V. K. Seth

Introduction

Forestry in India constitutes **a** significant element of the national economy. Impressive developments have taken place in the field of forestry during the last two decades. Nevertheless, the tasks for the future are stupendous and the forestry sector will undoubtedly be called upon to play a much bigger role in the national context than it has been doing so far.

The biggest task for the country is to provide food, fuel and fodder to the populace and animals. The next two decades are going to be crucial for the forestry sector and its performance will be judged in the light of how far it succeeds in providing these together with adequate raw materials to industries. The tasks of the utmost importance are the attainment of self-sufficiency in forest products and contribution to expert earnings.

The contribution of forestry and forest industries to economic development cannot attain the levels advocated by planners unless the country builds up an adequate professional and technical forestry and forest industries personnel to plan, control and effectively imple-

V. K. Seth

Chief Coordinator, Preinvestment Survey of Forest Resources, New Delhi.

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Appraisal of Trained Manpower Requirements for Forestry Development in India

In this paper an appraisal has been done of trained manpower requirements in the forestry and forest-industries sectors for the year 1985 based on prognoses of demands for industrial wood and fuelwoood. Norms have been adopted for working out requirements of technicians (Rangers) based on F.A.O. studies and experience in the field. The requirements of supervisory staff (Officers) have been worked out by adopting supervision ratios.

Based on a projected demand in 1985 of 50 million cubic metres of industrial wood and 300 million cubic metres of fuelwood, the requirement of technicians and officers works out to 30,000 and 7500 respectively in round figures as against the 1970 figures of 6000 and 1900. To fill this large gap nearly 500 officers and 2000 technicians will have to be trained annually with an input of Rs. 20 million. For this purpose more training institutions and centres will be required.

There is a pressing need for an evalulation of national manpower requirements in the forestry sector and integrating human resources planning with economic development.

It is hoped that this study will help in the identification, formulation and operation of new projects in the field of forestry education, the establishment of priorities and the coordination of the efforts of governments and industries.

ment the developments envisaged. The solution would lie in integrating human resources planning with economic planning.

A prerequisite for the success of the entire planning exercise is the elaboration of a proper methodology for estimating quantitatively the trained manpower requirements for forestry and forest industries. Even through there have been four Five Year Development Plans in the country and the Fifth Plan is on the anvil, very little work has been done to determine' with a fair amount of precision, the trained manpower requirements in the forestry sector for the coming years.

In this paper an attempt has been made to look into the future upto the period 1985 and to appraise the trained manpower requirements for forestry in India on the basis of trend studies and demand projections. There is a pressing need for such an evaluation of national manpower requirements in the forestry sector and also for an approximation of these within corresponding regional pictures. The inspiration for this study has

been derived from similar appraisals carried out by F.A.O. in African and Latin Americn countries. It is hoped that this study, which could subsequently be improved upon substantially, will help in the identification, formulation and operation of new projects in the field of forestry education, the establishment of priorities, and the coordination of the efforts of governments and industries.

Brief Review of Methods of Assessment of Trained Manpower Requirements Followed by F. A. O.

The trained manpower estimates that have been made by F. A. O. for African and Latin American countries are based on the specific operations that will be necessary to attain the production targets advocated by the Indicative World Plan for 1985. Empirical norms of technical staff (Rangers) per unit area of forest and unit production have been used: estimates of professional staff (Officers) have been derived from the numbers of technical staff by applying supervision ratios are based to a large extent on experience, and at best they could be considered as reasonable averages. They will have to be adjusted for each country and revised in the light of changing circumstances.

The methodology for the above studies was developed by S. D. Richardson in 1967.² What has been done is to determine the numbers of forest technicians (Rangers) needed by the target year 1985 to perform the various tasks required for fulfilling the goals of the Indicative World Plan, such as establishment and care of

forest plantations, management of natural forest harvesting of timber and manufacturing of timber, pulp and other primary products. Needs of professional foresters (officers) are arrived at by applying supervisory norms to the various technician tasks. In addition, trained personnel requirements for multiple-use forestry for parks, wildlife, watershed management and recreation, as well as requirements for education, research, extension and training, have been estimated. By applying attrition ratios it was possible to arrive at the annual out-turn needed for professionals and technicians.

Norms Used In FAO Studies :

Activities have been divided into categories and norms have been indicated for each. Some of the norms used for making calculations are indicated below :

1. Plantations

- a) Establishment (including related operations)-1 technician per 200 hectares.
- b) Management-1 technician per 1500 to 2000 hectares.
- 2. Natural forests

Management for production-50 to 75 per cent of the technicians required for the supply of industrial timber and fuelwood that is estimated to emoe from natural forests.

- 3. Supply of Industrial timber and fuelwood (felling, logging and transport)
 - a) For log production-1 technician per 10,000 m³ of roundwood removals per year.

- b) For production of other industrial wood-1 technician per 30,000 m³ of roundwood removals per year.
- c) Fuelwood production-1 technician per 100,000 m³ of fuelwood.

4. Forest Industries

- a) Sawmilling—1 technician per 25,000 m³ annual input.
- b) Wood-based panel industries-1 technician per 12,500 m³ annual input.
- c) Pulp-1 technician per 500 tonnes annual output.

5. Multiple-use forestry

Estimates based on the extent of national parks, wildlife reserves, areas subject to torrential phenomana, watershed areas that need protection, etc.

6. Ancillary activities

The needs of professional personnel for development and extension, research, education and training, are estimated at 15 per cent of total trained professional manpower requirements for activities 1-5 above. Supervision Ratios (Professional/Technical).

Plantations

a)	Establishment	-1:7
b)	Management	-1:6
Nat	tural forests	
Ma	nagement for	
production		-1:6
Timber Supply		-1:6
Ind	ustry	•
a)	Sawmilling	.—1:5
b)	Panel products	-1:3
c)	Pulp	-1:2

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Multiple-use forestry -1:4Ancillary activities -1:2

Anchiary activities -1.2 Based on the above norms and applying them to the targets included in the Indicative World Plan the requirements of professional and technical staff for 1985 for Latin American countries has been worked out as approximately 6500 and 30,700 respectively.³ By assuming a wastage rate of 5 per cent, an annual outturn of 500 professional staff and 2700 technical staff will be required to raise the present figures of staff to the figures postulated for 1985.

Similarly, for African countries (excluding Angola, Mozambique, Rhodesia and South Africa) the requirements of professional and tehnnical staff for 1985 have been worked out as nearly 1800 and 10,000 respectively, indicating a fourfold increase over the present strength⁴.

In general terms it has been suggested that in field operations, for every professional forester there should be from 6 to 9 technical staff, 45 to 50 sub-technical staff, and 280 to 502 labourers or workers depending upon the operation and type of forestry (Richardson, 1967)

Existing Position of Forestry Staff The Ministry of Agriculture⁵ has shown that, as on Ist April, 1970, there were 108 Conservators Circles and 619 Divisions in all the Forest Departments of the States and Union Territories. The position of professional and technical level staff for the entire forestry sector of the country has been

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shown to be 1925 professional level staff and 77,558 technical and sub-technical level staff. This gives a ratio nearly 1:40. The break-up by hierarchies is as follows:

Chief Conservators	- 20
Additional Chief Conser-	
vators and Deputy Chief	
Conservators	10
Conservators	-121
Deputy Conservators	- 679
Assistant Conservators	-1012
Engineers, Statisticians,	
Wild Life Wardens, etc.	- 83
	1925
Rangers	-4374
Deputy Rangers	1 799
Foresters	-14732
Forest Guards	-5 2587
Others	- 4066

The staff working in the Ministry, Forest Research Institute and other central Projects, such as Preinvestment Survey of Forest Resources and Logging Training Project has been excluded from the above list.

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On giving a closer look to the above figures the proportions of the different categories of staff would be approximately as shown below :

1. C.C.F. or : γ	4 C.Fs. : 25 Dy.
	C.Fs. : 40 Asstt.
	C. Fs. 200 Ran-
Addn1.C.C.F. (gers : 500 Fores
or Dy.C.C.F.	ters: 2000 Fo-
Ť · · ·	rest Guards.

For a divisional charge, held by a Deputy Conservator of Forests, the proportion of staff is approximately as shown below :--

1 D.C.F. : 2 A C.Fs. : 8 Rangers : 20 Foresters ; 80 Forest Guards.

The above break-up would, if anything, indicate an apprximate staffing pattern in India for the prevailing intensity and norms of forest management. There is, however, a need for working out an optimum pattern based on considerations such as terrain, climate, growing stock, state of development, etc. It would also be necessary to work out the changes that would be required to suit changing conditions of forestry development.

Forestry Situation Today and Trends For 1985

Just over one-fifth of the total land area of the country is covered by forests- Coniferous forests constitute nearly 4 per cent of the total forest area and broad-leaved forests occupy the remaining 96 per cent. About 95 per cent of the forest area is owned by Government.

The total growing stock in all the forests is estimated at nearly 2200 million cubic metres, of which broad-leaved species account for 1900 million cubic metres (86% of total) and aconifers for 300 million cubic metres (14% of total).

In terms of money value the total volume of standing wood in the forests would be worth Rs. 220,000 million in round figures. This much capital, if it were to be invested, would give an annual return by way of interest of Rs. 19,800 mill-

ion in round figures at 9 per cent, whereas the gross annual returns from the forestry sector at present are a small fraction of the above figure.

The striking features of the forest situation are the unbalanced geographical distribution of the forest resources, the paucity of resources, though not in extent of forests but in growing stock and increment, and the diversity of the regions forests. The increment is very much below the potential that can be achieved.

Population And Working Force :

The population of India in 1985 is expected to rise from the present figure of 547 million to 750 million, and the projected working force figure would be 252 million implying an increase of 80 million over the present figure. Providing jobs to such a large number of persons would be a crucial and challenging task which will have to be faced by government and planners. It would call for a concerted and unrelenting effort to regenerate the economy through massive inputs and the development of the country. It is in this context that the forestry sector holds a promise of spreading the benefits of development to the backward and weaker sectors of the country and ensuring a balanced regional development.

Demand Projections For Industrial Wood And Fuelwood :

It has been estimated that the requirement of industrial wood and fuelwood in 1985 would be 50 million cubic metres and 200 million tonnes (or 300 million cubic metres) respectively as against the the 1970 estimates of 14 million cubic metres and 130 million tonnes. A bulk of the production of fuelwood is from unrecorded source, and as much as 15 million tonnes of cow dung is burned as fuel instead of being used as manure in the fields.

Whereas the forest area is shrinking gradually due to the pressure of population and the sources of unrecorded production of fuelwood are inexorably getting depleted, the demand for industrial wood and fuelwood is growing at a rapid pace. This shows that the situation is quite unsatisfactory and will continue to deteriorate rapidly with the passage of years unless large-scale corrective measures are taken immediately.

Development of Forest-Based Industries :

For forestry to contribute effectively to national welfare, it is necessary that forest-based industries should develop rapidly and generate a demand for raw material.

The requirement of newsprint, writing and printing paper, rayon, etc. would be nearly 4 million tonnes in 1985, and to meet this production target, anything from 35 to 40 new pulp and paper mills will have to be set up during this period.⁶ The demand of raw material for this industrial sector in 1985 would be nearly 10 million tonnes.

There is also considerable scope for expanding and setting up other forest-based industries, viz : hardboard and particle board, drugs, oils, resins, gums, extracts and minor forest produce, etc.

Man-Made Forests :

Considerable progress has been achieved in the past in raising man-made forests of fast-growing and econmic species. However, the activities will have to be considerably augmented in future plans if forest production is to keep pace with the demands for fuel and industrial wood.

Investments Required For Forestry And Forest Industries Development

The allocation of funds under the Fourth Plan for forestry development has been nearly Rs. 900 million, which is quite meagre and is not at all commensurate with the sizable forest area. The per hectare annual availability of funds comes to a tardy figure of Rs. 3/--.

The green revolution in the agricultural sector has been achieved largely through heavy inputs, introduction of modern and scientific ideas and by organizational and institutional innovations. The lessons learnt in that sector could be applied to the forestry sector too and a tremendous improvement could be brought about. But for this purpose, a development investment of Rs. 15,000 million over and above the normal budgetary inputs would be requird to be made during the period from now to 1985. This would mean that the present annual plan allocation of Rs. 3 per hectare of commercial forest area will have to be raised to at least Rs. 20/-

As regards the investment on

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forest-based industries during the same period, it has been estimated that it would have to be to the tune of Rs. 15,000 million.

Contribution To Employment And Gross Domestic Product :

The required investments indicated above would be stupendous indeed and will call for a massive effort at resoursce mobilisation. The reasults and rewards of this effort would be tremendous and they would bring about a major contribution to employment and gross domestic product. It is expected that the forestry sector could account for a working force of 25 million in 1985 as against the present figure of 3 million and contribute Rs. 25,000 to G. D. P. as against the present figure of Rs. 5130 million.7

Estimation of Man-Power Requirements in 1985

The estimation that has been made of trained man-power requirements in India for the year 1985 is based on the projections of wood requirements that have been made in the preceding part of the paper. For this purpose man-power norms have been adopted partly on the basis of those used in the F.A.O. studies and largely on experience in the country. It would be appropriate to emphasise here that the man-power requirements are directly related to projection of demand and, as such, they would vary according to the figures that are projected by different agencies.

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The calculations have been linked to a projected demand of 50 million cubic metres of industrial wood and 300 million cubic metres

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of fuel wood in 1985. This level of demand suggests a tremendous increase over current figures, which could be met only through heavy in-puts and provision of adequate trained man-power.

The strategy for development of forestry will have to rely heavily on creation of new resources and augmentation of production from existing forests through intensification of management and development of infrastructure.

The efforts at creation of manmade forests will have to be stepped up considerably. It is postulated that the present annual target of 80,000 hectares will have to be raised to at least 500,000 hectares. Using the above parameters and indices an attempt will now be made to calculate trained manpower requiements.

I. Man-Made Forests

The area already planted up is nearly 1.5 million hectares. Taking the annual plantation target in the coming years as 500,000 hectares, it would be seen that till 1985, 6.5 million hectares more would be added. Thus the total planted up area in 1985 would be 8 million hectares. The potential annual availability of wood from these plantations would be near about 65 million cubic metres.

The norms for technicians for tackling the above targets of plantations are as below :---

- a) One technician for the creation of 200 hectares annually.
- b) One technician for looking after 2,000 hectares of created plantations.

Thus the requirement of technicians for an annual planting target of 500,000 hectares would be 2,500 and the requirement for looking after 8 million hectares of planted up area would be 4,000. The supervision norm for officers for this item has been taken as 1 : 4, and on this basis the requirement of officers for the two categories of plantation activity would be 600 and 1000 respectively in round figures.

II. Wood Supply

After deducting the production of wood from man-made forests from the total demand for the year 1985, there remains a balance of 285 million cubic metres. This will have to be met from other sources. Presuming that 35 million cubic metres will come from unrecorded sources, the production from the forests will have to be 250 million cubic metres. On the basis of a norm of 25,000 cubic metres of wood supply per technician, the requirement would be 10,000 and for a supervisory norm of 1:4, the requirement of officers would be 2,500,

III. Management of Forests

The management norm is taken as 50 per cent of the man-power requirement under Item-II of wood supply and the same ratio of 1: 4 is taken for professional level/technical staff. On this basis, the manpower requirement comes to 5,000 technicians and 1250 officers.

IV. Multiple Use Forestry

The estimate for technicians under this item has been placed at 3,000 for looking after national parks,

wild life reserves and areas subject to torrential phenomena, water-shed areas that need protection, etc. Applying a ratio of 1:4 for professional level/technical staff the requirement of officers comes to 750.

V. Ancillary Activities

The needs of technical personnel under this item has been worked out on the norm of 15 per cent of the requirement under item I,1I, III and IV. The total requirement would be 3,675 which for the sake of rounding off could be taken as 3,700. On the basis of a ratio of 1:4 for professional level/technical staff, the requirement of professional level staff would be 920 which could be taken as 950.

VI. Forest Industries

The major sector which would account for a bulk of the manpower requirements would be that pertaining to pulp, and board. Applying the technician norm of 5.000 tonnes of annual out-put, requirement of technicians for an annual production target of 4 million tonnes in 1985 would be 800. To this figure has been added an equivalent number for other forestbased industries which are bound to grow in the coming years. Thus the requirement of technicians under this item would be 1600 and on the basis of a ratio of 1:4 for professional level/technical workers, the requirement of officers would be 400. It may be pointed out here that industries have been extremely conservative and short-sighted in employing technical staff for looking after raw material supplies. As industries grow and the question

of procuring raw materials becomes increasingly difficult, there would be no alternative left but to employ efficiant and trained staff for^{*} handling this important aspect. In this respect, there is much that industries could do to improve their efficiency and provide employment opportunities for trained man-power. So also industries could sponsor their own candidates for training in the professional level and technical training institutes in the country.

VII. Total man-power requirements

Summarizing what has been stated above, the position of trained manpower requirements in the year 1985 would be as shown below :- sional level workers and 5 times among technicians.

Such a marked increase in the requirement of manpower within a short period of 13 years should cause immediate concern to planners and forest authorities. It should also suffice to highlight the pressing need for stepping up the programmes for forestry personnel in the country and for setting up more institutions for imparting technical training. Unless plans are formulated to produce 500 professional level workers and 2000 techicians annually, there could be a chronic shortage of trained manpower in the coming years.

The number of training centres

Item No.	Activity	Professional/ Fechnical ratio	Professional level staff	Technicians
1.	Man-Made Forests	1:4	1600	6,500
2.	Wood Supply	1:4	2500	10,000
3.	Management of Forests. 50 per cent of Item II.	1:4	1250	5,000
4.	Multiple Use Forestr	y. 1:4	750	3,000
5.	Ancillary activities. 15 per cent of Item I, II, III & IV.	1:4	950	3,700
6.	Forest Industries.	1:4	400	1,600
		T	otal 7,450	29,800

It would thus be seen that as against the present strength of 1900 professional level staff and 6,000 technicians in round figures, the corresponding requirements in 1985 would be 7,500 and 30,000 in round figures. This shows an increase of 4 times in the strength of profesrequired for the trained manpower targets indicated above could be worked out and the funding pattern could also be appraised. This is not being done in this paper as it would take a good deal of space and moreover, it would not be strictly relevent to the title of the ₩.

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paper. It sould suffice to indicate here that an annual input of Rs.20 million would be required for producing 500 professional level workers and 2000 technicians per year. Applying a norm of 4 forestors and 16 forest guards per technician, the total requirment of these in the year 1985 would^{*} be 120,000 and 480,000.

Conclusion

This paper would have served its purpose if it could create an awareness of the need to appraise systematically the requirement of trained manpower for a forestry development programme geared to meet the escalating demands of society. There could be differences of opinion on the demand projections taken for estimating trained manpower requirments. If that is the case then for any set of projections, similar requirements could be worked out on the basis of the methodology developed.

The requirement of trained manpower in the coming years is bound to rise steeply and this would provide both a challenge and an opportunity to forest departments to provide the requisite training facilities and employment opportunities in the forestry sector. There would also be a higher call for specialists as forest management gets more intensified and technology develops. Higher skills and specialisation are then bound to be rewarded satisfactorily.

The value of training and education as a productive investment of decisive importance to the de elopment process as a whole needs to be recognized. Investments in forestry education should be proportionate to the sectoral development targets which are part of a country's development plans. Forestry education should not be confined only to professionals and technicians. It should include forest workers at the vocational level and a vast sector of the general public as well, if sound policies are to gain national acceptance, needed programmes financed and forest industries contribute their full share to national development.

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