

CONTENTS

	Pages.
SUMMARY OF RECOMMENDATIONS	1—7
SECTION I — Introduction	9—12
SECTION II — Review of Present Position	13—17
SECTION III — Farm Forestry	19—23
SECTION IV — Extension Forestry	25—36
SECTION V — Reforestation in Degraded Forests	37—40
SECTION VI — Recreation Forestry	41—43
SECTION VII — Organisation	45—47
SECTION VIII — Research	49—50
SECTION IX — Financial Outlay	51—53
SECTION X — Acknowledgements	55

APPENDICES

I	— Composition of the Study Group on Farm Forestry, etc.	57
II-A	— Questionnaire on protection of trees standing on waste lands, Panchayat lands, village commons Gochar lands, tree groves etc. (outside forest areas within the Forest Departments).	59
II-B	— Questionnaire on ownership of trees standing/planted on public/private lands	60
II-C	— Information regarding waste lands	61
II-D	— Forest area under regular cultivation excluding shifting cultivation.	62
II-E	— Roadside Plantations.	63
III	— Illustrative list of trees suitable for raising on farm lands.	65—68

SUMMARY OF RECOMMENDATIONS

FARM FORESTRY

1. Farm forestry should be so organised that a substantial programme of planting of trees on bunds and boundaries of the fields of the farmers is taken up by the farmers themselves. Conditions differ from State to State. It is, therefore, necessary to choose the tree species for farm forestry with great care, taking into account the acceptability of the farmers in the local area. (Paragraph 3.10)

2. The agency entrusted with the implementation of the programme of farm forestry should take the responsibility for disposing of the produce collectively, after fixing up an up-set price in consultation with the individual farmers and the Panchayat, and then distributing the sale proceeds to the farmers in proportion to the quantity sold and up-set price fixed. (Paragraph 3.11)

3. A pilot scheme for development of farm forestry should be taken up in 100 selected districts in the country during the Fifth Plan period in the Central sector. Out of these 100 districts, 60 should be in areas with advanced agriculture where fuel and timber are scarce, and 40 should be in the dry and arid zones. In each year of the Plan, 20 districts may be taken up under the Scheme. (Paragraph 3.12)

4. The Forest Departments should organise extension units in the districts to propagate directly and through the agricultural extension staff the advantages of the programme and the methods of tree plantation. The forest extension units should also develop the nurseries from which seedlings would be supplied to the farmers at nominal price. (Paragraph 3.14)

EXTENSION FORESTRY

Mixed Forestry on waste lands, Panchayat lands and village commons:

5. Drought prone areas constitute a problem of immense magnitude for the concerned State Governments as well as the Government of India. Wherever irrigation facilities do not exist in drought prone areas, the approach to the solution of

the problem should include adoption of such land-use patterns as would essentially result in reducing the area of arable cropping and increasing the area under permanent vegetation.
(Paragraph 4.3)

6. With a view to preparing a land-use plan based on a village or a group of villages as a unit, a survey of waste land and village Panchayat lands including lands on the sides of village ponds and around community wells outside the villages, restricted in extent to that proposed to be tackled during the Fifth Five Year Plan period, should be organised in areas where the occurrence of waste lands is sufficiently high. A minimum area of 20 hectares should be available in a compact block for development of mixed forestry, comprising of raising of grass and leaf fodder, fruit trees and fuelwood trees.
(Paragraph 4.12)

7. Development of fodder and grass should be made an important component of mixed forestry to be taken up with optimum input and technology. Where feasible, waste lands should also be brought under fruit trees for shade, beauty and usufructs. The embankments of ponds, which are Panchayat property as in Haryana and Punjab, should be planted with grass and trees, specially fruit trees, as a part of mixed forestry programme which incidentally will also arrest erosion of embankments during the rains. Scientific methods, such as selection of the most suitable grass or fodder species, application of fertiliser, adoption of protection measures, tractor ploughing and scientific practice of harvesting should be adopted in the cultivation of fodder and grass.
(Paragraph 4.13)

8. The strategy of grass and fodder development as a part of mixed forestry should be to identify the native grasses with the help of the local people and for this, studies have to be made on techniques etc. for improving their productivity and growing them in conjunction with other suitable legumes. The programme of seed production and distribution should be properly organised involving the local farmers in production of seeds of recommended native grasses for rainfed areas. The seeds produced by the farmers should be purchased at reasonable rates for processing and distribution by well-organised agencies as recommended by us in the Interim Report on Seeds. The organisation of the Forest Departments which would take up programme of mixed forestry should have agrostologists in the concerned forest divisions, as well as in their research organisations.
(Paragraph 4.16)

9. Income from mixed forestry should be divided equally between the Panchayats and the State Governments. In addition, in the disposal of the produce from these forests, there should be an element of preferential treatment, including price preference, to the villagers. (Paragraph 4.17)

10. Suitable legislation should be enacted by the States as a preliminary to undertaking the programme of mixed forestry herein recommended. (Paragraph 4.18)

11. During the Fifth Plan, the programme of mixed forestry on waste lands, Panchayat lands, etc. should cover an area of one lakh hectares in the form of pilot projects in the Central sector. The funds may be distributed in proportion to the population of the States, provided that adequate waste lands are available and demand for fuelwood and small timber exists in the nearby areas. (Paragraph 4.19)

Shelter-Belts

12. Where establishment of shelter-belts is an immediate necessity, the Government should draw up the plans for their creation, acquire the necessary land and hand it over to the Forest Department for planting and maintenance operations. A coordinating agency should also be created with experts from Agriculture and Forest Departments in the State Government. (Paragraph 4.24)

13. At the same time, it is imperative that research should be carried out on priority basis by the concerned institutions to determine the regions where shelter-belts should be planted, their effect on the hydrology and crop yield, and on their composition, management and related aspects. (Paragraph 4.25)

14. There should be an element of subsidy that has to be built into the shelter-belts programme during the first fifteen to twenty years. But the subsidy should be shared between the Central and State Governments as this programme would help to increase the agricultural production. (Paragraph 4.26)

15. The shelter-belts programme for the Fifth Five Year Plan should be of the order of one lakh hectares distributed amongst the States of Haryana, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Mysore, Gujarat and Maharashtra, with 50 per cent Central assistance. (Paragraph 4.27)

Planting on lands on the sides of roads, canal-banks and railway lines :

16. All the States should follow the pattern of Uttar Pradesh, Punjab, Haryana, etc. in organising tree planting on the lands on the sides of roads and canal-banks. (Paragraph 4.28)

17. Forest Department should also take up, for planned afforestation, lands along the railway lines with the concurrence of the Railway authorities and under such conditions that they might prescribe for reasons of safety. For this purpose, either the Railways may be approached for handing over lands on the sides of railway lines for afforestation on suitable conditions, as is the practice in Haryana at present, or the Railways themselves may take up the plantations from their own resources. In the latter case, the Railways may get the forestry staff on deputation from the cadre of the concerned States.

(Paragraph 4.29)

18. The activity of raising plantations on lands on the sides of roads, canal-banks and railway lines should be treated as a commercial investment to be made by the States from their own resources or by loans from institutional financing agencies. The annual target of planting should not be less than 8,000 km. There should be an average of 6 rows, one row of shade trees and two rows of fuelwood trees on either side, at an estimated cost of Rs. 2,500 per km.

(Paragraphs 4.31 & 4.32)

REFORESTATION IN DEGRADED FORESTS

19. To begin with, the selection of degraded forests for reforestation, should be integrated with the proposed survey of waste lands. There must be sufficient extent of degraded forests which can be earmarked within a reasonable distance of rural and semi-urban complex, with which such forests are to be linked up for supply of fuelwood and small timber, without substantially upsetting the rights of user in the villages in the area.

(Paragraph 5.3)

20. Supply of fuelwood and small timber for agricultural implements including ploughs at fair rates in the rural and semi-urban areas is a necessary part of the programme of reforestation in degraded forests. We, therefore, suggest that whatever subsidy is to be built in during the first fifteen to twenty years should be borne by the State Governments in order to build up resources near the rural and semi-urban areas.

(Paragraph 5.7)

21. Each State should work out in detail its programme of action and then estimate what would be the loss it might have to bear on the supply of fuel and small timber, particularly for agricultural implements. If the areas of consumption are suitably selected and the sources of supply are also located nearby, the transaction should not lead to much of a loss. (Paragraph 5.8)

22. During the Fifth Five Year Plan period, reforestation with 50 per cent Central assistance should be taken up on at least 3 lakh hectares of degraded forests in the country. This area should be divided suitably amongst the States in proportion to their forest areas, with special weightage to States which have large degraded areas and less of forest resources. (Paragraph 5.9)

23. Even if agri-silviculture may not lead to much of a profit, the Forest Departments should encourage this practice at the sites reforested, wherever favourable conditions exist, so that employment can be given to as many landless labourers as possible. (Paragraph 5.10)

RECREATION FORESTRY

24. Each State Government should make a study of the problem of the recreational needs of the urban areas, and dedicate some forests or establish tree groves near such areas for recreational purposes. Green belts around towns and cities, where necessary, should also be created. (Paragraph 6.4)

25. A sum of Rs. 10 crores should be provided during the Fifth Plan period in the State sector for developing recreation facilities of the type which we have indicated. Each State may select the towns and cities and the sites to be taken up under the programme and formulate its own project. (Paragraph 6.6)

ORGANISATION

26. Suitable forestry extension organisations should be created at the Centre as well as in the States, and entrusted with the responsibility for implementation of the programmes of social forestry. (Paragraph 7.3)

27. Training in extension methodology and technology should be imparted to selected officers engaged or to be engaged in implementing the programme, at various Agricultural Universities and Research Institutes where a Department of Extension exists or by starting an Extension Branch at the Forest

Research Institute and Colleges, Dehra Dun. Moreover, the Agricultural Universities should include in their syllabi a course in social forestry for the agricultural graduates.

(Paragraph 7.4)

28. The strategy for popularising social forestry should include the establishment of a large number of field demonstrations. A beginning with such demonstrations should be made in State farms, agricultural demonstration farms, soil conservation demonstration centres, etc. The active participation of the three basic village institutions namely, local Panchayat, cooperatives and village school staff should be secured in these demonstrations.

(Paragraph 7.5)

29. To begin with, District Extension Officers of the rank of Deputy or Assistant Conservator of Forests should be responsible for the implementation of the social forestry programme in districts, assisted by Range Forest Officers from Forest Departments, and Field Assistants recruited from local people of the area to secure involvement of villagers.

(Paragraph 7.6)

30. All social forestry programmes should be executed by engaging local labour and no contract system should be introduced.

(Paragraph 7.7)

RESEARCH

31. Priority should be accorded to the programme of research in social forestry by creating special cells or by expanding the existing facilities at various Research Institutes concerned, viz. Forest Research Institute and its Centres, Central Arid Zone Research Institute, Agricultural Universities and similar research centres in the States.

(Paragraph 8.2)

32. There is only scattered and scanty information available at present about the technical aspects of the various programmes of social forestry indicated. But much of it has not come as a result of systematic research work undertaken in various agro-climatic regions. Research should be systematically done, so that future planners would have the benefit of results for better guidance. While some of the research might be basic, most of it would be applied in character.

(Paragraph 8.3)

FINANCIAL OUTLAY

33. It is estimated that for the period of five years of the Fifth Plan, Rs. 77 crores will be required to implement the

programmes recommended, including the expenditure on the extension organisation, but excluding that on research and preliminary survey to select suitable areas. The share of the Central Government would be Rs. 34.50 crores. The State's share includes institutional finance as can be mobilized by the State Governments for planting on the sides of roads, canal-banks and railway lines. Including research and survey the total expenditure during the Fifth Plan period is likely to be Rs. 80 crores. (Paragraphs 9.2 & 9.3)

SECTION I

INTRODUCTION

1.1 The Terms of Reference given to the National Commission on Agriculture include "Development of Forestry including farm forestry as a factor in agricultural progress and as a source of raw material for industry, exports as well as for sustaining ecological balance in nature and for providing employment opportunities to large sections of tribal and other population living in these areas". In its Interim Report on Production Forestry—Man-made Forests, the Commission dealt with development of forests mainly as a source of raw material for industry. We had stated therein that we shall deal with the subject of Social Forestry and the method of financing the same in a separate Report.

1.2 In the past, farm forestry was adopted as a means of creating new wood resources and replacement of wood harvests in farm lands, community lands, etc. In the Glossary of Technical Terms* farm forestry is defined as "the practice of forestry in all its aspects on farms or village lands, generally integrated with other farm operations". However, what was actually practised might possibly be better termed as extension forestry (with farm forestry as its integral part). It included the activity of raising trees on farm lands, village waste lands and community forest areas and on lands along the sides of roads, canal-banks and railway lines. But farm forestry (or extension forestry) has not made any uniform progress in all the States. Even where it did, the practice did not stem entirely from the concept of procuring from the forests or tree lands a flow of physical benefits and social values.

Why Social Forestry?

1.3 Farm forestry (or extension forestry) aimed at production of fuelwood and small timber only to some extent. But beyond that also there are many other needs in the rural sector—provision of grazing, supply of grasses and fodder, thorns for fencing, protection of agricultural lands against wind. Then

*Indian Forest Records, New Series, Silviculture, Vol. 10, No. 6—Forest Research Institute, Dehra Dun, 1960.

there is the need for recreation for the urban people. All these should be considered as social demands on forests and farm forestry (or extension forestry) as at present practised is not adequate to meet these demands.

1.4 The bulk of the rural population of the country has been getting their requirements of fuelwood and small timber for agricultural implements and rural housing partly from the tree growth on farm and community lands and partly from protected and reserved forests. The demand has been rising continuously with the increase in population. Adequate steps have not been taken to augment the resources through suitable programmes to meet these increasing demands. The present position is that much of the tree growth on farm lands has already been cut down without replacement, and community lands in most cases are bereft of their vegetal cover resulting in severe erosion.

1.5 In so far as reserved and protected forests in the vicinity of habitations are concerned, they are burdened with rights and privileges for supply of fuelwood, small timber, etc. to the villagers. There is reason to believe that, under the guise of these rights and privileges, there is quite a lot of clandestine removal of timber and fuelwood which is marketed in urban and semi-urban areas nearby. The pressure on such forests is progressively increasing with the consequences that the existing valuable forest growth is being depleted. But providing fuelwood and small timber to the neighbouring areas from the forests under the control of the Forest Departments should be considered as a service to the population. Accordingly, a part of the existing forests under the Forest Departments would also have to be so managed as to realise the objectives of social forestry. If steps are taken to provide for increasing supplies by organising new plantations of quick growing species under good management practices, such clandestine removal of produce from the reserved and protected forests can substantially be contained and these forests may be primarily and profitably managed for supply of timber and other raw materials for industries.

1.6 Few programmes can, therefore, have greater socio-economic impact on the rural community as well as on management of forest resources than those relating to raising of trees, grasses and fodder in the farmers' own lands, village commons, waste lands and degraded forests close to habitations. They provide the requirements of fuelwood, fodder, small timber

for rural housing and agricultural implements, thorns for fencing etc. At the same time, they remove a serious impediment in the practice of production forestry.

1.7 But the magnitude of the efforts needed cannot, however, be firmly stated, in view of lack of basic data regarding the needs of the forest produce in the rural areas and recreational needs of the urban areas. Only with regard to fuelwood some specific demand projections are available. The Fuel Policy Committee of the Ministry of Steel & Mines in their Report on "Fuel Policy for the Seventies" concluded, on the basis of the Study by the Energy Survey Committee in 1965 and the National Sample Survey (18th Round) conducted during 1963-64, that fuelwood would continue in the Seventies to be the main source of non-commercial fuels in the rural areas. There were other studies by the NCAER, Planning Commission etc. After considering all these, the Commission estimated that the requirements of fuelwood for 1980 and 1990 both from forest and non-forest sources would amount to 256 million m³ and 300 million m³ respectively.

✓ 1.8 Most of the studies show that about 60-65 million tonnes of dry dung (amounting to about 25 million tonnes coal replacement) are used as domestic fuel annually. With a wetness ratio of 5 : 1, this means about 300-325 million tonnes of wet dung. One Study* indicates that about 400 million tonnes of wet dung are used as domestic fuel annually. The burning of dung cakes as fuel is equivalent to destroying annually as much fertilisers as more than eight Sindri Fertilizer Plants can produce at present. In this context, the use of cow dung as a source of non-commercial fuel is virtually a crime. Supply of fuelwood would, therefore, release cow dung for its use as manure.

1.9 Fuelwood is used as non-commercial fuel by a large section of the population particularly those in the lower income categories. Adequate supplies of this commodity at reasonable prices have, therefore, to be ensured. If the production policy is not immediately oriented towards increasing availability, the large demand envisaged in the near future will push the prices up resulting in an adverse effect on the economy of the population with low income. Moreover, if cow dung has to be saved for manuring, plentiful availability of fuelwood at reasonable prices will be essential. For all these reasons, a

*Chhedi Lal—"Conservation of Cowdung and Problem of Fuel in Rural Areas—Agriculture and Coal Industry", Coal Utilisation Council, New Delhi, 1970, page 44.

planned programme of production and supply of fuelwood is imperative.

1.10 The objectives of social forestry would, therefore, be:

- (i) fuelwood supply to the rural areas and replacement of cow dung;
- (ii) small timber supply;
- (iii) fodder supply;
- (iv) protection of agricultural fields against wind; and
- (v) recreational needs.

All these are basic and economic needs of the community, aimed at bettering the conditions of living. Hence any application of the technology to achieve this is a social activity. Improvement of incomes of the rural people would not be enough by itself to ensure supply of a minimum quantum of essential goods. A national effort is needed for production and for meeting their minimum needs for fuelwood, rural housing, etc. 'Social Forestry', as conceived now, will, therefore, bring greater objectivity to this national effort.

1.11 Considering its importance, the Commission constituted a Study Group to examine in depth various issues relating to social forestry (with farm forestry as an integral part). The composition of the Study Group is given in Appendix I. The members of the Study Group had discussions with various Government officials, individuals and organisations. The Commission also issued questionnaire and proformae to State Governments and concerned organisations, in order to elicit the relevant information on different aspects of social forestry. These are reproduced in Appendices II-A to II-E. In formulating its recommendations, the Commission has taken into account the suggestions made by the States, individuals and different organisations and the Study Group. In this Report, the Commission has indicated the strategy and programme designed to give a boost to social forestry and to meet the country's growing requirements of fuel, small timber, fodder and grass, and recreation.

SECTION II

REVIEW OF PRESENT POSITION

2.1 Vanamahotsav, an annual festival of trees, was inaugurated in 1950 with the hope that it would create tree-consciousness among the people. It was supposed to represent the means of putting the idea of 'tree lands' into practice through the cooperation between the Forest Department and the public, the former working more or less as catalyst besides giving technical guidance. The planting of trees during Vanamahotsav was to serve the following objectives:—

- (i) To provide fuel, and thus to release cowdung for use as manure;
- (ii) to increase production of fruits, and thus add to the potential food resources of the country;
- (iii) to help creation of shelter-belts around agricultural fields, to increase their productivity;
- (iv) to help conservation of soil and stop further deterioration of soil fertility;
- (v) to provide fodder leaves for cattle, and thus to relieve intensity of grazing over reserved forests;
- (vi) to provide shade and ornamental trees for the landscape;
- (vii) to provide small poles and timber for agricultural implements, house construction and fencing;
- (viii) to inculcate tree-consciousness, and love of trees amongst the people; and finally
- (ix) to popularise the planting and tending of trees in farms, villages, municipal and public lands for their aesthetic, economic and protective value.

The objectives of Vanamahotsav are basically sound. But somehow or other, it has not generated the enthusiasm and the tree-consciousness amongst the people that it was intended to. On the contrary, a situation has developed in which it is being looked upon as a mere annual ritual observed mainly by the Government without any regard to the prevailing essential conditions, such as onset of monsoons, etc.

2.2 The National Forest Policy of 1952 envisaged a concerted effort on the part of various Governmental and other agencies towards planned afforestation with a view to enlargement of tree lands outside the regular forests. It was hoped that the "Defence, Railways, Public Works Department, Universities and Colleges, Boards, Municipalities and other local authorities, associations and institutions could lend a helping hand by converting the lands at their disposal into tree lands". It was indicated that "a systematic programme of extending existing tree lands and establishing new ones should be framed by the Governments concerned".

2.3 Under the Policy, "it should be the duty of the Forest Departments concerned—(a) to awaken the interest of the authorities within their region in the development, extension and establishment of tree lands, (b) to draw up plans for such purposes bearing in mind the need for species of commercial importance, (c) to establish nurseries and seed stores in each area for the supply of saplings, plants and seeds, (d) to supervise the planting of trees, and render such technical assistance as may be necessary for the development of tree lands, and (e) to arouse tree-consciousness among the people through publicity by celebrating the Vanamahotsav and by encouraging the *Vana Premi Sangh*." But neither in the First nor in the Second Five Year Plan was any concerted effort made to establish such tree lands under a systematic programme.

2.4 In order to meet the shortage of fuelwood in the country, a scheme for farm forestry-cum-fuelwood plantations was formulated as a part of the Third Five Year Plan for which a provision of Rs. 363 lakhs was made in the State sector. Under this scheme, it was proposed to raise fuelwood trees on village commons, boundaries of fields, on lands on the sides of roads, canal-banks, railway lines, as also on other available sites with the active cooperation of the villagers. But the programme of farm forestry-cum-fuelwood plantation as envisaged did not make much headway. The situation has not improved during the Fourth Five Year Plan.

2.5 The Farm Forestry Symposium held in 1958 under the joint auspices of the Indian Council of Agricultural Research and the Forest Research Institute, Dehra Dun, recommended scientific management of waste lands on the basis of integrated land use plan comprising forestry, raising of grass and quick yielding fruit trees like ber (*Zizyphus* spp.) Mango, segwa (drumstick) (*Moringa Oleifera*) etc., depending upon the land capability. It further recommended that farm forestry

should be popularised through extension approach by educating the farmers in the basic principles of land use practices, in which trees play a significant role.

2.6 To interest the farmers in farm forestry has been a difficult task. An average Indian farmer is a hard realist with a high degree of practical sense as demonstrated by his switching over to modern agriculture. In the field of forestry too, instances are known e.g. in Punjab, Haryana, Gujarat, Mysore and Tamil Nadu where trees are raised successfully by individual efforts without any Government assistance whatsoever except sometimes by way of supply of seedlings. The reason for the favourable attitude of the farmers in these areas appears to be the quick returns from tree planting. In Tamil Nadu and Mysore, *Casuarina* and *Pongamia pinnata* plantations are raised on farms, where, on account of the poor nature of the soil, arable cropping is not an attractive proposition. In Gujarat, grafting of ber (*Zizyphus* spp) is done because the farmers get a revenue of at least five to six rupees per tree per annum. Similar is the case in respect of segwa (drumstick) (*Moringa oleifera*). But the practice of farm forestry has not spread uniformly in all the States.

2.7. In the matter of funding, the Third Five Year Plan envisaged a grant of Rs. 25 per acre (Rs. 62.50 per hectare), to be shared equally between the Central and State Governments, for the scheme of farm forestry-cum-fuelwood plantations. The stipulation was that the Panchayat Samities would take up the programme, with assistance from Forest Departments in the shape of assured supplies of seeds and seedlings in each area. In the Annual Plans that followed, the same pattern of subsidy was maintained, except that in the last year of the Annual Plans, i.e. in 1968-69, earmarked subsidy by the Central Government was raised substantially. Two individual projects were recognised:

- (i) extension forestry, where the State Forest Departments would raise plantations on waste lands contiguous to Government forest areas handed over to them by the Revenue Department, Panchayats, or on lands on the sides of roads and canal-banks. For this, the Central subsidy was 50%, subject to a maximum of Rs. 500 per hectare; and
- (ii) village plantations on the farmers own holdings, village commons, banks and bunds of tanks etc. Central assistance was to the extent of Rs. 200 per hectare,

but preferably in kind like supply of seedlings and fencing materials.

In the Fourth Plan, the farm forestry-cum-fuelwood plantations continued in the State sector, but there was no separate quantum of Central assistance earmarked for this programme.

2.8 The actual cost of implementation of farm forestry (or extension forestry) was found to be very much more than the ceiling adopted in the pattern of assistance indicated in the previous paragraph. The balance of funds had, therefore, to come either from the State budget or through investment by the individual farmer or Panchayat. In the States, forestry did not receive adequate priority in the allocation of funds, and hence the efforts made by the States did not result in reaching the targets set. In most parts of the country, the farmers also did not and could not make any investment.

2.9 There were other difficulties standing in the way of wide-spread acceptance of the idea of farm forestry (or extension forestry). These were neither properly appreciated, nor any concerted action taken to remove the difficulties. The local population is apt to look with suspicion at any programme which seeks to keep them back from any area, from which they were deriving some privilege. In the past, unfortunately, the primary beneficiaries among the local population have not been associated either with the formulation or with the implementation of this programme, meant to be of interest and benefit to them, resulting in their indifferent and at times hostile attitude. For instance, since grass is in short supply in all the rural areas, the integration of grass land development with forestry may be important for the rural community, in view of its quick benefit from the second year, if not from the first year. But in so far as village commons, waste lands and Panchayat lands are concerned, the Forest Departments have not made the approach on the basis of mixed forestry, comprising raising of grass and leaf fodder, fruit trees and quick growing fuelwood trees. Under the circumstance, willing cooperation of the local people may not have been readily available in the protection of plantations on village commons etc.

2.10 A review of the past performance and experience in respect of farm forestry (or extension forestry) as practised hitherto indicates that attempts were made to implement the programme through various agencies and by providing various rates of subsidies. But by and large, it has failed to carry the

message of trees to the public. The absence of people's interest and involvement, generally low rates of subsidies, absence of well-defined and suitably equipped agency to implement the scheme, injudicious selection of areas and species for farm forestry and disregard of the views and the convenience of the nearby villagers have been mainly the factors responsible for poor performance in the past. The relatively long gestation period involving continuous attention in raising trees fails to enthuse the people without whose whole-hearted cooperation, farm forestry can never succeed. The absence of quick results is a factor which deters even the enlightened amongst the farmers and the Panchayats alike.

Scope

2.11 The social aspects of forestry have wider implications, and in order to cover all the varied activities in a comprehensive manner, the scope of the social forestry programmes should include the following:—

A. Farm Forestry

- (a) Raising rows of trees on the bunds or boundaries of fields and the individual trees in private agricultural lands;
- (b) wind-breaks.

B. Extension Forestry

- (a) Mixed forestry, comprising raising of grass and leaf fodder, fruit trees and fuelwood trees on suitable waste lands, Panchayat lands and village commons;
- (b) Shelter-belts;
- (c) Raising of plantations of different quick-growing species on lands on sides of roads, canal-banks and railway lines.

C. Reforestation in degraded forests.

D. Recreation forestry.

These aspects are critically examined in subsequent Sections of this Report and suitable recommendations made. Organisational, research and financial aspects have also been dealt with in subsequent Sections.

significantly to the advances in agricultural research. There is need for continued international cooperation and collaboration. This could be effectively organised through the Central Research Institutes and the agricultural universities.

3.8 We recommend that the ICAR should evolve a system whereby continued international cooperation and collaboration between agricultural scientists of India and abroad becomes possible on a regular basis.

SECTION III

FARM FORESTRY

3.1 At present, about half the land area has come under man-controlled agro-ecosystems for the production of food-grains and commercial crops. The monoculture of short duration crops in extensive areas has reduced the diversity of ecosystems and simplified food chains resulting in the elimination of natural enemies of insects and other pests and creation of ideal conditions for their multiplication.

3.2 Dr. A. S. Atwal, Dean and Dr. S. S. Bains, Storage Entomologist, College of Agriculture, Punjab Agricultural University, Ludhiana, observed in their paper read in the Symposium on "Man-made forests in India" held in Dehradun in June, 1972: "Although the original balance of nature cannot be restored immediately, it is necessary to rehabilitate as far as possible the relationship between soil, vegetation and animal life. Efforts should, therefore, be directed towards preserving these diverse biotic complexes. The fact that crop monocultures are often severely damaged by pests where the diverse climax vegetation is harmed very little has led to the assumption that maximum diversity is desirable in the agricultural land." Such diversity can be achieved by creating blocks of forests if possible, interspersed with cultivation, or by introducing trees in larger numbers in the ecosystem after careful selection.

3.3 In India, farmers' holdings are small. So it is most unlikely that a farmer would like to reserve any areas out of his small holding for growing trees only, except in certain coastal areas where, on sandy soil, *Casuarina* plantation has been more profitable than any other agricultural crop. Experiences in Mysore, Tamil Nadu and other coastal States point to the success of *Casuarina* as an economic crop, because of good urban markets for fuel nearby. In Rajasthan, almost every plot of agricultural land has khejri (*Prosopis cineraria*) trees. The value of land goes up in proportion to the number of trees the plot has. It has been observed that this tree does not have any harmful effects on arable crops. Large scale plantations on farm lands by farmers are unknown. Tree planting in farms, therefore, has to be practised by

growing trees on the bunds and boundaries of the fields of the farmers. Unfortunately, the benefit of growing trees on arable lands are not fully appreciated. The farmer feels that birds will settle on the trees and harm his crops. It is also feared that there will be shading effect by the tree canopy on the agricultural crop and the roots of the trees will be competing with the agricultural crop for nutrition in the field itself. By properly choosing the tree species and adjusting the agricultural practices, it should be possible to reduce all these hazards.

3.4 Birds have both a beneficial effect and a harmful effect on crops. Ornithologists are of the view that the trees on the field harbour more of the useful birds than of the harmful ones. The birds are useful in dealing with pests that destroy crops.

3.5 The shading effect can be offset by selecting trees which have a thin narrow crown. Trees with attenuated foliage like babul (*Acacia arabica*) do not have much of shading effect. Further, if trees whose foliage is used as fodder for cattle and sheep are planted, the annual harvesting of the foliage will generally leave the canopy small and reduce shade effect. An illustrative list of trees available for raising on farm lands is given in Appendix III.

3.6 The sapping effect can be looked after by selecting species which have deep roots or for shallow-rooted ones, by cutting a trench parallel to the bunds on field boundaries, to a depth of 0.5 m to 1 m. Thereby the surface roots, which may draw sustenance from the upper layers (say 60 cms) of the soil, are eliminated. Agricultural crops rarely draw sustenance below this level. Further, in areas where heavy fertilisers are applied in wet cultivation, a lot of nitrogen is leached down and is not available to the agricultural crops. Trees on the bunds or boundaries of the fields will draw upon at least a part of this leached nitrogen along the field boundaries and bunds. This symbiosis is, therefore, beneficial.

3.7 In West Dinajpur (West Bengal), there is a long standing practice of the farmers planting sissou (*Dalbergia sissou*) on their field bunds. This is taken as an investment by the farmers. Long lines of these plantations can be seen from the road. In Mohindergarh District of Haryana, wherever khejri (*Prosopis cineraria*) trees have come up naturally, the farmers have left them on the field and have

also tended them carefully. Thus, in this area one can see a large number of trees which are useful both for fodder and food, and ultimately timber. In Mysore, besides planting small wood lots of *Casuarina* on dry lands, the farmers plant *Casuarina* and *Pongamia pinnata* both on dry and wet lands along the bunds of the cultivated lands. *Pongamia* is very useful, as it provides leaf manure and bears oils seeds.

3.8 In dry and arid areas, tree-planting on bunds and boundaries of fields will also serve as wind-breaks, provided such plantings are fairly extensive in the region. Normally, even one row of planting may serve the purpose, but if the bund is wide, upto 3 rows should be raised.

3.9 Any programme of planting of trees in farms should serve the following general objectives:—

- (a) to supplement production of fuelwood and small timber to meet increasing requirements;
- (b) to release cow dung for use as manure;
- (c) to increase the production of leaf fodders; and
- (d) to create a diverse ecosystem by having trees interspersed with cultivation.

The agency entrusted with the implementation of this programme will have to keep in view the factors which contribute most to the success of this programme, such as:

- (i) farmers' willingness and capacity to invest;
- (ii) sustained effort by the organisation for the guidance of the farmers; and
- (iii) effects of tree planting in farms on agricultural productivity.

3.10 For these reasons the Commission recommends that farm forestry should be so organised that a substantial programme of planting of trees on bunds and boundaries of the fields of the farmers is taken up by the farmers themselves. Conditions differ from State to State. It is, therefore, necessary to choose the tree species for farm forestry with great care, taking into account the acceptability of the farmers in the local area.

3.11 To sustain the enthusiasm of the farmers for continued raising of trees in farm lands, it is necessary to make satis-

factory arrangement for marketing of these trees when mature. The trees planted a few years back in some of the States are now ready for harvesting. An individual farmer is unable to market these trees at competitive rates on account of the number of trees being very small and scattered. It would be necessary to come to the farmers' help. Reserve price below which no offer is generally acceptable called the up-set price should be fixed beforehand for each type of produce, before the produce is disposed off. The Commission, therefore, recommends that the agency entrusted with the implementation of the programmes of farm forestry should take the responsibility for disposing of these produce collectively, after fixing an up-set price in consultation with the individual farmers and the Panchayat, and then distributing the sale proceeds to the farmers in proportion to the quantity sold and up-set price fixed.

3.12 The Commission recommends that a pilot scheme for development of farm forestry should be taken up in 100 selected districts in the country during the Fifth Plan period in the Central sector; out of these 100 districts 60 should be in areas with advanced agriculture where fuel and timber are scarce, and 40 should be in the dry and arid zones. In each year of the Plan, 20 districts may be taken up under the scheme.

3.13 The Forest Departments may already have nurseries in the districts to be selected for the programme during the Fifth Plan Period. These should be expanded for the purpose of supply of seedlings to the farmers. Otherwise, the nurseries will have to be located suitably, one or more per district, to cover the areas of operation conveniently. The seedlings should be supplied only in polythene bags and be big enough for the chances of survival to be good. It has been suggested that seedlings should be supplied free as an incentive; but free supplies generally lead to wastage of good material. Until a price, even if it is nominal, is fixed for the goods, a farmer is apt to treat the material as not worth his bother. An illustrative list of species which could be considered for introduction, has been given in Appendix III.

3.14 The Commission, therefore, recommends that for the programme of farm forestry, the Forest Departments should organise extension units in the districts to propagate directly and through the agricultural extension staff the advantages of the programme and the methods of tree plantation. The forest extension units should also develop the nurseries from which seedlings would be supplied to the farmers at a nominal price.

3.15. It will be necessary to continue study and research on certain aspects, which will enable later to set right any drawback noticed in the programme. Some of these are:

- (a) assessment of the economics of the programme for its projection to the farmers, particularly in the case of small individual holdings;
- (b) selection of proper species, which will have no adverse effects of shade in agricultural crops;
- (c) evolution of a technology which will conserve moisture in the top soil for the agricultural crop, allowing the roots of the trees to go deep;
- (d) marketing of the produce when mature to the best advantage of the farmers;
- (e) cost reduction in nursery and plantation techniques; and
- (f) how best to provide extension service and demonstration of technology resulting from all these researches.

creation of these Chairs and the subjects chosen should depend on the identification of a suitable field of research which the university is in a position to promote and the presence of an outstanding scientist, who can build up a tradition of research in the particular research field. By creating these Professorial Chairs and providing for sufficient research grants many of our talented scientists competent to carry out fundamental research can be attracted to join the agricultural universities. While a good number of these Chairs may carry a scale of pay of Professors available in the universities, a few may be created on a higher scale and designated as Chairs of Excellence to be offered to outstanding scientists who have earned recognition in the field of fundamental research in agriculture or any discipline allied to it. These chairs may also be availed of to enable outstanding Indian scientists serving abroad to return and work in the country. It will also be useful to provide for Research Fellows, generally three to four in number, to work with each Professor in the designated subject. Adequate provision will also be necessary by way of Travelling Allowance, equipment and contingencies of recurring nature, besides non-recurring expenditure on additional facilities by way of laboratory, equipment, etc. The recurring cost is expected to be of the order of Rs. 80,000 per annum per Chair and non-recurring expenditure of the order of Rs. 50,000 per Chair. The total cost is expected to be roughly Rs. 4,50,000 per Chair over a period of five years.

5.9 Great care is necessary in the selection of the Professors for manning these Chairs. The selection should be made on an All-India basis by a Central Committee comprising two representatives of the university where the Chair is located, two representatives of the ICAR and a Chairman to be nominated by the President, ICAR. The appointment will be made by the university subject to the concurrence of the ICAR.

5.10 It is recommended that for every Plan period, the Centre and the States should inform agricultural universities of the minimum level of funding that they can expect for research from Plan funds annually. This minimum should be at a level of 80% of the possible actuals. The universities should then plan their recruitment of research personnel on a fairly long-term basis.

5.11 We recommend creation by the ICAR of 50 Professorial Chairs distributed 40 in the agricultural universities and

SECTION IV

EXTENSION FORESTRY

4.1 The extension forestry, as envisaged in this Report, will cover mixed forestry in waste lands, Panchayat lands, village commons, raising of shelter-belts in dry and arid regions, and raising of plantations of different quick growing species on lands on the sides of roads, canal-banks and railway lines.

Mixed forestry on waste lands, Panchayat lands and village commons:

4.2 There are about 43 million hectares in the categories of cultivable waste land, permanent pasture and other grazing lands, land under miscellaneous tree groves and fallows other than current fallows, distributed amongst 567,000 villages in the country. In certain regions of Madhya Pradesh and Orissa, a part of waste land is recorded as village forest in the village records and carries various rights of user by the villagers. In other areas, though there may not be specific allocation as village forests, the villagers have the rights of user on the trees standing on the community lands. Even otherwise, in the absence of an organised protective agency, such trees are being steadily pilfered away. Over the years, most of the trees in these lands have disappeared. What is left, however, is continuously pollarded and is stunted. Such areas, having lost their natural defences (trees), are exposed to destructive effects of wind and water and also pose an erosion hazard to the neighbouring agricultural land. Such areas spoil the landscape of the countryside so much so that it becomes an eyesore even to a casual tourist and visitor. These areas, therefore, need immediate attention. It is possible to bring back tree growth on such of the waste lands where forest existed in recent years. Such a measure would go a long way towards meeting a part of the fuel and small timber demand of the rural population.

4.3 Drought prone areas constitute a problem of immense magnitude for the concerned State Governments as well as the Government of India, and it is in these areas that waste lands occur to a greater extent. In the past, millions of rupees have been spent in organising relief works. However, in spite of having spent this huge amount, no lasting solution to this pro-

blem has been achieved. Timely and adequate rain is essential for the success of raising arable crops. On the contrary, the trees and grasses can benefit by untimely rainfall and thereby stabilisation of production in such areas is better assured from trees and grasses than from arable crops. It is, therefore, felt that a new approach to the whole problem is required to be adopted. Wherever irrigation facilities do not exist in drought prone areas, the approach to the solution of the problem should include adoption of such land-use pattern as would essentially result in reducing the area of arable cropping and increasing the area under permanent vegetation. Such a measure would improve the water regime, moderate climatic excesses, and reduce dependence of the local people on agriculture.

✓ 4.4 For improving agriculture in rainfed areas which constitute 3/4th of the total area under cultivation in India, and to arrest the growing gap between the income of a farmer with irrigation facilities and the one without it, the Indian Council of Agricultural Research undertook in October, 1970, a suitable programme under the Fourth Five Year Plan. As a part of the above programme, 24 Research Centres have been established to cover agro-climatic regions. These Research Centres are linked with pilot Development Projects. It would thus appear that these Research Centres and the Pilot Projects linked with them offer very favourable sites where integration of tree growing with arable cropping can be demonstrated. In this connection it may be relevant to reproduce the recommendation of the National Seminar on 'Integrated Dryland Research and Development Projects', held at New Delhi in September, 1972:

✓ "Livestock has a major role to play in building the economy of drylands. Lands not suitable for cultivation exist in many project areas and they should be used for grassland and farm forestry on a community basis to provide basis for animal husbandry and protect the critical areas".

4.5 In order to visualise the problem connected with the utilisation of waste lands for extension forestry, one has to identify oneself with the common villager who has the free run of these lands for centuries. He is used to let loose his cattle in these areas; he is used to taking away thorny bushes and other harvestable products from these lands free and otherwise utilise these lands without being questioned. In addition, there are various miscellaneous uses to which such lands are being put for the benefit of the community as a whole. In other words, it would not be wrong to say that these lands

are, as it were, owned by the rural community collectively as well as individually. Under these circumstances, any effort by the Government agency to take away part of these lands for raising plantations is likely to be strongly opposed by the local people. Somehow, rightly or wrongly, a suspicion has crept into the minds of the people about the intention of Government officers in dealing with such lands. They fear that if a plantation is raised, the community as a whole, as well as every individual of the community, would be denied, once and for all, the use of such lands. The tendency, therefore, is to forestall their transfer, failing which the villagers will adopt a hostile attitude and make the protection almost an impossible task.

4.6 It is difficult to say precisely what proportion of waste land and village Panchayat land would be available for raising extension forests and of the land available how much would be suitable for the purpose. In many parts of the country, e.g. Rajasthan, Punjab, Haryana, etc. village commons are sometimes earmarked entirely for grazing or for resting of the cattle (i.e. goradeh). There are lands on the sides of tanks and around community wells outside the villages, which are Panchayat property, and even a few years ago there were trees for shade and wind-break, adding to the beauty of the landscape. There are common lands, dedicated to deity, as in Rajasthan, which will not otherwise be encroached upon, but which are now almost devoid of grass cover due to excessive grazing. It is, therefore, considered essential that a survey should be carried out in selected areas restricted in extent to the areas proposed to be tackled during the Fifth Five Year Plan. It is possible that a survey of all government waste lands—the extent and location — is being, or has been, carried out in some States. Any information that may have been collected as a result of such survey should be made use of. On the basis of the available information and the personal knowledge of experienced officers, it should be possible to identify specific districts and, within districts, villages or groups of villages, where a relatively greater possibility of getting such lands exists.

4.7 After having listed such villages, the next step would be the assessment of the needs of the neighbouring rural and semi-urban population. If an acute need for fuelwood, small timber etc., is found to exist, then only the proposed survey should be proceeded with. It is estimated that the proposed survey should not take more than three months if proper guidelines are worked out and the extension workers to be

entrusted with the task are given an orientation course lasting two weeks or so. The survey should be carried out by an extension agency and would entail the preparation of a land use plan based on a village or a group of villages as a unit. The land use plan should clearly indicate the areas which would be earmarked for grazing and for raising grass and fodder, fruit, fuelwood and timber species. The preparation of an appropriate land use plan is a necessary pre-requisite and would make all the difference between success and failure. The extension workers engaged in the preparation of land use plan should ascertain the consent and convenience of the local people at the very outset. After providing for their convenience, separate areas for specific uses may be earmarked for which also the villagers should be consulted and their willing consent secured. In other words, any programme of mixed forestry in the village waste lands and Panchayat lands should be such as is acceptable to the village population.

4.8 The programme would thus be undertaken only in areas where the incidence of waste land in a village or a group of villages is sufficiently high, so that a part of it can always be kept apart for satisfaction of the rights of the villagers. Accordingly, it is hoped that this programme can be pushed through at the national level as an important national effort towards a change in social attitudes in the villages. Acceptance may be easy if the land use plan takes into consideration the villagers' immediate concern and plan for a 'quick yield of such produce from at least a part of the area. Fodder and grass are examples of such produce.

4.9 The protection of such mixed plantation is perhaps the most difficult aspect of social forestry. Protection cannot be enforced by law nor by engaging Forest Guards alone. It is to be the joint responsibility of the villagers (Panchayats). Experience has shown that wherever such plantations have been raised by the Forest Department with Government investment and the Panchayat's share comprising only the protection any income being shared equally by the Panchayat and the Forest Department, such arrangements have worked remarkably well. The degree of success is greater when the mixed forestry starts yielding benefits in the form of grass and easily marketable fruits like ber (*Zizyphus* spp), Cashew, segwa (*Moringa oleifera*) etc., within 4 to 5 years. It is, therefore, felt that the best solution would be to follow similar arrangement with full agreement of the Panchayats and the people. These proposals are contrary to the present

habits of the villagers to exploit their village forest areas without any payment. Even though it may be provided that, at the time of harvesting, the material would be sold first to the villagers at a reasonably low price, there has to be a general change in the attitude of the villagers to the concept of village forest rights. The duty of maintaining such forests should be inherent in the claim of the rights of enjoyment of the products from village forests. Villagers have failed to contribute towards the plantations or maintenance of the village forests. Having over-exploited the resources, they cannot in all fairness expect that somebody else will take the trouble of providing them forest produce free of charge. Now that enlightened Panchayats in the country have been able to take up the programme of plantations with Government investment and protection by the Panchayat concerned, it is our view that in the interest of the villagers themselves, it must be made clear that planned afforestation of the village forests will be followed by a price for forest produce from these forests, but there should be some preferential treatment to the villagers.

4.10. In view of the need to share the income with the Panchayats, and give price preference to the villagers, it is quite possible that in the first round of investment and exploitation, there will be a substantial loss to the Forest Department if the programme is treated as a purely commercial scheme. Extension forestry, which will be the responsibility of the Forest Department, imposes certain duties on the Forest Department and social obligations on the Government to invest without any expectation of return, if necessary, for the general welfare particularly of the poorer sections of the society. In the interest of the stabilisation of the village forest system, an initial investment without any expectation of return in the programme will be justified.

4.11. The right of enjoyment of free timber and fuel from the village forest being a right probably given in the village *Wait-ul-arz*, it will be necessary for the States to support the new programme with suitable legislative measures to reserve a part of the waste land or a village forest for afforestation on the principles stated above. No doubt, it may be argued that, with the agreement of the villagers, the programme can be pushed through without any immediate legislation. Experience in the past has shown that wherever development investment has been made in community areas, in good faith, on the basis of what may be called

'general village agreement' it has led later to claims of village rights by the public to the detriment of the development programmes.

4.12. The Commission, therefore, recommends that with a view to preparing a land-use plan based on a village or a group of villages as a unit, a survey of waste lands and village Panchayat lands including lands on the sides of village ponds and around community wells outside the villages, restricted in extent to that proposed to be tackled during the Fifth Five Year Plan period, should be organised in areas where the occurrence of waste lands is sufficiently high. A minimum area of 20 hectares should be available in a compact block for development of mixed forestry, as otherwise the ~~intensity~~ work would make it prohibitive in cost.

4.13. Since grazing and fodder are vital to the village economy, particularly to the small and marginal farmers and agricultural labourers, we recommend that development of fodder and grass should be made an important component of mixed forestry to be taken up with optimum input and technology. Where feasible, waste lands should also be brought under fruit trees for shade, beauty and usufructs. The embankments of ponds, which are Panchayat property as in Haryana and Punjab, should be planted with grass and trees, specially fruit trees, as a part of mixed forestry programme, which incidentally will also arrest erosion of embankments during the rains. Scientific methods, such as selection of the most suitable grass or fodder species, application of fertilisers, adoption of protection measures, tractor ploughing and scientific practice of harvesting should be adopted in the cultivation of fodder and grass. The cost may be Rs. 1000 per hectare for mixed forestry to cover the cost of fencing, whether of trench or any other type.

4.14. Since grassland improvement would have significant contribution to the economy of the local people, particularly the marginal farmers and landless labourers, a special attempt should be made for grass and fodder development in mixed forestry. In irrigation areas, there may be much wider choice of species of grass, than in rainfed areas. There have been some research and demonstrations already made in this regard, and some amount of experience and expertise is available. The Indian Grassland and Fodder Research Institute at Jhansi was established in 1962 during the Third Plan period. The Institute is working on improvement of native grassland as well as on introduction of new

grasses and legumes. Protection, apart from technical knowledge, is essential for grassland improvement both under the reseeded and native conditions. The Institute has at present six divisions, namely divisions of (i) Plant Improvement, (ii) Soil Science and Agronomy, (iii) Grassland Management, (iv) Weed Ecology and Control, (v) Plant Animal Relationship, and (vi) Economics and Extension. The Central Arid Zone Research Institute, Jodhpur has also done a lot of research and demonstration on grassland development under arid conditions.

4.15. In addition to the two Institutes mentioned above, there are certain Regional Stations for Forage Production and Demonstration, directly working under the Ministry of Agriculture. Three of them were established in 1969 and four in 1973. They are located in different climatic zones. Their main purpose is the propagation of cultivated fodder crops and helping the State Animal Husbandry Departments in their extension programmes. In the Southern Station located at Dhamrod near Ankleshwar, the main emphasis has been on grass. These Stations as well as the Institutes have propagated the particular varieties of grass and legumes suitable for the particular region, and they have also the potentiality for production of the recommended variety of grass and legumes on a much wider scale for use in the programme of mixed forestry. But there has been hardly any attempt to draw in local people for collection of seeds of preferred native grasses and accelerated production of these seeds in nurseries.

4.16. However, it is a fact that in rainfed areas, introduction of exotic grasses may not succeed, but improvement of native grasses is possible through proper selection of grass species suitable for the locality, seed collection and multiplication and introduction of suitable legumes in grasslands. The local people have a strong native sense regarding the suitability of local grasses to be cultivated and improved. It is also felt that if more stress on native grasses is made the programme will win the confidence of the local people, without whose cooperation the programme may not succeed. It is accordingly recommended that the strategy of grass and fodder development as a part of mixed forestry should be to identify the native grasses with the help of the local people and for this, studies have to be made on techniques etc. for improving their productivity and growing them in conjunction with other suitable legumes. The programme of seed production and distribution should be properly organised involving the local farmers in production of

seeds of recommended native grasses for rainfed areas. The seeds produced by the farmers should be purchased at reasonable rates for processing and distribution by well-organised agencies as recommended by us in the Interim Report on Seeds. It is also recommended that organisation of the Forest Departments which would take up programme of mixed forestry should have agronomists in the concerned forest divisions, as well as in the research organisations.

4.17. We also recommend that the income from mixed forestry be divided equally between the Panchayats and the State Governments. In addition, in the disposal of the produce from these forests, there should be an element of preferential treatment, including price preference, to the villagers.

4.18. The Commission further recommends that suitable legislation be enacted by the States as a preliminary to undertaking the programme of mixed forestry herein recommended.

4.19. The Commission also recommends that during the Fifth Plan, the programme of mixed forestry on waste lands, Panchayat lands etc. should cover an area of one lakh hectares in the form of pilot projects in the Central sector. This will mean roughly an expenditure of about Rs. 10 crores. As almost all the States are more or less in the same situation as regards social attitudes towards forest, the funds may be distributed in proportion to the population of the States, provided that adequate waste lands are available and demand for fuelwood and small timber exists in the nearby areas.

Shelter-belts

4.20. Another field of extension forestry will be creation of shelter-belts. In the dry areas of the country and particularly in the arid zones where tree growth is sparse, or has been completely removed and where high velocity winds are prevalent, wind erosion causes serious loss of top fertile soil. The surface evaporation in such areas is also high. One method of protecting agricultural crops and orchards in these areas is to provide for extensive and long barrier of trees and tall grasses in the form of shelter-belts. Since shelter-belts have a specific orientation with respect to prevailing wind direction, they would require meticulous planning with respect to their alignment, composition and density. Moreover, the shelter-belts will embrace a number of private farms, and so it will be beyond the reach of individual farmers. As such, it will have to be an activity of the Government.

4.21. The most important advantage of having a shelter-belt is that it can reduce the velocity of the wind, the extent of reduction being dependent upon the degree of penetrability or density and the height of the shelter-belt. Some studies have shown that the sheltered zone to the leeward of a shelter-belt may extend to approximately 30 times the height of the belt. If a 20 per cent wind reduction is taken as the criterion of useful shelter, this may be said to extend up to 15 to 20 times the height of the belt. Opinions differ regarding the minimum wind speed reduction which should be considered significant. This depends to a great extent on the wind speed prevailing in the sheltered areas and also on the critical velocity values above which soil-erosion occurs or plant growth is inhibited. When a shelter-belt is dense or impenetrable, the wind resumes its normal velocity and pattern at a comparatively short distance from the barrier leading to a reduction of the sheltered areas. In the case of belt which is partially penetrable, there is a tendency for the streamline flow over the barrier to re-establish its unobstructed pattern gradually and the sheltered area is correspondingly wide in extent. It, therefore, appears that a partially penetrable shelter-belt is more efficient, and the optimum degree of penetrability is between 30 and 50 per cent.

4.22. Very little research work has been done in India regarding the benefits of shelter-belts on the yields of agricultural crops and grasses. However, where high wind velocity prevails and surface evaporation is substantial, there is reason to believe that the increase in the yield would be appreciable, since the moisture is a critical factor in the dry regions. Experiments carried out in Russia and United States of America indicate that under such conditions crop yields can be increased by about 150 per cent and the fodder increase may be as high as 300 to 400 per cent. Our findings, when available, are not likely to be materially different. Again, shelter-belts hold up the movement of shifting sand and thus save the agricultural fields as well as the roads and railway tracks from damage by moving sand dunes. The recent experience of the farmers of Haryana and Punjab has brought to light yet another benefit of shelter-belts. They have observed that the crop in the immediate neighbourhood of trees is better protected from frost and looks healthier.

4.23. Thus, the shelter-belts will be particularly useful in the dry and arid regions, which constitute the bulk of the total cultivated area in Haryana, Punjab, Andhra Pradesh, Gujarat, Rajasthan, south western Uttar Pradesh, parts of Madhya Pra-

desh, Mysore and Maharashtra. The size, composition and density of strips and the spacing can be adjusted from area to area on ad hoc consideration pending research findings. The Central Arid Zone Research Institute has advised that in the arid zones with wind velocity not exceeding 20 km per hour, a typical belt may consist of 3 to 5 rows and in some areas even 7 rows planted at a distance of 4 x 4 metres. If at least nine to ten rows of plantations are done, it should be possible to rotate the harvest in such a way that there is always a shelter-belt standing. These shelter-belts will also provide fuelwood and small timber for the people in the neighbourhood. The coordinated effort of the Agriculture and Forest Departments of the State Governments is essential for the planning and creation of shelter-belts. It should be possible to establish immediate coordination between these two Departments in the States where the necessity of shelter-belts is urgently felt, viz. Rajasthan, Gujarat, Haryana and Punjab and later on adopted in other States indicated.

4.24. We, therefore, recommend that where establishment of shelter-belts is an immediate necessity, the Government should draw up the plans for their creation, acquire the necessary land and hand it over to the Forest Department for planting and maintenance operations. A coordinating agency should also be created with experts from Agriculture and Forest Departments in the State Government.

4.25. The Commission further recommends that at the same time, it is imperative that research should be carried out on priority basis by the concerned institutions to determine the regions where shelter-belts should be planted, their effect on the hydrology and crop yields, and on their composition, management and related aspects.

4.26. In a reasonably good area, even shelter-belt plantations may be harvested in 10 years or so, and such activity will be self-paying. Such areas may be covered by production forestry, for which we have made recommendations in the Interim Report on Production Forestry—Man-made Forests. But in most of these dry and arid areas it may take 15 to 20 years before the shelter-belt plantations can be harvested. So liquidation of the expenditure in the first round may not be possible. The cost of acquisition of land may also increase the cost in the first round. The Commission, therefore, recommends that there should be an element of subsidy that has to be built into the shelter-belt programme during the first round of fifteen to twenty years. But the subsidy should be shared between the

Central and State Governments, as this programme would help to increase the agricultural production. On a rough estimate, Rs. 1500 per hectare inclusive of the cost of land that may have to be acquired would be needed for establishment of shelter-belts.

4.27. The Commission also recommends that the shelter-belts programme for the Fifth Five Year Plan should be of the order of one lakh hectares distributed amongst the States of Haryana, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Mysore, Gujarat and Maharashtra, with 50 per cent Central assistance.

Planting on lands on the sides of roads, canal-banks and railway lines:

4.28. The strips of land on the sides of roads, canals, distributaries and railway tracks are not put to any productive use in most of the States. In the prevailing conditions of increasing demand for forest produce and shrinking forest areas, such strips assume a very great importance. The programme of planting these strips can, therefore, add to the availability of fuelwood and small timber to the population. Punjab started this experiment since long by handing over these lands to the Forest Department for afforestation. The experiment has more than paid for itself. These plantations are today an important source of supply of fuelwood and small timber to the villages. Particularly on the canal sides, the timber growth is impressive. On the road sides too, the growth is encouraging. Uttar Pradesh is perhaps the pioneering State in regard to this activity. Gujarat has just started and the initial efforts are very promising. Other States should follow this lead. This is a paying investment because fuelwood and timber are available on the road side. It can be treated as a commercial investment by the Forest Department. The Commission strongly recommends that all the States should follow the pattern of Uttar Pradesh, Punjab, Haryana, etc. in organising tree planting on the lands on the sides of roads and canal-banks.

4.29. The Commission further recommends that Forest Departments should also take up, for planned afforestation, lands along the railway lines with the concurrence of the Railway authorities and under such conditions that they might prescribe for reasons of safety. For this purpose, either the Railways may be approached for handing over lands on the sides of railway lines for afforestation on suitable conditions, as is the practice in Haryana at present, or the Railways themselves may take up the plantations from their own resources. In the latter

case, the Railways may get the forestry staff on deputation from the cadre of the concerned States.

4.30. Complete information has not been received from different States so far regarding the availability of lands on the side of roads, canal-banks and railway lines. However, it is learnt that the annual target in Gujarat is about 500 km and in Uttar Pradesh about 700 km, whereas in Haryana it is about 1700 km. Considering that the total length of National Highways upto 31-3-72 is of the order of 28,800 km and that there is a lot of activity in building new canals and distributaries, the Commission feels that there is great scope for intensifying the planting on the sides of roads etc. to a substantial extent. What is needed now is a phased programme so as to cover all the available lands on the sides of roads, canal-banks, distributaries and railway lines in all the States. In Punjab and Haryana, wide strips of land along kutchha village roads may also be available for planting. Such lands are called 'gondas' and are Panchayat property. These can be brought under fruit trees, if protection can be assured within reasonable cost.

4.31. It will be necessary for every State to draw up a 10 to 15 years' programme for covering these available strips. We, however, suggest that the annual target of planting may not be less than 8000 km for which an expenditure of Rs. 2500 per km with an average of 6 rows, one row of shade trees and two rows of fuelwood trees on either side, may have to be incurred.

4.32. The Commission recommends that the activity of raising plantations on lands on the sides of roads, canal-banks and railway lines be treated as a commercial investment to be made by the States from their own resources or by loans from institutional financing agencies.

SECTION V

REFORESTATION IN DEGRADED FORESTS

5.1. Under the pressure of population, protection and scientific management of forests in the neighbourhood of centres of consumption has become a great problem. The gravity of this problem is reflected by the necessity of having to create mobile squads, mobile courts and special Protection Forest Circles and Forest Divisions. It is very doubtful whether such measures alone would help in arresting the inroads into the forest. The Commission is of the view that the remedy primarily lies in providing for the basic requirements of the people, so that the necessity for resorting to indiscriminate and unauthorised destruction of forests does not arise. Therefore, before taking up any reforestation in degraded forests, such areas are to be identified and linked up with the nearby rural and semi-urban areas, the requirements of fuelwood and small timber of which should be met. The Forest Department should have, it is felt, no objection to the above arrangement because even otherwise it cannot manage these forests on scientific lines for the purpose of production of industrial wood ignoring the requirements of fuelwood for the neighbouring rural and semi-urban centres which depend heavily on fuelwood as non-commercial source of energy.

5.2. If degraded forests are to be clearfelled and planted with quick growing species for meeting the requirements of fuel and small timber of the rural and semi-urban areas, the programme will have to be handled by the Forest Department. In so doing, the forests will have to be closed to the neighbouring villagers. It is not unlikely that some of these areas are burdened with rights of user. It is under the cover of the rights of user that pilferage of wood takes place frequently. Many villagers in the neighbourhood also make a living by selling the fuelwood in the nearby semi-urban areas. A substantial part of the degradation, the Commission feels, is due to the unsatisfied demands of the neighbouring rural and semi-urban centres for fuelwood and the need for part-time employment for a sizeable number of agricultural labour in the villages in the surrounding areas. It is not possible for the Forest Department to maintain a watch and ward of the magnitude required to prevent pilferage and subsequent process of degra-

dation. If an effort is made to provide for employment and for supply of fuelwood and small timber at the same time, any strong local reaction to the problem of closure for plantations can be met. If in closing these degraded forests, steps are taken to see that some areas are set apart to satisfy the rights of user by the villagers the agitation can be contained.

5.3. To begin with, the selection of degraded forests for reforestation, should be integrated with the proposed survey of waste lands. There must be sufficient extent of degraded forests which can be earmarked within a reasonable distance of rural and semi-urban complex, with which such forests are to be linked up for supply of fuelwood and small timber, without substantially upsetting the rights of users in the villages in the area. These degraded forests when suitably cleared and planted together with the waste lands/Panchayat lands selected for afforestation should be able to yield after 15 to 20 years an annual supply of fuelwood to the rural and semi-urban areas in the complex which will be reasonably sufficient to meet their requirements. Gap, if any, should be only marginal, so that there will be no need for a perpetual draw on fuelwood from long distances.

5.4. A good deal of pilferage from the degraded forests arises out of the need for some amount of profitable employment to the partially unemployed in the rural areas. A programme of clearing and planting the degraded forests will itself give employment to a large number of these people. The Forest Department must select and employ those people who are now in the habit of pilfering the timber from these areas. It should not be difficult to identify those living by this 'profession'. A planned plantation programme should provide employment not only in planting but also in weeding which are necessary at least for a period of three years following planting. With proper planning, it should be possible to provide employment to these people all the year round. Some of these unemployed are employed as agricultural labour during agricultural seasons. As such, the labour component of agricultural operations will have to be suitably integrated so as to provide continuity of employment. An interesting experiment has been recently undertaken in the Midnapore District of West Bengal under the "Crash Scheme for Rural Employment". The objective of the experiment is to employ on various forestry operations the local unemployed and under-employed persons in a forest where pilfering of timber and fuelwood was heavy. It is understood that this experiment is working very satisfactorily. The example of Midnapore deserves to be emulated with local adaptations in

other States. In a few other States, such as, Kerala, Uttar Pradesh, etc. agri-silviculture is being practised with success. In such areas, this practice would provide employment in arable cropping in between lines of planted tree crops for a period of at least two to three years after planting is done. The primary object, however, is to keep the land under forestry, so the practice of agri-silviculture should be adopted only where it is feasible.

5.5. Organisation of fuelwood supplies at reasonable rates is another way of preventing pilferage from neighbouring degraded forests. As far as possible, the fuel supply should be organised by the State Forest Department on a 'no profit no loss' basis. This may not be quite possible during the first round of the programme because there is not yet a sufficiently scattered location of man-made forests to support regular supply of this by-product at nearby places at all rural and semi-urban locations. Therefore, in the first round, which may be for a period of about 15 to 20 years till the man-made forests start yielding, a certain amount of subsidy in organising fuel supply may be unavoidable. Similar arrangement should be made for supply of small timber for agricultural implements, including plough pieces. If meanwhile the degraded forests are planted and start yielding fuelwood for supply to the rural and semi-urban areas, it is possible that the Forest Department may even make a small profit in the second round.

5.6. To sum up, the reforestation in degraded forests would have to achieve the following objectives:

- (a) to grow short rotation fuel and timber species for meeting the increasing fuelwood and small timber requirements;
- (b) to organise fuelwood supplies at reasonable rates, which will prevent pilferage from neighbouring commercial forests;
- (c) to tie up degraded forest areas with the nearby rural and semi-urban centres for their requirements of fuelwood and small timber;
- (d) to provide employment to the neighbouring rural population through forestry practices and where feasible through agri-silviculture; and
- (e) to rehabilitate the degraded forests in the process.

But the success of the programme of raising plantations in degraded forests would come if:—

- (i) the scale is sufficiently large to make an impact on the fuel and timber situation within a foreseeable future, and also on the employment situation; and
- (ii) supply of fuelwood and small timber at fair price in the rural and semi-urban areas in these zones is accepted as a supporting programme.

For the latter the States may have to provide a subsidy for some time to come.

5.7. The Commission recommends that supply of fuelwood and small timber for agricultural implements including ploughs at fair rates in the rural and semi-urban areas is a necessary part of the programme of reforestation in degraded forests. We, therefore, suggest that whatever subsidy is to be built in during the first fifteen to twenty years should be borne by the State Governments in order to build up resources near the rural and semi-urban areas.

5.8. It is difficult to estimate what would be the magnitude of this expenditure in each State, but on a rough basis we feel that the expenditure on subsidy may be of the order of Rs. 6 crores in all during the Fifth Plan, to support the programme that we are recommending. Each State should work out in detail its programme of action, then estimate what would be the loss it might have to bear on the supply of fuel and small timber, particularly for agricultural implements. If the areas of consumption are suitably selected and the sources of supply are also located nearby, the transaction should not lead to much of a loss. The cost of raising plantations is estimated to be on an average of Rs. 1000 per hectare only.

5.9. The Commission also recommends that during the Fifth Five Year Plan period, reforestation, with 50 per cent Central assistance, should be taken up on at least 3 lakh hectares of degraded forests in the country. This area should be divided suitably amongst the States in proportion to their forest areas, with special weightage to States which have large degraded areas and less of forest resources. The total cost involved would, therefore, be Rs. 30 crores in the Fifth Plan period.

5.10. The Commission further recommends that even if agri-silviculture may not lead to much of a profit, the Forest Departments should encourage this practice at the sites reforested, wherever favourable conditions exist, so that employment can be given to as many landless labourers as possible.

SECTION VI

RECREATION FORESTRY

6.1 The demand for recreational centres for urban population is increasing day by day. Most of our urban locations are congested, without much open space and parks. This reduces the scope for improving the quality of life in cities. There is a great need for it particularly for the younger generation. Without this, as also for various other reasons, their energies are very often misdirected in many undesirable ways. No doubt, this is a problem of maintaining and developing human environment. The United Nations in a Conference held at Stockholm in June 1972 considered a Declaration on the Human Environment which in part reads:

“Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life...Education in environmental matters, especially for the younger generations, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and enhancing the environment”.*

Recreation forestry can contribute both in social development and education in environmental matters. If small blocks of forests close to urban centres are dedicated for recreation or tree groves created for picnic corners, etc., the urban population will readily make use of these areas for recreation.

6.2 Recreation forestry is of two kinds. One provides for holidaying in the forests and hills with suitable holiday resorts and boarding and accommodation for the tourists. This has already been touched upon by the Commission in paragraphs 3.14 and 7.2 of its Interim Report on Production Forestry—Man-made Forests. The other provides for picnic resorts close to congested urban centres where the population can go during holidays for fresh air, greenery and recreation. Near Bangalore at Bannerghatta a National Park has been established to preserve both the wild fauna and the tree

*Source : UNESCO, Office of the Chief of Mission in India.

growth on an area of about 100 sq km. Within this complex, safari parks with separate large enclosures for lions, tigers, baboons have been carved out covering a total area of 14 sq km (1400 hectares). At the entrance to this park, facilities for picnic parties have been provided and artificial tanks have been created where migrating ducks can settle down during the winter season as an added attraction. In the undulating terrain, some observation points have been fixed from where the visitors may be able to see some of the animals gathering near the water-holes and salt-licks in the valleys. There is provision to drive through the park and also for aerial ropeways between vantage points to travel over the safari parks. Facilities are provided by the organisation to take people round for a nominal charge. The picnic corner covers an area of about 12 hectares. This is a wooded area for the visitors to the park to rest and spend some time either before getting into the park or after. This also includes fully equipped tents for camping, accommodation for parking of cars, and supply of water and electricity. A serpentarium, pet's corner, deer pen, diorama, museum, curio shop, etc. have also been provided for. Such a facility, near thickly populated urban townships where greenery is hard to come by and children grow up without having an opportunity to see varieties in animal life or trees or birds, would be a good balancing feature for proper human development. Some charges can be levied for the various facilities from the visitors in line with the zoos. Even then, there will be some outflow of funds in these ventures which the State Government will have to bear as a legitimate expenditure for giving this important recreation facility to the urban population in the congested townships.

6.3 It may not be possible for every State to have such a beautiful natural site as Bannerghatta only about 24 km from the heart of a city. Accordingly, a uniform pattern for creation of such picnic corners with added attraction of safari parks, etc., may not be quite feasible in all the States. But we believe that it will be quite possible for the States to establish tree-groves on suitable sites for picnics or dedicate parts of forests near urban centres for picnic corners. Most of the States have tried their hands in opening up outdoor centres near big cities and they have experience of how well the facilities have been taken advantage of, particularly by the younger generation.

6.4 The Commission, therefore, recommends that each State Government should make a study of the problem of the

recreational needs of the urban areas, and dedicate some forests or establish tree-groves near such areas for recreational purposes. Green belts around towns and cities, where necessary, should also be created.

6.5 As very little planning has yet been done about recreation forestry, it is difficult to assess at the present stage, the extent of the requirement of funds for this purpose during the Fifth Five Year Plan period. It is seen that the total cost of Bannerghatta Project in Mysore, to be completed in two phases, is likely to be Rs. 406 lakhs, bulk of which will go as labour payments to the land army to whom the entire work has been entrusted under the supervision of the Forest Department. Out of the total expenditure of Rs. 406 lakhs, an expenditure of Rs. 17.24 lakhs has been earmarked for the picnic corner together with serpentarium etc. It is felt that if a project for only a picnic corner, together with other facilities in such a corner as being planned at Bannerghatta, is prepared, the expenditure is likely to go to Rs. 25 lakhs on account of proportionately additional expenses on publicity, staff, arranging excursions, etc. But each State may have to develop its own details, which will depend on the site chosen and the facilities to be provided and also any arrangement for funding through other Departments. For instance, in Bannerghatta the camping site within the picnic corner is being sought to be financed by the Ministry of Tourism, Government of India.

6.6 The Commission recommends that a sum of Rs. 10 crores should be provided during the Fifth Plan period in the State sector for developing recreation facilities of the type which we have indicated. Each State may select the towns and cities and the sites to be taken up under the programme and formulate its own project.

9.6 In addition to the institutional training programmes, *ad hoc* training programmes will also have to be organised to train farmers as and when needed. Mass scale training courses should be conducted by the departments concerned before every season. Such programmes should be organised as far as possible on seed farms, school farms, research stations etc. It has been observed that the holding of weekly meetings of farmers on all government as well as university farms has proved beneficial in that the farmers from surrounding areas are shown the work that is going on and special discussions on specific subjects are arranged according to the needs of the season.

9.7 Lastly, the departmental personnel will require training in administration and management. At present there are no such opportunities. In addition to providing opportunities for taking training in specialised subject-matter areas, it is necessary to provide facilities for giving training at a fairly high level in agricultural administrations as well as in management. As an interim measure, the management training centres established all over the country or the Administrative Staff College at Hyderabad could be utilised for this purpose. If large scale training facilities are to be provided, one centre may not be sufficient and it may be necessary to establish a special centre for giving training in administration to high level personnel in the state departments. It may be necessary to organise a specialised management institution with bias towards agriculture, animal husbandry and rural sciences. The Commission will be examining this question later.

9.8 To organise training programmes to meet the above mentioned needs is a herculean task. The training programmes will have to be systematically planned and operated—a task that has to be handled with utmost diligence. For this purpose an officer at least of the rank of Joint Director should be appointed in each State on a wholetime basis. In some states, there is provision for such a post and a Joint Director is in charge of all the training programmes.

9.9 Looking to the present day needs as far as training of departmental personnel and farmers is concerned, the Commission recommends that a Joint Training Board may be constituted at the state level with members drawn from state departments and the agricultural university to formulate a comprehensive training programme for the state as a whole. An officer of the rank

SECTION VII

ORGANISATION

7.1 Social forestry is essentially a programme for the people and requires their active participation. Success of the new strategy, therefore, lies in evolving a suitable mechanism which would secure public involvement. The recommendations of Estimates Committee of Parliament, Planning Commission, the Asian Development Bank, as well as the Dry Zone Afforestation Symposium and Farm Forestry Symposium are unanimous in this regard. All have unequivocally recommended extension approach for the implementation of social forestry.

Extension organisation

7.2 The importance of having an adequate organisation staffed with selected officers having aptitude for implementing social forestry programmes cannot be over emphasised. Instances are known where social programmes have failed for no other reason than the operational incompetence, even though adequate finances were available. The implementation of social programmes demand tact, resourcefulness, perseverance, sympathetic attitude and above all a lot of tolerance.

7.3 The Commission recommends that suitable forestry extension organisations should be created at the Centre as well as in the States, and entrusted with the responsibility for implementation of the programmes of social forestry.

Training and Demonstration:

7.4 To achieve success, it will be necessary that methods and techniques of extension are properly understood and applied by those, who would be charged with implementation of the programme. The Commission recommends that training in extension methodology and technology should be imparted to selected officers engaged or to be engaged in implementing the programme, at various Agricultural Universities and Research Institutes where a Department of Extension exists or by starting an Extension Branch at the Forest

Research Institute and Colleges, Dehra Dun. Moreover, the Agricultural Universities should include in their syllabi a course in social forestry for the agricultural graduates. If all this is done, the Forest Departments, in course of time, would be able to build up a Forest Extension Organisation, imbued with a sense of dedication and purpose.

7.5 Demonstration of technology is designed to overcome the initial inhibition and doubts of those who implement a programme. In the field of farm forestry, the farmers may be rightly concerned about the effects of trees on arable crops. Even in the case of shelter-belts, it should be necessary to arrange for an entire community to see for themselves the effects the shelter-belts can have on the total economy of the community. For all this, it is necessary that the forestry extension organisation is enabled to set up field demonstrations. The Commission, therefore, recommends that the strategy for popularising social forestry should include the establishment of a large number of field demonstrations. A beginning with such demonstration should be made in State farms, agricultural demonstration farms, soil conservation demonstration centres, etc. The active participation of the three basic village institutions namely, local Panchayats, cooperatives and village school staff should be secured in these demonstrations.

Involvement of local people:

7.6. Extension organisations most suited to the needs of social forestry will have to be worked out after a few years' experience. The Commission, however, recommends that to begin with, District Extension Officers of the rank of Deputy or Assistant Conservator of Forests should be responsible for the implementation of the social forestry programme in districts, assisted by Range Forest Officers from Forest Department, and Field Assistants recruited from local people of the area to secure involvement of villagers. The specific set up for the different programmes may be worked out by the State Governments in the light of local conditions.

7.7 For many special employment programmes, like Crash Scheme for Rural Employment, one strategy is direct employing rural labour and payment of wages to them, without any contract system. The contract system has many in-built disadvantages and full benefits of developmental expenditure do not flow into the rural economy. The local

people, without whose co-operation the social forestry programme can neither be implemented nor sustained through protective measures etc., can only be made to feel active participants in the development processes, if full benefits of development expenditure go to them. The Commission, therefore, recommends that all social forestry programmes should be executed by engaging local labour and no contract system should be introduced.

SECTION XI

Acknowledgements

11.1 The Commission takes this opportunity to thank the individuals, institutions, Agricultural Universities, ICAR and Government Departments for their valuable suggestions which they gave either by correspondence or in personal discussions.

11.2 Dr. R.K. Misra, Specialist, Sarvashri Sada Nand, Joint Director, M.L. Manrai, Assistant Director, S.P. Mathur, Research Investigator, N.L. Arora, Technical Assistant of the Research Division assisted the Commission in various stages of the preparation of this Report.

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NEW DELHI,
25th November, 1971.

J. S. SARMA
Member Secretary

SECTION VIII

RESEARCH

8.1 To supplement the existing technical data on various programmes suggested, a strong research support is essential. This would also involve study of the economics of these programmes and their impact on the social and economic life of the beneficiaries. Experience in India with regard to the wind-breaks and shelter-belts is very limited. The types of trees which would not interfere much are required to be

8.2 The Commission, therefore, recommends that priority should be accorded to the programme of research in social forestry by creating special cells or by expanding the existing facilities at various research institutes concerned, viz. Forest Research Institute and its Centres, Central Arid Zone Research Institute, Agricultural Universities and similar research Centres in the States.

8.3 Only scattered and scanty information is available at present about the technical aspects of the various programmes of social forestry indicated. But much of it has not come as a result of systematic research work undertaken in various agro-climatic regions. Research should be systematically done, so that future planners would have the benefit of results for better guidance. While some of the research might be basic, most of it would be applied in character.

8.4. It is difficult to identify at this stage in a comprehensive manner the various problems that may be required to be tackled by the research organisations. Quite a few of them would crop up when programmes are being implemented. However, a few of these problems are listed as illustrations:

(i) *Silvicultural*

- (1) Species suitable for planting on the sides of canals and distributaries in different agro-climatic regions.
- (2) Species suitable for planting on field bunds and boundaries in different agro-climatic regions.

- (3) Species suitable for planting along road-sides in different agro-climatic regions.
 - (4) Species suitable for wind-breaks and shelter-belts—determination of their spacing and composition.
 - (5) Species introduction trials.
 - (6) Effect of fertilizers and determination of optimum doses.
 - (7) Plantation techniques in degraded forests, waste lands, Panchayat lands, etc., in different agro-climatic regions.
 - (8) Evapotranspiration of tree crops and grasses planted on canal sides.
- (ii) *Agronomy*:
- (1) Effect of different species on yield of arable crops.
 - (2) Effect of shelter-belts and wind-breaks on crop yields.
- (iii) *Economics*: Economics of various activities proposed to be undertaken under the programme of social forestry.
- (iv) *Grass and Fodder*: Suitable high yielding grass of better nutritive value in different agro-climatic regions.
- (v) *Management* of grassland and pastureland.
- (vi) *Protection*:
- (vii) *Social*:
- (1) Impact of different social forestry programmes on the attitudes of the local people.
 - (2) Methods of securing public involvement and participation.
 - (3) Impact on socio-economic conditions of the rural population.

SECTION IX

FINANCIAL OUTLAY

9.1. It has been indicated that a low rate of subsidy has been one of the causes for the poor performance of farm forestry (or extension forestry) in the past. For the programme of social forestry as outlined in this Report, we have emphasised that, to begin with, in the first few years, there should be adequate funding from Central and State resources for implementation. The likely expenditure, except for actual planting by the farmers in their fields, are to be borne entirely by the Government.

Outlay during the Fifth Plan:

9.2. Unless information regarding the locations, the soil types and dispersion of the work is obtained, it is difficult to arrive at precise estimates of the financial implications involved in the implementation of the programmes. However, very general indications are given for a period of five years, as below:

(Rs. in lakhs)

Programme	Centre	State	Total
1. Raising individual trees rows of trees in private agricultural lands as pilot project (100 nurseries @ Rs. 2 lakh each).	200	..	200
2. Mixed forestry in suitable waste lands, Panchayat lands and village commons as a pilot project. (1 lakh hectares @ Rs. 1000 per hectare).	1000	..	1000
3. Raising of shelter-belts (1 lakh hectares @ Rs. 1500 per hectare).	750	750	1500

	Programme	Centre	State	Total
4.	Raising of plantations on lands on the sides of roads, canal-banks and railway lines (8000 km to be planted annually @ Rs. 200 per km).	...	1000*	1000
5.	Reforestation in degraded forests (3 lakh hectares @ Rs. 1,000 per hectare).	1500	1500	3000
6.	Recreation forestry	..	1000	1000
	Total	3450	4250	7700

9.3 The above estimates include the expenditure for the extension organisation that is required to be created, but do not include the expenditure on research and preliminary survey needed for selecting suitable districts and within the districts most suitable areas required to be tackled under the programme. Including research and survey the total expenditure during the Fifth Plan period is likely to be Rs. 80 crores.

9.4. We feel that judging by the expected benefits and the total impact that the programmes will have on the economy and on the population, an investment of this order will be fully justified. The success of the programme, however, should not be judged by the amount allocated or spent, but by the physical achievements.

Estimate of production:

9.5. In view of the widely varying climatic and soil conditions and considering the fact that the stage of deterioration and degradation of the areas to be tackled under the programme of social forestry varies widely, it is hazardous to venture an estimate of production beyond furnishing very rough and approximate indication. If the choice of species is properly made and cultural operations are carried out timely and complete protection is afforded to the plantations, it is estimated that the per hectare production at the end of fifteen years would be in the neighbourhood of 30 tonnes.

*Includes institutional finance as can be mobilised by the State Governments *vide* paragraph 4.32.

9.6. The annual plantations of tree species (producing both fuel and leaf fodder) are estimated to be 75 per cent of the annual target set for the programme of mixed forestry, namely 20,000 hectares in total. The annual plantations for fuelwood in degraded forests will cover 60,000 hectares. Thus, in these two programmes alone, the annual planting area will be 75,000 hectares and after an initial lapse of fifteen years or so the annual production of fuelwood from planting under these two programmes will be over 22 lakh tonnes. To this may be added the outturn of fuelwood from plantings in farms and on lands on the sides of roads, canals and railway lines. But the projected requirements of the fuelwood in the country would be very much larger. In view of the above the Commission feels that the programme outlined in this Report is the minimum. Some of the programmes will be of the nature of pilot programmes. The success of these programmes will govern the future of social forestry in the country. Once the pilot programme succeeds the Panchayats and people themselves would perhaps adopt it as their own activity to be financed from their own private funds.

- (e) The Coordination Programmes do not have the support of a good agricultural economist or farm management specialist. Hence economics does not appear to have come to the advisory system. This is a basic defect and needs immediate correction.
- (f) Field experience of the high-yielding varieties is not travelling up to the Coordinators fast enough. The Hybrid Jowar experience is significant. There is at present no effective way for the Coordination Programme to really assess the field experience of a released crop. Methods to overcome this may be:—
- (i) Utilise the National Demonstrations to gather the field experience.
 - (ii) Utilise the Coordination Organisation of the State Agricultural Department and the State Agricultural University to check on the field experience and bring up the defects quickly.
 - (iii) Have a purposeful and fully supervised pre-release cultivation on Government and University controlled farms to identify possible trouble spots.
 - (iv) Carry out field evaluation studies through selected agro-economic research centres so that not only scientific problems but problems of economics and sociology are also attended to.

Do you agree about the importance of these items for urgent action?
Have you any alternatives, additions or modifications to suggest?

18. At present there are a number of research, experimental or demonstration farms scattered all over the State. How many such farms are there in your State? What are their functions and what role do you envisage for them in the future research set-up? What is the present level of expenditure on them? Are there any Government farms for demonstrations or trials?

SECTION X

ACKNOWLEDGEMENTS

10.1. The Commission takes the opportunity to thank the individuals, institutions and Government Departments for their valuable suggestions which they gave either by correspondence, personal discussions or in reply to Questionnaire.

10.2. We wish to place on record our deep appreciation of the valuable contribution made by Shri S. A. Shah, Secretary, Central Forestry Commission and Convener of the Study Group on "Farm Forestry" formed by the Commission.

10.3. We also wish to acknowledge the substantial assistance rendered by Shri B. N. Ganguli, Specialist (Forestry) and his successor Shri S. B. Palit in the preparation of this Report. We would also like to acknowledge the valuable assistance rendered by Shri S. K. Mitra, Joint Director, in the write up of the Report. Shri Anand Singh and Shri M. C. Kukreti, Senior Technical Assistants (Forestry) have assisted in the collection, compilation, analysis and study of the data furnished by the States in reply to the Questionnaire.

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Sd/- Hari Singh

Sd/- Triloki Singh

Sd/- N.K. Panikkar

Sd/- J. S. Sarma

Member Secretary

New Delhi

August 3, 1973

*On tour abroad

10. What is the number of top level experts at the Doctoral level and above available in the agricultural colleges and university in your State? What part of their time can they spare for direct field contact with the farmers in an extension programme?

11. Taking a pragmatic view of availability of manpower and the time taken for training top level scientists, it has been suggested that technical support to the agricultural programme can be divided into three levels of technical competence. They are :—

- (i) Top level scientific personnel should concentrate on demonstrations and field days for direct contact with farmers and the number should be adjusted to their capacity to earmark time for this in their overall programme of research, extension and teaching. Otherwise, they should be available for technical consultancy by the Department of Agriculture and the Extension Organisations direct involvement in large scale field programmes shall be limited.
- (ii) The experts of the Department of Agriculture should utilise their expertise in the field in large scale field programmes and for technical advice of a high order avail of the technical guidance of the top level scientists in the colleges and university.
- (iii) The Extension Organisation should be responsible for large scale field programmes of a simple kind and should be sufficiently trained to have the competence to understand the programme and put it across.

Do you agree with this division of labour? Or have you any alternative solution?

12. Keeping in view the various experiments so far made in the involvement of the top level scientists in extension and the experience of the Department of Agriculture and the Extension Organisation in the field, can you suggest a suitable framework for the top level scientists organisation to be in charge of the field liaison and identify their points of contact with the faculty in the university or college for coordinated work. Can you suggest, similarly, a suitable structure in the Department of Agriculture and the Extension Organisation to cover the field of extension in high level technical guidance in new agriculture.

13. There is a school of thought that the Community Development Organisation is not able to discharge its function of agricultural extension because of the duality of control of the agricultural experts (including the V.L.W's) in the Block. It is suggested that as the new agriculture requires a continuous link between top level expertise and the field programmes, the agricultural workers, in the Blocks should be placed squarely under the agricultural hierarchy for best results. What is your view?

14. It has been pointed out that the agricultural hierarchy will find it impossible to supervise if the entire field programme is placed on them. It is pointed out that it was out of the past experience of the intensive cultivation programme where the agriculture hierarchy found themselves unable to control the vast programme, that the division of labour between Community Development and Agriculture Department was evolved. It is suggested that there is a validity still in this division of labour for best efforts. Do you agree?

APPENDIX I

(See paragraph 1.11)

Composition of the Study Group No. 1.

on

Farm Forestry, Extension Forestry, Management of Marginal Lands, Shifting Cultivation, Forest Land under Cultivation.

Convener: Shri S. A. Shah, I.F.S.,
Secretary, Central Forestry Commission,
Ministry of Agriculture (Deptt. of Agriculture),
Krishi Bhavan, New Delhi.

Members

Shri R. S. Saharawat, I.F.S.,
Chief Conservator of Forests,
Government of Haryana,
Chandigarh.

*Shri T.N. Srivastava, I.F.S.,
Chief Conservator of Forests,
Government of Uttar Pradesh,
Lucknow.

Shri T. Jeyadev, I.F.S.,
Chief Conservator of Forests,
Government of Nagaland,
Kohima.

Dr. K. N. Singh,
Head of the Division of
Agricultural Extension,
Indian Agricultural Research
Institute,
New Delhi-12.

Shri Gurbachan Singh, I.F.S.,
Chief Conservator of Forests,
Government of Punjab,
Chandigarh.

Shri K. A. Bhojashetty, I.F.S.,
Chief Conservator of Forests,
Government of Tamil Nadu,
Madras—6.

Shri S. Muhammad, I.F.S.,
Conservator of Forests,
(Development Circle),
Govt. of Bihar, P. O. Hinoo,
RANCHI.

**Shri R. C. Ghosh, I.F.S.,
C/o Office of the Chief
Conservator of Forests,
Government of West Bengal,
Calcutta—12.

* Retired as Inspector General of Forests and Ex-Officio Additional Secretary to the Government of India

** At present Director of Forest Research, Forest Research Institute & Colleges, Dehra Dun.

- (ii) To support the intensive programme, selected Village Level Workers who have reasonable educational background and have shown extensive capabilities may be given intensive training in the particular programmes which they are to support and placed in position. Agricultural Extension Officers must be at least graduates and should be similarly trained.
- (iii) For the general extension, present levels of expertise of VLWs and AEOs may continue; but whenever there are dropouts and retirements, replacements must be of much higher level of technical competence.

Do you agree with this assessment or have you alternative suggestions?

19. An alternative view is that higher level technical advice is necessary at the village level and that this would call for the appointment of graduates as Village Level Workers and M.Sc. (Agriculture) as Agricultural Extension Officers. As the application of new technology would raise new problems such higher level technical competence is necessary for the extension staff. Do you agree with this view? If so, what will be the implications and how is the cost to be found?

20. It has been suggested that VLWs and Block staff should not be entrusted with supply functions i.e. provision of inputs, etc. and in many States the VLWs and Block staff have already been divested of this function. What is your view regarding this?

21. Another suggestion made is that the agricultural extension services should be strengthened by providing one agricultural graduate per village and Specialist services at the Block level as an essential link between the research scientists and the farmers. It is further suggested that such agricultural graduates need not be Government employees but should be self-employed and take to distribution of agricultural inputs, custom service, self-cultivation, and advisory services for the farmers. What is your view on this?

22. Yet another suggestion is that there should be a technically strong unit at tehsil (Taluka) level supported by field laboratory facilities for carrying on analytical work needed to solve field problems and an agricultural graduate at circle level (5 to 6 per tehsil) for contact with the farmers assisted by 2 to 3 field assistants. What is your view on this?

23. It is also suggested that full responsibility with regard to formulation as well as implementation of agricultural development programmes should be that of Agriculture Departments in all areas and that the needed authority should be delegated to the organisations to discharge this responsibility. What is your view?

APPENDIX II-A

(See Paragraph 1.11)

Questionnaire on protection of trees standing on waste lands, Panchayat lands, village commons, Gochar lands, tree groves etc. (outside forest areas within the Forest Department).

1. Is there any legal provision for the protection of tree growth standing on waste lands, Panchayat Samiti/Parishad lands, village commons, Gochar lands, tree groves etc. (outside the forest areas within the Forest Department)?
2. If the reply to question (1) is in affirmative, please indicate precisely the contents of the legal provision and the penalty provided.
3. Is the existing legal provision adequate? If not, kindly suggest modification. If there is no existing provision, do you think the absence of such a provision has been largely responsible for the destruction of tree growth in these areas?
4. What is the existing machinery for ensuring implementation of the existing legal provisions?
5. If the reply to question no. (4) is in the negative, do you think an enforcement organisation is necessary? If so kindly suggest the organisational pattern.
6. Relevant remarks, if any.

Name	Designation	Address
10. Shri T. Kipgen	Development Commissioner.	Secretariat, Government of Goa, Daman, and Diu, Panjim.
11. Shri M.R. Pai	Secretary Agriculture.	Food and Agriculture Department Government of Andhra Pradesh, Hyderabad, Andhra Pradesh.
12. Dr. Md. Quadiruddin Khan	Director of Agriculture.	Directorate of Agriculture, Government of Andhra Pradesh Hyderabad, Andhra Pradesh.
13. Dr. H.L. Kulkarny	Director of Agriculture.	Directorate of Agriculture Government of Mysore, Mysore Government Secretariat, Vidhan Soudha, Bangalore, Mysore.
14. Shri A.J. Chacko	Director of Agriculture.	Directorate of Agriculture, Government of Kerala, Trivandrum-1, Kerala.

AGRICULTURAL UNIVERSITIES

15. Dr. B. Samantrai	Vice-Chancellor	Orissa University of Agriculture and Technology, Bhubaneswar, Orissa.
16. Dr. M.S. Randhawa	Vice-Chancellor	Punjab Agricultural University, 216, Sector 9-C, Chandigarh.
17. Shri A.L. Fletcher	Vice-Chancellor	Haryana Agricultural University, Hissar, Haryana.
18. Shri G.S. Mahajani	Vice-Chancellor	University of Udaipur, Udaipur, Rajasthan.
19. Dr. L.S. Negi	Vice-Chancellor	Jawaharlal Nehru Krishi Vishwa Vidyalaya, P.B. No. 80, Krishi Nagar, Jabalpur-4, Madhya Pradesh.

APPENDIX II-B

(See paragraph 1.11)

Questionnaire on ownership of trees standing/planted on public/private lands.

1. Which tree species growing on private lands are treated as Reserved trees belonging to Government?
2. If the answer to (1) above is in affirmative, who is the owner of the trees of these reserved species which are planted on his private land by its owner?
3. Can a person plant trees on public lands and claim ownership both to its usufruct, as well as timber and fuelwood when dead?
4. Relevant remarks, if any.

APPENDIX II-C
(See paragraph 1.11)

Information regarding waste lands

Name of the State.....		Position as on _____ Unit: Area in ha.		
Sl. No.	Name of the District	*Total area of the district	Area of uncultivable waste lands in blocs of 20 hectares (50 acres) and more..	Remarks
1	2	3	4	5

*The area in the charge of Panchayat should also be included.

APPENDIX II-D
(See paragraph 1.11)

Forest area under regular cultivation excluding shifting cultivation

Name of the State.....

Position as on
Unit: Area in Ha

Forest area in charge of Forest Deptt			Total	Area under cultivation in the forest area in charge of Forest Department			Total	Remarks
Reserved Forests	Protected Forests	Unclassified Forests		Reserved Forests	Protected Forests	Unclassified Forests		
1	2	3	4	5	6	7	8	9

APPENDIX II-E
(Sec paragraph 1.11)

Roadside Plantation

Name of the State.....

Position as on

Unit: Road length in kms

Sl. No.	Category of Road National Highway State Highway Other roads	Total length in kms	Total length already plan- ted up with avenues	Agency which carried out avenue plan- ting	Suggestions regarding the agency which should execute avenue planting in future	Remarks
1	2	3	4	5	6	7

APPENDIX III

(See paragraphs 3.5 and 3.13)

ILLUSTRATIVE LIST OF TREES SUITABLE FOR RAISING ON FARM LANDS

Indo-Gangatic Plains, including Plains of Punjab and Haryana:

1. *Acacia arabica* babul
2. *Acacia catechu* khair
3. *Bombax ceiba* semal
4. *Dalbergia sissoo* sissoo
5. *Dendrocalamus strictus* lathi Bans
6. *Emblica officinalis* aonla
7. *Eucalyptus* spp.
8. *Morus alba* mulberry
9. *Populus* spp poplar
10. *Syzygium cumini* jamun
11. *Zizyphus mauretiana* ber

Hills of Jammu & Kashmir, Himachal Pradesh & Uttar Prade.

1. *Cedrela* spp. toon
2. *Grewia* spp.
3. *Melia azedarach* bokain
4. *Morus* spp. mulberry
5. *Populus* spp. poplar

6. *Prunus* spp.
7. *Salix* spp. willow

Dry regions of Rajasthan, Gujarat, Haryana and Uttar Pradesh:

1. *Acacia arabica* babul
2. *Acacia catechu* khair
3. *Acacia tortilis*
4. *Ailanthus excelsa* arroo
5. *Albizzia* spp. siris
6. *Anona squamosa* sitaphal
7. *Azadirachta indica* neem
8. *Dalbergia sissoo* sissoo
9. *Dendrocalamus strictus* lathi bans
10. *Emblica officinalis* aonla
11. *Eucalyptus* spp.
12. *Madhuca latifolia* mahua
13. *Moringa oleifera* drumstick
14. *Parkinsonia aculeata*
15. *Phoenix* spp. date palm
16. *Prosopis cineraria* khejri
17. *Prosopis juliflora*
18. *Tecomella undulata*
19. *Zizyphus mauritiana* ber

Southern Plateau:

1. *Acacia arabica* babul
2. *Acacia catechu* khair

3. *Ailanthus excelsa* maharukh
4. *Anacardium occidentale* cashew
5. *Casuarina equisetifolia*
6. *Dalbergia sissoo* sissoo
7. *Dendrocalamus strictus* lathi Bans
8. *Eucalyptus* spp.
9. *Glyricidia maculata*
10. *Gmelina arborea* gambhar
11. *Phoenix* spp. . . . date palm
12. *Pithecellobium dulce* vilaiyti Babul
13. *Pongamia pinnata* kanji
14. *Tamarindus indica* tamarind

Coastal Region :

1. *Acacia auriculaformis*
2. *Anacardium occidentale* cashew
3. *Areca catechu* supari
4. *Borassus flabellifer*
5. *Casuarina equisetifolia*
6. *Cocos nucifera*
7. *Eucalyptus* spp.
8. *Phoenix* spp. date palm

Southern Hills :

1. *Acacia decurrens* wattle
2. *Acacia mollissima* wattle

3. *Albizia* spp.
4. *Eucalyptus* spp.
5. *Gravillea robusta*

Eastern Region :

1. *Artocarpus heterophyllus* kanthal
2. *Azadirachtra indica* neem
3. *Bischoffia javanica* kainjal
4. *Cedrela toona* toon
5. *Eucalyptus* spp.
6. *Gmelina arborea* gambhar
7. *Melia azedarach* bakain
8. *Populus* spp. poplar
9. *Syzygium cumini* jam