ownership of most of the forests; forest education and training had perforce been confined to limited personnel of the forest department. The NCA recommended 'gradual approach to introduction of teaching in forest science in agriculture and other universities, which are to undertake forest research. To begin, forestry should be included as one of the subject in the under-graduate course and then gradually widened to graduate, master's and doctoral degree courses in forestry, as qualified staff and other facilities needed for research and teaching become available, the syllabus should be drawn by a national committee, specially appointed for this purpose.'

176. The N.C.A. also recommended, 'the F.R.I. should organise graduate, master's and doctorate degree courses in forest science outside the inservice training courses. The agency for direction and promotion of forest research and education should be Council of Forest Research and Education (C.F.R.E.) to be set up in the Union Ministry of Agriculture'.

177. The Working Group on tribal development (1980—85)³ recommended that 'human resource development through training and extension is essential for conversions of the natural resource endowment into a ready economic asset. The programmes of extension and training of tribal will, therefore, have to be vigorous. Training and orientation of forestry have to be paid special attention'.

178. Prime Minister, Smt. Indira Gandhi, in her speech at Nairobi in 1981⁴ stressed adoption of programmes such as 'tree for every child', 'nutrition gardens'; 'forest farming' and 'energy plantations'. She desired that, 'people should be considered as potential allies in the battle for reafforestation and should be suitably equipped.' The Parliamentary Committee for SC & ST also recommended introduction of forestry education in the schools and colleges.

179. In 1981, Members of Parliament of tribal communities requested the Government of India to introduce forestry education in all the schools and colleges. They also stressed that all aspects of tribal development should be included in training programmes. It was appreciated by them that new concept of social forestry and its implementation for the benefit of the people living below the grinding poverty line is being incorporated in the training of forestry personnel at different levels. In their opinion forestry has to play a dominant role in rural development and uplifting the poor families above the grinding poverty line.

180. It is felt that the technological part of the present level of training has served well in the past. The structure of the hierarchy needs no change and the same levels of trained personnel can be maintained. However, it is emphasised that the requirement of officers and other forestry personnel is increasing at a very fast pace. All the existing colleges are finding it very hard to meet the requirements of the States. Particularly the afforestation drive and Social Forestry projects are extremely labour-intensive and the present day requirement of trained forestry personnel is very high. It is also felt that the relevance of old concepts of Silviculture and Silvicultural systems is not much for the people needed for afforestation and Social Forestry, whereas the traditional forestry training has to lay greater emphasis on these aspects and tribal development. Consequent to the deliberations of this Committee and intensive effort and drive of President, F.R.I. & Colleges, a gradual shift in emphasis in priorities has resulted into a reorientation and relationship of importance of Social Forestry and tribal development at all levels.

181. With the change in emphasis the forestry has to be a mass-movement where people have to be associated actively. The afforestation has to be an integral part of development activities where it is imperative to break the frontiers of traditional mode of forestry training and make it more practical by introducing the concept of bare-footed foresters. The idea is to educate and train people in afforestation techniques and launch an intensive mass-movement of planting trees on every inch of vacant land. This level of training has also to be envisaged and planned by the States.

1. Report of the Scheduled Areas and Scheduled Tribes Commission appointed by President of India. Chairman U.N. Dhebar 1961.
2. Report of the Committee on "Tribal Economy in Forest Areas" under the Chairmanship of Shri Hari Singh 1967.
3. Report of the Working Group on Tribal Development during Sixth Plan 1980—85.
4. "New and Renewable Sources of Energy"—Smt. Indira Gandhi's speech 1981 at Nairobi.

182. Forests are not the concern of foresters alone. Every enlightened citizen has to be educated about the basic role of trees and forests in day-to-day life as well as its importance during war and other calamities. Natural conservation, love for greenery, town planning, industrial-plantations, energy plantations, cellulose-banks, all of them are important for the people and should be understood by every citizen. Thus, it is essential to impart an insight into the basic concepts of forestry, for which education through schools and colleges should be introduced. The Committee also feels that such education will go a long way in generating additional resources and shall make the job

of professional foresters a little easier and shall lead to the desired awakening in the people.

183. A general course with basic concepts for schools and specialised regular courses in Forestry at Graduate and Post-graduate level should be started in all the Agricultural Universities and Colleges and Forestry should be one of the optional subjects for Bio. or Maths. group combinations at Graduate level in other Science Colleges. The Civil Engineers, Town-Planners, Architects and Bio-aesthetic Designers can be given due orientation through short courses, in forestry.

CHAPTER V

NEED FOR FOREST EDUCATION AND TRAINING

184. The need for forest education and training is felt in respect of five categories of persons since forest have a direct bearing on their work and daily life (i) Forest staff which includes all categories of forest personnel from Indian Forest Service-Officers to forest guards; (ii) development administrators which include all levels of public servants engaged in development work in forest-tribal areas; (iii) personnel of Voluntary agencies and Research Institutes engaged in development and research work in forest/tribal areas; (iv) people residing in and around forest areas and are directly or indirectly dependent on the forests in their day to-day life, and (v) others.

Category First :

185. Though the forest personnel at all levels receive comprehensive technical and managerial training in protection, maintenance and development of forest in institutions wholly managed by Government, it is now widely accepted that they need to develop a perspective of their job by relating it to the social needs of the people dependent upon forest for their sustenance, accepting some modicum of social control over their activities and seeking their (people) cooperation and involvement in decision-making in order to give their work social relevance. This would not merely require knowledge about tribals but may also demand a thorough reappraisal of the technical knowledge they have acquired in certain fields. In effect, it may mean sometimes modifying some of the things about forestry operations traditionally associated with their training and also acquiring a lot of knowledge about economic development and societal structure which has an important, though still unrecognised, bearing on their technical job. The objective of training and retraining programmes mean for them is to equip them for this changed role.

Category Second :

186. Development Administrators who are engaged in planning and execution of development schemes in tribal and forest areas suffer from ignorance about the peculiar problems of forests and forest-dwellers and therefore need a basic knowledge of forestry and the ways in which this knowledge can be effectively utilised for development purposes. Forestry education and training courses meant for them would enable them to prepare socially relevant and realistic development schemes, which give them an insight into the success and failures of programmes currently in operation which in turn would help them in giving correct direction of existing development programmes. Similarly, development personnel working with public financial institutions need forestry education most, to enable them to appreciate forestry as a resource for correctly evaluating the economics of forest-based schemes for lending purposes.

187. The planners should develop a proper prospective about the vast potentialities of forestry sector. A knowledge about tangible and intangible benefits of forests and its vast scope in employment generation, should be fully harnessed to produce fuel, fodder and timber for rural tribal people. Like any other development activities the forestry should be planned as an essential infrastructure requirement for rural and tribal economy.

Category Third :

188. For voluntary agencies engaged in development work in tribal and forest areas and the research agencies entrusted with the task of preparing project reports and evaluation of new, on-going and completed schemes, it is necessary that their personnel acquire some forestry education so that they have a correct understanding of the social life and economy of these areas, the problems of people arising from it and type of development schemes that would suit them most. Only then they would be able to make their work useful to the people and their own efforts worthwhile.

Category Fourth :

189. People need extensive forestry education so that they can derive maximum social and economic benefits from forest resources and their existing assets through forest-based development and effectively contribute towards harmonious development of forests and environment. Thus, forestry education and training acquires a great urgency and importance.

Category Fifth :

190. The elected representatives like M.L.As, M.Ps, village headman, block-pramukh etc. should be educated to view forestry both as a long term and short term so very vital for the people.

Important Points for Finalising the Syllabi :

191. Recent events in few tribal areas have shown an element of hostility and confrontation between tribals and foresters. This emanates largely from a contradictory perception of each other. Some foresters view tribals basically as 'head loaders', who are encroaching on and destroying the forests and over-grazing the forest areas. The tribal people, on the other hand, with their recent experience of dealing with forest administration largely perceive the latter as a machinery lacking in sensitivity to their problems who have usurped their traditional hold over the forest and who want to deprive them of even their existing customary rights and concessions in the forest. The enforcement of forest laws and restrictions placed on the use of forest by tribals are perceived by them as encroachment on their rights. These differing perceptions are partly rooted in history and are reflected in

the way forest policy has evolved since the British period. A change in attitudes is urgently called for.

192. Forestry is not considered as an essential development activity for planning purposes at the district or State level. Consequently, except for special programmes like D.P.A.P., N.R.E.P. etc., the planners did not allot any funds for forestry operations. While road, irrigation and electricity etc. were considered essential infra-structure for rural development, it is unfortunate that creation of small village forests was never given due priority in planning. Even in activities like tribal development, where all the committees and commissions high-lighted the role of forests in tribal development, adequate accounts of the same was not taken by planners. Consequently, the forestry programmes developed in isolation from the main-stream of planning. Now when most of the attempts to ameliorate the lot of tribals have failed the usual scape-goat for planners is the forest department. It will not be out of place to maintain that the forests, are regarded as readily available cash money by the people living around them. The temptation and allurements to fell a tree and export it, is considered as a risk worth taking. Most of the people over-politicalise the situation and talk too liberally to be accepted by any norms of forest conservation. It should be appreciated that whatever forests exist have to be managed scientifically, and new forests have to be created particularly near the village to meet the demands of tribal people. It is a piquant situation in North Eastern States where community forests are protected by the same people who destroy the reserved forests. Very few people realise that these community forests look better because all the pressure of forest needs is mainly borne by reserved forests situated in the vicinity.

193. Apart from attitudinal change, certain concrete and positive steps have to be taken to improve the image of the forest bureaucracy in tribal areas. For example, the system of forest villages must not only be abolished, and converted into normal revenue villages as recommended by a number of committees, but tribals should be helped to obtain benefits of development schemes to improve their economic condition. Similarly, and form of social exploitation, if perpetrated by lower level forest staff hailing mainly from non-tribal areas must also be effectively and expeditiously dealt with by superior officers. It must be realised that due to inaccessibility of forest areas and poor communications, tribals who are victims of social exploitation can't seek expeditious justice elsewhere. This puts heavier load and higher responsibility on senior officers, who should appreciate it and instead of taking a narrow departmental view of the complaints by defending subordinates, they should administer quick and effective justice. The other areas calling for immediate attention is that labour engaged in forestry operations should be paid statutory minimum wages and every labour legislation relevant should be enforced. Other programmes likely to benefit tribals include :—

- (i) All landless people in the vicinity of the forest should be provided gainful employment in forest operations. Local tribal youths in the vicinity of the forest should be

employed in forest department so that their sense of belonging to forest can be restored.

- (ii) On the pattern of Gujarat, tribal families should be involved in plantation work on wages-cum-usufruct sharing basis. There is a need to ensure that the basic needs of tribals for which they depend on the forest, like fuel for energy, edible roots and fruits for food, herbs and plants for medicine, timber for agriculture and house construction and rights to collect forest produce are respected and allowed to be enjoyed. If this is done it would make it unnecessary for them to resort to illicit use of forest.
- (iii) The following other steps to improve the image should be taken :—
 - (a) They should provide drinking water wells/schemes near the tribal habitations within the ambit of their development programmes.
 - (b) Forest staff at lower levels should be given minimum elementary health education and should be equipped with first-aid-kit and some essential medicines so that relief to the local people in time of grave emergency can be provided.
 - (c) Most interior forest areas are not served by any schools or educational facilities. Forest department should incorporate within their development programmes to educate these people.

194. Till recently, forestry operations have been primarily regarded as revenue-earners and performance of a forest officer was judged to the extent he achieves this objective. In the entire gamut of forest operations and forest policy, tribal development has not been given any special position. Tribals were considered only as source of labour supply to forest. It is important to recognise that forest and tribals have symbiotic relationship and tribal life is profoundly affected by whatever happens in the forest and Forest Department cannot achieve its objective without involvement and cooperation of tribals. This can be maintained only by linking forestry programmes with the development of tribal communities.

195. In this connection, it is important to recognise that forestry operations are not only technical decisions but have sociological implications and the people affected by them may have legitimate views about contents of the programmes and the manner of their implementation. Singhbhum and Bastar tribal agitations have brought into sharp focus the point that it is possible to have alternative schedules of plantation for the same land, different from what is purely perceived on technical considerations. The views and experiences of local people should be accorded proper recognition and consideration in taking up departmental programmes. In fact, if local people are involved in these decisions, not only that the area of choice for departmental officers would increase but that these programmes would have larger chance of

success. Thus, seeking public cooperation in departmental operations, involvement of local people in decision-making and learning from the knowledge of the local people should constitute a major aspect of the training programme for forest bureaucracy at all levels.

Forestry and Tribal Development

196. In almost all the Committee reports on the subject, it has been emphasised that forests occupy a central position in tribal economy and therefore, development of forests should form an integral part of tribal development plans. The needs of local tribal economy and the programmes of forest development should be dovetailed to make both complimentary to each other.

This can be done in a number of ways :—

- (i) Forest operations should be so planned as to ensure sustained and gainful employment to landless and marginal farmers in the vicinity of the tribal areas. For those who cannot be accommodated in wage employment, social security plantation schemes on the pattern of Gujarat and 'Kumra' cultivation of Andhra Pradesh should be taken up within the frame-work of overall working plans prescription.
- (ii) Forest Department should assist tribal farmers in taking up farm-forestry and agro-forestry to enhance their income and improve soil fertility. All technical inputs and training should be provided in a planned manner.
- (iii) Where animal husbandry programmes have been taken up under IRD and ITDP schemes and milch cattle and other animals have been distributed, there is need to take up fodder production in the forest areas for supply of fodder. Forest Department could assist and encourage tribals for fodder cultivation schemes as a support activity of dairy development and the marketing of fodder should be undertaken by Forest Development Corporations/Tribal Development Corporations so that tribals do not face any marketing problem and also get remunerative price for their produce.
- (iv) In areas of cocoon rearing, *Arjun* and *Asan* tree plantation should be taken up intensively and tribals should be trained in new rearing and grainage techniques with a view to ensure that tribal families engaged in this profession can increase their earning.
- (v) In areas where it is possible for forest department to set up small processing or manufacturing units based on forest produce, they should be so located as to provide gainful employment to local tribal people. Where it is not possible for forest department to enter into processing or manufacturing fields directly, liaison should be established with appropriate department to persuade

them to establish such units so that MFP collected from the areas could be processed locally and tribals are enabled to get remunerative price and employment.

- (vi) By establishing proper linkage with other development programmes, bullock carts could be provided to certain eligible tribal families and these bullock carts could be engaged by the forest department in transportation of seedling, forest produce and consumer goods, construction material etc. instead of transporting these goods by trucks or tractors as is the practice at present.
- (vii) Keeping in view the importance of MFP in tribal economy and life, rights of collection and extraction of MFP should be conferred on them. MFP should be collected only through tribal cooperatives controlled by tribals at the primary level so that remunerative price could be ensured to them. For this purpose, local tribals should be trained in collection & storage techniques (tribal techniques of storage should also be studied for mutual benefit) and, wherever possible, first stage processing be done there.
- (viii) All committees and commissions have recommended that contractors should be eliminated from the working of forest and Forest Labour Cooperative Societies should be organised. Sometimes, there was reluctance on the part of Forest Department to allot forest coupes to them on the ground that most FLCS were dummies for private contractors having no administrative and financial capability to manage the operation. Orientation and training programmes should break this attitudinal barrier as FLCS have already been given a successful trial in a number of States.

Forest Development Orientation :

197. Emphasis must be shifted from commercial forestry to social forestry. This would mean that forestry activities would be carried out by many people/institutions. The changed circumstances would require a different role of the foresters who would have to work in close cooperation with these people/institutions and in harmony with the interests of beneficiaries. At present, the education and trainings of foresters do not equip them for this task. For working as extension experts a new educational culture has to be inculcated through appropriate training programmes.

198. On the pattern of Gujarat Forest Development Corporation and Andhra Girijan Cooperative Development Corporation, certain forest-based small industries should be set up like wood workshop, preparation of card boards from grass, toys and baskets from bamboo, leaf saucers and cups, saw mills, honey pasturing unit, gum processing unit, extraction of fibre from Sissal levels etc. in which tribals should be associated not merely as wage-earners but as shareholders. It is necessary that people who join forest

services should acquire thorough knowledge about these industries to enable them to plan in a systematic manner.

199. Tribals residing in forest areas have a number of traditional skills. These should be harnessed for forest development. Their skill should also be upgraded and new additional skills imparted to make them more useful for forest departmental activities. Such activities would help in establishing a better rapport between them and the Forest Department.

200. There are a large number of primitive tribes who are becoming extinct because of multifarious pressures exerted on them and their inability to cope with them. Government of India have, therefore, suggested for drawing up of special schemes for their rehabilitation. Many of these tribes are totally dependent upon forests for their sustenance and can only be rehabilitated in and around the forest areas with the active help of the Forest Department. Forest Department, therefore, have to play a crucial role in formulation of viable rehabilitation schemes for them with cooperation from other departmental agencies.

201. Practice of shifting cultivation is a dominant productive activity in certain tribal regions. Because of its baneful effects on soil erosion and fertility, forest officials are not in favour of this practice. On account of this, there is a great confrontation between tribals and forest officials in areas affected by it. It must be appreciated that shifting cultivation is intimately linked with the entire cultural ethos of tribes practising it and also ecology of the region. Wherever it is practised and in most cases the tribes practising them also happen to be primitive, who are facing the danger of extinction. Pressures from forest department will make them further vulnerable and their existence more precarious. It would not be advisable therefore to ban it without providing alternative source of sustenance, in the interest of these tribes. Steps should be taken to regulate it within the overall frame work of the interests of individual families and the community. In some places in the north-east, shifting cultivators have taken protective measures to counter the adverse effects of this practice. There is a need to find effective substitute for this practice relevant to the area so that tribals do not lose their livelihood. In any case, without providing alternative living no force should be exerted to stop this practice and the shifting cultivators should not be harassed on this account. The specific needs and circumstances should be studied before any alternative scheme is to be substituted. From a macro-point of view a broad approach incorporating forestry on hill-tops, horticulture in the intermediate slopes and terrace cultivation in the foot-hills has been suggested and has even been tried with success in some North-Eastern States. In the context of micro situations, as has been suggested by Roy Burman Committee, perspective plans as per the three-tier agro-silviculture pattern should be formulated by multi-disciplinary teams covering all facets of tribal life. In such a venture, forest department can get adequate support from tribal sub-plan and other sectoral plans.

202. In this context, it is also felt that planning for forest operations is done generally at the macro-level which tends to blur the perspective of micro-level requirements and also ignores the local needs of the people residing in and around the forest areas. The training programmes for foresters should equip them for grassroot planning in a manner that it dovetails local people's interest in regions over all programmes.

203. From the perusal of the existing training syllabi it is apparent that present training programmes of foresters do not equip them to discharge functions and responsibilities indicated above. Old concepts of forest management, traditional way of forest exploitation, revenue-earning ethos and forestry for its own sake are no longer relevant. Emphasis has shifted now to make forestry as a mass movement, wherein the needs of tribal communities determine the nature of forestry operations and various decision making processes concerning them are exposed to people's participations. A forester with a primarily law enforcement bias would be a misfit in the new framework. The traditional mode of training has, therefore, to make way for a bare-footed forester. The course content of all categories of forest staff needs to be drastically changed to incorporate all the points referred above. Besides giving them new skills, a great deal of emphasis has to be given to attitudinal change using modern motivational techniques.

Training for Forest Officers:

204. The accent in the training programme should be on breaking psychological and communication barriers between tribals and foresters. The training programme should broadly aim at :—

- (i) Giving an appreciative and positive account of tribal life, culture, values and character.
- (ii) Removing prejudices from the minds of the forest officers about tribal psychology and sociological reasons for their reacting resistance to various programmes/suggestions emanating from government machinery.
- (iii) Systematically curbing the traits of cultural arrogance, if any, and encouraging them to learn from tribal experiences.
- (iv) Removing various irritants which tend to reinforce mutual suspicions and misunderstanding.

205. During the training at the Forest Research Institute (FRI), each probationer may be encouraged to prepare a tribal development project in respect of the State to which he has been allotted. This will bring them closer to the tribals. Besides, they should be encouraged to pick-up the dialect of the tribe residing in their area of posting for which specific incentives can be inbuilt. Facilities for teaching important dialects should be created in the FRI.

206. The duration of the training on tribal aspects should not be less than what is provided for any major discipline besides covering this subject in course

of teaching other subjects. At the end of the course, like other subjects, a separate examination paper should be earmarked for clearance by the trainees. On the pattern of I. A. S., I. F. S. probationers should be attached to a tribal hamlet for a specific period during which they should be asked to study their entire life and economy. For this study they should be required to prepare at least one paper keeping in focus specifically upgrading the condition of tribals. It is learnt that trainee officers take up extensive field excursions. The practical knowledge about tribals should be suitably dovetailed into it.

207. There should be a systematic and adequate follow-up on this subject from the apex training institutes in the shape of brief get-together in the States to see whether the training ethos on this point is getting reflected in their actual working and if not, corrective steps by way of further training and refresher courses should be planned. The apex training institute should also become a store/clearing house of projects, schemes and programmes of various forestry operations planned and executed to further tribal development and how local people can be effectively and profitably involved in departmental working in the field. Also multi-disciplinary research programmes should be undertaken with the help of States Forest Department in the same direction. Experiments carried out in different States should be exchanged to open up the minds of the old foresters who might resist taking up new tasks. The apex Training Institute at Dehra Dun has a crucial role in this because its position is unique. It is not merely a training institute, it is also the highest repository of technical knowledge. To achieve this new objective, it is desirable to open a new Directorate of Social Forestry and Tribal Welfare at the F.R.I. & Colleges. This Directorate should look into technical and research aspects of tribal development and supervise the teaching and training programmes of forest officials with respect to tribal development.

208. Since the exclusiveness and 'isolation' of a forest officer has to be substituted by a broader vision and a social orientation, he has to be prepared intellectually and emotionally. The training programme should have a multi-disciplinary approach and the trainees at all levels must absorb this spirit.

Training Programme for Rangers/Foresters/Forest Guards :

209. At present training for forest rangers/foresters is imparted in the Training Institutes for a period of one year. The training syllabi for these courses suffer from the same deficiencies which have been highlighted above in respect of forest officers while the need for giving a proper orientation and a great deal of exposure about tribal development in respect of this category of forest professions is even greater because they come in contact with tribals much more than gazetted officers. Therefore, the duration of training on tribal orientation should be larger than what is earmarked for IFS/SFS officers. It should not be less than for a period of one month, covering the same subjects and adopting the same strategy as outlined for officer trainees with the additional input of giving them a greater degree of practical orientation. It has

been observed that lower category of forest staff coming from the non-tribal areas have a greater tendency of giving vent to their cultural arrogance and to take advantage of the simplicity and gullibility of tribals. The success of the training programmes at the State level would be determined by the extent to which their attitudes are referred and changed. If need be, their training period could be suitably extended. About the forest guards in many States there are no formal per-entry courses. The general practice is to recruit them and give them training on the job and latter to give them a short training for three months or so. We feel that forest guard is at the most crucial level since he contributes the first contact with the tribal people at the grass root level and their behaviour and attitudes largely determine the perception of the people about the department. This level, therefore, should be largely, manned by tribal people since adequate number of tribals with eligible qualification for this post are available. This itself would restore tribals' confidence in forest administration and would minimise many problems which crop up because of lack of understanding of tribal life and psychology on the part of non-tribal labour-level bureaucracy. Even after that, we feel that out of three months training course for this category of staff, atleast 1/3 should be devoted to orienting them for tribal development and welfare work. The course design for them should be suitably prepared incorporating among other things aspects which bring him in conflict with people. For example, while a forest guard is assiduously trained in the relevant section of IPC and Forest Acts to prepare him for this law-enforcing role, he should be equally familiarised with rights and concessions which tribals enjoy in forests and necessity of ensuring their development programmes. The basic account of the training programmes should be on building bridges with people, trying to be helpful to them rather than be a police man, seeking their cooperation and advice in discharging his duties without hurting tribal community's interest.

The present account of forest administration is on filing of court cases and instituting legal proceedings in respect of 'violation' or 'alleged violation' of forest laws. This leads to a lot of harassment of tribals while the offences are petty in character, they have to run to the far off located courts for months and years. Many of these offences can be sorted out with the help of local tribal community. The unpleasant part of forest department role could be shared by the local tribal Panchayat exercising moral authority over the people. We also recommend that a very large number of cases already filed in courts should be sorted out in suitable manner.

210. A forest guard has to be given some additional training outside the sphere of his normal departmental duties. For example, elementary, health training would give him a healer's role with which he can be of assistance to the local people in case of emergency when no doctor can be approached. Some common medicines can be placed with him which don't need a doctor's prescription. This would bring him nearer the people and dilute the rigours and negative part of his law enforcing role. They should

be intensively trained in agro-forestry, farm forestry and social forestry so that they can advise the local people about improving and supplementing their earnings/production from forestry operations. In other words, a forest guard has to be made a benign V. L. W. also. The Committee firmly believes that this will not compromise with his duties but would rather make him more useful.

211. (i) The training to forest guards and foresters should be imparted in the local regional language. In fact, it would be increasingly necessary to impart training to Rangers also in the local language because of decreasing proficiency at the graduation level. It is, therefore, recommended that serious efforts should be made to prepare adequate literature to cover, among other things, aspects of training programmes highlighted at various places in this report. Since the problem of lack of availability of appropriate literature is likely to be faced while imparting training to non-officials and even officials of other departments, particularly those operating at the grass-root level, it would be desirable to constitute a committee to oversee preparations of such literature.

(ii) Government should earmark adequate funds for getting this literature prepared, printed and circulated. Forest Officers (Retired/Serving), other development administrators, tribal experts, social workers, researchers should be associated for this work. The training institutes imparting training to Rangers/Foresters/Forest Guards should be adequately strengthened and equipped for carrying out their new duties.

212. A general limitation observed in the structure of the training programmes for various categories of forest personnel at present in operation is about its pre-occupation with forest areas. Somehow the basic assumption of training has been that forest officers and staff would be dealing, by and large, with reserve forest alone. The trends in evidence today point out that the future development will shift from reserve forest to areas where afforestation programmes have acquired a much greater degree of urgency in view of environmental factors and the need for finding additional sources of energy. The traditional training programmes, therefore, must shift its pre-occupation with reserve forest and equip the forest officers and other staff with skills which may be relevant for their activities even in totally non-forested areas also. This in itself requires radical structuring of training programmes because of a very different role expected of them in a different physical and social environment. This shift of emphasis may itself make foresters more oriented towards people's needs and more prepared to seek their cooperation and support for their programmes.

Forestry Education For Development Administrators :

213. While foresters require a change of emphasis in their training programme and a reorientation of their attitudes towards tribes and their development, other personnel engaged in development activities in tribal areas need basic training and education about forestry itself. Since forestry education is not imparted in schools, colleges, universities (except few) or other institutes and is almost entirely confined to forest institutes for training those recruited in government

services, development administrators coming from diverse background totally lack resource literacy, working of forests and their potential for development. These administrators include not only grass-root level functionaries like VLWs, Gram Panchayat Supervisors, Revenue Officials, Welfare Inspectors, Agricultural Extension Workers, Animal Husbandry Supervisor etc. but also middle level functionaries like Block Development Officers, Meso Project Officers for ITDPs, Deputy Commissioners/Deputy Development Commissioners, District level officers for agriculture, animal husbandry, cooperation/minor irrigation etc., as also bank managers and other personnel of public financial institutions. The list also includes a number of officers and staff engaged in tribal development activities, like those working in the tribal development cooperative corporations, working co-operative staff associated with functioning of LAMPS, engineering personnel etc. It has been found on the basis of experience that lack of knowledge of forestry is a great handicap in planning and execution of relevant, realistic and useful development programmes at various levels. For example, it has been observed that under, IRDP schemes, same type of schemes are being extended to the forest areas which have been taken up in non-forest, particularly agricultural developed areas. These schemes naturally fail to click because they do not take notice of the geographical terrain, soil conditions, ecological factors and social needs and attitudes of the people living in these areas for development. However, a basic knowledge of forestry and forest-based programmes in these areas would help in devising useful, viable and protective schemes which would have a larger chance of success. But, due to lack of knowledge the development administrators including engineers, architects, town and village planners are not able to see various options available and degree of success these programmes would have. Thus, the planning effort for poverty alleviation programmes in these areas largely go waste. This may continue to happen in future also. It is, therefore, extremely necessary that all development administrators working in tribal/forest and hilly areas, whatever be their level and discipline must acquire basic and essential forestry education to enable them to take up/support right kind of schemes.

Training for Top Level Decision Makers :

214. In this respect, a beginning has to be made from the top itself since all directions and policy guidelines emanate from the top. If inappropriate policies/directions are issued from the top, at lower rungs of administrative hierarchy there is little courage to oppose them. It is, therefore, proposed that the top level generalist and administrators in forest, rural development, finance, tribal welfare, irrigation departments be given a good exposure to the relevance and potential of forestry for tribal development, before they start dealing with their departmental activities. In fact, Reserve Bank of India stipulated such a training in the field of banking in Bombay, for new incumbents to the post of Registrar of Cooperative Societies. Such a training programme would bring up greater relevance to the process of planning for tribal development and would also help bridge the gaps in percep-

tion of grass-root level administrators, beneficiaries and top level decision makers. This sort of training programme of 4—6 days should broadly cover the following subjects :—

- (i) Basic knowledge about forests, production forestry and economics to enable them to critically understand forest department's working in the field and evaluate schemes proposed by them.
- (ii) Potential of forestry for tribal and rural development.
- (iii) Importance of forest for environmental planning, soil and water conservation, integrated land use and perspective planning of habitat development.
- (iv) Grazing rules and techniques of development of pastures and village woodlands.
- (v) Importance of MFP and Forest industries in tribal economy.
- (vi) Employment potential and beneficiary schemes in forestry sector by harnessing forest resources for providing gainful employment to people living in and around.
- (vii) Need for education and involvement of and seeking cooperation from local people for better planning and execution of development programmes.

215. This training programme should be organised at Dehra Dun where adequate facilities for giving an effective exposure exist. During the training, tours of the forest areas could be organised to give a practical bias to their training. The Dehra Dun Institute should do sufficient preparatory work to make this training programme effective, purposive and interesting. The trainees should be given sufficient literature to fall back upon whenever such a need arises in course of their administrative duties.

Training of Executives of Tribal and Forest Development Corporation :

216. In this category of personnel, managing directors and other executive officers of tribal development corporations and forest development corporations should be given an additional input of training relevant to their specific needs and requirements. Personnel of the forest development corporations who, in any case, are forest officers should be given a more detailed training on the following subjects :—

- (i) Economics of the Minor Forest Produce; Marking and Pricing of MFP.
- (ii) Collection, preservation and storage techniques.
- (iii) Primary level processing and various industrial process as for secondary level processing.
- (iv) Detailed knowledge about project formulations, monitoring and evaluations.

- (v) Labour laws and legislations applicable to the forest area and its activities.

217. For managing directors and other staff of the tribal development corporations (TDC) who are not foresters, the general course, meant for top level decisions-makers plus a more detailed knowledge about minor forest produce, would be necessary. Managing directors of TDCs must undergo a training programme of three weeks specifically designed for their requirements.

Development Administrators :

218. For other development administrators like the deputy commissioner, the deputy development commissioner, meso project officers, BDOs, executive engineers, district level agriculture, animal husbandry, welfare and co-operative officers and banking personnel and research officers of tribal research institutes, a two weeks general training programme covering the following aspects should be sufficient :

- (i) Status of forests and its product in India; Production Forestry and Forest Economics.
- (ii) Symbiotic relationship between forests and tribals; difficulties and handicaps suffered by forest-dwellers living in isolation from the general administration.
- (iii) Potential of forest for rural and tribal development.
- (iv) Social Forestry and Agro-forestry, revitalisation of rural economy through forestry activities.
- (v) Various development schemes in operation in tribal areas and their linking with forestry.
- (vi) Economically viable forest based schemes which can be taken under IRDP/NREP/DPAP/DDP development.
- (vii) Minor forest produce and its potential for development.
- (viii) Areas of conflict between forests and tribals.
- (ix) Areas of cooperation between forest and other development departments.
- (x) Recreation and wild life management steps.
- (xi) Development of grazing lands and wastelands, pastures, woodlands, their techniques.
- (xii) Environmental planning, integrated land use; importance of forests in soil and water conservation.
- (xiii) Need for involvement of tribals in forest development programmes and enforcement of forest laws.
- (xiv) Labour laws and legislation having applicability to the forest areas and its activities.

219. Besides general forestry education, additional training should be imparted to certain specialised groups. For example :

- (i) Bankers should be particularly educated about the economic viability of forest based schemes and their potential evaluation for lending purposes.
- (ii) For economists and planners, additional training should cover, (a) Forest development planning which may include forest management, valuation of financial activities, risks and damages in project selection, Forestry plan execution, monitoring and control programming, budgeting, staffing and recruitment and labour relations.
- (iii) Engineers should be educated about planning of irrigation schemes in forest areas taking into account ecology and environmental needs, wild life preservation and above all requirements of local tribals.
- (iv) Animal husbandry officers should be additionally educated about fodder development programmes to be dovetailed in the existing agricultural practices of tribals and forest development schemes.
- (v) Agriculture officers need education about sponsoring agro-forestry schemes which would improve the earnings of farmers and would also improve the ecology in forest areas. They should also be taught about agriculture and forest crops that can be grown in forest and hilly terrains without much use of water and other inputs and about the utility of the technologies of cultivation used by the local people, without blindly extending technologies from developed areas.
- (vi) Research officers of TRIs should be particularly trained to prepare project reports of ITDPs in forest areas taking forest as a basic resource and also to evaluate development programmes taken up in the forest areas.
- (vii) Industrial executives and industrial extension officers, should be imparted training about (a) raw material potential for industry, (b) ways to involve people near the industrial location for raw material production, (c) techniques of collection of MFP, its preservation, storage and marketing (d) preparation of project reports for setting up of processing units.
- (viii) For executives engaged in mining activities and establishment, knowledge of afforestation on abandoned mines, development of grazing lands and pastures, particularly with the help of underground water in abandoned mines, rehabilitation of displaced persons around mining areas with forest based schemes, environmental planning should be imparted.

Training for Grass-Root Level Public Functionaries :

220. A training programme needs to be organised for grass-root level functionaries in tribal areas like VLWs, Panchayat Sewaks, Revenue Karmacharis, Overseers, Welfare Inspectors, etc. The course content should cover (i) social forestry, its benefits for rural and urban people; (ii) agro-forestry its meaning and techniques, advantages for optimum production (iii) integrated land use; soil and water conservation, land capability; (iv) better animal husbandry, advantages of stall feeding, and development of grazing lands and waste lands, (v) silviculture of trees raised in social forestry and agro-forestry; (vi) utilisation of forest products and marketing.

221. In the above training programme, particular efforts should be made to give them a field exposure and a practical orientation so that they can make use of their education and training straight away. This could be done by way of organising planned tours and attachment to tribal settlements in the forest areas for a specific period.

222. It is also felt that forestry education should also be introduced in the syllabi of IAS, IPS, PCS, IFS courses so that after coming out of the probationary period, the members of these services are not totally ignorant of the subject and are able to make use of their knowledge in discharging their duties. The course design for these services can be prepared by the concerned training institutes in consultation with FRI, Dehra Dun, who would lend experts and aids for carrying out teaching programmes.

223. Similarly, colleges and universities teaching specialised courses in Agriculture, Fishing, Animal Husbandry and technical institutes teaching engineering and mining should incorporate forestry education in their curricula. The idea is to introduce essential forestry education in as many places dealing with development activities, as possible. National Institute of Banking Management should do like-wise. All agencies training people for rural development whether official or non-official should impart knowledge about forestry.

Training of Non-officials and General Masses:

224. The third category of persons to require forestry education are publicmen and people directly linked to and effected by forest operations. In this broad category would be covered three types of persons :—

- (i) Legislators. Mukhias/Sarpanches and other grass-root level political leaders.
- (ii) Tribals residing in and around forest areas.
- (iii) Other people outside forest areas.

225. Regarding the first-category, a 2-3 days training programme could be organised to cover the following subjects :—

- (i) Forest Economy.
- (ii) Symbiotic relationship between forests and tribals.

- (iii) Tribal rights and concessions in forest.
- (iv) Areas of conflict between tribals and forest bureaucracy.
- (v) Agro-forestry integrated land use.
- (vi) Employment potential of forestry and schemes for generating gainful employment to local people all round the year.
- (vii) Need for peoples' involvement in various decision-making processes of forest department.
- (viii) Social forestry : need for raising trees around houses, farms, roads, canals etc.
- (ix) Forest ecology: forest environment and dependence of people on forest development of Indian forests.

226. Regarding tribals, it should be borne in mind that tribals and others residing in and around forest areas are not ignorant of forest and its working. By virtue of their age-long association with forests and their day-to-day exposure to activities in the forest they have already a lot of knowledge of forest and know its importance. So the training programme designed for them must have the objective of seeking their constructive cooperation and using their traditional knowledge and experience for the working of forests and imparting them necessary technical knowledge so that they can improve their earnings from the assets available to them. The training programme meant for them should cover the following aspects:—

- (i) Beneficiary programme in forestry.
- (ii) Agro-forestry for increasing productivity.
- (iii) Forest based cottage industry.
- (iv) Rights and concessions of tribals in forest areas.
- (v) Minor forest produce, their collection, storage, processing and marketing.
- (vi) Social forestry on community land.
- (vii) Areas of conflict between forest officials and tribals and resolving technique; and
- (viii) Local peoples' involvement and participation in forest department programmes and enforcement of various laws.

227. This training should be preferably imparted in a forest camp 'Vanshivir' on the pattern of rural labour camps organised by the National Labour Institute for educating the rural agriculture labour. National Labour Institute generally organises a three day labour camp in which participants are paid minimum wages and also given food. The committee is of the view that same pattern be followed for education of tribals in forestry. Needless to say that a very special type of literature would have to be designed for such training programmes, particularly in local tribal dialects. Like in rural labour camps, forest officers (trainers) and trainees would participate in the entire

activities of the camp together which will bring them nearer to each other and break the existing hiatus between them.

228. For other people who are residing outside the forest areas, a training programme for a duration of two to three days should cover the following:—

- (i) Forests, wild life and tribals.
- (ii) Forest and environment.
- (iii) Social forestry.
- (iv) Problems of fuelwood and fodder.
- (v) Role of forests in rural & national development.

Identifying Training Institutes:

229. For carrying out training programmes on such a large scale, it is necessary to identify various training institutes and equip them before training programmes are started. As emphasised, it is extremely important to identify and produce relevant literature for various categories of personnel. Since the task involved is strenuous, it is necessary that a committee may be set up for this purpose urgently.

Forestry Education in Schools, Colleges and Universities:

230. (i) The magnitude of forestry education envisaged in above programmes and our perception about the need of forestry education makes it absolutely necessary that it should be brought out if the exclusive confines of government institutions and introduced as a subject of general education. It may be recalled that agricultural development in late 50s and early 60s got a great impetus through the proliferation of specialised teaching courses in agriculture for which separate universities imparting specialised training in agriculture were also set up. A similar development is happening in the field of dairy development, animal husbandry and pisciculture. In case of forestry coverage, education required would also be sufficiently wide because it is intended to create a mass movement for mobilisation of people throughout the country. In order to achieve this objectives following steps are necessary:—

- (1) Primary level—basic knowledge about forest should be incorporated in the general text books used for primary level teaching. This would give children some idea of the forest and its importance for life.
- (2) Forestry as a separate subject should be introduced at the middle level in tribal areas and should be taught in the same manner as basic sciences and social science are being taught. This should start first in the school curricula of the tribal areas.
- (3) Matriculation—a full subject on forestry should be introduced in the curricula of matric/higher secondary schools functioning in the tribal areas. Forestry as a subject could be usefully combined with geography, agriculture, botany, zoology etc,

- (4) Graduation course should include forestry as independent subject which could be taught in combination with geography, agriculture, dairy sciences, botany, zoology, physics and chemistry. This should be introduced in colleges located in rural areas.
- (5) (i) Post-graduation course in forestry should provide detailed technical knowledge about forestry and should be taught in agricultural/general universities. Because of change in emphasis on social forestry and increase in development activities, forest department also require a large number of personnel which the State-run training institutes can't produce. University/School education would fill this gap which can be supplemented by short term course in the training institutes.
- (ii) In all these academic courses, separate provision for lectures and field exposure should be made in the syllabi emphasising the symbiotic relationship between the tribals and forest to give a correct orientation for understanding of forests, tribal communities and their development. This is extremely essential so that students doing academic courses in forestry at any level do not divorce the existence and development of forests from tribal welfare.

231. It has been emphasised earlier in this report that the local tribals residing in and around forest areas should be employed at various levels in the forest department. Institutions of forestry education and schools should enable tribal youths, who already have traditional knowledge of the subject to find entry into these services. In fact, traditional knowledge about forestry and a school certificate with a subject of forestry should be made a compulsory entry qualification for appointment even to posts of forest guards. Similarly, for higher level forestry posts, I.Sc./B.Sc. qualification with forestry as a subject should also be introduced. Thus, the entrants to these services would already have a basic grounding in the subject which with a short term pre-entry training would enable them to discharge their duties. The idea of introducing these courses in tribal areas first is precisely to enable tribal youths with their traditional knowledge and formal forestry education to get absorbed at various forest-level posts. For this purpose, it is necessary to reserve seats in forestry course for tribals with traditional forestry background in schools/universities otherwise non-tribals from non-forest areas may monopolise entry to these courses and also to jobs, what has happened so far.

232. The Rajasthan State Government have recently taken a decision to post forest extension officers in blocks located in tribal and forest areas. This points to the shape of things to come. With the increase in general awareness about the importance of forestry in national life and development and also about the positive and symbiotic relationship between forest and tribal areas more and more persons educated in forestry would be required to handle extension jobs both

in Government and non-Government sectors which the existing government training institutes geared to train only government servants cannot produce. Therefore, forestry education has to be introduced in schools and colleges so that a large number of trained people are available to handle these jobs.

233. The Committee has emphasised in this report time and again the need for involvement of tribal people in various decision-making processes concerning forest department and to actively associate them in the execution of various forest development programmes. In order that people are enabled to discharge these responsibilities, their training would have to be organised on a very large scale for which extension workers and those trained in forestry operations would be required. It is clear that government training institutes cannot meet this heavy demand. In fact, these institutes will not be able to meet demand even for government recruits for planned programmes.

234. Forest department activities in the tribal areas as also other department activities are linked to institutional finance. This means that persons requiring institutional credit for forest-based development schemes would have to get credit from banks. In order that banks are able to appreciate the potential of these schemes correctly, and release institutional credit for them, they should have at their command a number of experts who can correctly evaluate the potential of these schemes for them. This again would require experts trained in forestry. Hence the need for introducing forestry in universities so that a graduate with forestry education can fill this gap.

235. Many voluntary agencies, research institutes, management institutes and development agencies require people trained in forestry to carry out research and to do development work based on forest resources in tribal areas. In the near future this demand is likely to increase. In order to meet this demand it is necessary that forestry is introduced as subject in colleges and universities so that the trained manpower from there can be usefully utilised for these agencies.

The potential of minor forest produce has not yet been fully realised. In fact a very small portion of minor forest produce is collected through government agencies. In this report as well as in other reports on the subject, a great deal of emphasis has been placed on collection of minor forest produce through collections of tribal people and on preservation, storage, processing and marketing of the produce. To achieve these objectives, the activities of tribal and forest development corporations as well as of the private industries which use minor forest produce as a raw material will increase substantially. They would all require people with some knowledge and training of forestry and minor forest produce so that they can discharge various responsibilities in this field. It is, therefore, necessary that adequate knowledge of this subject is given in the tribal areas at the school level so that people having done their middle level or matric level schools education can be gainfully absorbed in these employment oriented activities.

CHAPTER VI

RECOMMENDATIONS

Training of Forestry Professionals :

236. The 1952 National Forest Policy recommended coverage of one-third of the total land area under forests but it is only 22.7 per cent and not more than 40 per cent of which has good forest cover. The remaining forest areas have been degraded and depleted due to demographic and commercial pressure. With the exploding population and growing needs of people, cattle and forest industries, our forest resources are fast dwindling and several species of flora, fauna and primitive tribes have either become extinct or facing the danger of extinction.

237. India is a veritable ethnological museum of a multitude of races and ethnic and linguistic groups having diverse culture and religious practices. The 40 million scheduled tribes constitute nearly 7.48% of the population of the country as per 1971 census. The tribal communities largely occupy forest areas where for a long period of their history, they have lived in isolation but in harmony with nature. They draw their sustenance largely from forests. The forests not only provide them food, material to build houses, fuel for cooking, light and warmth, fodder, for their cattle, but also satisfy their deep rooted sentiments. Tribal life is connected one way or the other with forests, right from birth to death. They are the children of the forests.

238. Article 46 of the Constitution, obligates the State to promote the educational and economic interests of the weaker sections particularly scheduled castes and scheduled tribes. Article 48-A of the Constitution obligates the States to protect and improve the environment and safeguard the forests and wildlife of the country. Since scheduled tribes mostly live in forest areas, compliance with these two principles of the Constitution is mutually reinforcing.

239. Recent events in few areas have shown an element of hostility and confrontation between tribals and foresters. This emanates largely from a contradictory perception of each other. One must accept that the problem of forest conservation and protection cannot be separated from the lives of forest-dwellers. A new programme that develops new healthier relationship between tribal and foresters must be evolved in order to strengthen their symbiotic relationship.

240. We, therefore, recommend that :—

(i) Syllabus for Forest Officers (IFS/SFS) course should include tribal study (tribology) as a subject as per annexure-1. All other subjects taught during training period should give pointed emphasis on coverage of tribal development. Exposure to tribal problems and their needs and interests

should be given during field tours and attachment to a tribal settlement leading to a preparation of specific project report/programmes within the ambit of forest development activities.

- (ii) Syllabus for Forest Ranger Course should include tribal study (tribology) as a subject as per annexure 2. All other subjects taught during training period should give pointed emphasis on and adequate emphasis on and coverage of tribal development. Exposure to tribal problems and their needs and interests should be given during field tours and attachment to a tribal settlement leading to preparation of specific project reports/programmes within the ambit of development activities.
- (iii) Syllabus for Foresters should include tribology as a subject as per annexure-3. Trainees should be imparted practical knowledge about tribals of the State.
- (iv) Syllabus for Forest Guard Course should include tribology as a subject as per Annexure-4. Training should be imparted in practical knowledge in respect of generating employment and income to the tribals through various forestry operations.
- (v) Forest Research Institute and Colleges, the highest repository of technical knowledge in forestry, should establish a separate wing on tribal development and should have in their faculty some non-forest experts also on different aspects of tribal studies. For this purpose FRI should function as an apex training institute and storage/clearing house of projects, schemes of forestry sector of rural and tribal development. It should closely monitor tribal development orientation programmes of forest officials posted in different States, evaluate their impact and should devise various methods including periodic refresher courses to ensure that this orientation strikes deep roots in the forest officials at all levels. The Institute should coordinate all research programmes connected with shifting cultivation, forest village development, MFP schemes, social forestry etc. in which tribals are directly involved.
- (vi) State Forest Research Institutes should equip themselves for handling training programmes not only for foresters but also other development officers. Necessary funds should be earmarked for strengthening these institutes in the respective sectoral plans.



Rehabilitated 'Birhor' women of Village Jehangutwa,
District Ranchi (Bihar)



A welfare camp of Lepcha and Bhutia women in
North Eastern States

- (vii) Schools of Foresters and Forest Guards must equip themselves for imparting training as per syllabi prescribed herein not only for forest staff at grass-root level but also for staff of other development departments.

Training of Officers/Officials involved in Development :

241. The conquest of poverty and unemployment has been a major area of concern of the successive five year plans. In spite of sustained efforts over the last 32 years, the incidence of poverty is high because more than 32 crores people are living below the poverty line. Poor living in the rural areas mainly include landless labourers, small and marginal farmers, rural artisans, scheduled castes and scheduled tribes and other backward classes. These people have either no assets (except labour) or assets with very low productivity, few relevant skills and no regular full-time job or very low paid jobs.

242. It has been estimated that in India, about 7 million people are entering the job market every year and by 1985 the projected figure of unemployed will have risen to 118 millions. Poverty, unemployment and regional imbalances are rapidly increasing and causing public unrest.

243. Integrated rural development and national rural employment programmes have not been able to make any dent in the tribal areas mainly because the schemes under implementation are neither viable nor sustainable. For devising useful, viable, sustainable and protective schemes in the tribal areas under IRD and TSP, basic knowledge of forestry and forest-based programmes is necessary.

244. According to the national Sixth Five Year Plan document, forestry and logging provided estimated employment to 6.207 million standard persons year (mspy) during 1979-80. Free of constraint, the forestry sector can generate employment for about 20 mspy in the backward areas. Thus, forestry in association with agriculture, animal husbandry and industries can alleviate the persistent poverty and unemployment in rural areas.

245. We, therefore, recommend that :—

- (i) Planning and development officers and officials engaged in development of tribal areas should be imparted training for 6—10 days in forestry as per annexure-5. This will enable them to prepare socially relevant and realistic schemes which can be successfully implemented in the difficult areas.
- (ii) Personnel working in financial institutions should be imparted training in forestry for 10 days as per annexure-6. This will enable them to appreciate forestry as a resource for rural development and for correct evaluation of the forestry schemes for institutional financing.

- (iii) Personnel working in LAMPS/Tribal Development Corporations/Forest Development Corporations should be imparted a 10 days training as per annexure-7.

- (iv) Forestry experts should be associated with national and State level planning institutions for appropriate formulation and appreciations of forestry-based schemes, their monitoring and evaluation.

Forest Education for Masses :

246. The continuing degradation of forests has created environmental hazards in the form of floods, soil-erosion, desertification, silt damage, drought and whether disruptions. The rising demands for goods and services due to rapidly increasing human and livestock population, growing competition of land for agricultural and urban uses coupled with low productivity have caused India to be classified on the world's map of forest resources as belonging to a 'forest deficit zone'.

247. *Conservation is another name for survival—* Only by harmonising nature with our life style or by trimming our demands to the revival capacity of nature, we can hope to survive. Environment protection and conservation of forests will have to be the backbone of our natural development.

248. Article 51-A of the Constitution obligates every citizen with the duty 'to value and preserve the rich heritage of country's culture and to improve the natural environment including forests, lakes, rivers and wildlife.' Every citizen has, therefore, to be educated about the basic role of trees and forests in day-to-day life and protection of environment.

249. We, therefore, recommend that :—

- (i) At primary level, general knowledge about trees, wild-life and vegetation should be incorporated in the general text books used for teaching.
- (ii) At middle level, forestry should be taught as a separate subject in the same manner as basic sciences and social sciences are being taught to the students. This should start first in the school curricula of tribal/forest areas.
- (iii) At matriculation level, forestry should be introduced as a subject in the curricula of Matric/High School/Higher Secondary schools usefully combined with agriculture, geography, biology, science, mathematics etc. The Committee proposes the syllabus for the above course as per annexure-8.
- (iv) States having intermediate courses may introduce forestry as an optional subject for the tribal areas for which syllabus is as per annexure-9.

- (v) At graduation level, forestry may be introduced as independent subject which could be taught in combination with geography, agriculture, dairy science, pisciculture, physics, chemistry, zoology, botany, zoology. Syllabus for this course is as per annexure-10.
- (vi) Post-graduate course in forestry should provide advanced technical knowledge about forestry. Syllabus for this course is as per annexure-11.
- (vii) Parliamentarians, legislators, mukhias, sarpanch and other grass-root level political leaders may be given resources literacy by organising 2-3 days seminars. Besides, delivering lectures, they may be explained the problem with audio-visual aids. Subjects for discussion in the seminar may be as per annexure-12.
- (viii) In order to carry out training programmes for such a large number of officials and non-officials, it is necessary to identify training institutes at the national as well as the State level and also to equip them adequately for the purpose. It is also important to identify training and to produce appropriate and relevant literature for these training programmes which are intended to cater to the requirements of various categories of government personnel as well as non-officials. In the task of preparing appropriate literature not only the forest officers but also experts in tribal development, social activists, researchers and people engaged in development programmes in tribal areas through voluntary efforts should be associated. Since the task involved is strenuous it is recommended that a committee should be constituted to oversee the production of such literature both in English and regional languages and tribal dialects. Adequate funds should be earmarked for production, printing and distribution of this literature.
- (ix) Tribals and others residing in and around forest areas are already familiar with forest and its working by virtue of their age-long association with forest. The training programmes for them should be designed on the pattern of rural labour camps organised by the national labour institute for educating rural workers. These camps for giving forestry education to masses should be called 'Van Shivar'. In the camps organised by National Labour Institute the participants are paid minimum wages for the duration of their participation and are also given free food. Through lectures, audio-visual methods and stimulation games, necessary consciousness is created about the objectives of the programme. Same pattern should be followed for forestry camps. Special types of literature should be designed for these camps in local tribal dialects.
- (x) Voluntary organisations should play a bigger role in stimulating masses for taking up afforestation activity as a source of income and livelihood. Personnel working in these organisations should be imparted suitable training as per annexure-13.

Recommendations of Administrative nature :

250. The committee while endorsing the discussion on the subject contained in the report, more specifically list the following important recommendations :—

- (i) As recommended by National Commission on Agriculture, there is an immediate need for creation of Council of Forest Research and Education.
- (ii) A tribal wing may be created in the forest department of each State. This wing should develop forest beneficiary schemes and extend training facilities in forest and environmental development to the people.
- (iii) Indian Forest College should be made a National Forest University/Institute for imparting forestry education and training in the country.
- (iv) Forest education should also be imparted by Regional Forest Research/State Forest Research Institutes.
- (v) Rural Development and District Rural Development authorities should have forestry experts for orienting forestry programmes, in rural/tribal areas.
- (vi) There is an urgent need for involvement of local people particularly tribals in various decision making processes concerning activities of the Forest Department with a view to see that the areas of conflict between forest officials and tribals are sorted out and forest activities are carried out in harmony with the interest of local tribal people. For this purpose, it is necessary that an effective mechanism should be devised to permit participation of local people at all jurisdictional levels in the Forest Department. These forums should provide adequate opportunity to local people to put up their grievances by them to the officers present so that corrective steps can be taken by them without delay. This would help in resolving many conflicts arising between them. The training programmes for various categories of forest personnel should orient them towards seeking their cooperation and dovetailing their views in departmental programmes through this type of democratic participation.
- (vii) It is necessary to employ local tribal youths in various posts of the forest department particularly at lower and intermediary levels

so that their faith in the credibility of the Forest Department and their sense of belonging to the forest can be restored. In the tribal areas, employment of local tribal youths at the cutting-edge even in the Forest Department would go a long way in building bridges between the tribal people and the forest officials.

- (viii) For this purpose, their traditional skills, should be conserved, reorganised and upgraded and imaginative programmes may be taken up to utilise them.
- (ix) "FORESTRY" should be included as optional subject for the written competitive

examination held by UPSC every year for the selection of IFS probationers. Similarly, for the written competitive examinations held by the State Public Service Commissions, Forestry should be introduced as one of the optional subjects for S.F.S. written examination. Forestry should be introduced as one of the optional subject for all competitive examinations conducted by U.P.S.C. and State Public Services Commissions.

- (x) Social Forestry training should be imparted in all agricultural universities, Forest Colleges, etc. as per annexure-15.

ANNEXURE I
SYLLABUS FOR I.F.S./S.F.S.

LECTURE—30 hrs.

SUBJECT : *Tribology*

1. Introduction : Linkages of Forestry and Tribal Development :
 - (a) Demography and distribution of Scheduled Tribes.
 - (b) Social and cultural characteristics, customs, ethos, beliefs and practices of tribals in general with special emphasis on important tribes dwelling in forests.
 - (c) Tribal economy and role of forests.
2. Constitutional provisions for development of Scheduled Tribes and forests.
3. Tribals for forests—symbiotic relationship.
 - (a) Food, fuel, fodder, wildlife, fertilizer, fibres and other domestic needs.
 - (b) Rights, privileges and concessions.
 - (c) Ecology and economy.
 - (d) Forest policy, Forest Act and Wildlife Preservation Act and tribals.
4. Concept of Tribal Development :
 - (a) M.A.D.A. approach (Modified Area Development Approach).
 - (b) Tribal sub-Plan approach.
 - (c) Primitive tribes development.
 - (d) Scattered tribes development.
 - (e) Tribal Development through various Five Year Plans.
5. Tribal Administration at the national and the State levels :
 - (a) Traditional institutions.
 - (b) Administrative structure for tribal development.
 - (c) Research and academic institutions.
6. Forest Villages.
7. Tribal Cooperative Societies including F.L.C.S. and Forest Development Corporations.
8. Minor Forest Produce—Collection, processing, development and marketing.
 - (a) Tribal development cooperatives, corporations or federations.
 - (b) LAMPS and other special societies.
 - (c) Procurement, processing and marketing—role of NCDS, NAFED & TRIFED.
 - (d) Other arrangements including cottage industries.
9. Socio-economic aspects of shifting cultivation—need for settlement by adopting alternative techniques.
10. Displacement of tribals due to river valley, irrigation, mining projects and National Parks etc., and their rehabilitation programmes.
11. Project formulation, monitoring and evaluation of the tribal development programmes.
12. Special programmes for development of primitive groups.

13. Areas of conflict between forest officials and tribals and how to resolve them. Among other things, this should specifically deal with enforcement of forest laws, the resultant harassment of tribals on account of filing of criminal cases and the need for involvement of tribal customary panchayats/community for sorting out these matters for the benefit of both.
14. Tribal land and tenurial systems; the importance of protective legislation in safeguarding tribal rights on land.
15. Tribal protest movements and agitations—main issues behind them and their impact on future tribal policies.
16. Various forms of tribal exploitation practised even to-day—debt bondage, land alienation, exploitation by contractors, middlemen and traders; social exploitation etc.
17. Labour laws—Minimum Wages Act, Bonded Labour Abolition Act, Inter-State Migrant Labour Act; Social Security Legislation etc.
18. Need for involvement of tribal people in activities of the Forest Department—methods for achieving this.
19. Attachment to a tribal hamlet for a period of not less than two weeks leading to the preparation of a project report on some aspects of tribal development within the framework of Forest Department's activities.
20. Tribal psychology; reasons for their suspicion of 'outsiders' and resistance to certain programmes; how their fears can be removed.

ANNEXURE II

SYLLABUS FOR FOREST RANGERS

LECTURE—25 hrs. for two years course

20 hrs. for one year course.

SUBJECT : *Tribology*

1. Scope of the subject.
2. General definition, types, distribution and demography of tribes, racial classification, races, family, class and kinship, principle of social grouping, political organisation and social controls etc.
3. Role of forests in their culture, ethos, beliefs and day-to-day life.
4. Constitutional provisions regarding tribal development.
5. Tribal development and five year plans.
6. Role of forests in tribal economy.
7. Tribal development policies, policy of isolation, assimilation and middle path.
8. Tribals and forests, their symbiotic relationship.
9. Forest policy and tribals.
10. Primitive tribes and their development.
11. Tribals and Forest Development Corporations.
12. Tribals and Forest Labour Cooperative Societies.
13. Tribals and minor forest produce.
14. Tribals and shifting cultivation.
15. Tribal rights and concessions in forests.
16. Tribals and social forestry.
17. Tribal development projects of forest department in various States.
18. Tribals and Wildlife.
19. Special beneficiary schemes in forestry sector.
20. Areas of conflict between tribals and forest officials and how to resolve them.
21. Tribal land tenure system and protective legislation.
22. Tribal agitations and main issues behind them.
23. Various forms of tribal exploitation.
24. Tribal psychology, the reasons for their being suspicious of outsiders and resistance to certain programmes and schemes.
25. Labour laws and legislation.
26. Need for and methods of involvement of local tribal people in forest programmes and activities which affect them.
27. Field attachment for a specific period in a tribal hamlet leading to preparation of a project report on some aspects of tribal development within the framework of forest department's activities.

ANNEXURE III
SYLLABUS FOR FORESTERS

LECTURE — 15 hrs.

SUBJECT : *Tribology*

1. Distribution and characteristics of tribals in that particular region.
2. Tribal development concepts.
3. Constitutional provisions and approaches adopted for tribal development.
4. Tribal development.
5. Tribal rights and concessions in forests.
6. Tribals and minor forest produce.
7. Tribals and forest industries particularly cottage industries.
8. Various tribal development schemes running in that State.
9. Brief mention about Forest Labour Cooperative Societies, Forest Corporations.
10. Shifting cultivation.
11. Beneficiary schemes in forestry sector.
12. Social forestry and involvement of tribals.
13. Forest villages.
14. Areas of conflict between the forest officials and tribals and how to resolve them.
15. Need for and methods of involvement of local tribal people in Forest Departments, decisions and development programmes which affect them.
16. Labour laws and legislation.
17. Tribal psychology, the reasons for their being suspicious of outsiders and resistance to certain programmes and schemes.
18. Various forms of tribal exploitation.
19. Field attachment to a tribal hamlet for a specific period leading to the preparation of a report showing how tribal welfare/development can be carried out within the framework of the departmental activities.

ANNEXURE IV
SYLLABUS FOR FOREST GUARDS

LECTURE—10 *hrs.*

SUBJECT : *Tribology*

1. Tribal characteristics and distribution of tribals in that particular State and region.
2. Constitutional safeguards and various developmental measures taken in the past.
3. * Rights and concessions of tribals in the forests.
4. Minor forest products and tribals.
5. Forest Corporations, Forest Labour Cooperative Societies and their linkage with tribal development.
6. Tribal development and social forestry.
7. Various tribal development schemes running in that State.
8. Enforcement of forest laws; how to sort out matters with the cooperation from tribal customary Panchayats/ community.
9. Need for seeking public cooperation in carrying out various duties and functions.
10. Various forms of tribal exploitation.
11. Tribal psychology, their attitude towards outsiders and reasons thereof.
12. Labour laws applicable to the forest areas.
13. Elementary knowledge of public health and rural development.
14. Field attachment to a tribal hamlet for a specific period leading to preparation of a project report and how the trainee would like to help the tribals within the course of his duties.

ANNEXURE V

SYLLABUS FOR FOREST EDUCATION (ORIENTATION) FOR ADMINISTRATORS/DEVELOPMENT OFFICERS/PROJECT OFFICERS/ENGINEERS ETC. WORKING IN TRIBAL AND FOREST AREAS

1. Forest and Wildlife :
 - (i) Forests.
 - (ii) Forest Policy.
 - (iii) Forest Legislation.
 - (iv) Wildlife.
2. Forest and Environment :
 - (i) Soil erosion and Land degradation.
 - (ii) Flood damages.
 - (iii) Air Pollution.
 - (iv) Water Pollution.
 - (v) Endangered species of flora, fauna and primitive tribes.
3. Forestry in Rural/Tribal Development :
 - (i) Production of food, fuel, fodder, fibre etc.
 - (ii) Employment generation.
 - (iii) Beneficiary oriented schemes in forestry sectors :
 - (a) Forest Development programmes;
 - (b) Social forestry programmes;
 - (c) Minor forest produce programmes.
 - (iv) Forest -based cottage and small industries.
 - (v) Forestry schemes and their supplemental role in the schemes of other sectors.
4. Role of Forestry in Development Schemes :
 - (i) Integrated Rural Development Programme.
 - (ii) National Rural Employment Programme.
 - (iii) Drought Prone Area Programme.
 - (iv) Hill Area Development Programme.
 - (v) Tribal sub-Plan & Scheduled Castes Component Plan.
 - (vi) Dairy Development Programme.

ANNEXURE VI

FOREST EDUCATION (ORIENTATION) COURSE FOR BANKERS, ECONOMISTS, PROJECT PLANNERS

(Background material will be supplied in advance)

1. Social and cultural characteristics of tribal communities, their customs, beliefs and practices; various forms of tribal exploitation; tribal psychology and behaviour and its sociological dimensions.
2. Problems of tribal development—shifting cultivation, minor forest produce, displacement of tribals on account of the projects—strategy for tribal development, why have previous programmes and strategy failed to alleviate poverty and remove exploitation; faulty schemes not appropriate for tribal people.
3. Tribals' resistance to taking loans—reasons thereof—Past experience with loan based development programmes (including those of the cooperative), danger of tribal land alienation through bad loaning system.
4. Need for involvement of local people in various activities.
5. *Forest Economics*
Introduction of physical setting and economic environment—Review of economic principles as applied to Forestry, historical aspects and present status—timber economy, firewood economy, M. F. P. economy, recreation, wildlife, water management in Forestry, Forestry in National Development, Forest Policy and Monetary Policy.
6. *Forest Development Planning*
Forest Management Planning and Valuation Principles—Interest and Investment, valuation of Forest Stand and Land, Valuation of trees, Valuation of financial alternatives. Risks and damages, Project Selection—Development Planning.
7. *Forestry Plan Execution—Monitoring & Control*
The management of forestry projects, programming and budgeting, staffing, recruitment and labour relations, public relations—Compartment histories—Forest summaries and Documentation—Quality control—method of control—Future Planning—Research and Development.
8. *Agro-Forestry and Social Forestry*
Integrated land use, forestry, agriculture, animal husbandry, and other rural sectors and their complementary roles. Revitalising the rural economy, Social Forests around houses, farms, roads, canals, rivers and villages, recreation forestry, role of social forestry in rural and tribal economy.
9. *Production Forestry*
Initiation of a Forestry Project—Operational Planning Prescriptions—short term Planning—Medium term planning and Long term planning—Cost benefit analysis—Net work analysis for prescription of activities and methods.
10. *Tribal Development and Forestry*
Tribals and forests and their symbiotic relationships, Role of forests in tribal economy—Tree-man relationship in Forests—Constitutional Responsibility—State directives, Financial Rules—How forestry can contribute to tribal development.

ANNEXURE VII

SYLLABUS FOR FOREST EDUCATION (ORIENTATION) FOR OFFICERS OF TRIBAL CO-OPERATIVE DEVELOPMENT CORPORATIONS/FOREST DEVELOPMENT CORPORATIONS

1. Forest in National Development :
 - (i) Ecological security.
 - (ii) Dependence of rural and tribal economy on forests.
 - (iii) Supplemental role of forests in various developmental projects.
 - (iv) Supportive role in alleviation of poverty programmes.
2. Tribal and Forests—Symbiotic Relationship :
 - (i) Food, fuel, fodder, fibre, small timber and other domestic needs of the people.
 - (ii) Rights, privileges and concessions.
 - (iii) Forest policy, Forest Act and Wild Life Act.
 - (iv) Ecology and economy of tribals.
 - (v) Constitutional provisions for development of scheduled tribes and forests.
3. A detailed introduction to the tribal social structure, their customs and practices relevant to area of work of the trainees.
4. Labour legislation applicable to tribal areas.
5. Need for and methods of involvement of local people in planning and execution of development programmes.
6. Technologies used by tribals for various economic activities particularly extraction, storage, processing of minor forest produce etc.
7. Forest Produce :
 - (i) Harvesting and marketing of (a) Major Forest Produce, (b) Fuelwood, (c) Pulpwood and (d) Bamboo.
 - (ii) Collection, processing and marketing of minor forest produce viz., Tendu leaves, oilseeds of tree origin, lac, tannins, medicinal herbs, mahuline leaves, etc.
 - (iii) Cottage and small forest-based industries viz., Beedi making, extraction of oil, shellac manufacture, tannin extracts, alkaloids etc.
 - (iv) Export and import of forest produce.
8. Role of Different Agencies :
 - (i) Working of Forest Labour Co-operative Societies.
 - (ii) Working of LAMPS.
 - (iii) Working of special co-operatives.
 - (iv) Role of Tribal Development Co-operative Corporations/Federations.
 - (v) Role of Forest Development Corporations.
 - (vi) Role of NAFED.
 - (vii) Role of N.C.D.C.
 - (viii) Other agencies viz., S.T.C., Export Corporations etc.
9. Forest Produce Trade :
 - (i) National Trade.
 - (ii) International Trade.
 - (iii) Future Projects.

ANNEXURE VIII

A COURSE IN FOREST EDUCATION AT HIGH SCHOOL LEVEL

Class IX : Syllabus

General Aims

1. To have good knowledge of forests.
2. To understand the significance and importance of forests.
3. To enable them to take up scientific study of afforestation and to gain needed skills for the same.
4. To gain knowledge of forest trees and thereby to develop expertise in plantation and growing trees.
5. To acquire knowledge about grasses in the forest.
6. To acquire requisite skill and expertise in forest administration.
7. To gain knowledge about both major and minor forest produce and their processing.

THEORY-WORK (EDUCATIONAL UNITS)

- 1 **Usefulness of forests and direct and indirect advantages of forests.**
- 2 **Knowledge about the forest types in the State laying emphasis on the necessity of extending forest areas and forest extension activities.**
- 3 **Identification of trees and other botanical plants growing in the forest and also to acquire knowledge about the significant trees, such as Sal, Teak, Mahuwa, Tendu, Harra, Saja, Arjun, Baheda, Eucalyptus, Su-babool, Bamboo etc.**
- 4 **Collection, storage and preservation of seeds of useful trees yielding ornamental flowers, fodder, fruits and fibres.**
- 5 ***Forest Ecology***
Factors affecting environment, heat, wind, rain, sunlight, geological forces, origin and formation of earth, climatic conditions in the beginning, underground water, underground gases, mineral products, organic products-factors regarding learning of underground water resources, direction of slopes, height, biotic forces, interference of human-beings, cattle, insects, worms, wild animals, etc.
- 6 ***Nursery of Plants***
Details and complete information about types of nurseries including where to raise nurseries and how to raise and nature of different tasks and methods and also growing seedlings in plastic bags. Maintenance of nursery register.
- 7 ***Plantations***
Various methods of plantation and growing trees, advance site preparation, earth-work, method of plantation, cleaning, weeding, methods of loosening the earth around roots of plants and application of manures and fertilizers. Maintenance of plantation records.
- 8 ***Soil-Science***
Types of soil, soil-erosion and its reason, necessity of prevention of soil-erosion, earthen check-dam, levelling of land and double levelling.
- 9 ***Fertilizer***
Knowledge regarding organic and inorganic fertilizers, nutritive elements for plants: Nitrogen, Potas, Phosphorous and their impact on plants, signs of their deficiency, types of nutrition from different fertilizers obtained.

10. Complete information regarding plantation and growing of Teak, Sisham, Saja, Arjun, Nilgiri, Khair, Bamboo, Babul and other fast-grown trees.
11. Knowledge regarding ornamental trees such as Gulmohar, Ashoka, Amaltas etc.
12. Identification of medicinal plants and knowledge regarding their uses; preservation and making of medicines particularly the following eight plants :
 - (i) Aonla, (ii) Harra, (iii) Baheda, (iv) Bhilwa, (v) Sarpagandha, (vi) Sandal (vii) Nuxvomica and (viii) Khair.

PRACTICAL AND FIELD WORK

Practical tasks for affirmation of theoretical knowledge :—

Samples and collection of forest plants, making albums and preservation in small boxes and to organise exhibition.

Collection of seeds, to make experiments regarding germination in the laboratories and in open land too. Raising of nursery.

Studying the structure of land and its types, making charts, and also to do physical analysis of the land.

To make notes and tree-wise register.

Fieldwork (works regarding socially useful products).

Raising nursery for seedlings and also to gain knowledge about these.

Raising nursery for quick growing seedlings. Formation of sunken and raised beds, use of polythene bags and containers.

Each student will plant 25 trees and will also be responsible for looking after these during the period of growth.

A COURSE IN FOREST EDUCATION AT HIGH SCHOOL LEVEL

Syllabus for Class or Standard X

General Objectives :

1. Knowledge about Forest Management.
2. Understanding the significance of protection of forests and acquiring skills in it.
3. Understanding the role of forest environmental development.
4. Understanding the role of forests in rural development.
5. Acquire insight regarding grass land development.
6. Knowledge about cottage industries based on forest produce.

THEORY (EDUCATIONAL UNITS)

1. *Forest Management*

Concepts of high and low forests. Important systems of forest management. An idea about compartment, coupes, felling series, working circles, etc. General idea about volume tables, yield tables and weight tables.

2. *Silviculture*

Regeneration of forest areas :¹

- (i) Natural seedling regeneration.
- (ii) Coppice regeneration.
- (iii) Rehabilitation of degraded forests.
- (iv) Reafforestation and afforestation.
- (v) Tall planting.
- (vi) Grafting of trees.

3. *Forest Protection*

Various types of damages caused to forest areas :

- (i) Damage due to fire and its control.
- (ii) Damage due to overgrazing and browsing.
- (iii) Soil erosion.
- (iv) Wind, frost, and other causes.
- (v) Illicit felling, lopping, girdling etc.
- (vi) Insect and fungal damages.

4. *Life Cycle of Important Tree Species*

Teak, Sal, Shisham, Eucalyptus, Bamboo, Kaju and Subabool.

5. *Management of Grass Lands and Production of Fodder*

Types of grasses and grass land in the country. Fodder producing trees. Ways of preservation of fodder in forest areas and transporting the same to deficit areas.

6. *Forest Based Cottage Industries*

- (i) Beedi making.
- (ii) Rope making.
- (iii) Bee keeping.
- (iv) Handmade paper.

7. *Practical and Field work*

- (i) Preparation of observational notes on trees and forest area visited. .
- (ii) Preparation of sunken and raised beds and method of raising of seedlings of important species.
- (iii) Grafting of trees.
- (iv) Raising of medicinal herbs and plants.
- (v) Collection of Tendu leaves, grasses (for making ropes).

Each student will be required to walk inside the forest for about 5—7 kms. per day. The programme will be conducted for a period of 5 days.

House construction, maintenance and repair works.

Use of forest produce to be demonstrated.

ANNEXURE IX

SYLLABUS FOR 11TH & 12TH STANDARDS/CLASSES

I. SILVICULTURE

1. Locality factors :
 - (a) Climate, topography, soil, biotic.
 - (b) Different types of soils found in India and their correlation with forest types.
 - (c) Biotic factors :
Fire, grazing, browsing, pests, wild animal and man.
2. Definitions and meaning of the terms :
Evergreen trees, evergreen forest, deciduous trees, deciduous forest, water table, Humus, importance of Humus.
3. Forest Species :
Regeneration.
Natural regeneration—by seed, coppice and root suckers, artificial regeneration by (a) sowing, (b) transplanting (c) stumps, (d) branch cutting and rhizomes.
4. Collection of seed, storage and pretreatment of seed with special relation to Teak, Khair, Babul, Sissoo, Neem, Mahuwa, Bamboo and Eucalyptus Spp.
5. Germination of seeds, germination percentage, plant percentage, seed and tree improvement.
6. Nursery, site selection, preparation, control of grasses and weeds, types of nursery beds, methods of preparing nursery beds, pricking out, methods of irrigation and installation of irrigation facilities. Types of containers.
7. Nursery techniques for Teak, Khair, Bamboo, Eucalyptus, Siven Siras, Saru, Prosopis juliflora and Neem.
8. Advantages and disadvantages of direct sowing and transplanting.
9. Transplanting with (a) bare rooted, (b) ball of earth, (c) stump and presprouted stump (d) branch cutting, (e) seedlings raised in containers.
10. Planting methods for Teak, Khair, Bamboo, Eucalyptus etc.
11. Tending operations, weeding, soil working, cleaning, climber cutting, thinning and cutting back and pruning. Types of thinning—Mechanical, silvicultural, A.B.C. and D grades of ordinary thinnings; Light and heavy crown thinnings.
12. Afforestation of saline and alkaline lands, desert areas, degraded forests and denuded hills.
13. Methods of fencing.
14. Use of fertilizers and pesticides.
15. Looping, pollarding, girdling and grafting.
16. Definition of seedling, sapling, pole, tree, dominant tree, suppressed tree, Moribund tree, stag-headed tree, Witches Broom.
17. Broad forest types and sub-types with special reference to the forest type of particular State :
Silviculture of the following species :
Teak, Khair, Bamboo, Sissoo, Eucalyptus, (Mysore gum), Desi Subabul, Prosopis juliflora, Kaju etc.

II. SOIL CONSERVATION

Soil, top soil, sub-soil.

Agencies of erosion.

Sheet erosion, rillerosing, Gully formation, Ravine formation.

Adverse effects of erosion.

Causes of erosion.

Measures to check erosion in hills and sparsely wooded areas.

Meaning of the terms-Contour lines, Catchment area, Water-shed.

Hard species suitable for afforestation in degraded and denuded forests.

Wind erosion, effect of wind breaks and shelter belts, wind velocity and the extent of effect.

Afforestation on desert fringes.

Afforestation on coastal sands.

III. EXTENSION FORESTRY

1. Meaning of the terms :—

Social Forestry, Extension Forestry, Farm Forestry, Agro Forestry.

2. Main activity under Social Forestry.

3. Road side and canal side plantations.

—Objects and benefits to be derived.

—Nursery technique and time table for operations.

—List of species to be chosen and their utility as shade.

—Trees, ornamental trees and other uses.

--Type of fencing in such plantations.

4. Plantation on village waste-land and grazing-lands.

Technique and choice of species.

Procedure to obtain lands and protection from grazing such plantations.

5. Vanmahotsava.

6. Farm Forestry, Agro Forestry, A tree for every child for involving masses.

7. Social security plantations, involvement of masses in afforestation schemes as beneficiary programmes.

8. 'Tree Army', Eco-development forces.

IV. FOREST UTILISATION.

1. Forest produce or Forest product.

Major forest produce, Minor forest produce.

Legal definition of timber, commercial definition of timber.

Physical properties of timber.

Defects in timber, Shakes etc.

2. Names of timber species suitable for the following uses and a description of the same :—

(i) Railway sleepers.

(ii) Agricultural implements.

(iii) Bullock carts.

(iv) Household furniture.

(v) Internal door timbers.

(vi) Internal fittings.

(vii) External roof timbers.

- (viii) Doors and windows.
- (ix) Packing cases.
- (x) Sports goods.
- (xi) Truck bodies and Railway coaches.
- (xii) Textile machinery—Bobbins.
- (xiii) Matchwood.
- (xiv) Paper and pulp.
- (xv) Plywood.

Utilisation of the following species :

Teak, Saja, Khair, Bamboo, Haldu, Sisham, Sissoo, Siris, Mahuwa, Kakad, Neem, Amla, Karanj, Nilgiri, Semal, Arjun etc.

Method of felling trees :—

By axe alone, axe and saw, Swiss logging saws.

Wood seasoning—what is it and why is it necessary ?

Air seasoning. Method of stacking timber for air seasoning.

Kiln seasoning.

Wood preservation.

Chemical preservation, treatment.

ASCU treatment plant.

Importance of wood preservation treatment.

Comprehensive list of timber species available in the country including areas from which they are produced.

Comprehensive list of important minor forest produce produced in substantial quantities in various areas and agency for their collection.

V. WILD LIFE PRESERVATION

Definition of the term WILD LIFE.

As distinct from wild animal.

Game Sanctuaries, National Parks.

Difference between Sanctuary and National Park.

Sanctuaries and National Park in Gujarat State.

Closed time, Water holes, Salt lakes.

Protected animals.

Necessity for wild-life preservation with reference to balance of nature.

Benefits of wild-life preservation.

General information on the following species:

Lion, Tiger, Panther, Deer and Antelope, Indian Wild Ass.

Flamania, Peacock, Great Indian Bustard, Blue Bull, Stag.

Difference between Deer and Antelope.

Difference between Cheetah and Panther.

Wild animal and bird products.

Measures required to be taken to protect and foster Wild-life preservation

VI SURVEY

1. Scale, Simple Scale, Representative Fraction

2. Chain Survey, Various types of chains.

Chain Survey and method of triangulation.

3. Traverse, open traverse, closed traverse.
4. Where chain survey is useful ?
5. Prismatic compass, its construction.
Orientation on Station Point. Forward bearing, Back bearing, Offsets.
6. Where is prismatic compass survey useful ?
7. Orientation of a map and map reading. Simple map and Topo-sheet.

VII. FOREST MENSURATION

1. Rules regarding measurement of height of standing trees.
2. Measurement of height by Abney's level.
3. Quarter girth formula for measurement of volume of round timber.
4. Calculations of number of plants per hectare in rectangular planting for various espacements.
5. Main classes as per standard classification of round timber showing their length and girth ranges.

VIII. FOREST MANAGEMENT

1. Meaning of the terms : working plan, sustained yield, rotation, working circle, felling series and coupes. Distinction between rotation and felling cycle. Distinction between coupe and compartment.
2. Silvicultural system, its chief ingredients.
3. Study of the following silvicultural systems as they prevail in the State :
 - (a) Clear felling with artificial regeneration.
 - (b) Coppice with reserves.
 - (c) Selection-cum-improvement.
4. List of species which are :—
 - (a) Good coppiciers.
 - (b) Bad coppiciers.

Success of coppice with relation to age of the trees, felling season and trimming of tree stool.

PRACTICALS

1. Preparation of observational notes on forest types, tree species and grass lands visited during excursions.
2. Actual raising of seedlings in the schools and colleges.
3. Collection of seeds for important species viz., Teak, Eucalyptus, Bamboo, Pine and Ornamental trees.
4. Soil conservation demonstrations.
5. Plantation of tree seedlings and managing the same on scientific lines.
6. Collection of Tendu leaves, oilseeds of tree origin, Lac, Tassar, Cocoon, medicinal herbs, etc.
7. Visiting National Parks and Sanctuaries.
8. Carrying out land survey.
9. Measuring trees, logs and sawn timber.
10. Developing and managing bamboo forests and medicinal herbs.

ANNEXURE 10

PROPOSED SYLLABUS FOR FORESTRY AS ONE OF THE THREE OPTIONAL SUBJECTS IN B. Sc. IN TRADITIONAL UNIVERSITIES

NOTE : This syllabus is meant for B.Sc. Pass course. The syllabus for forestry is designed so that forestry could be offered as one of the three subjects required to be taken for a B.Sc. Pass course; in combination with any other two subjects both in the Physical and Biological Science streams.

1. SILVICULTURE AND FOREST ECOLOGY Teaching hrs. 60

A. *Silviculture* : Teaching hrs. 30

1. Forest, their components ; uses ; influences and need for protection.
2. Locality factors of forests :
 - (i) Climatic.
 - (ii) Edaphic.
 - (iii) Biotic.
3. Growth and form of trees and crops :
 - (i) Shoot, cambial, root, reproductive growth and differentiation.
 - (ii) Tree and crop morphology.
 - (iii) Crop growth.
4. Structure, physiology and reproduction.
5. Tree improvement, selection and breeding.
6. Natural regeneration (with particular reference to *Pinus roxburghii*, *Shorea robusta*, *Quercus incana*, *Tectona grandis*, and Bamboo species).
7. Artificial regeneration (with particular reference to *Eucalyptus species*, *Cedrus deodara*, *Abies pindrow*, *Pinus roxburghii*, exotic sub-tropical pines, *Dalbergia sissoo*, *Acacia catechu*, *Tectona grandis*, Bamboo species and other fast growing species).
8. Tending (thinning, cleaning, weeding, fertilization etc.)
9. Silvicultural systems (clear-felling systems, uniform system, irregular shelter wood system, selection system, coppice system, coppice-with standard system).
10. (a) Environmental impact of silvicultural systems.
(b) Social Forestry, Agro Forestry, Farm forestry etc.

B. *Ecology* Teaching hrs. 30

11. Basic principles of Forest ecology, Forest eco-system and its characteristics.
12. Forest soils, moisture relations and nutrients.
13. Plant succession and Climax forests.

14. Factors affecting the attainment of Climax forests :
 - (a) Light.
 - (b) Climatic factors.
 - (c) Topographical factors.
 - (d) Edaphic factors.
 - (e) Biotic factors.
 (Pre-climax, sub-climax and post-climax).
15. Theories of Forest types, Forest types of India. Detailed forest types of Himalayan region.
16. Forest eco-systems, biomass and productivity.
17. Environmental Conservation.
18. Ecological security of the Nation:
 - (a) Soil erosion.
 - (b) Flood.
 - (c) Desertification.
 - (d) Drought.
 - (e) Endangered species of flora, fauna and primitive tribes.
19. Role of Forest Ecology in National Development :
 - (a) Increase in vegetation cover.
 - (b) Increased production of food, fuel, fodder, fibre etc.
 - (c) Support to rural development programmes.

II. FOREST MENSURATION AND STATISTICS

Teaching hrs. 50

A. *Elements of Forest Mensuration*

Teaching hrs. 25

1. Definitions, conventions and units of measurement.
2. Measuring instruments and their use: tape ; callipers, levels, relascope ; increment borer etc.
3. Single tree measurements :
 - (a) Over-bark and under-bark measurement, breast height measurement, measurement of diameter, girth, height, basal area, volume, increment, age.
 - (b) Stump and stem analysis.
 - (c) Preparation, categories and use of volume tables.
4. Crop Measurements :
 - (a) Measurement of crop height, girth, diameter, age, basal area, growing stock, quality, mean, current and periodic increment.
 - (b) Sampling and assessment of forest crops by conventional methods and by use of aerial photography and photo-interpretation.
 - (c) Preparation, categories and use of yield tables with particular reference to important species.
5. Measurement of felled timber: linear, square, cubic and weight measurements.
6. Elementary population dynamics of forest stands, Mayers and Fergusons Methods and Seth's modification.
7. Research plot measurements.
8. Weight table of pulping and fuelwood species.

B. Elementary Statistics & Data Processing.

Teaching hrs. 25

9. Standard error, number of observations required for a given degree of accuracy.
10. Population and samples; tests of significance.
11. Chi-square test for goodness of fit and independence.
12. Fitting of simple curves, regression and correlation.
13. Sampling procedures.
14. Design of experiments.
15. Computer programming.
16. Different types of tables. *

III. WOOD ANATOMY, TIMBER TESTING & FOREST UTILISATION

Teaching hrs. 75

A. Wood Anatomy and Properties

Teaching Hrs. 25

1. Structure of wood.
 - (a) Growth process ; gross features of wood ; growth rings ; grain and textures.
 - (b) Anatomical structure and its importance ; pores of vessels ; tyloses ; fibres; tracheids; wood parenchyma ; rays ; ripples ; canals.
2. Physical properties of wood and their measurement :
Density and moisture content, transmission of sound, light and electricity, thermal expansion, combustibility, permeability, wood working qualities, porosity, colour.
3. Mechanical properties of wood and their measurement :
 - (a) Definitions and general principles.
 - (b) Bending, compression, tension and shear in different directions.
 - (c) Torsion ; brittleness ; nail and screw-pulling.
 - (d) Suitability coefficients and working stresses.
 - (e) Factors effecting strength of wood.
4. Chemistry of wood and wood components.
5. Identification, properties and use of the following :

Pinus roxburghii, Cedrus deodara, Pinus wallichiana, Abies pindrow, Picea smithiana, Cupressus torulosa, Shorea robusta, Tectona grandis, Dalbergia sissoo, Acacia catechu, Adina cordifolia, Mitragyna parvifolia, Holoptelea integrifolia, Hymenodictyon excelsum, Anogeissus latifolia, Terminalia alata va. nepalensis, Bombax ceiba, Trewia nudiflora, Grewia elastica, Celtis australis, Carpinus vimini, Abus nepalensis, Ulmus wallichiana, Juglans regia, Fraxinus excelsa, Populus ciliata, Morus alba, M. indica, Acer caesium, Aesculus indica, Betula alniodes, B. utilis, Prunus padus, Toona ciliata, Mangifera indica, Quercus incana, Q. dilatata, Q. semecarpifolia, Syzygium cumini and Eucalyptus tereticornis.

B Forest Utilisation

Teaching Hrs. 50

1. Use of wood.
2. Extraction, conversion and marketing of timber with particular reference to modern improved logging.
3. Wood seasoning.
4. Wood preservation.
5. Wood improvement.

* NOTE : Elementary portions on Statistics are included in optional Mathematics.

6. Modern Timber Engineering Techniques.
7. Minor Forest Products (MFP) :
 - (a) Importance of MFP.
 - (b) MFP potential.
 - (c) Commercial importance of MFP.
 - (d) Constraints in MFP development.
 - (e) Research and development efforts.
 - (f) Existing organisation for collection of MFP.
 - (g) MFP collection and rural development.
 - (h) LAMPS, Special cooperatives, MFP Corporations, Tribal Development Cooperative Corporations, NCDC, NAFED and STC.
8. The following forest industries :—
Honey extraction, Beedi making, Shellac & lacquer, products from lac, extraction of oil from oilseeds of tree origin, tassar cocoon rearing, reeling and weaving, tamarind concentrate and starch from its seeds, gum grading, broom making from grasses, Katha and Catechu, wood-ware furniture, sports goods, pencils, toys, saw-mills, plywood, veneer, hardboard, particle board, pulp and paper, rayon, match industry, resin, turpentine and derivatives etc.
9. Medicinal plants based industries.

IV. FOREST MANAGEMENT AND PROTECTION

Teaching Hrs. 30

A. Forest Management

1. Scope of Forest Management.
2. Objects of Management :—
 - (a) National and State forest policies; legislation; reservation, rights.
 - (b) Goods and services from forests (including recreational and environmental values).
 - (c) Factors influencing management.
 - (d) Methods of achieving objects.
3. Sustained yield concept, its limitations and modifications; normal forests, rotation, conversion and felling cycle, regeneration period, exploitation period.
4. Forest Organisation :
Survey; maps and mapping, primary territorial units; (blocks, compartments; sub-compartments), Management units (Working circle, felling series, cutting section, periodic blocks, regeneration area).
5. Growing stock, increment and yield :
 - (a) Their inter-relationships.
 - (b) Methods of their determination and limitations of methods under different silvicultural systems.
 - (c) Methods of yield regulation.
6. Working plans.
7. Environmental considerations; Forest recreation; Wild life management.
8. Forest Economics :
 - (a) Definitions and scope, production, consumption, supply, demand, value, price and market. Relationship and law governing these. Elasticity of demand, Foresting; its supply and demand.
 - (b) Costs and benefits and their quantification. Elementary ideas on cost-benefit analysis.
 - (c) Social and individual time preference. Elementary ideas on project valuation.

9. Forest valuation :

- (a) Scope.
- (b) Distinctive features of forestry in economical appraisal, changes in markets, value of money.
- (c) Compounding and discounting of costs and incomes. Financial yield and financial rotation, limitations thereof.
- (d) Application of valuation techniques in choice of species, thinnings, injuries to forest and their control.

B. Protection (General)

Teaching Hrs. 30

10. Factors injurious to forests :

- (a) Climatic factors—frost, drought, wind, snow, hail, flood.
- (b) Biotic factors—human activities, cattle, wild animals, insects and diseases, plants, fire, encroachment and lopping.
- (c) Soil erosion, landslides and avalanche.

11. Means of protection, their classification and application :—

- (a) Physical.
- (b) Chemical.
- (c) Biological.
- (d) Silvicultural.
- (e) Educative.
- (f) Legislative.

12. Specific Protection Problems :

- (a) Principles of environmental protection, land management, soil and water conservation.
- (b) Protection for climatic elements.
- (c) Control of grazing, browsing and lopping.
- (d) Fire fighting.

13. Acts of Protection of Forests and Wild Life.

14. Involvement of masses in afforestation and protection programmes :

- (a) Individual beneficiary schemes.
- (b) Involvement of community.
- (c) Policy, services and technological packages.
- (d) Involvement of tribals.

C. Protection (insects, pests and diseases)

Teaching Hrs. 20

15. Forest Entomology :

- (a) Importance of Forest Entomology in forestry, losses due to insects and their assessment.
- (b) Insect anatomy, taxonomy and ecology.
- (c) Classification of pests according to food-habits; pests of standing trees, felled trees, converted timber, seeds and fruits.
- (d) Methods of control, *i.e.*, chemical, physical, silvicultural, biological, genetical and environmental aspects of pests and their control.

- (e) Important insects, pests and their control in respect of the following species namely—*Pinus roxburghii*, *P. wallichiana*, *Cedrus deodara*, *Abies pindrow*, *Picea smithiana*, *Cupressus torulosa*, *Populus ciliata*, *Quercus incana*, *Toona ciliata*, *Shorea robusta*, *Dalbergia sissoo*, *Acacia catechu*, *Bombayc eiba*, *Eucalyptus tereticornis*, *Mangifera indica* and *Syzygium cumini*.

Teaching Hrs. 25

16. *Mycology and Forest Pathology*

- (a) Definitions, importance and broad classification of fungi.
- (b) Important families in Hymencomycetes and important genera in Polyporaceae.
- (c) Broad ideas about mycorrhiza and edible fungi.
- (d) Diseases, causes and symptoms, principles of control and plant quarantine.
- (e) Important diseases, causes, symptoms and control for the species mentioned in item 11(e) above.
- (f) Environmental aspects of diseases in natural crops and plantations of both indigenous and exotic species

V. OPTIONAL[†] MATHEMATICS

Teaching Hrs. 20

A. *Arithmetic*

1. Revision of compound interest and discount.

B. *Elementary Statistics*

1. Data collection and tabulation.
2. Mean, mode and median.
3. Frequency distribution and probability integral.
4. Standard deviation and its calculation.

C. *Co-ordinate and Solid Geometry*

1. Calculation of surface area and volumes of simple, two—dimensional and three—dimensional figures, *i.e.* triangle, polygon, circle, ellipse, parabola, hyperbola, sector, segment, cylinder, prism, pyramid and cone and their frustums, sphere.

D. *Algebra*

1. Simultaneous and quadratic equations.
2. Graphs of simple algebraic and trigonometrical functions.
3. Arithmetical and geometric progression.
4. Simple derived series (arithmetic, geometric, arithmetico-geometric, squares and cubes of natural numbers).
5. Binomial theorems, exponential function and logarithms.

E. *Trigonometry*

1. Calculation of heights and distances by trigonometry.
2. Simple solution of triangles.*

VI. OPTIONAL[†] BOTANY

Teaching Hrs. 20

1. Importance of Botany in study of forestry.
2. Classification of plant kingdom :
 - (a) Cryptoyames, their main divisions *i.e.*, algae, bacteria, fungi, lichens, bryophyta and pteridophyta.
 - (b) Phanerogams; their main divisions, Ymnosperms, Angiosperms, their broad characters. Classification into orders, families, genera and Spp.

*NOTE : This may need revision on the arrival of students educated under 10+2 scheme.

3. External morphology of root, stem, leaf, flower, inflorescence, fruit and seeds, their functions, modifications, parts, development, description, terms etc.
4. Pollination, fertilization, development and dehiscence of fruits, development and germination of seed, seed dispersal.*

EXCURSIONS

10 days in 1st year.
10 days in 2nd year.
†10 days in 3rd year.

First year

- | | |
|-----------------------------|--|
| 1st excursion | Study of forest botany, entomology, pathology, soils, silviculture and ecology. |
| 2nd excursion | Study of geology, soils, botany and entomology. |
| 3rd excursion | Measurement of height, girth, diameter etc. in plantations and visit to nursery. |
| 4th excursion | Local visit to young crop. Thinning and ring counting instructions. |
| 5th excursion | Carry out stump analysis and increment borings. |
| 6th excursion | Carry out stem analysis. |
| 7th, 8th and 9th excursions | Exercise in Economics, visit to some local villages in different batches of 2-3. Survey of supply and demand on forest products and fulfillment in villages. Project report for alleviation of poverty of tribal families based on forestry schemes. |
| 10th excursion | Time, motion and cost study of river and road transport of timber. |

Second year

- | | |
|----------------|---|
| 1st excursion | Visit to I.T.I. and Wood Working Centre. |
| 2nd excursion | Study defects of timber. Timber passing, visit wood industries nearby. |
| 3rd excursion | Study of management of fuelwood plantations for production of firewood. Study of food, fodder and fibre production schemes. |
| 4th excursion | Study system of management of natural forests. |
| 5th excursion | Sowing of forest species in nurseries, practical seed testing etc.‡ |
| 6th excursion | Transplanting operation in nursery. |
| 7th excursion | Different ways of planting out (entire naked root, entire with ball of earth; pot-planting, stamps etc. This can be combined with Van-Mahotsava planting. |
| 8th excursion | Seed collection and storage of important species. |
| 9th excursion | Demonstration in fire-fighting in forests. |
| 10th excursion | Visit to National Parks, Sanctuary and Biosphere. |

Third year

- | | |
|---------------|--|
| 1st excursion | Visit to energy plantations, industrial plantations and fodder and pasture development plots. |
| 2nd excursion | Individual beneficiary schemes in forestry sector viz., tassar, farm nursery, social security plantations etc. |
| 3rd excursion | Forestry schemes under implementation under IRD, TSP, SCP, HAD, NREP programmes. |
| 4th excursion | Actual preparation of forestry projects for institutional financing. |
| 5th excursion | Visit to forest industry. |

*NOTE : This may need revision on the arrival of students educated under 10+2 scheme.

†NOTE : Depending on number of years fixed for completing the course.

‡NOTE : At the end of 2 years each student will be expected to submit a collection of plants and insects, properly mounted and labelled, which will count towards practical marks.

OUTSIDE EXCURSIONS

DETAILS OF PRACTICALS IN VARIOUS SUBJECTS

IST YEAR

| | No. of hours | Details |
|---------------------|--------------|--|
| 1. Mensuration I | 10 | (i) Use of height and diameter measuring instruments in the field. (ii) Solution of problems as Statistical exercise by use of Facit machine. |
| 2. Mensuration II | 20 | (i) Use of instruments for photo-interpretation. (ii) Practice in Stereoscope vision. (iii) Practice in seeing and interpreting aerial photographs. (iv) Field practice. (v) Study of instruments for photo-interpretation. |
| 3. Forest Soils | 30 | (i) Determination of soil moisture and loss-on-ignition. (ii) Mechanical analysis of soil. (iii) Estimation of bulk density and porosity. (iv) Determination of maximum water holding capacity. (v) Determination of moisture equivalent. (vi) Determination of soil-permeability. (vii) Estimation of PH. (viii) Determination of organic matter by Walkey and Black's method. (ix) Determination of Nitrogen. (x) Determination of Cation exchange capacity. (xi) Determination of exchangeable CaCO_3 . (xii) Determination of free CaCO_3 by rapid titration method. (xiii) Determination of lime requirement. |
| 4. Geology | 16 | (a) <i>Minerals</i> 1. Physical characters of minerals. 2. Important rock forming minerals. (b) <i>Rocks</i> 1. Igneous rocks. 2. Sedimentary rocks. 3. Metamorphic rocks. (c) <i>Fossils</i> 1. Introduction of fossils. (d) <i>Maps</i> 1. Simple geological maps. |
| 5. Utilisation | 25 | Maintenance of saws and hand tools; work study methods, area planning. |
| 6. Forest Surveying | 50 | 1. Drawing equipment and their uses. 2. Lettering. 3. Construction of diagonal and Vernier scales. 4. Map reading. 5. Chain surveying instruments. 6. Chain survey of an area; field work, plotting and finishing. |

7. Prismatic compass and theodolite.
 8. Chain and compass.
 - 8.1 Intersection.
 - 8.2 Traversing.
 - 8.3 Plotting and distribution of errors.
 - 8.4 Gales Traverse Table.
 9. Plane Tabling
 - 9.1 Surveying and finishing.
 - 9.2 Two and three points problems, levelling.
 10. Levelling
 - 10.1 Instruments; simple levelling and booking.
 - 10.2 Compound levelling.
 - 10.3 L-Section and grading.
 - 10.4 Permanent adjustment.
 11. Computation of area—the Polar Planimeter.
 12. Copying, enlargement and reduction of map.
7. Optional Elementary Mathematics
- 10 (i) Classroom exercises giving basic ideas of Algebra and Trigonometry to non-Mathematics students.
- (ii) Use of tables and relations between ratios and other general principles of Algebra and Trigonometry.
8. Optional Botany
General Botany
- 10 I. *External Morphology*
- 40 Study, sketching and description of—
- (i) Seeds—Dicot, monocot and germination studies of various types of seeds.
 - (ii) Leaves—Arrangement, simple and compound leaves, various parts of leaves and the botanical terms and their description, modification of leaves, types of stipules etc.
 - (iii) Stem-Aerial and Underground stems, climbers, cladodes etc.
 - (iv) Study of various types of Inflorescence like Racemose, Cymose etc.
 - (v) Study of flowers—various types, detailed study of calyx, Corolla-Stamens & Pistil.
 - (vi) Fruit—example of various types of dispersal mechanisms.
- II. *Internal Morphology*
- (i) Stem and root structures of Dicot and Monocot stems and roots.
 - (ii) Secondary growth in the stems and roots and Dicots.
 - (iii) Internal structure of leaf.
 - (iv) Cork formation and lenticels.
9. Forest Engineering I
- 30
1. Location of reinforcement of RCC lintels, beams and slabs, columns and weather shades.
 2. Foundations of buildings; standard foundation and design by Bankine's formula.
 3. Bonds in brick-work—English Bond at corners, junctions and inter-sections of one and one-and-half brick-walls.
 4. Timber joints in roof Trusses and timber stairs.
 5. Doors and windows, different types.
 6. Plan, section and elevation of a small building with Gable roof, Hipped roof.
 7. Preparation of a building estimate.
 8. BM and SF diagrams—cases of simply supported beams and Cantilevers carrying concentrated/uniformly distributed loads.

10. Development of forest villages, settlement of shifting cultivators.

1. Schemes for development of forest villages.
2. Models for settlement of shifting cultivators.
3. Soil forestry schemes for rural development.

Second Year

1. Forest Economics

- 10
1. Problems in demand and supply current and price equilibrium.
 2. Problems in two in-put, two out-put analysis.
 3. Problems in multiple use.
 4. Problems in linear programming.

2. Wood Technology Utilization III.

21

Wood Structure (15)

Microscopic study of the structure of wood and identification of different wood Spp. on the basis of the internal structure.

Properties of wood (4)

Study of wood testing instrument in the laboratory.

Composite wood (2)

Visit to Composite Wood. Wood Seasoning, Preservation of Wood & Cellulose and Paper Branches.

3. Forest Botany II

- 30
- There will be thirty practicals. Dissection, sketching, description and identification (with flora of forest plants).

4. Forest Engineering II

- 30
1. Road design-cross-section of a road in the plains/hills, and retaining walls.
 2. Preparation of road estimate—Earthwork calculations.
 3. Setting out road curves by ordinates.
 4. A masonry arch culvert.
 5. A simple timber girder bridge.
 6. A Cantilever bridge.
 7. A suspension bridge.
 8. Stress diagrams for timber trusses with and without wind-loads
 9. Design of ties and struts of a timber frame.

Forest Zoology

5. Forest Entomology

- 30
1. Classification of animal characters and examples of each.
 2. *Invertebrate Zoology*
Examination of the following with the help of slides, specimens and charts—Amoeba, liver, fluke, tapeworm, oyster, teredo, martesia, sphaeroma, limnoria, scorpion, spiders, mites and insects.
 3. *Vertebrate Zoology*
Examination of the following with the help of specimens and charts.
 - 3.1 Pisces-mahseer, trout and mirror carp. Amphibia-frog and toad. Reptilia, lizard, snakes (cobras, kraits, vipers dhaman, python), crocodile, tortoise.
 - 3.2 Aves-jungle crow, jungle mayna, rosy-pastor, red vented bulbul, paradise flycatcher, grey-tit, Indian roller, golden backed woodpecker, hoopoe, common bee eater, Indian cuckoo, blossom headed parakeet, jungle fowl, night jar, Indian jungle fowl, pea fowl, kalij pheasant, grey partridge, bush quail, chukor, mallard duck, eagle, shikra and weaver bird.
 - 3.3 Mammalia-adaptations, dentition.

Forest Entomology

1. Insect anatomy. Cockroach or grass-hopper as a type in detail.
2. Insect biology—life cycles, metamorphosis.

3. Insect taxonomy—Application of keys or the field; identification of important insect orders and families (both adult and immature stages).
4. Forest Entomology—Study of the following pest specimen and their damages—
 - 4.1.1 Sal heartwood borer, teak defoliator, teak canker grub, too flower, seed & shoot borer, mahogany collar borer. Shisham defoliator, collar borer, babool root and stem borer.
 - 4.1.2 Semul shoot borer, ailanthus defoliator, champ bug, gamhar defoliator, Eucalyptus termites, poplar stem and root borer.
 - 4.1.3 Deodar defoliator, bark beetles, spruce budworm, pine shoot borer.
 - 4.1.4 Bamboo shoot borer.
 - 4.2 Nursery pests—Cutworms, cockchafer grubs and crickets.
 - 4.3 Seed pests-bruchids, weevils and micro-lepidoptera.
 - 4.4 Insect vectors of plant diseases: *Jassus indicus*, *Moonia albimaculta*.
 - 4.5 Termite nest, termite dasts.
 - 4.6 Timber Entomology-pests of felled timbers.
 - 4.6.1 Bark borers; pine hole borers, ambrosia beetles.
 - 4.6.2 Borers.
 - 4.6.3 Sapwood borers, shot hole borers, heartwood borers.
 - 4.6.4 Drywood borers.
 - 4.7 Beneficial insects.
 - 4.7.1 Parasites, wasps and flies.
 - 4.7.2 Parasites, bugs, beetles, mantids, wasps.
 - 4.7.2.1 Lac insect.
 - 4.7.2.2 Honey bee.
 - 4.7.2.3 Silk worm.
5. Visit to Entomology Museum to see insects, pests and their damage.
6. Methods of insect pest control-techniques.
7. Applied insectary and field techniques.
 - 7.1 Visit Forest Entomology Insectary.
 - 7.2 Diagnosis of insect attack by symptoms.
 - 7.3 How to report and send specimen to Forest Research Institute asking for advice.
 - 7.4 Insect collection, setting, pinning and preservation. Students shall submit a collection of 50 insects to cover 9 orders and 20 families collected during their tours. Field observations of the collection to be written in field note book. Collection (wet and dry damage and life histories) should be systematically and biologically grouped, labelled and identified upto family.
Submission of insect collection at the end of 2nd year.

6. Mycology and Forest Pathology

10 Mycology practicals.

1. Examination of the mycelium of *Mucor* or *Bhizopus* growing on a moist bread and study of asexual reproduction of the fungus.
2. Study of fruiting structures of an Ascomycetes (e.g. *Xylaria*) and Basidiomycetes (e.g. *Polyporus*). Reproductive structure (ascus and ascospores in the former and basidia and basiospores in the latter) to be examined.

10. Development of forest villages, settlement of shifting cultivators.

1. Schemes for development of forest villages.
2. Models for settlement of shifting cultivators.
3. Soil forestry schemes for rural development.

Second Year

1. Forest Economics

- 10
1. Problems in demand and supply current and price equilibrium.
 2. Problems in two in-put, two out-put analysis.
 3. Problems in multiple use.
 4. Problems in linear programming.

2. Wood Technology Utilization III.

21

Wood Structure (15)

Microscopic study of the structure of wood and identification of different wood Spp. on the basis of the internal structure.

Properties of wood (4)

Study of wood testing instrument in the laboratory.

Composite wood (2)

Visit to Composite Wood. Wood Seasoning, Preservation of Wood & Cellulose and Paper Branches.

3. Forest Botany II

- 30
- There will be thirty practicals. Dissection, sketching, description and identification (with flora of forest plants).

4. Forest Engineering II

- 30
1. Road design—cross-section of a road in the plains/hills, and retaining walls.
 2. Preparation of road estimate—Earthwork calculations.
 3. Setting out road curves by ordinates.
 4. A masonry arch culvert.
 5. A simple timber girder bridge.
 6. A Cantilever bridge.
 7. A suspension bridge.
 8. Stress diagrams for timber trusses with and without wind-loads
 9. Design of ties and struts of a timber frame.

Forest Zoology

5. Forest Entomology

- 30
1. Classification of animal characters and examples of each.

2. *Invertebrate Zoology*

Examination of the following with the help of slides, specimens and charts—Amoeba, liver, fluke, tapeworm, oyster, teredo, martesia, spheoroma, limnoria, scorpion, spiders, mites and insects.

3. *Vertebrate Zoology*

Examination of the following with the help of specimens and charts.

3.1 Pisces—mahseer, trout and mirror carp. Amphibia—frog and toad. Reptilia, lizard, snakes (cobras, kraits, vipers dhaman, python), crocodile, tortoise.

3.2 Aves—jungle crow, jungle mayna, rosy-pastor, red vented bulbul, paradise flycatcher, grey-tit, Indian roller, golden backed woodpecker, hoopoe, common bee eater, Indian cuckoo, blossom headed parakeet, jungle fowl, night jar, Indian jungle fowl, pea fowl, kalij pheasant, grey partridge, bush quail, chukor, mallard duck, eagle, shikra and weaver bird.

3.3 Mammalia—adaptations, dentition.

Forest Entomology

1. Insect anatomy. Cockroach or grass-hopper as a type in detail.
2. Insect biology—life cycles, metamorphosis.

3. Examination of sporophores in Basidio mycetes.
 - 3.1 Thelophoraceae.
 - 3.1.1 Hymenochaele (H. Rubiginosa).
 - 3.2 Polyporaceae.
 - 3.2.1 Polyporus (P. Shoreae)
 - 3.2.2 Trametes (T. Pini-Fomes pini)
 - 3.2.3 Fomes (F. annosus, F. caryophyll)
 - 3.2.4 Ganoderma (G. Lucidum, G. applanatum)
 - 3.3 Agaricaceae
 - 3.3.1 Armellaria (A. Mellea).

Distinguishing characters of the families in general to be stressed.
4. Study of the type of decay of timber.
 - 4.1 White fibrous rot.
 - 4.2 White pocket rot.
 - 4.3 Brown cubiodal rot.
 - 4.4 Dry rot.
5. Study of rust diseases of Conifers.
 - 5.1 Peridermium cedri on Deodar.
 - 5.2 Cronartium himalayense on Chir.
6. Local excursions to acquaint with common tree diseases on Sal, Shisham, Khair and other hard woods.

7. Electives

- | | | |
|---------------------------------|----|--|
| (i) Genetics & Tree Improvement | 20 | <ol style="list-style-type: none"> 1. Vegetative propagation and use of growth promoters. 2. Plus tree selection. 3. Seed orchards and their establishment. <ol style="list-style-type: none"> 3.1 Various types of grafting and budding. 3.2 Control of pollination. 3.3 Treatment of seed orchards. |
| (ii) Forest Ecology | 20 | <ol style="list-style-type: none"> (i) Instruments used in environmental measurements. (ii) Study of organic productivity and nutritional cycling in the field and laboratory, analysis of the sample. (iii) Nutritional study in the field and laboratory. |
| (iii) Forest Statistics | 20 | <ol style="list-style-type: none"> (i) Finding out the standard deviation and moments by use of machines. (ii) Filling, regression equation to serve data with the help of machines. (iii) Correlation coefficient for degree of association. (iv) Analysis of variance. |
| (iv) Tribal Development | | <ol style="list-style-type: none"> 1. Study of forest communities. 2. Economic development of tribals based on forestry programmes. 3. Development of primitive tribes. 4. Cottage industries to generate employment. |
| (v) Rural Development | | <ol style="list-style-type: none"> 1. Employment potential in forestry sector. 2. Food production system in forestry. 3. Fodder production and dairy development programmes. 4. Energy plantations. 5. Cottage and small forest industries. |

*Third Year**

- | | | |
|----------------------------|----|---|
| 1. Forest Management | 20 | <ol style="list-style-type: none"> 1. Problems of fuelwoods, shortages and present supply. 2. Fodder shortages and present supply. 3. Industrial raw-material shortages. 4. Shifting cultivation, settlement alternatives. 5. Rural development. |
| 2. Wild-life Management | 20 | <ol style="list-style-type: none"> 1. National Parks and Game Sanctuaries management. 2. Zoo management. 3. Game Farms for meeting people. |
| 3. Environmental problems | 20 | <ol style="list-style-type: none"> 1. Soil erosion and siltations of dams and reservoirs. 2. Water pollution. 3. Air pollution. 4. Upgradation of ecological security. |
| 4. Preparation of Projects | 50 | <ol style="list-style-type: none"> 1. Tribal development and rural projects in forestry sector. 2. Social forestry schemes and energy plantation schemes. 3. Other types of schemes. |

*NOTE : Only in those Universities where it is three years course.

ANNEXURE XI
PROPOSED SYLLABUS FOR MASTER OF FORESTRY DEGREE
SEMESTER-I

| <i>Title of the course</i> | Number of lecture hours | | |
|--|-------------------------|-----------|------------|
| | Theory | Practical | Total |
| 1. Silviculture I (Foundation and Practice of Silviculture). | 80 | 40 | 120 |
| 2. Soil Conservation and Land Management. | 30 | 10 | 40 |
| 3. Forest Soils | 35 | 40 | 75 |
| 4. Forest Volume Estimation and Yield Prediction | 65 | 30 | 95 |
| 5. Minor Forest Products | 50 | — | 50 |
| 6. Basic Mathematics (including exercises) | 100 | — | 100 |
| 7. Elementary Statistics (including exercises) | 60 | — | 60 |
| Total | | | 540 |

Course Title : SILVICULTURE I (FOUNDATION AND PRACTICE OF SILVICULTURE)

| | |
|-------------|-----|
| Total hours | 120 |
| Theory | 80 |
| Practical | 40 |

Course Contents :

Definition and Generalities—Definitions, Extent of forests in India and other countries, Role of forests (productive, protective, recreational, ameliorative) in industrial development, History of forests and forestry in India.

General features of the vegetation of the world.

Silviculture—Foundation, practice and basis of rational silviculture.

Forest Composition and Distribution—Competition between species, Concept of succession and climax, Classification of forest types (Definition of forest types, basis of classification, criteria for delimiting forest types, forest types in relation to climate, forest types in relation to soil, forest types in relation to topography, forest types in relation to biotic factors), Principal forest types of India and their distribution.

Environment or Site—Factors of site (climatic, edaphic, physiographic and biotic), Site quality, Classification of site factors and their mode of affecting vegetation. Modification of site factors in silvicultural practices.

Influences of Forests on their Environment—Micro-climate of forest stands, effect of forests on animal life including mankind (effect on animal life, effect on mankind, forest aesthetics).

Protection against Forest Fires—Definition of terms Heat and Combustion, Fire risk, Fire hazard, Fire danger, Inflammability, Fire Season etc. Causes and types of fire. Fire prevention-risk and hazard reduction. Prediction, fire weather, fire danger rating. Detection-Watch towers, patrolling, aerial surveillance. Communication-Wireless, telephone, runners. Presuppression-Planning, equipment, safety. Suppression-Direct and indirect methods. Fires, effects-Damages and beneficial effects, Harnessing fire for forest management.

Growth and Development—Growth regions-Terminal, intercalary and cambial, phenology and its relation to growth, Periods of growth and rest, Growth rings and determination of age of tree, Longevity and death.

Sedimentation—Source, Problems, Sediment delivery ratio, Sediment prediction i.e. Universal soil conservation equation, Siltation of reservoirs, Sediment measurements.

Erosion—Definition, Types and Extent, Agencies causing erosion-wind, water, gravity, climate.

Wind Erosion—Mechanics of soil movement by wind action, Saltation, Suspension and Surface Creep.

Wind Erosion Control—Shelter belts, wind breaks, dune fixation and other silvicultural and agronomic methods i.e. Ley farming, stubble mulching, soil and water conservation measures i.e. buffer or wind or fieldstrips.

General Principles of Water Erosion Control—(a) Protection against the direct action of rain, (b) Restricting the velocity of the moving water below the erosive velocity, (c) *Mechanical measures*—Design, construction and maintenance of (i) contour cultivation, strip cropping, (ii) contour furrowing, trenching, (iii) Bunding-contour bunds, field bunds, graded bunds, (iv) Terracing-level terracing, outward sloping terraces, inward and laterally sloping terraces, (v) Grade stabilization or erosion control structures-check dams, chutes, (vi) Torrents and their training (both in the channel and in the catchments), (vii) Landslides and their control, (viii) Rail & Road side erosion and its control, *Biological measures* : Cover crops, Composting, Mixed and rotational cropping, Green manuring and mulch farming, *Afforestation* : Protective afforestation-techniques i.e. trenching, wattling, mulching, planting methods and techniques, nursery raising and production of planting methods and techniques, nursery raising and production of planting stock, silviculture of important species like *Vitex negundo*, *Ippmoea cornea*, *Salix* sp. etc. used for protective afforestation. *Pasture management* : The extent of pastures, the present conditions of pastures and cattle, grassland types of India and their ecological status, principles of grassland improvement and management. Forage Conservation (hay and silage making), Tree and shrub forages, Forest grazing.

Soil Conservation Planning—Unit of planning and management-the watershed-definition, Watershed characteristics and functioning, watershed work plan, watershed management, surveys for watershed and/or land use planning-land capability, survey or erosion intensity survey, Determination of priority watersheds. Watershed management in relation to flood control.

Course Title :—FOREST SOILS

Total hours 75

Theory 35

Course Contents

Practical 40

Reproduction—Sexual reproduction, Seed-maturation and dormancy : Viability and longevity, Germination, Mode of germination, Vegetative reproduction (a) root suckers, (b) cuttings, (c) layering.

Natural Regeneration—By Seed, by coppice, by root suckers, cultural operations.

Artificial Regeneration

Seed collection and processing—Preparation of plantation area, Nursery work, Planting out, Mechanisation, Vegetative propagation. Exotic versus indigenous species, pure versus mixed crops.

Artificial Regeneration of Fast Growing Species—Definition, Species, Nursery practices, planting technique, Site preparation, After-care, Cultivation of agricultural crops, Genetical aspects, Artificial regeneration of special sites. Protection of Plantations.

Site Maintenance and Improvement—Site maintenance in regeneration operations, Site maintenance in Forest Stands.

Tending : Necessity of tending, Weeding and cleaning, Climber control, Thinning in plantations, Thinning in natural regeneration areas, Thinning in irregular crops.

Practicals—Nursery work, vegetative propagation, planting, tending operations.

Course Title—SOIL CONSERVATION AND LAND MANAGEMENT

Total hours 40

Theory 30

Course Contents I

Practical 10

Soil and water conservation-Definition and the Concept—Soil & Water Conservation-Global and regional extent, overall land utilization patterns and problems in India.

Problems of land degradation : (a) Agrarian customs, (b) Agricultural practices, (c) Fragmented holding, (d) Shifting cultivation, (e) Grazing problems, (f) Fire, (g) Population explosion, (h) Unscientific mining, road construction and maintenance, deforestation for human settlement etc.

Hydrological cycle—The Hydrological cycle and its importance, Interception, Infiltration, Percolation, Evaporation, Transpiration, Ground Water recharge, Surface run off.

Course Contents II

Introduction—Definition of soil and its concept, Soil and plant relationship, Soil and site, Forest soil and agricultural soil.

Soil Composition—Composition of soil, Constituents of soil.

Soil profiles—Definition of soil profile, Development of soil profile-effect of soil forming factors and soil forming processes, Development of some typical soil profiles.

Soil properties—Physical properties—Soil texture or particle size distribution, Soil water, Soil structure, Soil air, Soil temperature, Consistency, Colour, Swelling and shrinkage of soil. *Chemical properties*—Problems of saline alkaline soils and methods of reclamation, Soil PH, Cation exchange phenomena, Availability of nutrients. *Biological properties*—Organic matter decomposition and significance of C:N ratio, Role of microbes in nutrients transformations/Role of mycorrhiza in mineralisation of nutrients.

Soil survey and classification—Objectives of soil Survey/Types of soil survey, Soil classification—Utility of soil survey maps, Soil survey work done in India.

Soil types of India

Plant nutrition—Essential nutrients and role of nutrients in plant metabolism, Deficiency symptoms of nutrient elements on plants.

Soil fertility, evaluation and fertilisation of soils—Soil fertility, Evaluation techniques and usefulness, Applicability of different techniques, Fertilization of soils with inorganic and organic materials.

Problem soils—Acid soils, Salt affected soils. Soils affected by diseases and pests; Soils affected by nutrient deficiency: Tackling problem-soils.

Management of forest soils—Nursery soil management, Management for optimum returns.

Practicals—Handling soil samples for the laboratory analysis, Determination of soil PH, Mechanical analysis of soil; Soil moisture determination; Soil organic matter determination, Determination of Nitrogen, Phosphorus and Potassium in soil, Determination of bulk density and porosity in soil, Determination of cation exchange capacity etc; Analysis of nursery/plantation, Soil sample.

Field Studies—Selection of site for exposing soil profiles, Differentiation of horizons, Soil sampling and storage; Use of soil testing kit for field study.

Course Title : FOREST VOLUME ESTIMATION AND YIELD PREDICTION.

| | |
|-------------|----|
| Total hours | 95 |
| Theory | 65 |
| Practical | 30 |

Course Contents

Direct measurement of the Volume of a tree—Measurement of standing trees; Measurement of diameter and girth, Reference diameter and reference circumference, Practice of diameter measurement on standing trees, Diameter measurement with a calliper, Girth measurement with a tape, Method of the ruler for diameter measurement at small heights, Wheeler pentaprism tree calliper, Wedge-prism, Bitterlich relaskp, Comparison of various instruments with reference to their relative accuracy.

Measurement of height—Reference points for height measurements: total, clear hole and merchantable height, their definitions, Height measurement with different instruments, Dendrometers, Principles and construction of commercial dendrometers, Sources of error in height measurement, Special treatment for leaning trees.

Measurement of bark thickness: Bark gauge, Bark percent table, Measurement of felled trees—Length, diameter under bark, Measurement of stacked wood, Direct calculation of volume of a tree from measurements taken on the tree, Various formulae to compute volume e.g. Huber, Smalian, Newton etc., Comparison of these formulae for various solid forms e.g. cylinder, conoid, neiloid, paraboloid etc.

Study of tree form—Various theories to explain form, Hojer's and Behre's formulae, Form quotient, Form factor, Form point ratio, their definition, Form class taper tables etc.

Growth and Yield prediction—Reasons, Production Planning, Silvicultural Research and Planning, Ecological Research and Environmental Management, The methodology of growth and yield prediction. The estimation of growth and yield, Construction of a Mathematical model, Testing of the model for validity, Application of the model to the required End-Use, Design of yield prediction studies-special features of regression, parameter estimation, Sampling design for model construction, Temporary plots, Permanent sample plots.

Procedures for Data collection and primary analysis—Sample plot demarcation, sample plot measurement forms and primary analysis, stem analysis procedure, Special methods of tree increment estimation, Indirect free and dominant height estimation, Data storage systems—Advantages of computer-based data storage systems, data validation, Contractors for the preparation of computer programmes, Storage systems for plot data, Analysis of growth and yield data for uniform forest-site classification, Use of dominant height as an Indicator of site, Construction of site index curves, Site Assessment Models based on environmental factors, Problems in the application of site assessment functions, Static and dynamic methods of predicting yield, Thinning Ratio, Estimating Thinning Yields in static and dynamic models, Mortality—Establishment mortality, Density-Dependent mortality, Disease and pest mortality—Wind-throw and fire damage, Stand volume prediction—Stand volume Equations based on dominant height and basal area, Using Tree Volume Equations to predict stand volume, estimation of volume to a top diameter limit, Volume of thinning, Advanced techniques of growth and yield prediction—Size class models, Tree position models.

Analysis of Growth and Yield data for mixed forests—Site classification, Static yield function for mixed forest, Transition Matrix models, Distance-Independent tree models based on different equations.

Validation of growth and yield models—The role of validation, Validation data, Residual errors, Graphical comparisons, Defining the limits of model utility, Application of the model to the required end use—Introduction, Even-aged stands, Mixed stands. Photo-interpretation and its use in timber volume Inventory.

Types of aerial photographs, taking of aerial photographs, obtaining and handling of aerial photographs, storage.

Measurement on aerial photo. How a photo differs from a map? Scale and horizontal measurement, displacements on a single photo, stereoscopy, Displacement in stereoscopic pair of photographs.

Agencies for obtaining aerial photographs (new or old) in India. What are the formalities involved? Forms prescribed by Survey of India for requisition of photographs.

Course Title—MINOR FOREST PRODUCTS.

Total hours 50

Course Contents—

Introduction—Introduction, definition, and nomenclature of M.F.P., Importance and role of Minor Forest Products in rural and industrial economy, as a source of revenue and foreign exchange in community forestry, agroforestry, social forestry, etc., Demerits of collection and exploitation of Minor Forest Products in the present system and suggestions to overcome them, Methods of survey of Minor Forest Products.

Fibres and flosses—Classification of fibres according to their origin, structure and economic importance, Methods of extraction of fibres, Cultivation methods of some fibre yielding plants, some commercially important fibre yielding plants from forests, their occurrence, yield of fibre, uses and future proposals for development.

Grasses, bamboos & canes—Grasses—their regional occurrence and uses, Bamboos of India—their occurrence, propagation, exploitation and uses; Canes—their distribution, propagation methods, harvesting, Processing and uses.

Fatty oils and waxes—Nature and kinds of fatty or fixed oils, Oilseeds of forest origin, methods of extraction and uses of fatty oils, potential of fatty oils from forest, present status of supply and demand, methods of collection, processing & packing and storage, Problems in the exploitation and ways to overcome them, Plant waxes obtained from seeds and leaves, their uses etc.

Essential oils—Nature of essential oil—Important essential oils obtained from grasses, leaves, wood, root, flowers and distribution of various species, methods of recovery of essential oils from plants and their industrial uses, methods of cultivation and exploitation of commercially important essential oil bearing plants, importance of essential oils, present status of essential oils—both within the country and abroad.

Gums, resins and oleo-resins—Nature and chemistry of gums, resins and oleo-resins, classification of various kinds of gums, gum-resins, gum-oleo-resins and oleo-resins and their economic importance, Scientific methods of tapping and collection of commercially important gums, gum-resins and oleo-resins including the details of tools required for tapping; grading, processing and storage, present status and problems in exploitation of gums, gum-resins and oleo-resins with suggestions for boosting the production including the propagation methods; Rubber and Guttaparcha yielding species, methods of their tapping, processing and uses.

Tans and dyes—Vegetable tanning materials obtained from forests, their importance and systems of their collection; Method of extraction, processing, handling and storage; Vegetable dyes and their importance; Manufacture of Katha and Catechu.

Medicinal plants, poisons and insecticides—Important medicinal plants from forests, and their importance in various systems of medicines; Methods of cultivation of important plants under forestry conditions, their harvesting, grading and processing for pharmaceutical preparations; Poisons and insecticides, their extraction and uses.

Edible plants—Sources of leafy vegetables, fruits, and food adjuncts, viz. spices, flavouring materials and beverages; Importance of wild edible plants and need for their organised propagation, collection and utilisation in forests.

Miscellaneous minor forest products—Charcoal making and destructive distillation of wood; Various types of kilns used for manufacture of charcoal and utilisation of biomass. Identification of species for use as fuel, gun powder, activated charcoal etc.; Destructive distillation of wood; Charcoal dust and saw dust briquetting. *Leaves*: Leaves for platters; Leaf fodders and miscellaneous uses; Bidi leaves; Soap nuts as source of saponins/detergents; Beads, marking nuts, soda pith, etc.

Animal products—Lac and shellac; Silk and Tassar; Honey, Wax and Ivory- Mineral products.

Course Title—BASIC MATHEMATICS (INCLUDING EXERCISES)

Total hours 100

Course Contents

Arithmetic—Approximation; Powers and roots; Logarithms.

Factorisation; Standard forms; Trinomials; Remainder theorem; Equations-simple, simultaneous, quadratic; Arithmetic progression; Geometric progression; Permutations and combinations, Binomial theorem.

Trigonometry—The ratios—Relation between ratios; Angles more than 90 and signs of ratios; Use of tables; Solution of Triangles; Areas of triangles.

Numbers, Plane analytical geometry, Lines, Parabolas;

Sets, Cartesian products, Functions, Graphs of functions, Composition of functions, Inverse functions.

Limits, Continuity, Derivatives, Product and Quotient differentiation formulae, Chain rules, Higher derivatives, Differentials.

Rolle's Theorem, Mean Value Theorem, Maxima and Minima of functions and applications of the theory.

Antiderivatives, Fundamental Theorem of Integral Calculus, Integration formulae, Change of variables, Integration by parts.

Introduction to Vectors, Matrices and Probability.

Course Title—ELEMENTARY STATISTICS (INCLUDING EXERCISES)

Total hours 60

Course Contents—

Orientation, The nature of measurement, The Frequency Distribution, The Presentation of Data in Tables, Measures of Relative Position, Averages, Measures of Variability, Further Characteristics of a Frequency Distribution, The Normal Distribution, Regression and correlation—General Concepts, Regression and Correlation—Computations.

SEMESTER II

| <i>Title of the Course</i> | Number of lecture hours | | |
|--|-------------------------|-----------|-------|
| | Theory | Practical | Total |
| 1. Silviculture II (Silvicultural Systems) | 25 | — | 25 |
| 2. Silviculture III (Silviculture of Indian Trees) | 30 | — | 30 |
| 3. Forest Management and Working Plan | 45 | — | 45 |
| 4. Taxonomy of Woody Plants | 40 | 40 | 80 |
| 5. Forest Ecology and Environmental Conservation | 50 | 10 | 60 |
| 6. Forest Genetics and Tree Improvement | 40 | 25 | 65 |
| 7. Tree Physiology | 40 | 20 | 60 |
| 8. Forest Pathology | 25 | 10 | 35 |
| 9. Forest Entomology | 30 | 10 | 40 |
| 10. Wood Science & Technology | 80 | 20 | 100 |
| | | Total : | 540 |

Course Title—SILVICULTURE II (SILVICULTURAL SYSTEMS)

Total hours 25

Course Contents

Introduction—Definitions, Scope and classification; Formulation and objectives of systems.

Clear felling systems and its modifications; Cutting section and its application in India.

Shelterwood System—Uniform system including regeneration period; periodic blocks, their types and importance, regeneration, felling, examples and application in India (Chir, Deodar, Kail, Sal, Teak) Group system, Irregular shelterwood system.

Selection System—Characteristics, rotation, felling cycle, application in India.

Coppice System—Simple coppice system, Coppice with standard rotation, Selection of standards, Yield, Coppice with Reserves, Pollards system.

Conversion—Reasons for conversion; and types of conversion, Conversion from Uniform to Selection; Conversion from Coppice system to High forest.

Concept of Dauerwald.

Changing concepts in Silvicultural Systems.

Course Title—SILVICULTURE III (SILVICULTURE OF INDIA TREES)

Total hours 30

Course Contents

General description—Dealing with general value, growth characteristics, distribution (Geographic and Geological), Phenology, Silvicultural characters, Autecology, Syn-ecology, Community environment, Regeneration methods and management of Indian species of economic importance. **Main species**—Conifers (*Abies pindrow*, *Picea smythiana*, *Cedrus deodara*, *Pinus wellichiana*, *P. roxburghii*, *Broadleaves* (*Acacia niletica* and *Acacia catechu*, *Albizia* spp, *Dipteracarpis*, *Dalbergia sissoo*, *Dalbergia latifolia*, *Santalum album*, *Juglans regia*, *Anacardium occidentale*, *Poterocarpus santalinus*, *Shorea robusta*, *Tectona grandis*; *Bombax Ceiba*, *Bamboos*).

Exotics—Study of the below mentioned exotics emphasising their importance, role in forest economy, purpose of introduction, suitability of species, ecological and economic factors, means of establishment, management and other considerations.

Casuarina ecuisetifolia—Eucalyptus, Acacias, *Prosopis* Spp, Poplars. Other important exotic species e.g. tropical pines, *Leucaena leucocephala* *cryptomeria japonice* etc.

Species of secondary importance, General account of the following :—

Toona cilita, *Alianthus excelsa*, *A. grandis*, *A. malabaricum*, *Dalbergia latifolia*, *Gmelina arborea*, *Adina cordifolia*, *Lagerstremia* Spp., *Holoptelia intergrifolia*, *Terminalias*, *Humenodictyon excelsum*, *Quorcus* Spp. *Boswellia serrata*, *Hopea parviflora*, *Artocarpus* Spp., *Pterocarpus* Spp. *Anogeissus pendula*.

Species of special suitability—This will involve study of species suitable for the following : Canal bank plantations, Road side plantations, Landscape plantations, Rail side plantations.

Course Title—FOREST MANAGEMENT AND WORKING PLAN

Total hours 45

Course Contents

FOREST MANAGEMENT

Introduction—Definition and scope, Management of forests and its peculiarities, Principles of Forest Management and their application.

Objects of Management—Purpose and policy, Choice of objectives; Owner's attitudes and social role of forestry. **Sustained Yield**—General definitions, e.g. felling series; rotation; felling cycle, cutting sections etc.

Normal Forest—Definition and concept; Normality in regular forests; Normality in irregular forests.

The Actual Growing Stock and its Increment—General considerations, Distribution of age gradations or classes in regular forests—normal and actual, Distribution of age gradations of classes in irregular forests—normal and actual distribution of age gradations or classes in forest under coppice systems.

Growth estimation and reduction factors for—Density, quality, miscellaneous, quality and price increment and forest percentage.

Yield regulations—General principles of yield calculation, silvicultural systems in relation to yield regulation. Methods of yield regulation. Yield regulation in regular forest—

By area-reduced areas and Hufnagl's modification.

By volume and increment methods.

Yield regulation in irregular forests.

Methods based on growing stock only.

Von Mantel's formula and its modifications.

Methods based on increment only.

Methods based on volume and increment.

Biolley's *method du controle*.

Austrian method, Hufnagl's French Method of 1883 and its modification.

Method based on number of trees in various age classes and time taken to pass from one age class to the next—Brandis' method, Hufnagl's method, Smythies' safeguarding formula.

APPLICATION AND CONTROL OF THE DIFFERENT METHODS OF YIELD REGULATION IN FOREST MANAGEMENT IN INDIAN FORESTRY

Multiple uses of forestry

WORKING PLAN

Introduction—

Definition, object, scope sphere, necessity for revisions; Division of forests into various units; Maps.

Preparation of a working plan—Preliminary working plan report; Field work—Stock mapping, Checking of maps, Compartment description, Collection of Statistical data, Collection of other data: Office work—Collection of data for Part I, Writing of Part I & II

Control of working plan

Course Title—TAXONOMY OF WOODY PLANTS

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|-------------|----|
| Total hours | 80 |
| Theory | 40 |
| Practical | 40 |

Course Contents

Systematic Botany of Indian Forest Plants following Bentham & Hooker's system with emphasis on families of forestry importance, tree species, their distribution, field characters and economic importance.

Dicotyledons

Polypetalae—Magnoliaceae, Bixaceae, Guttiferae, Dipterocarpaceae, Malvaceae, Sterculiaceae, Tilliaceae, Rutaceae, Simarubaceae, Burseraceae, Meliaceae, Sapindaceae, Anacardiaceae, Leguminosae, Rosaceae, Rhizophoraceae, Combretaceae, Myrtaceae, Lythraceae.

Geopetalae—Rubiaceae, Fricaceae, Sapotaceae, Ebenaceae, Oileaceae*, Apocynaceae, Asclepiadaceae, Bignoniaceae*, Verbenaceae.

Apetalae—Lauraceae, Santalaceae, Euphorbiaceae, Urticaceae, Casuarinaceae, Cupluiferae, Salicaceae.

Gymnosperms

Gnetaceae*, Coniferae, Cycadaceae*.

Monocotyledons

Orchidaceae*, Palmaceae, Gramincae.

Practicals—

Sketching, description and identification (with flora) and dissection of forest plants.

Excursions—For familiarisation of flora and identification of plants, both wild and cultivated, around Dehra Dun and Mussoorie Hills.

Course Title—FORESTS ECOLOGY AND ENVIROMENTAL CONSERVATION

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|-------------|----|
| Total hours | 60 |
| Theory | 50 |
| Practical | 10 |

Course Contents

Introduction—Ecology—Its meaning and scope; division of ecology and basic principles, ecological systems definition of a system, components of ecological systems, eco-system stability; essential processes in eco-system.

The Eco-system—Abiotic limits to the system, adaptability of the organism, Law of minimum and law of tolerance.

*to be taught in brief.

Energy flow in the eco-system—Nature of energy and laws of Thermodynamics; energy storage, food chains, models of energy flow, concept of Biomass and forest productivity.

Biogeochemical cycle in the eco-system—Water cycle, Gaseous cycle; Sedimentary cycle.

Phytosociology & Community structure—Physical structure; Species composition; the Niche, Nature of Communities, Interaction in the communities.

Development and evolution of eco-system—The strategy of eco-system development, concept of climax; Evolution of ecosystem and coevolution.

Autecology and Genecology—Study of individual species in relation to biotic and biotic variables of the environment, ecological adaptation and evolution, Plant indicators.

Forest Environment—Biotic and abiotic components of the environment like gaseous composition, solar radiation, temperature, humidity, wind, precipitation, dust and harmful gases, conditions of the activity of microbial population of the soil, processes influenced by micro-organism in soil microflora of the forest soils; Inter-relationship of the micro-organisms and trees, effect of forestry measures on forest soil and soil microflora.

Biosphere Reserves, gene pools, and conservation of plants and animals in natural eco-system. Impact of human activities on the Forest Eco-system.

Phytogeography and forest types of the globe in general and with special reference to India.

Practicals—Based on above topics.

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| <i>Course Title</i> —FOREST GENETICS AND TREE IMPROVEMENT | Total hours | 65 |
| | Theory | 40 |
| | Practical | 25 |

Course Contents

Introduction—Problems peculiar to forest genetics-its space and application to tree improvement.

Fundamental Genetics—Cell, Chromosome structure and function, Genes, DNA and RNA; Inbreeding.

Population Genetics—Variation, heritability and their estimation; Selection, Plus tree selection; Spontaneous mutations and induced mutations; Role of ionising radiations in mutation breeding.

Selective Breeding for tree improvement—Role of selective breeding, General principles; Breeding methods, Choice of breeding methods.

Estimation of Heritability and Genetic Gain—Experimental procedure and applicability, Parent-Progeny Regression, Variance analysis, Genotype-Environment interaction, Effect on breeding plans.

Seed Production—Seed production area; Seedling seed orchards, Clonal seed orchards.

Hybridization—Objectives of hybridization in forest trees; Methods of hybridization; Crossability pattern, Hybridization and Evolution; Mass produced F1 hybrids; Utilisation of F2 Generation hybrids.

Polypoidy, Aneuploidy and Haploidy—Definitions; Techniques for Chromosome study; Importance of Polyploids, Induction and recognition of polyploidy; Haploidy.

Useful Techniques—Controlled pollination, Measurement of test plantations; Experimental designs; Hints on measurements; Statistical consideration; Tissue culture, Isoenzymes and other techniques.

Practicals—Plus tree selection Seed production area; seed orchards, Controlled pollination; Chromosome study Polyploidy study; Mutation study.

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|--------------------------------------|-------------|----|
| <i>Course Title</i> —TREE PHYSIOLOGY | Total horus | 60 |
| | Theory | 40 |
| | Practical | 20 |

Course Contents

Introduction to the field of tree physiology and its practical utility in forestry; Plant respiration, respiratory metabolism; Photophysiology, Photosynthesis, Photo-respiration; Mineral nutrition, Assimilation of mineral elements; Effect

of mineral deficiencies; Process of translocation, Kinetics, active transport, source sink relationship, Plant water relationship, Transportation, stomatal movements, water stress; Plant growth substances and Physiology and Biochemistry of plant growth substances; phenomenon of growth, measurement of growth, analysis of growth and factors influencing growth of forest plants; Reproductive physiology of forest plants, photoperiodism vernalization, flowering stimulus, Biological clocks; Enzymes, Carbon, Nitrogen, Carbohydrate and fat metabolism. Nitrogen fixation.

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|--|-------------|----|
| <i>Course Title</i> —FOREST ENTOMOLGGY | Total hours | 40 |
| | Theory | 30 |
| | Practical | 10 |

Course Contents

Introduction—Economic importance of insects in relation to forests and forest products, Harmful insects, neutral insects; beneficial insects—Scope and divisions of Forest Entomology—History of development of Forest Entomology in India.

General Entomology (Fundamentals) : Insect Anatomy—(a) Morphology and anatomy of insects (digestive respiratory, circulatory, reproductive, nervous, excretory systems; (b) Musculature and locomotory mechanism; (c) procurement, ingestion and digestion of food etc. (d) Metamorphosis.

Insect Biology—Insect biology; Insect ecology—interrelations with the living environment; Intraspecific relations, Interspecific relations with plants; Interrelations with non-living environmental (temperature, humidity, rainfall, light, seasonal and geographical variations etc.). Fluctuations in populations of insects.

Geographical distribution of insects—

Insect Physiology—Digestion, respiration, excretion, locomotion, reproduction, neurosecretions, hormones, pheromones etc.

Insect Development (i) Structure of the insect egg, maturation, cleavage, early embryonic development, (ii) Germ layers, blastokinesis, segmentation; (iii) Organogenesis, determination, hormonal control; (iv) Metamorphosis, types of metamorphosis, Factors controlling metamorphosis; Physiology and hormonal control of metamorphosis, significance of metamorphosis; (v) Types of larvae and pupae, significance of larval life; (vi) Moulting, diapause hibernation, activation and number of generations, life-tables.

Taxonomy and classification of insects—(a) Principles of taxonomy of insects; Technique of study of various parts; preservation of insects; (b) Classification into orders and families of economic groups like Coleoptera, Lepidoptera, Hemiptera, Isoptera, Orthoptera, Hymenoptera and Diptera with characters.

Practical—Visit to Entomology Museum, Insectary and New Forest Campus to see insect, pests and their damage.

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| <i>Course Title</i> —MYCOLOGY AND FOREST PATHOLOGY | Total hours | 35 |
| | Theory | 25 |
| | Practical | 10 |

Course Contents

The Fungi : Introduction, vegetative structures, physiology, nutrition, reproduction and growth. Broad classification. Detailed classification of Basidiomycotina with special reference to Aphylophorales. Detailed classification of Form, Class, Deuteromycotina. Bacteria, General characters, classification, Viruses, Viroides and Mycoplasmas like organisms, Identification of culture of Poroid Aphylophorales, Economic Importance of Fungi. Forest Diseases — Causes and symptoms. Study of some important diseases of Indian tree species, Timber pathology, General introduction, Decay, types, factors for establishment of decay, control of decay. Plant quarantine, Forest disease control.

Practical—Examination and study of vegetative body of a fungus, Examination and study of various forms of vegetative structures of fungi, Mycelial felt, Rhizomorphs, Sclerotia, study of various fruiting structures of Fungi, Examination and study of representative of the following sub-division: Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina; Examination and study of important genera of the following order in class Hymenomycetes; Agaricales, Aphylophorales; Examination and study of important genera of the following order in class Tiliomycetes. Uredinales; Examination and study of important genera of the following order in class Gastremycetes, Lycoperdales, Sclerodermatales, Field excursions.

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| <i>Course Title</i> —WOOD SCIENCE AND TECHNOLOGY | Total hours | 100 |
| | Theory | 80 |
| | Practical | 20 |

Course Contents

WOOD ANATOMY

Theory—Wood anatomy and its scope; *Gross structure of wood* : Cellular composition, bark, sapwood, heartwood and pith.

Early wood, late wood and growth rings. Other gross features helpful in identifying timbers, *Minute structure of Wood* : Types of cells, their sorting and arrangements, Wood rays and parenchyma cells, Tyloses and other inclusion in pores. Intercellular canals. *Ultrastructure of wood* : compression and tension of wood, Electron microscope, characteristics.

Practicals—Identification of 51 commercial timbers of India.

WOOD SEASONING

Theory—Seasoning, its necessity and advantages : moisture content of seasoned timber for different uses; methods of seasoning; types of kilns; seasoning schedules; classification of Indian timbers; stacking of timber; moisture determination; moisture meters; status of seasoning industry in India.

Practicals—Stacking of timber; Moisture content determination of wood; Demonstration of operation of seasoning kilns and use of kiln instruments; Examination of timber for defects.

WOOD PRESERVATION

Theory—Fats of timber in the environment, durable and non-durable woods, causes of natural durability. Biodegradation of timber, preservatives, their properties and methods of application, storage of wood and its protection, economics of treatment and benefits from wood preservation. Protection of wood against fire.

Practicals—Familiarity with sound, decayed and insect attached wood; storage methods and application of preservatives for storage; Treatment by various nonpressure and pressure methods; Fire retardant tests; Sport tests for identification of treated timber.

WOOD WORKING, SAW MILLING & FINISHING

Theory—Basic concept of the cutting process under different operations, fundamental aspects of saw blades, tooth design suitability, energy consumption, surface quality etc. Rotary surface generating equipments. Use of different types of saws in conversion, saw doctoring, wood finishing, raw materials, processes and evaluation.

Practicals—*Saw-Milling*—Operation of different wood cutting machines, Saw doctoring, *Wood Working*—Operation of various wood working machines, Evaluation of working qualities, Preparation of different wood joints; *Wood Finishing*—Surface preparation including bleaching, staining and pore filling etc. Application of transparent coating. Application of paints.

TIMBER MECHANICS

Theory—Introduction to Timber Mechanics, General concept, Physical and Mechanical properties of timber, Factors influencing strength properties, Importance of properties of various end uses, Timber grading practices in India, Non-destructive testing of timber, Railway sleepers.

Practicals—Testing procedures and machines for various physical and mechanical properties of wood; Evaluation of various properties.

TIMBER ENGINEERING

Theory—Scope and significance of modern timber engineering in India, Rational classification of structural timbers, use of structural timbers from thinnings and cultural operations, Fire hazards in timber/structures, Prevention of termite attack in buildings, Fasteners in timber structures, strength properties of jointed timber; ABC of timber designs in beams, ties, purlins, columns, nail jointed timber trusses, timber floors, timber bridges, Bamboo reinforced concrete, Pre-fabrication in timber structures.

Practicals—Laboratory testing and evaluating strength, properties of typical jointed specimen, Design problems in beams and columns; Blue print reading/drawing office practice; Visit to timber Engineering Branch Museum and demonstration structures.

COMPOSITE WOOD

Theory—Plywood—Definition, advantages of plywood over solid wood, types and grades, methods of manufacture, its uses, Block Boards and flush doors etc. Adhesives—Definition, classification of various adhesives, viz. animal glue, blood-albumin glue, casein glue, Soyabean and other vegetable proteins, starch derivatives and synthetic resins. Modified woods—definition types of modified woods viz. compressed, impregnated, compregnated wood etc. and their

uses; Particles Board—Definition, classification, methods of manufacture, advantages and uses, Fibre Board—Definition, classification, methods of manufacture, advantages and uses, Other types of Boards—Saw-dust Board, Plastic Board, Bamboo-mat Board and Mosaic Board etc.

Practicals—Practical demonstration of methods of preparing resins, plywood, improved wood, Hard Board and Particle Boards etc. Testing of the above mentioned products.

PULP AND PAPER

Theory—Classification and characteristics of fibrous raw materials, Wood, bamboo, grasses, agricultural residues such as rice straw, wheat straw, bagasse, jute sticks hemp etc. Fibre morphology and chemistry of wood viz. Lignin, Cellulose, Hemicellulose, extractives, Pentosans, Merits and demerits of these substances on pulping and paper making sciences, Various pulping processes in brief, Types of pulps and yield range, Manufacture of Paper and Board, Classification of paper and testing of paper products, Manufacture of Rayon grade Pulp and Rayon in brief with Flow Sheet diagram, Recent advances in Indian Paper Industry.

Practicals—Demonstration of methods of making Pulp and Paper.

SEMESTER III

| Title of the course | Number of lecture hours | | |
|---|-------------------------|-----------|-------|
| | Theory | Practical | Total |
| 1. Applied Statistics | 90 | — | 90 |
| 2. Forest Economics and Valuation | 60 | — | 60 |
| 3. Wild-life Biology | 50 | 40 | 90 |
| 4. Timber Harvesting | 30 | 20 | 50 |
| 5. Indepth Study (Specialisation) on one of the following : | | | |
| (a) Silviculture and Ecophysiology | | | 250 |
| (b) Forest Insect-pest and diseases | | | |
| (c) Plant Taxonomy | | | |
| (d) Wood Science | | | |
| | | Total .. | 540 |

Course Title :

APPLIED STATISTICS

Total hours 90

Course Contents

Introduction of Statistical Methods—Statistical data, Measures of central tendency, Measures of dispersion, Frequency distribution—(a) Binomial distribution, (b) Poisson distribution, (c) Normal distribution, (d) Other important types, Central Limit theorem and its uses.

Statistical Inference—Concepts of probability, Estimation methods—(a) Method of least squares, (b) Maximum likelihood, (c) Minimum chi-square. Tests on parameters—(a) Concepts of Statistical tests, size of a test, power of a test, (b) Test on parameter of distributions: Binomial, Poisson and Normal, B. T-test, F-test, Z-test.

Experimental Designs—Principles of scientific experimentation, Sources of variation in field experiments, Competition due to inter and intra effects of the experimental units, Size and shape of the experimental units, Replications. Some useful designs like—(a) Complete randomisation, (b) Randomised block, (c) Latin square, (d) Split-plot, (e) Factorial design, Calibration for better results.

Analysis of Variance—The basic assumption in the analysis of variance, Partitioning of the sum of squared deviations for different effects, Analysis of variance for orthogonal design; Analysis of variance for some non-orthogonal designs, Analysis of co-variance.

Sampling Theory—Concepts of Sampling, Estimation of population parameters by using Samples, Different systems of sampling in forestry—(a) Simple Random Sampling, (b) Stratified Random Sampling, (c) Systematic Sampling, its indirect effect on self-weighting Stratified Random Sampling, (d) Strip and Line-plot Sampling, (e) Statistical problems in Systematic Sampling, approximate estimation of standard error in systematic layout of sampling units : Point sampling, Bitterlich method, Multiphase Sampling, Sequential Sampling. Sample Survey for regeneration studies.

Statistical Prediction Procedures—Prediction using consecutive observation on the character—(a) Is there a predictable pattern? (b) What is that pattern? (c) How to derive and use that pattern? Regression methods, Prediction using related characters' observations—(a) Linear regression, (b) Test of linearity, (c) Multiple regression, (d) Curvilinear regression.

Distribution-Free Methods—Central value and dispersion; Comparison of two populations; Distribution free tests—(a) One factor experiment, (b) Two factor experiment with one observation per cell, (c) Two factor experiment with several observations per cell: Test of association, Regression.

Course Title : FOREST ECONOMICS & VALUATION

Total hours 60

Course Contents

Introduction—Nature and Scope of Forest Economics; Fundamental Problems of Forest Economy

Timber and other forest produce demand functions—Analysis of Demand theory: Application of Demand theory to forest products.

Supply function or Production functions of Forest Products—Labour production functions, best combination of forest capital, Land production function, Supply of standing timber, Supply of processed products, Location theory and transportation, Timber production and economic peculiarities, Financial objectives and financial rotations, Multiple product management, Financial institutions and forestry.

The Markets—Marketing functions, Price and quantity determination, Prices of factors of production, Market systems and equilibrium, Appraisal in Forestry : Export and import.

Timber Products Economics—Saw-milling industry, Panel products, Paper industry, Match industry, Small-scale industries; Forecasting techniques.

Forest Valuation—Introduction, Methodology for forest valuation, Land expectation value, Costs in forestry; Income of Forestry, B/C Ratio analysis, Internal rate of return analysis; Economic appraisals.

Project formulation and evaluation—Introduction, Project Planning, Preparation of techno-economic and feasibility reports and feasibility analysis, Project evaluation—meaning and approach, Social Cost Benefit analysis, Programme evaluation and review techniques—(a) Critical path method, (b) Net work cost and system.

Course Title : WILD-LIFE BIOLOGY

Total hours—90

Theory—50

Practical—40

Course Contents

Introduction—Definition and concept of Wild-life; Scope of Wild-life Biology and allied subjects in Wild-life Management.

Wild-life in India—Faunal zones in India, Diversity of species: A survey of important fauna and related flora in India—(a) Mammals : Felids, Canids, Bovids, Carvids, Rare and threatened species of mammals, (b) Birds : Migratory and Resident species, Rare and threatened species of birds, (c) Reptiles : Crocodiles, snakes, turtles etc., Rare and threatened species, (d) Fishes : Game fishes of India.

Wild-life as a Natural Resource and Land Use—Conflict in land use, Wild-life as a multiple land use concept, priorities of land use, Classification of areas used for wild-life purpose, Biosphere Reserves, National Parks, Sanctuaries, Game Reserves and closed areas. Income from wild-life, classification of wild-life values, Consumptive and non-consumptive uses of wild-life, Wild-life as productive reserves, Wild-life as a landed capital, Gene pools and wild-life as a Gene pool resource, Wild-life management as a resource management: Ecosystem approach to wild-life management.

Evolution of life—Life and its origin, Time scale of evolution; Evolution and classical theories, Evolution of animal life. The animal kingdom, a survey of present day animal species, Centres of Speciation and Wallace's realms. The zoo—geographic regions of the world.

Wild-life Ecology—The Ecosystem; concept, structure and functioning of ecosystems, Bio-geochemical cycles, energy flow and trophic structure of an ecosystem, Food webs; Terrestrial ecosystems, Forests, Grasslands, Marshy lands, Aquatic ecosystems, Fresh water ecosystems, Marine ecosystems, Productivity of an ecosystem.

Population Biology—Population : concept of population, Properties of populations; Numerical and Biological attributes, Population growth, Parameters influencing growth rates, Growth forms, Life tables and Life Equations.

Community Ecology—Community—definition and concept, Biomass; Community structure, Biotic succession, Biotopes.

Wildlife Habitats and Niches—Habitat, Definition and concept, Niche, Definition and Concept, Habitat Factors—(a) Welfare factors, Food, Water, Cover, Function and Forms, Quality and quantity and the effect on wild-life, (b) Decimating factors, Pathogens, Malnutrients etc. (c) Limiting factors, pinch period, Wild-life Home Range and Territory.

Principles of Animal Behaviour—Importance of animal behaviour studies; Behaviour, Instinct and learning, Evolution of behaviour, Different types of behaviour, Social organisation in animals.

Wild-life Legislation and Policy—Indian Wild-life (P) Act, 1972, CITES.

Wild-life Studies and Research—Evaluating populations: Census and estimates, formulation of models for evaluating populations; Evaluation of productivity of an ecosystem, Primary productivity, secondary productivity, studying animal behaviour, writing a project report, use of computers in wild-life studies.

Practicals—(a) Measurement of productivity of ecosystems, (b) Evaluation of populations, (c) Studies in animal behaviour. These practicals can be carried out in F.R.I. as well as in neighbouring Wild-life Sanctuaries.

Course Title : TIMBER HARVESTING

| | |
|-------------|----|
| Total hours | 50 |
| Theory | 30 |
| Practical | 20 |

Course Contents

Definition and Scope—Forest resources, supply and demand, forest land use, tree crops for timber, growth and volume of standing trees and tree crops, removals, environmental issues, silviculture and logging.

Objectives—Logging variables, stumpage appraisal, accessibility of forest terrains and terrain classifications.

Principles and practices in felling trees, bucking for higher volume production and higher value, assortments in bucking and conversion, losses in felling and bucking, grades.

Felling, bucking technology, tools, equipments, machines, cost calculations, utilisation calculations, assortment calculations.

Principles and operation of skidding and forwarding timber loads on forest terrains, density of forest roads and skidding distances on terrains and various forest conditions. Road planning and costs, economical calculations, Silvicultural considerations.

Loading, unloading and storage principles, methods and cost calculations. Power logging—Cable logging systems, winches and machine mounted winches, high-load skidding, multispan skyline systems, mobile tower yarders, carriages and cable logging system, combinations and planning, wire ropes principles and constructions, skyline carriages, cables and steel wire ropes for logging operations.

Long transportation of timber by roads, rails and rivers. Road and hauling carts, vehicles, capacity, operating costs, distances, depreciations, limitations. Water transportation—floating calculations, river and lake, rafts and booms, ocean rafts, motor launches.

Work study and its applications to forestry conditions, method of study, work measurements, time study, work specifications.

Physical functions, muscular work, physical work load capacity, aerobic and anaerobic process, energy expenditure during work and requirements, nutrition and physical performance. Field exercises on data collections and experiments. Ergonomics—scope, loads, designs and control, motion economy, environment.

Its scope in logging operations, definitions, linear programming, formulation of linear optimisation models, assignment problem and transportation problem. Programme evaluation and review technique/initial Path Method and their uses in timber harvesting management.

Objectives, limitations, define problems and decisions, solution algorithm, data requirements and data collections, data processing, long and short term logging plans, storage and haulage plans and plan control.

Course Title : SILVICULTURE AND ECOPHYSIOLOGY

Total hours 250

Course Contents.

Seed Technology—Seed Biology—Flowering, fruit and seed development, ripeness and dispersal, factors affecting flowers, fruit and seed production, dormancy, and seed germination.

Harvesting, Processing, and Storage of Fruits and Seeds—Pre-harvest preparation, harvesting, treatments and care after collection, processing of cones; fleshy and dry fruits, factors influencing storage, preparation for storage, dry storage, special methods, storage container, seed longevity.

Pre-sowing Treatment of Seed to Speed Germination—Quick treatment for hard seed coat, stratification treatments, combination treatments, and chemical treatments.

Seed Testing and Certification—Sampling, physical characteristics including purity, weight, moisture content, genuineness and origin, potential germination including germination tests, rapid viability tests, vigour, framing of seed testing rules, Tree seed certification and seed problems in India.

Plant Exploration and Introduction—Plant introduction on a world wide basis, factors necessary for introduction, Centres of origin and selection of species/varieties, Genetical and physiological considerations, Techniques in collection and introduction, Receipt and maintenance of collections, Plant introduction, provenance trials and status of exotics in India.

Forest Influences : Climate—Solar radiation, direct radiation, diffused sky radiation, amount of clouds, temperature, temperature and latitude, temperate zones, annual range, diurnal range, frost, snow, rainfall and humidity, rainfall distribution, monsoon rainfall, heavy rainfall, annual variation, floods and droughts, seasonal distribution, winter rainfall rainy days, rainfall intensity, humidity, dew, invisible condensation, fog and mist, seasons, wind, pressure, wind velocity, monsoon winds, diurnal variation, integration of climatic factors, bioclimate, climate and potential productivity.

Physiography—Altitude, insolation, temperature, rainfall, aspect and slope, topography.

Microclimate—Microclimate of forest stands, solar radiation, air temperature, soil temperature, frost, moisture relations, rainfall interception, stem-flow, humidity, dew, fog, and mist evaporation from soil, wind, shelterbelts.

Afforestation—Physiography and major land forms, climate, soils, afforestation in various climatic zones, afforestation techniques in practice in various parts of India, propagation techniques of tree species, afforestation of difficult sites.

Forest Ecosystem—Structure and function of main types of forest ecosystem; Nutrient Budget, Production and Energy flow in the system.

Systems Ecology—An introduction to the systems approach and Mathematical models in Forest Ecology.

Environmental Conservation and Applied Ecology—Conservation of natural resources in general, Forestry and wild-life, Range management; Landuse; Water and soil use and conservation; Genepool and Biosphere reserves.

Ecosystems dynamics, tree architecture in relation to environmental variables :

(a) Nutrition Requirements of Forest Plants, (b) Isotopes and Radiation Biology, (c) High Altitude Ecophysiology of Plants, (d) Ecophysiology of Arid Zone Plants, (e) Mechanism in flowering.

Practicals—Based on the above topics.

Course Title : FOREST INSECT-PESTS AND DISEASES

Total hours 250

Course Contents

Insect Ecology—(i) An overall picture of insects in relation to forests; importance of insect ecology in forestry and protection of forests; Losses due to forest insects; Assessment of losses in forests due to insects. (ii) Interacting environmental or habitat factors which influence the relative abundance and distribution of insects; Biotic potential—Rate of multiplication—Fecundity, Polyembryony; Sex ratio, effect of sex ratio; Values for Fecundity etc. (iii) Environmental resistance—Physical factors—Plant physiological factors; Biotic factors; Nutritional factors; Biotic balance; Protection against environmental resistance. (iv) Competition, Parasites and Predators. (v) Ecological

principles as applied to problems in forest Entomology; Biological Control Programmes—Management and Methods. (vi) Ecological classification of injurious forest insects in relation to their food habits; (vii) Entomological Surveys of major insect pests with reference to forests of Indian Region.

(i) *Insect-Pests of Standing Trees : Plantations and natural forests*—Injury, biology, life histories and control of insects of economic importance in forestry with special reference to following tree species (a) *Broad-leaved*—Sal, Teak, Toon, Mahogany, Shisham, Acacia, Cashew, Semul, Ailanthus, Michelia, Gmelina, Eucalyptus, Poplars and Willows, (b) *Conifers*—Deodar and high level conifers (Spruce and Firs). (ii) *Insect pests of felled and converted timber*—Injury, biology, life history and control at felling site, during transportation and haulage and store house. (iii) *Termites in relation to forestry and timber*—Biology, ecology, life history and control. (iv) *Insect pests of seeds*—Injury and methods of storage—(Protection of seeds) and control. (v) *Insect pests of nurseries*—Injury, biology, life history and control in seed beds, transplant potted plants etc. (vi) *Insect vectors of plant diseases with special reference to Sandal Spike diseases*—Ecological classification of beneficial insects, Minor Forest Produce of animal origin with special reference to lac, honey, silk; insects as human food; parasites and predators.

Control of Insects—Principles and methods of insect control, General principles—integrated control measures. Methods : *Chemical control*—Toxicology of insecticides—Study of the physical, chemical and biological properties of materials used to destroy insect (General principles); Formulations, toxicology, and physiology as related to insecticides are emphasized; technique (appliances); assessment; *Biological control*—Biological agents (parasites, predators and microbes), techniques of development, rearing and releasing; assessment. *Silvicultural control*—attractants and repellents; sterilization (both chemical and radiation induced); antifeedants; Hormones—Juvenile hormones, sex hormones; Legislative controls : Plant quarantine measures, forest hygiene.

Applied Forest Entomology (Technique)—Insectary and field technique in the study of forest insect problem; introduction to method and equipment, diagnosis of insect attack by symptoms; problem analysis, evaluation and surveys of damages (e.g. ground survey, aerial survey, mapping and aerial photography etc.).

Forest Entomology—Study of the following pest specimens and their damage in the field as well as in laboratory—(i) *Pests of standing forest trees*—(a) Sal heartwood borer, (b) Teak canker grub, (c) Teak defoliators and skeletoniser, (d) Teak flower, seed and shoot borer, (g) Babul root and stem borer, (e) Mahogany collar borer, (f) Shisham defoliator, (h) Semul shoot borer, (i) Ailanthus defoliator, (j) Camp bug, (k) Gambar defoliator, (l) Eucalyptus termites and other pests (m) Poplar stem and root borers and defoliators, (n) Pine shoot borer, (o) Bamboo shoot borers and gheon borers; (ii) *Nursery pests*—Cutworms, cockchafer grubs, crickets; seed pests—Bruchids, weevils, and microlepidoptera, Insect vectors of plant diseases, *Coccidia indica*; termite nests, termite castes; (iii) *Timber Entomology*—Pests of felled timber; Bark borers; pine hole borers; ambrosia beetles, sapwood borers, shot hole borers, heartwood borers, dry wood and powder post borers; (iv) *Beneficial insects*—(a) *Parasites*—Wasps and flies, (b) honey bees; (v) Visit to Entomology Museum and Insectary to see insect pests and their damage; (vi) Methods of Insect pest control, technique, appliances etc; (vii) Applied Insectary and field techniques, diagnosis of insect attack by symptoms; (viii) Collection of insects from field, preservation (wet and dry) in field and laboratory, pinning, labelling, packing and forwarding to the specialist; (ix) Identification of insects adult and immature stages upto family; (x) Excursion to adjoining forest area to witness attack on standing trees or at felling sites and timber depots.

Practicals—(i) *Insect anatomy*—Cockroach or a grasshopper as type in detail; (ii) *Insect biology*—Life cycles, metamorphosis (in detail) of 2 insect posts; (iii) *Insect taxonomy*—Application of field as well as laboratory identifications (upto family status) of important insects, orders and family (both adult and immature stages).

Course Title : FOREST PATHOLOGY

Course Contents

(1) Introduction; (2) History of Forest Pathology (3) *Disease*—Definition, Causes of plant diseases and classification; (4) Identification of plant diseases; (5) *Pathogenesis*—Inter-relationship of Parasitism and Pathogenicity, Law of host parasite balance in pathogenesis; (6) *Diseases caused by fungi*—root diseases; (a) Pathogenic Soil inhabiting fungi, (b) Vascular Wilt fungi with special reference to wilt disease of Sissoo caused by *Fusarium solani* and wilt of casuarina due to *Trichosporium Vesiculosum*, (c) Pathogenic root inhabiting fungi with special stress on *Ganoderms* root rot in Khair and *Polyporous shoreae* root rot in Sal and Principles of root disease control; (7) Nursery diseases: Introduction, non-infectious and infectious diseases, chemical control; (8) Symbiosis : Mycorrhiza, Root modulation; (9) Stem diseases : (a) *Heart rot* in trees—(i) Establishment of Heart rot fungi. Progress of Heart rots; predisposing factors and detection of Heart rot, (ii) Heart rot in Sal due to *Fomes caryophylli*, *Fomes fastuosus* and *Hymenochaete rubiginosa*, (iii) Heart rot in Khair due to *Fomes badius*, (iv) Heart rot in coppice forests—in teak and Sal, (v) Heart rot in Kail due to *Fomes pine*, (vi) Heart rot in Deodar due to *Peniophera luna*, (vii) Control of Heart rot in trees (b) *Rust diseases of forest trees*—(i) Stem blister rust of Chir pine (*Pinus rexburghii*) and blue pine (*Pinus wallichiana*) caused by *Cronartium himalayansa* and *C. ribicola*, (ii) *Parasitic anti-sperms-Lornathus* sp. in Sissoo and dwarf mistletoes on *Pinus Wallichiana*, (iii) Canker diseases, different types of Canker. Pink diseases of Eucalyptus, *Endotnea parasitica* on Chest-nut and *Monochaetia* canker on Cupressus; (10) *Foliage diseases*—(i) *Olvia tectanae* on teak (ii) *Desturella divina* on Bamboo, (iii) *Coleosporium companulae* on Chir pine, (iv) *Peridermium cedri* on Deodar, (v) *Dothistroma pini*, *Cercospora pini densi-florae*, *Diplodia pine* and *Lophodermium pini* on pines; (11) Disease due

to physiological (non-infectious) causes (i) water trees—drought and excess of water, (ii) Ministerial, (iii) water temperature extremes, (iv) pollution; (12) Diseases of unknown origin; (13) Timber pathology—(i) Introduction, (ii) deterioration of wood by various agencies, (iii) types of decay, (iv) symptoms of fungal decay in wood, (v) factors affecting wood decay, (vi) Chemistry of decay, (vii) sap stain, (viii) Control of decay and sap stain; (14) Seed Pathology: Introduction, detection and control of seed borne fungi; (15) Plant quarantine; (16) Principles of tree disease control.

Practicals—(1) Examination and study of tree disease symptoms; (2) Examination and study of the following fungi causing damping off—(a) *Rhizoctonia*, (b) *Fusarium* and *Pithium*; (3) study of following fungi causing root diseases—(a) *Fusarium solani*, (b) *Trichosporium vesiculosum*, (c) *Polyporus shorae*, (d) *Ganoderma lucidum*, (e) *Heterobasidium annosum*, (f) *Armillariella mella*, (g) *Poria rhizomorpha*; (4) *Not in mucorrhiza*—(a) *Ectrophib*, (b) Endotrophic; (5) Examination and study of root nodules of leguminous tree; (6) studies of the following Heart rot fungi, (a) *Fomes caryophylli*, (b) *Fomes fastuosus*, (c) *Hymenochaete rubiginosa*, (d) *Trametes cubensis*, (e) *Fome pini*, (f) *Fomes badius*; (7) Study of important tree rusts—(a) *Cronartium himalayense* on Chir pine, (b) *Coleosporium campanulas* on Chir pine, (c) *Peridermium cedri* on Deodar, and (d) *Olivea tectonae* on Teak; (8) Study of timber defects caused by micro-organisms; (a) Decay of timber (b) Sap stains; (9) Mycological excursions.

Course Title : PLANT TAXONOMY

Total hours 250

Course Contents

(1) *Taxonomy and its significance*—inter-relationship with allied sciences, problems in taxonomy opportunities, (2) *Historical review of classification*—classification based on habit, artificial systems, systems based on form relationships, phylogenetic and other contemporary systems, (3) Principles of taxonomy : Major and minor categories of classification, infra-specific categories, morphological criteria, (4) *Phylogenetic consideration*—Significance, phyletic concepts and phylogeny, (5) *Current systems of classification*—Bentham & Hooker, Engler & Prantl, Rendle, Wettstein, Pulls, Skottsberg, Bessey, Hallier, Hutchinson, Takhtajan, Cronquist, etc., (6) *Plant Geography*—Geography and its relationships of plant distribution, vegetation areas of the earth, physiographic regions of India, importance of Phytogeography to taxonomy, (7) *Modern trends in plant taxonomy*—Biosystematics and modern taxonomy, methods in experimental taxonomy, numerical taxonomy, chemotaxonomy, palynology, cytotoxicology, etc., (8) *Plant Nomenclature*—Historical review, importance of nomenclature, International code of botanical nomenclature, scientific naming of plants, (9) *Plant identification*—use of flora and key herbaria, (10) *Field and herbarium techniques*—collecting procedures, presentation of data, framing of keys, descriptions, citations, etc., (11) *Floristics*—types of floristic study, procedure, preparation of floras and floristic accounts, (12) *Spot and field characters of trees*—ways and means of identification using vegetative characters, etc., (13) *Arboriculture/Landscaping*—importance, bioaesthetic plantings, laying out of parks and gardens, choice of species, seed exchange, etc., (14) *Endangered plants and their conservation*—*in situ* and *ex situ* conservation, preparation of inventories and Red Data Book, biosphere reserves, National Parks, Sanctuaries, Gene Banks, role of botanic gardens, etc., (15) *Brief history of Taxonomic Botany in India*—review of history, present status, important herbaria and botanic gardens, (16) *Literature of Taxonomic Botany*—Taxonomic indexes, Floras, monographs, bibliographies, catalogues, periodicals and other works of reference, (17) *General account of families of forestry importance*—study of important families not covered in Semester II.

Practicals—(1) Collection of plant specimens and field data, (2) Preparation, preservation and curation of specimens for the herbarium, (3) Identification of plants with the help of floras, (4) Dissection and critical studies, (5) Consultation of herbarium for matching purposes, (6) Organising material in the herbarium and Carpological museum, (7) Practice in writing of taxonomic accounts/monographs. Field training and visit to important botanical institutions/herbaria/botanical gardens, etc.

Course Title : WOOD SCIENCES

Total hours 250

WOOD ANATOMY

Course Contents

Introduction—Wood anatomy and its scope, use of wood through the ages. *The wood plant cell*—Formation and structure of the cell wall—primary cell wall and secondary cell wall; chemical components of the cell wall, polysaccharide fractions of the cell walls, lignin, extraneous material, distribution of the chemical constituents in the cell wall, cell wall pitting and their modifications, spiral thickening. *General features*—Colour fluorescence, lustre, odour weight, hardness, grain, texture and figure. *The minute structure of non-porous woods (conifers)*—Cell constituents of nonporous wood, tracheids, their structure, longitudinal parenchyma, ray parenchyma, Intercellular canals, field pits. Minute structure of Chir, Fir and Dodar. *The minute structure of porous woods (dicotyledonous)*—Cell constituents of the porous woods, vessels, their shape, size, arrangement: frequency, vessel elements, type of perforation plates, intercellular pittings; longitudinal parenchyma (soft tissue), various types of parenchyma patterns; radial parenchyma (rays), their structure and arrangements; fibres, their structure. Other features *viz.* intercellular canals, tyloses, ripple marks, including phloem, pith flocks, cell inclusions etc. Minute structure of one ring porous (Teak) and on diffused porous (Sal) woods. *Structure and identification of wood*—The need for identification of wood

structure—a scientific basis for identification of woods in the field; finger prints of wood; equipment and procedures for examination of timber in the field; keys for identification of timbers (a) Dichotomous keys (b) Punched card keys; principles and methods of using various keys, advantages and disadvantages of the two types of keys, *growth abnormalities (natural defects)*—Cross-grain, reaction wood, compression wood and tension wood, their anatomical structure; knots, resin streaks. *Ultrastructure of wood*—Scanning and transmission (electron microscope), Electron microscope characteristics of wood.

Wood Anatomy Practicals : Identification of 25 commercial timbers.

WOOD SEASONING

Course Contents

(1) *Physical characteristics of wood related to drying*—Change of density, thermal, electrical and mechanical properties with moisture content, (2) *Wood physics concepts in wood drying*—absorption of water, non-aqueous vapours and gases by wood; fluid flow including permeability and diffusion; thermal properties with modes of heat transfer important in wood drying and usage; electrical conduction and dielectric properties; shrinkage and hygroscopicity as influenced by extraneous and intrinsic factors; (3) *Theories of drying wood and veneer*—Calculations of drying time during constant-rate and diffusion-controlled drying stages; Effect of density, thickness, initial moisture content permeability and extraneous factors; drying stresses and development of drying defects; kiln drying schedules including moisture content-based, time, stress-control shrinkage-strain control, continuous rising temperature and high temperature schedules, (4) *Drying techniques for wood and veneer*—Air drying; kiln drying, solar drying, high temperature drying, chemical seasoning; dehumidification drying; other special methods, conductive, convective and jet drying of veneers, predriers, preseasoning treatments, (5) *Design of kilns and veneer dryers*—Progressive and compartment type kiln; kiln aerodynamics and heat and mass transfer; kiln heating systems; venting and heat recovery; chamber profiles and construction; veneer dryers, (6) *Kiln operation*—Classification of Indian timbers; schedules modification; kiln instrumentation and automation; special kiln treatments; storage of seasoned timber, conditioning of wood working factories.

Practicals—(1) Plotting description, Isotherma for wood, (2) Determination of fibre saturation point by shrinkage, swelling and electrical resistance measurements, (3) Evaluation of drying diffusion coefficients, (4) Progress of drying stresses in kiln drying; (5) Kiln certification, (6) Pre-seasoning treatment.

WOOD PRESERVATION

Course Contents

(1) Timber, bamboos and thatch grasses as structural materials, (2) Natural durability of timber, (3) Agencies responsible for the destruction of timber, (i) Fungi, (ii) Insects, (iii) Marine organisms; (4) Requirements of an ideal preservative, composition and properties of various types of preservative, testing of preservatives under laboratory and field conditions, qualitative and quantitative analysis of preservation in treated timbers, (5) Treatment of timbers storage of timber, chips, and protection methods, (6) Treatability classes of timber, (7) Permeability and treatability (8) Diffusion principle, (9) Fixation of wood preservatives, (10) (i) Conditioning process of treatment in sizing, steaming, or Boulton vapour drying etc., (ii) Brushing, spraying and dipping, (iii) Steeping and diffusion, (iv) Boucheris treatment and other methods in green conditions, (v) Hot and cold bath processes, (vi) Pressure processes Full cell, Lowry, Rueping and low pressure processes, (vii) High pressure treatment, (viii) Post treatment of timbers *in situ*, etc. (ix) Post seasoning of timber treated with water soluble preservatives, (11) Indian standard specifications for different uses, (12) Factors influencing/treatment and penetration of preservatives, (13) Fire protection of timber and other cellulosic materials and methods of testing the same, (14) Specification and operation of preservation plants, (15) Lay out of preservation plants including storage yards, (16) Economic aspects of preservative treatments.

Practicals—(1) Laboratory methods of chemical analysis and testing of preservatives, (2) Operation of preservation plants, (3) Examination of timber specimens in the test-yard, (4) Testing of fire-proofed materials, (5) Analysis of treated wood, (6) Determination of retentions and treatability of timbers, (7) Testing of wood preservatives, laboratory testing against fungus.

SAW MILLING, WOOD WORKING AND WOOD FINISHING

Course Contents

Saw milling—(1) Introduction to saw milling, saw mill : design; types: size: location and layout; log storage types, preventing deterioration during storage, log handling, (2) Saw mill machinery: Debarkers, Cut off saws, kickers loaders; and turners; head saws; band saws; sash saws; reciprocating saws; inserted tooth saws; circular saws; gang saws; log carriage; edger; trimmer; resaws; slashers; log-surfacing and shaping machines, (3) Tooth geometry for reciprocating saws; circular saw; band saw and surface planner; tooth pitch gullet; tooth angles; angle of hook, clearance angles and bevels set; sharpness angle; Kerf-width etc. inserted tooth; knife angle; tooth punching and selection of saw, (4) Saw doctoring : grinding; brazing; jointing; filing; tensioning; sharpening and setting; maintenance of saws;

(5) Manufacturing process : break down of logs; general principles of sawing; edging; ripping; trimming; surfacing and shaping; storage of saw material, (6) Quality control : fundamentals of quality control: control charts for variables; need for quality control.

Wood Working—(1) Wood working machines; operations and maintenance, jointing, planning, moulding, shaping, sanding, turning, tenoning, mortising and boring machines, (2) Evaluation of working qualities of different timbers under major wood working operations and evaluation of working quality, (3) Study of different kinds of joints used in furniture and cabinet making.

Wood Finishing—(1) Necessity of finishing wood, wood finishing aids and raw materials, surface preparation, sanding, priming, bleaching, staining, pore filling and some special surface preparation techniques; (2) Opaque coatings (Paints) and their application, types of opaque coatings, pigmented oil paints or enamels, nitrocellulose lacquers, perchlorovinyl enamels etc., their application, schemes for applying different types of coatings, (3) Transparent coatings and their application, types of transparent coatings, drying oil coating, mat finishes, varnishes and polishes, their application, Scheme for applying different kind of coatings.

Practicals—Saw milling—(1) Operation of different wood cutting machines, (2) Saw doctoring; (3) Yard management. *Wood Working*—(1) Operation of various wood working machines, (2) Evaluation of working qualities, (3) Preparation of different wood joints. *Wood finishing*—(1) Surface preparations including bleaching; staining; pore filling etc., (2) Application of transparent coating. (3) Application of paints.

TIMBER MECHANICS

Teacher(s)—

Course Contents—

Physical properties of wood, density and specific gravity and factors influencing density of timber. Wood in relation to heat, light, sound and electricity, non-destructive testing of timber and timber products.

Mechanical and elastoplastic properties of wood, sampling and layout of timber and its conversion for testing. Mechanics of wooden beams, columns and stresses in the beams before and after elastic limits. Standard tests for evaluation of different properties of timber. Methods of different tests, Computation of various properties under different tests. Derivation of formulae used. Factors affecting strength, properties of timber. Application of various properties in industrial and engineering practices. Suitability indices, working stresses. Different types of testing machines and their calibration and calibration charts.

Defects in wood—Natural defects, defects due to processing, defects occurring due to wood destroying agents. Identification, measurement and evaluation of defects. Influence of defects on utilization characters. Grading of timber—commercial and stress grading. Grading principles and practices. Grading rules for logs and converted timber. Visual and machine stress grading. Timber grading machines and limitations. Wood stores and wood products—Testing and evaluation of wood stores and wood product like wood poles, furniture items, tool handles, sports goods, packing cases, tea-chests, crates and pallets, plywood hard-board, particle board, block board, flush door, Classification of timber for various end-uses. Standardisation-Indian specifications on wood and wood products and their role in quality control.

Practicals : (1) *To evaluate physical properties of timber*—(a) Specific gravity, (b) Moisture content, (c) Shrinkage, (d) Sound absorption coefficient, (2) *Mechanical properties of timber*—(a) Static bending, (b) Impact bending; (c) Shear, (d) Compression, (e) Tension, (f) Hardness, (g) Torsion, (h) Nail screw pulling, (i) Creep and fatigue, (3) *Testing of wood stores*—(i) Poles, (ii) Packing cases, (iii) Doors & furniture, (iv) Sports goods. (4) *Calibration of machines*—Testing machines.

TIMBER ENGINEERING

Course Contents

Scope and significance of modern timber engineering in India; Introduction of timber and other materials of forestry origin as structural materials—Classification of structural timber and introduction of lesser known species in structures of timber, structural timber from cultural operations; fire hazards and control; prevention of termite attack on buildings by constructional methods; Strength and design of structural timber joints—Conventional vs new type of joints, strength of structural timber joints in single, double and multiple shear. Design of timber joints with nail belts, timber disc-cowels, steel connectors and adhesives having side members of timber, plywood and m. s. plates. Linear structural components in timber—beams, ties, purlines, struts and columns—solid, laminated and composed. Trusses and arches in timber—Materials, analysis and design of simply supported, three hinged and two hinged trusses and arches. Special structures in timber and their forms—Timber lamellas, solid web-type girder, open web girder, composite construction, shells, transmission posts and grain siles. Timber floors. Timber bridges—simple, composite and suspension. Economical use of small dimensional timbers for a variety of buildings with special emphasis on forest

and rural areas. Bamboo reinforced concrete constructions; theory, analysis and design. Introduction of glued-aminated timber structure. Prefabrication in timber structures.

Practicals—Design problems in beams, columns and roof strusses, Arches, solfa web type girder, etc. Laboratory testing and evaluating strength properties of joined timber specimens—Mechanical fasteners, Synthetic adhesives; finger joints, Flexural units in ending, Wooden column. Proto-type testing and assessment of wooden roof truss designs. Techniques of bamboo reinforcement in concrete structural units. Study visit to Timber Engineering Branch Museum and demonstration structures; Blue-print reading and design office practice.

COMPOSITE WOOD

Teacher(s)

Course Contents

Veneer manufacture; Rotary veneer; Sliced veneer; Sawn veneer; Lathea; Slicers; Drying of veneers; Yield and wastes.

Brief history of plywood, Raw materials—Wood and adhesives Advantages; Properties; Production and manufacturing techniques; Uses, Classification; types; Indian standard specifications on plywood; status of plywood industry.

Modified woods, Heat treatment; Impregnated wood; Advantages; Production, properties and uses; Compregnated wood; Laminated wood; Compressed wood; Stayb wood; Acetyleted wood; Polyethylance glycol treated wood; Formaldehyde treated wood; wood-Plastic composites.

Adhesives : Theory of adhesion; Rheology of glues; Classification of glues and adhesives; Animal glue; Vegetable glue; Casein glue; Soyabean glue; Blood albumin; Synthetic resins and their chemistry; Extenders and fillers; Application; Durability; Difficulties and defects in gluing; Uses and testing.

Particle Board: History and development, classification of particle board. Wood and other lignocellulosic raw materials, adhesives and additives, manufacturing techniques, particle preparation, drying of particles, storage, resin blending, mat formation, pressing of particle board by flat plate and extrusion process, surface furnishing and overlaying of particle boards, properties, uses and testing, factors affecting the properties of particle board, quality control and standardisation treatment of particle board, status of particle board industry and R & D activities in India and world.

Fibre board: History and development, classification of fibre board, raw materials for fibre board, raw material preparation, pulping processes, manufacturing techniques for fibre insulation board and hard board, mat formation by wet felting and air felting, hot pressing, tampering of hardboard, surface finishing and overlaying of hardboards, properties, uses and testing quality control and standardisation. Status of fibre board industry and R&D activities in India and world.

Other types of boards : Saw dust board, bamboo mat boards, and mosaic boards.

Practicals—Analysis of raw materials, wood, casein, purity of phenol and formalin; Preparation of resins : Phenol-formaldehyde (water soluble), Phenol-formaldehyde (alcohol soluble), urea-formaldehyde (casein glues). Preparation of Gels : Silica gels, paddy husk gels; Preparation and testing of plywood using unextended and extended resins, U.F. Cold set, U.F. Hot set, P.F. (Water soluble), P.F. (alcohol soluble). Preparation and testing of impregnated wood and compregnated wood. Preparation and testing of laminated wood. Preparation and testing of compressed wood. Preparation of testing of fibre boards. Preparation and testing of particle boards.

PULP & PAPER

Course Contents

Chemistry of Cellulose. Hemi-cellulose and Lignin—Occurrence of cellulose. Morphology of the fibre and composition of the cell walls. Action of light, heat, water, bases, acids, salts and oxidizing agents on cellulose, nature of monomer, chain length (D.B.) cross linkages, crystalline and amorphous regions, orientation. Cellulose derivatives.

Hemi-cellulose-compositi n. Nature of hemi-cellulose in coniferous and deciduous woods. Association of hemi-cellulose with lignin. Tests for the hydrolytic products of hemi-celluloses. Estimation of total hemi-celluloses and pantosans. Effect of hemi-cellulose on pulp quality.

The evolution of lignin chemistry. Distribution of lignin. Colour reactions. Isolation and estimation of lignin. Properties and uses of lignin. Reactions with lignin. Structure of lignin. Lignin formation and linkage in the plant. Synthetic lignins.

Principles and processing of Pulp and Paper—Classification of fibrous raw materials—Mechanical pulping, grinders, variables in grinding-stone surface. Stone speed, grinding pressure, power input, energy consumption, temperature and consistency of grinding. Freeness and strength. Pre-steaming process. Characteristics of ground-wood pulps. Brightening of groundwood pulps. Semi-chemical-pulping -chemicals used : Variables in semi-chemical pulping. Bleaching. Recovery of chemicals. Properties and uses of semi-chemical pulps. Chemiground-wood and Chemimechanical process. Cold caustic soda process. Thermo-mechanical process. Prehydrolysis-Kraft process. Mechanochemical processes. Preparation of cooking liquors. Variables in pulping, effect of total chemicals, liquor concentration, temperature and time of cooking. Characteristics of pulps. Recovery of chemicals. Bleaching of pulps. Other pulping processes. Lime process. Rayon pulp.

Preparation of stock. Theories of beating and refining. Use of hydrophilic binders during beating. Fillers and loaders-types of fillers, effect of fillers. Theories of retention: sizing-engine and tub-sizing. Sizing agents. Effect of sizing. Colouring sheets. formation-fibre dispersion and flocculation, fibre bending. White water. Couching. West processes. Drying. Calendering and super-calendering. Coating and paper conversion.

Effluent disposal : Load of effluent, I.S.I. specifications, various methods of effluent treatment. Air pollution and its control.

Practicals—Fibrous materials for Paper making and microscopy of fibres—Preparation in the laboratory of chemical pulps from grasses, bamboo, coniferous and deciduous woods, bagasse, etc. Semi-chemical pulps. Bleaching of pulps by single stage and multi-stage methods. Preparation of standard sheets. Determination of basic weight, thickness, tensile strength, tear, burst, folding endurance and brightness. Chemistry of cellulose, Hemi-cellulose and Lignin. Proximate chemical analysis of fibrous raw materials, permanganate number of unbleached pulps. Principles and processing of pulp and paper. Groundwood pulps. Soda and sulphate pulps. Cold caustic soda pulps. Lime pulping.

SEMESTER IV

| Title of the Course | Number of lecture hours | | |
|--|-------------------------|-----------|------------|
| | Theory | Practical | Total |
| 1. World Forestry | 40 | .. | 40 |
| 2. Forest Policy, Law and Administration | 30 | .. | 30 |
| 3. Tribal Welfare | 35 | .. | 35 |
| 4. Social Forestry | 35 | .. | 35 |
| 5. In the subject of specialisation any one topic suggested by the student through the adviser concerned and approved by the faculty : | | | |
| (a) Guided reading for dissertation, documentation of relevant information | .. | 100 | 100 |
| (b) Laboratory and field work | .. | 150 | 150 |
| (c) Dissertation | .. | 150 | 150 |
| Total .. | | | 540 |

Course Title :

WORLD FORESTRY

Total hours 40

Course Contents

Forest geography of the world—Factors influencing the world distribution of forests; Historical background and present distribution of world forests.

Forest resources and forestry practices in different regions of the world—North American region*, Central American region (Tropical)*, South American region, Scandinavian region*, European region*, Mediterranean region, U.S.S.R., Central Africa (Tropical)*, South Africa, South East Asia*, Eastern Asia (Japan and China), Australia.

*To be given greater importance.

REGIONAL DEVELOPMENT OF WOOD BASED INDUSTRIES IN THE WORLD TRADE PATTERNS IN FOREST RAW MATERIALS

International forest organisations and agencies.

Course Title : FOREST POLICY, LAW AND ADMINISTRATION Total hours 30

Course Contents

Forest Policy—Definition, necessity, scope, range and various considerations. Foundations of a stable forest policy, Contents of a national forest policy, Forest policies of some developed countries, India's National Forest Policy—(a) contents of the 1952 Forest Policy and its correlation with the Policy of 1894, (b) Need for a revised forest policy in India.

Forest Law—Legal definitions, General principles of Criminal law, Legal principles of punishment, Objects of special Forest Law, The Indian Forest Act—(i) General provisions (ii) Detailed study, legal organisation of the forest service.

Course Title TRIBAL WELFARE Total hours 35

Course Contents

Definition, types, distribution and demography of tribes, racial classification; Concept of race, tribe, family clan and kinship, principles of social grouping; Cultural traditions, customs, ethos, beliefs and practices of tribals in general, political organisations and social controls. Tribal economy, Details of few important tribes of India, e.g. Bhils, Santhals, Gonds, and nomadic tribes; Administration of tribal affairs, Constitutional provisions for their welfare and tribal development plans; Approaches towards tribals: policies of isolation, assimilation and middle path; Tribal forest policy and forests, their symbiotic relationship, Tribals and shifting cultivation, Tribal welfare programmes of various State Forest Departments.

Course Title : SOCIAL FORESTRY Total hours 35

Course Contents

Definition, scope, necessity, special significance in the context of energy and small timber requirements of India, environmental pollution and recreation; place of social forestry in the national forest policy of India.

Farm Forestry—Its need and scope on and around agricultural lands; role of rural economy and its effect on agricultural practices; establishment of farm forests, choice of species, planting techniques, maintenance, organisation of the programme, role of the Forest Departments, protection.

Extension Forestry—Objectives and scope *vis-a-vis* farm forestry; raising of trees for fodder, timber, firewood, creation of pasture lands; avenue plantations, canal bank plantations, plantations along railway lines; choice of species, techniques, maintenance; extension approach, organisation of the programme, role of the Forest Departments, protection.

Recreation Forestry—Needs of the urban population, scope of its application in forests, city forests and concept of integrated town planning and forestry; creation of forest parks in natural forests close to urban centres.

Windbreaks, Shelter belts and Catchment Forests—scope of creation of windbreaks, shelter belts, choice of species, techniques, maintenance, scope in the catchment forests of water works, etc., protection.

Social Forestry in relation to tribal welfare.

Organisation, legislation and publicity-extension, organisation, training and demonstration, public participation and publicity; need for a defined policy, suitable legislation to support the programmes.

Social Forestry Projects for different States in India.

ANNEXURE XII

SYLLABUS FOR EXPOSURE TO PARLIAMENTARIANS, LEGISLATORS, OTHER PUBLIC REPRESENTATIVES, MUKHIA, SARPANCH AND OTHER GRASSROOT LEVEL POLITICIANS

Course Contents

1. *Forests and Environment*

Role of forests in soil conservation, storage and regulation of water flow, moderating the adverse effect of wild snow, forest floods, purification of air and water and maintaining the ecological security of the country.

2. *Importance of Forests in National Economy*

- (i) Direct support to Agriculture, Animal Husbandry and Industries.
- (ii) Supply of timber and other forest produce to the Railways, Defence and several other organisations.
- (iii) Supply of fuelwood and charcoal for meeting energy requirements.
- (iv) Employment generation in most backward areas.
- (v) Economy of the poorest among the poor depending on forests.
- (vi) Recreational values of wildlife, parks & Urban forests.

3. *Role of Forests in Rural Development*

- 1. Supply of food, fuel, fodder, fibre and small timber to the local people.
- 2. Supporting agriculture, animal husbandry horticulture and industries.
- 3. Generating employment to unemployed and under-employed.
- 4. Alleviation of poverty through viable, sustainable and practical forestry based on individual beneficiary schemes.
- 5. Maintaining irrigation projects, increasing fertility of the soil (fixation of nitrogen through bacteria) and moderating climatic disruptions.

4. *Special Features*

- (i) Endangered species of flora, fauna and primitive tribes to be protected from becoming extinct.
- (ii) Mountains, hills, deserts and sea to be checked and not allowed to march towards habitations.
- (iii) For keeping the country green : afforestation, social forestry, agro-forestry and a tree for every child schemes should be supported by masses.
- (iv) Minor forest produce development, collection and processing can gainfully employ all those people at present indulging in illicit felling of forest areas.
- (v) Forestry needs financial and mass support for increasing production.
- (vi) Dependence of tribal development on forestry.
- (vii) Rights, concessions and privileges of tribals in forest areas.
- (viii) Areas of conflict between forest officials and tribals and how to resolve them.
- (ix) Labour legislation.
- (x) Need for and methods of involvement of local people in various decision-making processes of the forest departments.
- (xi) Employment of local tribal people in various skilled and unskilled jobs of the forest department ; the need for upgrading their skills for meeting departmental requirements.

ANNEXURE XIII

SYLLABUS FOR TRAINING PEOPLE OF VOLUNTARY ORGANISATIONS

Course Contents

1. Forests, Wildlife and Tribals.
 - (a) Rights, concessions and privileges of local tribals in forest areas.
 - (b) Areas of conflict between forest officials and tribals.
 - (c) Various forms of exploitation of tribals, particularly by contractors and middlemen.
 - (d) Labour legislation.
 - (e) Need for and methods of involvement of local people in forestry programmes.
 - (f) Wildlife and tribals.
2. Forests and environment.
3. Role of forests in national development.
4. Role of forests in rural development.
5. Forest based cottage & village industries.
6. Social forestry and agro-forestry for increasing production.
7. Minor forest products, their collection, processing and marketing.
8. Individual beneficiary programmes in forestry sector.
9. Shifting cultivation and development of forest villages.
10. Integrated land-use pattern.
11. Supplemental role of forestry in agriculture, animal husbandry and dairy development programmes.
12. Project formulation, implementation and evaluation techniques in forestry sector.

ANNEXURE XIV

SYLLABUS FOR TRAINING OF LOCAL TRIBALS THROUGH FORESTRY CAMPS (VANASHIVER)

Course Contents

1. Beneficiary programmes in forestry.
2. Agro-forestry for increasing productivity.
3. Forest based cottage industries.
4. Rights and concessions of tribals in forest areas.
5. Minor Forest Produce, their collection, storage, processing and marketing.
6. Areas of conflict between forests and tribals and how they can be overcome.
7. Peoples' involvement and participation in decision-making processes about forest activities and enforcement of forest laws.
8. Social forestry and community lands.
9. Employment of local people, need for upgrading skills.
10. Development of grazing pastures and waste-lands.

ANNEXURE XV

SYLLABUS FOR TRAINING IN SOCIAL FORESTRY

Course Contents

1. *Social Forestry*—Introduction-definition, scope, history and (SCFI) necessity, special significance in the context of energy and small timber requirements of India, environmental pollution and recreation ; place of Social Forestry in the National Forest Policy of India. Psychology of change, behavioural sciences etc. Gandhian concept.
2. *Tribals and Social Forestry*—Definition of tribe, caste, kin, taboo, totemism, races etc. Demography of tribals in India, their ethos, beliefs, customs, social and political organisations. Constitutional provisions to safeguard their interest, forest policy and tribals, forest in the tribal economy, forest labour co-operative societies, tribal development projects of forest departments in various States, special beneficiary schemes in social forestry sector.
3. *Farm Forestry*—Its need and scope on and around agricultural lands, role in rural economy and its effect on agricultural practices ; establishments of farm forests, choice of species, planting techniques, maintenance, organisation of the programme, role of the forest department, protection.
4. *Extention Forestry*—Objectives and scope *vis-a-vis* Farm Forestry ; raising of trees for fodder, timber, firewood, creation of pasture lands ; avenue plantation, canal bank plantations, plantations along railway lines ; choice of species, techniques, maintenance, extension approach, organisation of the programme, role of the forest department, protection.
5. *Recreation Forestry*—Needs of the urban population, scope of its application in forests, city forests and concept of integrated town planning and forestry ; creation of forest parks in natural forests close to urban centres. Improvement of slum areas by planting suitable trees.
6. *Wind-breaks, Shelter-belts and Catchment Forests*—Scope of creation of wind-breaks, shelterbelts ; choice of species, techniques, maintenance, scope in the catchment forest of water-works etc. ; protection.
7. *Organisation, Legislation & Publicity*—Extension, organisation, training and demonstration, public participation and public need for a defined policy, suitable legislation to support the programme. Obtaining people's co-operation.
8. Various projects running in States with regard to Social Forestry : their salient features, availability of land, financial involvements and returns. Impact of these projects.
9. Writing a project with a view to bring villagers above the poverty line, keeping in view :—
 - (a) unit of operation.
 - (b) availability of land.
 - (c) unit of administration, staff.
 - (d) returns thereof.
 - (e) financial viability.
 - (f) long-term impact.
10. Visit to certain States e.g. Gujarat, Madhya Pradesh and Uttar Pradesh to study the social forestry schemes and to evaluate their success etc.
11. Special schemes like Tassar cultivation, Babool-gum tapping, Bidi leaf, minor forest products (Mahua, Kanji, Neem etc.), their potentialities and financial returns.
12. Generation of employment in various plantation works and the extent of income generated directly from the sale of the forest produce and also in terms of wages earned by the workers.
13. Institutional and organisational support for implementation, training, research and education. The role of the World Bank and other international assistance.

ANNEXURE XVI

No. 12023/9/80/TDB

GOVERNMENT OF INDIA
(BHARAT SARKAR)
MINISTRY OF HOME AFFAIRS
(GRIH MANTRALAYA)

New Delhi, the 5th December 1982

OFFICE MEMORANDUM

SUBJECT : *Forest Education—Preparation of syllabi and course contents—Constitution of Committee therefor.*

The working group on Tribal Development during Sixth Plan (1980—85) in their report have recommended--

- (i) Since forests occupy a central position in tribal economy, advancement of tribal economy and forest economy should be two co-equal goals.
- (ii) Raising productivity levels in the field of forestry by adopting beneficiary—oriented programmes to enable a targetted number of families to cross the poverty line.

Besides, it has been represented off and on that the hiatus in perception between foresters on the one hand and tribals on the other, needs to be bridged. There has also to be concordance between tribal development and forest policies and programmes

2. These goals can be achieved if foresters responsible for formulation and execution of tribal policies and programmes have the right background and orientation. To examine this matter, it has been decided to constitute a committee with following composition :—

- (i) Shri K.M. Tiwari
President, FRI and Colleges,
DEHRADUN. Chairman
- (ii) Shri K. Chandrasekharan,
Special Relief Commissioner,
Orissa, CUTTACK. Member
- (iii) Shri, K.B. Saxena,
Secretary, Personnel Department,
Govt. of Bihar,
PATNA. Member
- (iv) Shri S.A. Shah, IFS (Rtd.),
Adviser,
Gujarat State Forest Development Corporation Ltd., VADODARA Member
- (v) Shri D.K. Zeliang,
Chief Conservator of Forests.
Nagaland,
KOHIMA. Member
- (vi) Shri D.K. Ganguly,
DIG (Forestry),
Ministry of Agriculture & Co-operation,
NEW DELHI. Member

- (vii) Shri M.B. Peter,
Chief Conservator of Forests,
Madhya Pradesh, BHOPAL. Member
(Now Member, State Public Service Commission, M.P., Indore)
- (viii) Dr. T.B. Naik,
Director, Tribal Research & Training Institute,
Gujarat Vidyapith,
AHMEDABAD. Member
- (ix) Shri D.N. Tewari,
Director, Tribal Development,
Ministry of Home Affairs,
NEW DELHI. Member-Secretary

3. Broadly speaking, the committee will deliberate on syllabi and course contents of forest education with particular reference to tribal life and economy, More specifically, the committee will be required to make recommendations in regard to :—

- (i) The syllabi and course contents for Forest Guards, Forest Rangers and other officers receiving training in the State Training Institutes, Forest Research Institutes and other Colleges in the context of tribal development.
- (ii) Introduction of forest education in schools and colleges with special reference to tribal life, culture and economy.
- (iii) Establishment of forest education faculty in Colleges, FRI and Universities.

4. The committee may hold its meetings and visit areas as it may consider necessary. Its report should be submitted within six months of its constitution.

(B.L. GUPTA)

Deputy Secretary to the Govt. of India