DEVELOPMENT OF FOREST RESEARCH IN PAKISTAN

Dr. M. Omar Ali,
Divisional Officer,
Forest Research Institute,
Chittagong.

Pakistan consists of two regions, viz., East and West Pakistan, separated by nearly 1,000 miles of Indian territory. The climatic conditions, the soil and forest types of these two regions are varied. On the national basis, less than ten per cent of the total land area is classified as forest and range land. In East Pakistan, however, 17.3 per cent of the land area is forest land of which approximately ten per cent is under scientific management and the remaining 7.3 per cent is in the category of unclassed state forests where shifting cultivation by the tribal people is practised. Less than one third of the forest area in West Pakistan is regarded as productive forest land and the balance is range land. The types of forest land and their distribution are given below:

East Pakistan

Type	Area (sq.mile)	Distribution.
(i) Hill or moist deciduous forests	2,698 (Reserved) 3,494 (Unclassed)	Tertiary hills in the north-east and south-east.
(ii) Low grade deciduous forests	443	Pleistocene terraces in the north and centre.
(iii) Tidal or mangrove forests	2,340	Tidal plains in the Sundarbans.
	8,975	

West Pakistan

(i) Coniferous forests	5,339	Occupy hills ranging between 5,000 and 10,000 feet, includes Azad Kashmir and Gilgit Agency.
(ii) Riverain forests	1,073	Lower Indus basin.

Type	Area (Sq.mile)	Distribution.
(iii) Man-made forests.	5,339	Irrigated forests, blocks along roads and canals.
(iv) Degraded mangrove forests.	1,332	Along coastal plains.
(v) Range land	20,557	
	29,161	

	Total land area(Sq.mile)	Forest area(Sq.mile).
East Pakistan	54,501	8,975(includes unclassed state forest)
West Pakistan	3,44,073	29,161(includes range land).
	3,98,574	38,136

It will be seen from above that good forest crops occupy 5,481 Sq.miles in East Pakistan and productive forests occupy 8,604 Sq.miles in West Pakistan. The productive forest land, therefore, constitutes less than four per cent of the total land area in Pakistan. whereas at least 15 per cent, gradually rising to 25 per cent, is required for a balanced economy in a developing country.

The annual production of industrial wood from state forests in East and West Pakistan during 1966-67 is reported to be 27.25 and 13.19 million Cu.ft. respectively giving a total production figure of 40.44 million Cu.ft. Against this, the anticipated demand for industrial wood in 1972 in the whole of Pakistan is shown as 43.46 million Cu.ft. Apart from the demand of industrial wood, fuel wood requirements in Pakistan are very high. No reliable statistics is available, but the consumption of fuel wood in 1962 was placed at 445 million Cu.ft. While fuel wood is normally small wood a consumption of this magnitude represents a very heavy drain on the forest.

The scarcity of forests in Pakistan and the unhappy situation of demand and supply of industrial and fuel wood call for a sound forestry policy entailing large scale afforestation programme, increased exploitation, intensive management of existing forests and integrated forestry research programme with a view to increasing the existing forest resources as rapidly as possible and finding the most economical use of whatever forest products are available. The present paper deals with the chronological development of forest research organization in the two wings of the country.

Pakistan Forest Institute, Peshawar:

Pakistan did not inherit any forest research organization. Until 1947, research on forestry and forest products was conducted at the Forest Research Institute, Dehra Dun, India. In November,1947, a nucleus organization of the Pakistan Forest Institute was started at the campus of Agricultural College and Research Institute, Lyallpur with a few staff members of the Indian Forest Research Institute who had opted for Pakistan. In March-April,1948, the Pakistan Forest Institute was shifted from Lyallpur to Upper Topa in the Murree Hills and was housed there temporarily in military barracks. The Institute was later moved to Abbottabad in October, 1951 and was located in a few rented buildings. The construction of the Institute building at its permanent site adjacent to the Peshawar University campus was started in 1955 and was completed by 1965. The Institute staff gradually started moving from Abbottabad to Peshawar in 1958 and the final shifting was completed by August,1963. On July,1965, the Institute was transferred from the control of the Central Government to the West Pakistan Government.

The Institute occupies an area of about 230 acres. The main building has been built at a cost of Rs.5.6 million. The college,the research branches, the central library and the museum are housed in the main building covering a floor space of over 1,48,000 square feet. The Institute estate contains a botanical garden, experimental plots, medicinal plant farm, an insectory, nurseries and other facilities.

Until June,1965, the Pakistan Forest Institute was controlled and financed by the Central Government after which it was administered by the Department of Agriculture,Government of West Pakistan,through a Governing Body consisting of the Secretary,Agriculture Department, Government of West Pakistan as its Chairman,and the Inspector General of Forests, Government of Pakistan; the Joint Secretary(Forests), Government of West Pakistan; the Chief Conservator of Forests, Government of East Pakistan; the Chief Conservator of Forests, Peshawar Region; and a representative of the Finance Department, Government of West Pakistan as its members. With the dissolution of one unit in West Pakistan, the administrative control of the Pakistan Forest Institute is uncertain at present. The Institute is

headed by a Director General who is an officer of the rank of Chief Conservator of Forests. The various research branches are grouped into three research divisions as shown below:

General Directorate:

1. Main Office
2. Forest Economics Branch (1966)
3. Extension and Publicity Branch
4. Central Library
5. Museum.

I. Division of Forestry Research:

1. Silviculture Branch (1956)
2. Forest Mensuration and Management Branch
3. Range Management Branch (1964)
4. Watershed Management Branch (1965)
5. Forest Genetics Branch.

II. Division of Biological Sciences Research:

1. Forest Entomology Branch (1950)
2. Botany Branch (1949)
3. Chemistry Branch (1952)
4. Medicinal Plants Branch (1951).

III. Division of Forest Products Research:

1. Utilization Branch (1948)
   - (i) Wood Anatomy Section
   - (ii) Wood Seasoning and Timber Physics Section
   - (iii) Timber Mechanics Section
   - (iv) Composite Wood Section
   - (v) Sawmilling and Woodworking Section
   - (vi) Services and Maintenance Section.

Each research division is headed by a Director of Research. Besides the three research divisions, there is one more division, viz., Division of Forestry Education which imparts forestry training and education to the Superior Forest Service and Forest Ranger probationers upto the level of B.Sc.(Hons.) and Diploma in Forestry respectively. The Institute has 35 research officers. The research officers of various research divisions are required to teach part

time in their respective fields in addition to their normal research work. The various research branches started at different times and their dates of initiation are shown in paranthesis against each. Out of a total of eleven branches, five branches were set up prior to First Plan, two during the Second Plan and the remaining three, viz., the Forest Economics Branch, the Forest Mensuration and Management Branch and the Forest Genetics Branch came into existence during the Third Plan Period (1965-70). A few more branches are proposed to be added in the near future to conduct research on forest products, fire protection and recreation and wild life management.

The development of the Pakistan Forest Institute is being assisted by a United Nations Development Programme Project which is under execution since February, 1964 at a total estimated cost of approximately Rs.20.00 million spreading over a period of five years initially of which the contribution from Pakistan's own resources for the same period is nearly Rs.15.00 million.

A brief account of some of the important research activities of Pakistan Forest Institute is presented in the following paragraphs:

In the Silviculture Branch, research is conducted on the growing, tending and measurement of the forest crop. Several strains of exotic species and hybrids especially of poplar, eucalyptus, acacia and pine are under comparative growth trials at different field research stations throughout West Pakistan. The research on introduction of exotics with a view to developing suitable strains of fast growing species has great impact on the national economy if proved successful. The failure of natural regeneration of silver fir in the hilly forests of West Pakistan is a serious problem. The causes of failure in natural regeneration in fir forests are being investigated.

The Forest Mensuration and Management Branch is engaged in the compilation of growth statistics and preparation of volume tables of important forest species of West Pakistan. Maintenance of existing sample plots and lay-out of new sample plots of commercial timber species are being carried out in this branch.

The important activity of the Range Management Branch has been the development of range analysis techniques applicable to

West Pakistan. Approximately 20,557 Sq.miles of potential range land exists in West Pakistan. The various problems associated with the management and improvement of this range land are being tackled by the Range Management Branch.

The activities of the Watershed Management Branch which started in 1965 are being planned to tie in closely with the general development of the land and water resources of West Pakistan. Catchment management experiments have been initiated in co-operation with the Watershed Management Branch of West Pakistan WAPDA.

The Forest Genetics Branch has initiated a programme for propagation of shisham by cuttings. Selection of plus trees of shisham, P.euphratica, A.arabica, blue pine, chir pine and deodar, hybridization of P.euphratica with other species, production of inter specific hybrids of acacias, grafting of eucalyptus species with other eucalyptus species, establishment of seed orchards of deodar, blue pine and chir pine are some of the other projects of this branch. The report of propagation of shisham by cuttings has been published.

The Forest Entomology Branch has developed effective control measures against forest insect pests like shisham defoliator and powder post ('ghoon') beetles. With the full implementation of control measures, the West Pakistan Forest Department can supply 4.8 million Cu.ft. of additional fuel wood annually which will bring an additional revenue to the tune of Rs.3.2 million. The Entomology Branch is engaged in research work in the field of systematic entomology, insect biology, insect ecology, insect toxicology, survey of insect fauna of forests and nematology.

The Botany Branch carries out studies on the ecology, mycology and physiology of plants of forest origin and is engaged in the preparation of floras for different regions of West Pakistan. Part I of the Peshawar District Flora has already been published by this branch. Work on the preparation of floras in the Swat State is in progress. A correct identification of various species growing in the forests and elsewhere is essential for the future development and utilization of various tree species, shrubs and medicinal plants.

The Botany Branch has, so far, collected over 21,000 plants from various localities and about half of this number has been properly classified, identified, mounted and incorporated in the Institute herbarium. The mycological section has collected more than 2,000 specimens of fungi, most of which belong to the wood-rotting group.

In the Chemistry Branch, chemical analysis is carried out on various types of forest soil to determine their physico-chemical constituents, on vegetable tannins to determine their yield, on medicinal plants to determine their alkalloid contents and on forage grasses to evaluate their nutritive value. The bark of twelve-year old babul tree has been found to contain as high as fourteen per cent tannin of superior quality.

The Medicinal Plants Branch has conducted a number of qualitative and quantitative surveys of medicinal plants in various parts of Pakistan and is undertaking cultivation of medicinal plants in forest areas. The Medicinal Plants Branch herbarium contains over 5,000 specimens of medicinal plants and 300 drug specimens collected from different areas of Pakistan.

The Utilization Branch has yet to be developed and manned properly to undertake comprehensive research programme on different aspects of forest products. The work of this branch in the past has been mainly industry counselling and furnishing technical information to Government Departments. The branch has a large collection of wood specimens from Pakistan and several foreign countries. Some of the research works done in the Utilization Branch include anatomical studies on local timbers and reaction wood, effect of physico-chemical treatments on the shrinkage and absorption behaviour of wood.

The Pakistan Forest Institute has to its credit nearly 200 publications of various categories published in foreign and home journals and as Government publications.

<u>The Forest Research Institute, Chittagong</u>:

Dr.R.K.Winters, Forestry Advisor of the U.S.Government made a detailed forestry problem analysis for East Pakistan in which he outlined research problems fixing priorities. On the basis of this

feasibility report, an Operational Agreement between the Governments of Pakistan and U.S.A. was signed in June, 1952, to initiate a project for establishing a Forest Research Laboratory at Chittagong with technical and financial assistance from the Government of U.S.A. for conducting research in the following broad fields:

"(i) Problems of timber production including studies on the incremental growth rate, adopted varieties, tree spacing, forest and soil classification, etc., covering the entire field of forestry.

(ii) Utilization of by-products of extracted timber including the usual range of chemurgic studies covering the entire field of forest products utilization.

(iii) Economic aspects of timber extraction and by-products utilization."

The project started with the immediate object of determining the optimum uses of timber resources of East Pakistan and with the ultimate object of conducting research in all aspects of forestry. As research in forest products was of immediate necessity and training of senior research personnel and procurement of equipment were to take time, the establishment of forest products research facilities was started during the First Five-Year Plan period (1955-60) in the following five major fields:

(i) Woodworking and Timber Engineering

(ii) Wood Preservation and Wood Chemistry

(iii) Seasoning and Timber Physics incldуing Wood Anatomy

(iv) Veneer, Plywood and Composite Wood Products

(v) Pulp and Paper Technology including Hardboard.

A sum of Rs.4.8 million was spent out of the total estimated cost of Rs.7.0 million during the First Plan. During the Second Five-Year Plan period research work was started in all the five divisions in the forest products field. In addition to these five divisions, three new divisions of Forest Botany, Silviculture and Forest Economics in the forest management field, and a section of Statistics were created during the Second Plan. A sum of Rs.8.2 million was spent during this period.

A scheme entitled "Expansion and further development of Forest Research Laboratory into a complete Forest Research Institute, Chittagong" was prepared for the Third Plan period (1965-70) for development of forestry in East Pakistan.

Development scheme in the Third Plan emphasized the development of Forest Management Wing of the Institute with the assistance of U.N.Special Fund, but due to the delay in execution of the plan of operation of United Nations Development Programme and due to initial administrative difficulties resulting from the transfer of the Institute from the Centre to the East Pakistan Government on July, 1965, no concrete works on the Third Plan Scheme could be undertaken prior to 1968-69. According to the proposed development scheme of the Third Plan, the Institute will have a General and Services Branch and two research wings consisting of 12 divisions as shown below:

General and Services Branch:

1. Administrative Officer
2. Executive Officer
3. Doctor
4. Librarian
5. Publicity and Liaison Officer
6. Curator
7. Statistics Division
8. Service and Engineering Division.

I. Forest Management Wing:

1. Silviculture and Management Division
   - 1.1 Silviculture Section
   - 1.2 Mensuration Section
2. Forest Economics Division
   - 2.1 Forest Economics Section
   - 2.2.Market Survey Section
3. Forest Botany Division
   - 3.1 Wood Anatomy Section
   - 3.2 Botany Section
4. Forest Genetics Division(planned, but not yet activated)
5. Forest Protection Division
   - 5.1 Forest Pathology Section
   - 5.2 Forest Entomolgy Section
6. Soil Chemistry Division.

II. Forest Products Wing:

7. Woodworking and Timber Engineering Division
   - 7.1 Woodworking Section
   - 7.2 Timber Engineering Section
8. Wood Preservation and Wood Chemistry Division
   - 8.1 Wood Preservation Section
   - 8.2 Wood Chemistry Section
9. Seasoning and Timber Physics Division
   - 9.1 Wood Seasoning Section
   - 9.2 Timber Physics Section
10. Veneer and Composite Wood Products Division
   - 10.1 Veneering Section
   - 10.2 Composite Wood Section
11. Pulp and Paper Division
   - 11.1 Hardboard Section
   - 11.2 Paper Technology Section
12. Minor Forest Products Division
   - 12.1 Minor Forest Products Section
   - 12.2 Medicinal Plants Section.

The Silviculture and Research Division of the Development circle of East Pakistan Forest Directorate has been transferred to the Institute and is functioning under the Forest Management Wing since May, 1969. This division has ten field research stations scattered throughout the Province. The Silviculture and Research Division has submitted an independent scheme costing Rs.2.9 million for further expansion of its research facilities during the Fourth Plan and is awaiting approval of the Government. This Division has also submitted a number of other schemes of national importance to the Agricultural Research Council which are under active consideration of the Council. The schemes are:

		Estimated cost (in million)
(i)	Study of forest soil in East Pakistan (already approved)	Rs.0.314
(ii)	Survey and study of insect pests found in the forests and their economic utility	Rs.0.336
(iii)	Survey and study of pathogenic organism found in the forest and their economic utility.	Rs.0.385

(iv) Study of silviculture of cane and bamboos Rs.0.389

(v) Study on role of wild life on the regeneration of the forests Rs.0.259

(vi) Study on cytogenetic variability in forest species for evolution of superior strains Rs.0.671

(vii) Studies on the ecological factors governing the development of forests Rs.0.737

(viii) Studies on the effect of land use on erosion of Karnafuli, Sangu and Matamuhari rivers Rs.0.454

The Institute campus consists of an area of approximately 70 acres of land. Construction work of the new Institute building where different research divisions of Forest Management Wing and the central facilities like library, museum, etc., will be located, has been started recently at an estimated cost of Rs.1.8 million. The Institute is headed by a Director and each research division by a Divisional Officer. Since July, 1965, the Institute is administered by the Forest Directorate of Agriculture Department, Government of East Pakistan. Out of a total of fifteen divisions (including two in the General Services and the Silviculture and Research Division), only four Divisional Officers were recruited in the past, one of whom is away for higher studies abroad since 1966. Recently three positions of Divisional Officers have been filled up by promotion and the resultant vacancies are yet to be filled up. The Institute is, therefore, in serious shortage of trained research personnel at the higher level who are required to perform more than one type of responsibilities.

The Institute has, at present, 45 professional research workers against the sanctioned strength of 93 and by 1975, it is planned to have nearly 153 professional staff. The basic research unit is a section headed by a Senior Research Officer who is assisted by a Junior Research Officer and a Research Assistant. Each research division is composed of two to three identifiable sections dealing with closely allied problem areas.

The Institute has submitted to the Government two research schemes for further expansion of Forest Products Wing and Forest Management Wing at an estimated cost of Rs.4.5 million and Rs.11.1 million respectively during the Fourth Plan. The contribution of UNDP/SF to the latter scheme is approximately Rs.4.5 million. In the

Fourth Plan development scheme, provision has been made for two supervisory research positions in the rank of Principal Scientific Officer in the two wings of forest management and forest products. Besides, a new Division of Board Products in the Forest Products Wing and a Forest Operation Division in the Forest Management Wing have been planned during the Fourth Plan.

Research activities in Forest Economics and Forest Protection in the Forest Management Wing were started only about a year ago and are still in the planning stage. Research work in different fields of forest products was started towards the end of 1960. The first few years were spent in the construction of buildings, installation of laboratory facilities and training of personnel. Despite the fact that the Institute started actual research work about ten years ago coupled with many difficulties and handicaps inherent in a new organization, the achievements in the various divisions of forest products have been fairly substantial and encouraging. The following are some of the major accomplishments of research conducted at the Forest Research Institute, Chittagong:

(i) Bleaching and finishing studies of garjan timber for manufacture of quality furniture.

(ii) Investigation on the suitability of eight East Pakistani wood species for pencil manufacture.

(iii) Co-operative studies with Pakistan Eastern Railway on treating schedule of garjan sleepers.

(iv) Treating schedule of sundri and garjan poles.

(v) Suitability of sundri and civit timbers for the manufacture of rayon pulp.

(vi) Extraction of tannin from mangrove species.

(vii) Development of kiln drying schedules for indigenous timber species.

(viii) Manufacture of hardboard from garjan, civit, champa, chapalish, gewa, kadam and gamar.

(ix) Manufacture of quality tea chest out of hitherto unused timbers of East Pakistan.

(x) Suitability of indigenous timber species like kadam, gewa, civit, gamar and other minor hardwood species of East Pakistan both singly as well as in mixture for the manufacture of various grades of pulp and paper.

(xi) Suitability of Sylhet grasses (ekra, khagra and nal) for pulp and paper manufacture.

(xii) Preparation of hand lens key for the identification of eighty timber species of East Pakistan.

(xiii) Building up of an authentic wood herbarium.

(xiv) Evaluation of strength characteristics of important timber species of East Pakistan and their suitability for construction work.

(xv) Air seasoning studies of ten indigenous wood species to evaluate the drying time and optimum drying season.

The works listed above have contributed greatly in the efficient and economic use of wood for industrial purposes. Some fundamental work to obtain basic information such as calorific value, shrinkage and density value of indigenous wood species are also being carried out in different research divisions of the Institute. It has to its credit nearly 75 technical papers published in foreign and local journals and as Research Bulletins.

Silvicultural Research in East Pakistan:

Prior to independence silviculture research in the provinces used to be carried out under the guidance of the Central Silviculturist located at the Indian Forest Research Institute, Dehra Dun. Between the period 1936 and the Second World War, a few sample plots were laid out by the Provincial silviculturists of Bengal and Assam in the area now constituting East Pakistan. Attempts were made to introduce a number of exotic species which are now found in the silvicultural plots at Hazarikhil in the Chittagong District and at Lawachera in the Sylhet District.

The silvicultural research effort was interrupted during the war, but started again after the establishment of Silvicultural Research Division of East Pakistan Forest Directorate in 1958. During the Second Plan Period two research stations were set up and nursery trials on Hevea branzilensis, Anacardium oxidentale and Coffea arabica were carried out. Large scale plantation of Hevea branzilensis has been taken up by the East Pakistan Forest Industries Development Corporation as a result of the nursery experiment. The cultivation of Anacardium oxidentale has also been proved to be quite successful and its large scale plantation for seed multiplication purpose is

underway. Trials on other exotics like some members of Conifera, Eucalyptus, Acacia, and oil palm did not meet the desired success in the past mainly due to inadequate research facilities which are now being expanded and improved through successive development schemes of the Third and Fourth Plan. The Silvicultural Research Division has in its possession a number of field research stations and sub-stations as shown in Table I. A Working Plan for silvicultural research containing 60 projects of urgent importance has been prepared with a view to ensuring continuity of the silvicultural research programme and work has already been started as per the Work Plan.

TABLE I(From "Working Plan for Silvicultural Research in East Pakistan")

Vegetation type	Rainfall	District	Station/ Sub-station	Expt. area acre	Sample plots No.	Sample plots Acre	Legal position.
Semi evergreen	Over 150"	Sylhet.	Lawachera Research [illegible] Station.*	200	20	35.54	Bhanugach Reserve Forests.
	130"-150"	Chitta-gong.	Shishak Sub-station.*	-	8	52.00	Kassalong Reserve Forests.
	110"-130"	Chitta-gong.	Keochia Research Station.*	1031	-	-	Govt. waste land.
			Hazarikhil Sub-station.	-	40	49.33	Ramgarh-Sitakund Reserve Forests.
			Hathazari sub-station.	-	15	28.51	Ramgarh-Sitakund Reserve Forests.
			Chainda Sub-station (arboretum).	200	15	88.27	Cox's Bazar-Rezu Reserve Forests.
Deciduous Forests	90"-110"	Mymen-singh.	Charaljani Research Station.	290	25	18.15	Modhupur Reserve Forests.
		Dacca.	Dacca Sub-station.	-	2	1.98	Collection of exotics from Balda Garden and avenue trees.
	70"-90"	Dinaj-pur.	Charkhai Research Station.*	190	2	0.03	Dhanjuri Reserve Forests.
Mangrove Forests.	110"-130"	Khulna.	Bogi Research Station.*	10	24	8.30	Sundarbans Reserve Forests.
			Total	2221	151	283.11	

* Also Meteorological Stations.

Conclusion:

Forestry research deals with a crop which requires the professional life span of several workers to mature and become a useful commercial commodity. Therefore, the forestry research programme has to be planned with vision and foresight on which its success largely depends. A host of research problems which the forests in Pakistan are facing to-day and which needs immediate attention are: The acceleration of natural regeneration, development of effective artificial propagation methods, evolution of genetically superior strains, afforestation of dry, saline and water-logged lands in West Pakistan, barren hills, waste land, road and railway-side land, river and canal bank, "haor" and coastal areas in East Pakistan, development of arid and semi-arid range lands in West Pakistan, replanting the existing forest with short rotation crop to meet the growing demand for industrial wood for pulp, paper, match, plywood, synthetic rayon, hardboard, etc., intensification of mechanized exploitation from the virgin forests, and to find the most economical application of wood and wood based materials.

Research is also needed for the protection of forests from fire, fungal diseases, insect pests and weeds. The development of new products and processes and improvement of the old processes based on latest technological knowledge needs to be investigated. Wood waste like saw dust, wood shavings, edgings, veneer clippings, cuts, limbs, branches, and stumps all have to be properly utilized so that nothing goes waste. Optimum water requirements in irrigated forest plantations in West Pakistan need also to be studied. The economics of long rotation teak plantations compared with that of the short rotation light wood plantations is yet another important aspect of scientific forestry research in East Pakistan. These forestry problems and many others are to be tackled by the respective Forest Research Institutes of the two wings of the country where they occur. The effective solution of these problems require proper planning of the forestry research programme on short and long term basis both of which need to be pursued simultaneously. This programme can be summarized as under:

Short term programme:

(i) Scientific management of existing forests.
(ii) Economic utilization of forest products.

(iii) Land use classification survey.

(iv) Survey and development of minor forest products.

Long term programme:

(i) Afforestation of barren areas.

(ii) Range development and improvement in West Pakistan.

(iii) Watershed management.

(iv) Protection of forests and forest products from pests, diseases and natural calamities.

Pakistan is spending only 0.13 per cent of GNP on scientific research whereas in technologically developed countries in the West, two to three per cent of GNP is spent on scientific and technological research. The general consensus among the leading scientists in Pakistan is that we should spend at least one per cent of our GNP on scientific research in order that this sector can make meaningful contributions to our national economy and the society.

REFERENCES:

1. Khalil, M.A.K., Forestry Problem Analysis and Research Programme for Pakistan. Pak.Jour.For. 8(2): 149-179.

2. Khalil, M.A.K., Forest Resources of East Pakistan and Research Problems. Proc. Fourth Pan Indian Ocean Science Congress, Section D, Agricultural Science, 1960.

3. Winters, R.K., Forestry Problem Analysis and Research Programme for Pakistan. Pak.Jour.For. 6(4): 259-288.

4. Choudhury, A.H., Planning and Forestry Research with Industrial Bias.

5. Choudhury, M.R., Changing trend of utilization of Forest Produce and its Impact on Forest Management. Forest Dale News 1(1): 56-67.

6. Ahmad, N.&Hasan, S.M., Forest and Forest Industries in East Pakistan. A Great Decade in Agriculture - pp.95-108.

7. Ali, M.O., Progress in Forest Products Research in East Pakistan. A Great Decade in Agriculture - pp.109-113.

8. Inauguration Ceremony of the Pakistan Forest Institute, Peshawar. Pak.Jour.For. 16(3): 210-230.

9. Research and Education Programme of the Pakistan Forest Institute for the Third Five-Year Plan. Pak.Jour.For. 17(1): 141-149.

10. Report on the Activities of the Pakistan Forest Institute, November, 1947 to 30th June, 1965.

11. Andersen, K.F., Forest Research in East Pakistan - An Assessment and a Programme.

12. Zahiruddin, A.S.M., Long Range Development Plan of Forest Research Institute, Chittagong.

13. Choudhury, A.H., Development of Forest Products Branch of the Forest Research Institute, Chittagong. Proposed Fourth Plan Scheme under Submission to the Planning Department, Government of East Pakistan.

14. Annual Progress Report of the Pakistan Forest Institute, Peshawar for the Period Ending 30th June, 1960.

15. Report of the Fact-finding Team on Forest-based Industries in the Region.
Economic Council for Asia and the Far East Asian Industrial Development Council, Fourth Session, 12-18, February, 1968, Bangkok.

16. Directory of Forest Research Institutes in Asia and the West Pacific. FAO Regional Office for Asia and the Far East, Bangkok, Thailand.

List of Botanical Names of Species cited in the Text.

Silver fir (Abies pindrow, Royle.)
Shisham (Dalbergia sissoo, Roxb.)
Chir pine (Pinus roxburghii)
Blue pine (Pinus wallichiana)
Deodar (Cedrus Deodara, Loulon.)
Babul (Acacia arabica, Willd.)
Garjan (Dipterocarpus spp.)
Sundri (Heritiera minor, Roxb.)
Civit (Swintonia floribunda, Griff.)
Champa (Michelia champaca, Linn.)
Chapalish (Artocarpus chaplasha, Roxb.)
Gewa (Excaecaria agallocha, Linn.)
Kadam (Anthocephalus cadamba, Miq.)
Gamar (Gmelina arborea, Roxb.)
Ekra (Erianthus ravennae)
Khagra (Saccharum spontaneum)
Nal (Phragmites karka)
