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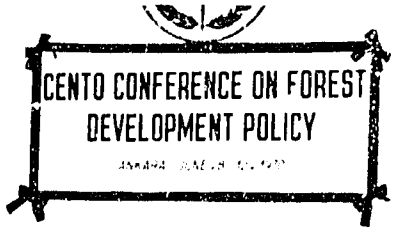
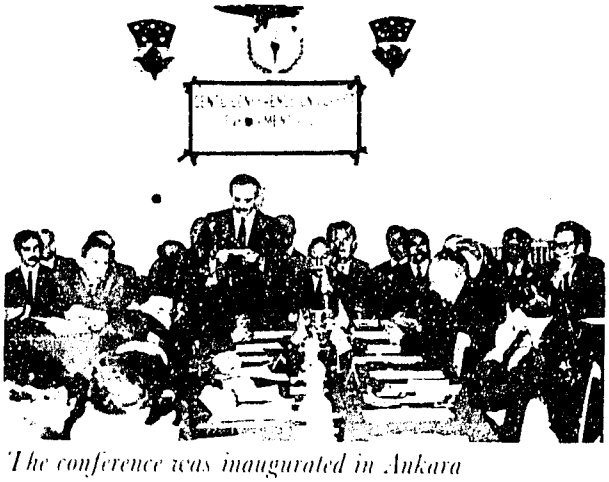
Conference Delegates at Work



Delegates to the CENTO Conference on Forestry Development Policy discussed ways and means to improve forestry development programs in the three regional countries, Iran, Pakistan and Turkey. Here His Excellency Mr. Turgut Menemencioglu delivers an opening address.



The conference was inaugurated in Ankara by the Turkish Minister of Forestry, His Excellency Mr. Hüseyin Özalp.

The Iranian delegation listens to the forestry situation in the other regional countries.

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FOREWORD

The CENTO Conference on Forestry Development Policy was held in Ankara, Turkey from June 8 to 12, 1970. This was the second time that a conference on the subject of forestry had been sponsored by the Central Treaty Organization. An earlier Seminar on Forestry was held in Tehran, Iran in 1959, and dealt with the basic first steps necessary to orderly forestry development — forest survey techniques, aerial photo-interpretation and field instruction for forest inventory.

The second conference had its genesis in the recommendations of the CENTO Sub-Committee on Agriculture, Animal Production and Animal Health, where it was decided that it was time for the representatives of the CENTO countries to meet again — not only to discuss the problems and experiences that each had encountered during these years, but to look to the future as it concerned forestry development.

As a result, the Turkish Government offered to host a Conference on Forestry Development Policy — the United States volunteered administrative and financial assistance, and the conference was held at the Forestry Research Institute in Ankara from June 8 to 12, 1970.

The conference had three main objectives: 1) to review and appraise the forest development policies in the CENTO regional countries, with special emphasis on the relationship of these policies to the economic and social development of the region, 2) to disseminate information to participants by the various delegates and speakers so that a general exchange of policies and procedures among the CENTO countries could be accomplished, and 3) to consider the

need and, if appropriate, prepare recommendations for changes in forest development policies in CENTO countries.

Country situations of each of the three regional countries were reviewed by the country coordinators, and a number of excellent papers were presented by the participants on various aspects of problems inherent in the effective management, utilization and renewal of the forests. Most of these papers are included in this publication, although space limitations have made it necessary to eliminate some and delete portions of others.

The major recommendation of the conference was:

> **The basic forest development policy for the CENTO countries should be forest land use development to achieve the greatest economic and sociological returns to the people commensurate with scientific forest land management principles.**

A number of subsidiary recommendations in support of the above stated objective were also made.

On the final day of the conference the delegates enjoyed a visit to the Turkish Experimental Range and Forest Area in the Bolu region, arranged by the Turkish Ministry of Forestry.

OPENING REMARKS

by
H.E. Mr. Turgut Menemencioğlu,
Secretary General, CENTO

AS SECRETARY GENERAL of the Central Treaty Organization it is a distinct pleasure for me to extend greetings to all of you on behalf of the CENTO Secretariat at the opening of this conference on the very important subject of Forestry Development Policy.

I should like to express appreciation to the Government of Turkey for hosting this conference and for providing these excellent arrangements. Secondly, I would express the sincere thanks of all of us to the Government of the United States of America for providing organizational support to this conference. Thirdly, we appreciate the fact that both the United States Government and the Government of the United Kingdom have provided experienced experts to consult with the experts from the three regional governments on the important subject of forest policy. Finally, and perhaps most importantly, I should like to observe that the high level of the delegations which have been sent by the three regional governments is testimony to the importance given to this conference by the regional governments and should ensure that your deliberations will be profitable.

As you know better than I, forests and forest products can make an increasing contribution to the economic and social development of the region. Even we who are not technicians know that proper management of forest areas helps to reduce soil erosion, to control the flow of rivers and streams, to beautify the countryside, to provide recreation areas and contribute to tourism, and indeed to affect the climate of the region. Forest products provide timber for construction, firewood for domestic use and raw materials for a wide variety of industries including paper and wood products, chemicals and pharmaceuticals. The natural forests are our heritage from the past. In this respect our countries are less privileged than many. So we need to take care, while utilizing our inheritance wisely, also to improve our forest capital. If we do this our own and future generations will benefit.

I understand that within the three regional countries of CENTO there are approximately 125,000 square miles designated as forest areas of various classes. This is almost 10 percent of the land area of the region. I realize that less than half of this is what you would class as timber land.

But the entire vast area is your responsibility for development, conservation and production management. To express this in more dramatic terms I would point out that the delegates from the three regional governments at this conference who are charged with the management of their forest areas are responsible for an area which is equal to 42 percent of the total area of Turkey.

The first CENTO-sponsored conference on forestry was the seminar held in Tehran, Iran in July 1959. At that time forest inventory was the prime problem. The seminar was highly technical and devoted largely to forest survey techniques, to aerial photo-interpretation and to field instructions for forest inventory. Much has happened in the 11-year interval since that seminar. I feel sure it is timely now for the regional governments to compare notes on their experience and progress.

I have read with interest the planning document prepared for this conference by Mr. George Spaur of the United States in cooperation with the experts from the regional governments. I have noted that your objectives are to "review and appraise forest development policies in the CENTO countries with special emphasis on the relationship of these policies to the economic development of the region" and that you will consider preparing recommendations for changes and improvements in existing policies. I hope that you will identify fruitful opportunities for regional CENTO cooperation to increase the contribution of forest areas to the economic and social development of the region.

You have a long agenda, and I hope that at the conclusion of your conference you will have found that your consultations have been profitable. I wish you success and I shall be looking forward with interest to your report.

WELCOMING ADDRESS

by
H.E. Mr. Hüseyin Özalp,
Minister of Forestry, Ankara

IT GIVES ME a very great pleasure to welcome you on behalf of my Government, at the opening of the Forestry Development Policy Conference. It is my pleasant duty and privilege to address you as delegates of CENTO countries. I would like to assure you that because of the importance of the subject I will follow your valuable activities, as well as the results of the conference.

The Central Treaty Organization since its foundation has played a very important role in the economic development of the regional countries. As a result of the technical assistance provided by the Organization in the field of agriculture and forestry, it has become possible to get to know the forestry officers of the member countries, to get acquainted with their forestry problems and to examine the technical and scientific development in this field. Also, because of technical assistance provided, valuable services of experts have been obtained for the implementation of forestry projects and training secured for forestry officers.

Furthermore, conferences, symposia and seminars organized at various levels are creating a common pool of knowledge for our joint benefit. All these have shown once again that science has no national frontiers. As a result of opportunities provided for technical personnel within the CENTO framework, it has been made possible to assess the regional problems and establish technical cooperation about ways and means in overcoming these problems which exist in various fields of our economies.

I feel confident that these positive and constructive developments will expand even further because the member countries do have the scientific, technical and organizational resources to help and support each other.

The Multilateral Technical Cooperation Fund established in 1959 has helped to finance many such regional projects and has brought a momentum to the technical effort of the regional countries.

Our achievements, however satisfactory they might be, should not be considered enough and our cooperation must expand further. Our common objective should be to identify our problems and find the right solutions for them.

Conferences like the one you are attending today are most useful in identifying these problems and solutions. The decisions that will be taken at this conference will help in the development of the forests of the region and will result, I feel sure, in the establishment of closer cooperation among the regional countries in the field of forestry.

I would like to thank those responsible in various CENTO bodies who have decided to hold this conference. I would also like to express my sincere appreciation to the representatives of the United States and the United Kingdom who have always financially supported efforts aimed at finding solutions to forestry problems. Thanks are also due to Mr. Davidson for his enthusiastic attention to our problems and also to Mr. Spaur and all other national coordinators who have spent so much of their valuable time in organizing this conference.

OPENING ADDRESS

by
H.E. Mr. Nasser Golesorkhi,
Minister of Natural Resources, Tehran

THE SUPPORTING ELEMENTS OF LIFE

THE FLORA AND FAUNA of the earth bloomed to life when air, soil and water, the three basic elements of production intermarried. The important point about these elements is that although they are renewable and can transform and translocate under various conditions, yet in volume and quantity they are unfortunately limited to their present content. Air, which essentially renders life possible for both the plant and animal societies, is limited in volume and cannot exceed the amount originally contained in the atmosphere.

Similarly, the water element whether in the form of vapour and clouds, or rivers, oceans and lakes is restricted to the existing amount and man can hardly add a drop more to its quantity.

The precious soil from which we derive our food is also limited. In whatever form, soil and its parent material cannot be increased beyond the original quantity and since the creation of the world, besides a few meteors which have hit the earth perhaps the only quantitative or qualitative element added to the earth, is the few kilogrammes of moon soil brought down by the astronauts from that far-off planet.

As mentioned above, through the interrelation of these three elements, animal and plant life have become possible and therefore a mere translocation and transfiguration of these elements can impressively influence and condition the existence of the above phenomena. On the other hand, it should not be forgotten that air, soil and water are living elements, for every cubic centimetre of each contains millions of living organisms. Therefore, like all living things if they are to survive, they need to be treated with continual care and attention.

The preservation of these elements is essentially necessary if the fauna and the flora are to sustain life and the only way this can be done is through exertion of strict control over the management and utilization of the above phenomena. This is where the delicate and sophisticated web of life, so closely intermeshed, evokes both a feeling of awe and admiration. Admiration to see how the melting snow from the Alaskan mountains serves to irrigate the wheat crops of the Canadian plains to feed the Indochinese population. And awe to

imagine that not a single link from this complex chain of life can be removed without endangering the existence of the others. If man continues to neglect this important fact and refuses to maintain a proper balance of nature, the latter will forcefully impose its own forces and it may ultimately result that the last link which will be removed from this chain will be that of human life.

It is a fact that all living earthly phenomena are at the same time producers and also consumers. A sheep, for example, consumes forage but produces meat. The forage plant in its turn is also a consumer for it feeds on the nutritious elements of the soil, but it produces fodder. Among the consumers and the producers, however, man is undoubtedly the most dangerous of all because his consumption exceeds by far his production. And all he produces is some organic matter that goes back to the soil. It must therefore be endeavoured to maintain a permissible balance between production and consumption or in other terms between the producer and the consumer.

The greatest menace to the creation and maintenance of such a balance, however, is the danger of overpopulation.

FROM ADAM AND EVE TO THE POPULATION EXPLOSION

According to the latest statistics of the United Nations, the world population in the year 2000 will be approximately 6,600,000,000. Some 500,000 years ago when the first human associations were formed who could even conceive that in the year 1800 the world population would attain 890,000,000? However, you will no doubt agree that 500,000 years is a longer period for reproduction than 200 years, for in even less than this time, i.e. in 1960 the world population had almost quadrupled, reaching 3,300,000,000. It may interest you to know that right at this moment while we are tackling the problem of population explosion, 144 people are added to the world population every minute. A recent publication by FAO reveals the following facts.

In 1910 in the developed countries population growth was eight persons per minute, while in developing countries it was 10 persons. In 1940 developed countries did not show any increase while the figure for developing countries had risen to 35. In the present year, 1970, the growth coefficient for developed countries is recorded at 17 persons while developing countries show an astounding increase of 126 persons per minute. The growth ratio for the year 2000 is anticipated at 22 persons for developed and 202 persons for the developing countries. The dreadful gap between the developed countries and the "Third World" ultimately widens to a hideous climax in the year 2030 when developed countries will show an increase of 29 persons per minute compared to 355 people that continue to be added to the already overpopulated regions of the Third World.

These same statistics indicate that the annual growth rate of reproduction is recorded at 2.5 percent. Considering this figure and plucking up some courage I calculated the world population beyond the year 2000 and found out to my great distress that in the year 2050 there would be 20,622,000,000 souls living on the earth.

This astounding increase in population necessitates provision of more food, shelter and clothing, all of which except a negligible synthetic-based portion, are only obtainable from nature and its resources. It becomes therefore evident that more and more pressure is imposed upon these resources through excessive and in some instances improper exploitation. If appropriate and systematic measures are not adopted in time for the preservation and conservation of these resources, in the years to come there may be little left of them to be of any use to future generations who will never forgive us for our selfish negligence. Whether accepted or not, it is a fact that nature and its resources do not belong exclusively to a single generation. They are a precious investment for all of humanity and should be conscientiously preserved by one generation for the use of the next.

Getting back to the figures given earlier, we note that the major portion of the population increase is in the developing countries and the disastrous gap between the developed countries and the Third World is increasingly widening. The future in store for these countries seems clearly to be an output of raw agricultural products in large volume for export at a minimum price in exchange for industrial goods or in some cases their own processed raw material at excessively high cost.

AIR: WITH EVERY BREATH

Specific problems totally inseparable from the growth of industry, rapidly advancing technology and the expansion of urban civilization constitute the foremost concern of industrialized countries who endeavour to find an effective way of confronting them.

Density of population, crowded and noisy cities

and mental strain are a few of the above problems threatening both the physical and moral health of the urban public. Statistics show that over 40 percent of the world population are centralized in big industrial cities and the incoming flow is increasing daily. This is more particularly true of the developing countries. By the year 2000 the urban population will have increased only four times in the developed countries, whereas in the developing world it will have augmented 20 times over the 1930 figure of 100,000,000 inhabitants. The rural people who once lived in and enjoyed the fresh air of the countryside, have been absorbed by industrial centres and have no option but to live in the air- and water-polluted suburbs and are often seriously affected. Thus it is consequently necessary to take strict measures to control air pollution in the rapidly industrializing centres.

We have to accept the fact that our countries are situated in one of the most arid zones of the world. Even with very little annual precipitation, there were still many small cities and towns along or near river banks that could act as pleasant holiday resorts for the sun-loving urban public. Unfortunately these are now rapidly transforming into large and crowded industrial towns with an exploding population and a growing traffic problem. As a result, a large portion of the surrounding agricultural lands and gardens have been converted to roads and construction for housing, factories, industrial plants and so forth. Improved living conditions and income have resulted in the addition of many thousands of vehicles to the already overcrowded streets. On the other hand the carbon dioxide content of the air has increased by 10 percent during the past century. It is estimated that at the present rate of increase the content will rise to 25 percent in the year 2000.

A very quick glance at the above factors, each and every one detrimental to the air we draw in with every breath, will emphasize the dire need for a green belt around large industrial cities which could at the same time act as a park for recreational purposes.

Forest and green areas can absorb large quantities of carbon dioxide annually: up to 4,800 kilogrammes per hectare. Recent investigations and research reveal that for every one million population a forest park of 5,000 hectares should be established in order to purify the air from the carbon dioxide produced by combustibles, factory chimneys, funnels and human and animal respiration. In other words, 50 square metres per capita forest cover is indispensable in the suburbs of industrial cities.

This programme has been widely implemented in most of the advanced countries and should be increasingly considered by the countries of the region where the population explosion and industrialization are hand in hand threatening the purity of the air.

WATER: AN ALARMING PROBLEM

The effect of the population explosion on the elements and resources of nature are manifold. It is anticipated that in the future a shortage of water will pose as alarming a threat as a shortage of food for the people of the world. Improvement in health and sanitation has increased the demand for individual per capita water consumption. In developed countries the per capita water consumption is 5 to 7 cubic metres per day. It is anticipated that this will increase to 8 cubic metres in 10 years, and will attain 12 cubic metres by the year 2000.

Expanding agriculture and industry also absorb a larger amount of water for their activities. It may be interesting to know that for the production of only one gramme of dry matter 900 to 1,000 grammes of water are consumed. Perhaps the most effective solution to the water problem is through water storage and preservation in catchment areas. Every drop of water lost through flooding could irrigate many types of cultivation and efforts should be made to save as much water as possible from wastage.

The Karoon River flowing in the south of Iran overflowed two years ago. As a result of flooding the water flow increased to 9,486 cubic metres per second in comparison to the normal 443 cubic metres, an increase of almost 20 times. Such an overflow in the streams originating from the denuded watersheds is not unexpected.

Although the overflow lasted for 20 days, yet calculating only five days of the flooding and assuming that if only 5,000 cubic metres of water were deposited into the Persian Gulf, we get a figure of 2,160,000,000 cubic metres of water that hurriedly flowed down into the Gulf in total wastage. Another simple calculation reveals that cultivation of every ton of wheat under irrigation in my country requires approximately 3,000 cubic metres of water, and if therefore the water lost during five days in the Karoon flooding could have been preserved and properly utilized it could have produced 720,000 tons of wheat, amounting to almost 20 percent of the annual wheat production of the country.

Water pollution, which is the direct effect of unbalanced urbanization and population increase, has fortunately not yet become a great menace to our countries since we have realized it soon enough to take appropriate measures. But factories and industrial plants are expanding, and the use of chemical fertilizers, herbicides and pesticides is being widely practiced, which necessitates a careful study of effective control methods if we are to keep our waters safe from the danger of pollution.

SOIL EROSION: A DISASTER

The catastrophic result of flooding is not only the loss of water, but another important element, the loss of soil that has washed away. Formation of one centimetre of soil in height takes nature between 200 and 800 years, according to the type of the parent material. Considering the fact that a good arable soil should be at least 25 centimetres in depth, we will be surprised to know that the land which we are cultivating today is the result of nature's hard labour for 20,000 years. Realizing therefore the prime importance of soil, let us go back to the figure of 2,160,000,000 cubic metres of water lost in the Gulf and see how much of this precious soil it has taken away with it. Assuming that the eroded soil constituted only 10 percent of the water we will bitterly acknowledge that during only five days 216,000,000 tons of precious arable soil of the country have been irretrievably washed away, perhaps to be regained only after many many centuries. I do not have any comparative figures for other large rivers of the world, but it is said that the Yangtze River annually discharges about 1,890,500,000 tons of soil into the sea. Considering therefore that time is the only element by which soil can be evaluated and bearing in mind the expanding need for more land from which to provide the food and shelter of the growing world population, admittedly the world can under no circumstances tolerate such catastrophic losses.

It is unfortunately a historic fact that such natural catastrophes as floods and storms have been the cause of the destruction of many civilizations. An American scientist, Dr. Lawdermilk, in a publication on the result of his studies in this part of the world writes that many countries of the region which were once centres of the most advanced civilizations, rose and fell several times as a result of dreadful storms, soil salination and sand dunes.

BASIC REFORM IN LAND USE POLICY IS A MUST

Problems facing our countries in respect to land use are generally the same. Range, forest and agricultural lands of the region are more or less in a similar condition since they have been subject to almost the same practices. Soil erosion, shifting cultivation, nomadic grazing and excessive and unmethodical exploitation of natural resources are common problems.

Centuries of traditional overgrazing have resulted in a severe depletion of the rangelands. Range and watersheds as production units should not merely serve to breed livestock for the provision of meat since science and experience have proved that the protective value of the rangelands and watersheds in controlling floods and conserving water and soil resources, as well as in preventing the translocation of these two important basic elements of life is much more important than providing food for a sheep or two per hectare. Only those rangelands that can submit to grazing with no risk of depletion should be opened to livestock; but at present the range and pasturelands of the region are extremely overstocked, and strict control measures should be exercised over the time and duration of grazing as well as the capacity of the rangelands.

Management and protection of watersheds should receive increasing attention since it is the most effective means of controlling flooding and siltation of the dams. Statistics show that even in the most advanced and developed countries where they have realized the importance of such a programme and have been implementing it for many years, it has happened that up to 10 percent of a dam has been silted in one year. Future technology will undoubtedly permit us to reconstruct the dam on another site of the same river to compensate for the one lost, but the soil that has been eroded and deposited in the dam reservoir cannot be recuperated at any price.

Transfer of livestock from rangelands to the farmlands is ultimately the key to the conservation of soil and water resources. In this connection I must stress strongly that the most important problem in the field of agriculture in my country and probably in other countries of the region as well, is the extreme separation of animal husbandry from farming, and unless these two are integrated, agricultural problems will remain as alarming as they are at present. At the same time, the importance of a balanced agro-sylvo-pastoral programme should not be overlooked.

Another major deficit in the land use policy of the region is dry farming which is widely practised. This gamble with nature, for indeed it is a gamble, should be limited to the areas with not less than 40 centimetres of annual precipitation. For most of our arid countries, shifting cultivation and dry farming can be cited as the two links in the vicious circle of desertification and a detrimental factor to the progress of the future agricultural activities.

There are no technical problems which we cannot solve. Our problems are rather of a socio-cultural nature which need time and education. The appraisable and rotational effects of natural resources should not be the sole focal point; rather, the revolutionary and nonappraisable effects involving a chain reaction should also receive due consideration. For example, wildlife management and recreation or park management is an almost neglected field but will undoubtedly gain momentum in the future, and we shall eventually be forced to admit its important role and introduce it into our immediate programmes.

It is with this in mind that I believe it would be for the good of all the countries of the region to consider and exchange ideas on the important question of land use policy which should, in my opinion, undergo a basic reform.

TYPES OF FOREST PRODUCTS

FAO statistics show that out of 13,345,000,000 hectares of the land surface of the earth, 3,978,000,000 hectares, or rather 30 percent of it is covered by forests. If we assume that the world population is now 3,300,000,000 the per capita forest distribution would be 13,000 square metres. Again, if we recall that in the year 2000 the world population will have attained a figure of 6,600,000,000 the per capita forest distribution will be half the figure of today, i.e. 6,500 square metres. If we also remember that the increased population will be immediately requiring shelter, food and clothing, man will eventually be forced to intensify his exploitation of water and land resources in order to meet the demand and that is the time when forests will have to give way to agricultural activities. Vast areas of forests and rangelands will be cleared and brought under cultivation.

Figures indicate that the practice of clearing and shifting cultivation for subsistence farming has up to now destroyed 100 million hectares of the tropical forests. Due to the same factors, annually 8 million hectares of forests in Asia and 5 to 10 million hectares in Latin America are devastated. Comparative figures for Africa further demonstrate the distressing situation of forestry in the world.

If we recall that at least 50 square metres of green area are necessary to purify the air for every person in the industrial centres, we will then realize that apart from the economic importance of this valuable resource, its existence is definitely indispensable for the well-being of the human race.

Technology today reveals that a forest tree can be processed into 4,000 different types of products. Undoubtedly the advanced technology of the future will not permit any sort of wastage, and may even add a few more products.

In the region, one of the main uses made out of forests could be for the production of pulp and paper in order to meet the expanding demand of our educational activities. It is indeed gratifying that our able and prudent leaders are devoting such a considerable amount of time and attention to the question of literacy programmes in our respective countries. Honoured by competent leaders and living in peaceful lands we endeavour to equip our people with the arm of knowledge and learning in order to prepare them for their innumerable future responsibilities.

IMPORTANCE OF RESEARCH AND EDUCATION

When dealing with nature, man is practically the slave of time and nature itself. Consequently, no mistakes are permissible, nor can they be afforded, for any such errors may cost a country many years of hard labour to recuperate. In order therefore to avoid such mistakes, research and investigation should be placed high above any other activity.

In the exploitation of natural resources, two times two does not always make four. A timely rain may favourably or adversely affect a farmer, and in some instances even change the course of his life. This is especially true of the arid zone.

In an automobile industry, for example, four or five years after the first cornerstone of the plant is laid down, production is assured. But if at the same time as construction is begun on the plant, an ornamental or fruit tree is also planted in the factory yard, an additional four to five years are needed for it to show itself. Thus, no mistakes in the field of agriculture are tolerable, for the only way such mistakes can be repaired is through time, and that is an element almost totally out of human control.

Training and education also play a leading role in the proper management and utilization of resources. Efforts should be made to make utmost use of the human resource through intensive training, short courses, fellowships and study tours, etc. Increased knowledge and technical know-how in the relative fields is the only means by which conservation and systematic exploitation of natural resources can be assured. I believe that this is a field in which the countries of the region could develop a fruitful cooperation.

CONSERVATION: A SACRED TASK

Soil, water, rangelands, forests, fish and wildlife, as well as other resources of nature are, as I have mentioned before, gifts of nature to man: to the man of yesterday, to the man of today, and to the man of tomorrow. It is of utmost importance that we should remember this and repeatedly awaken our conscience to the fact that after our generation there will definitely be another and yet another, and still one more. We have absolutely no right to deplete these resources as our forefathers have done. Most of the deserts covering the surface of the earth were once the delight of the eyes. Now, not even a single blade of grass can be found anywhere. Our ancestors destroyed the land and its green cover because they did not know how to use it and were unfamiliar with the consequences. But let us analyze why these resources are *still* being misused.

Today we have three categories of people exploiting the natural resources. The first group are the urban public who feel no responsibility whatsoever towards nature, and are almost completely unaware of the need for its conservation. They cut down a tree as easily as they would throw away a withered flower from the vase. The second group are those benefitting directly from these resources, such as the nomads and forest dwellers living in the immediate natural surroundings. These people do not feel themselves responsible either, since they consider it their only means of living and their legal right to exploit as much as they need. The third group are the private enterprises involved in exploitation. These are perhaps the most dangerous of all, since they are ready to sacrifice anything for a few extra pennies.

The prospect does not therefore seem to be very bright. It would be overoptimistic to expect assistance from any of the above groups for the conservation of nature and its valuable resources, which in my way of thinking is and should be considered as sacred and holy as any religious doctrine.

An educational and enlightening public relations programme seems to be of prime importance in familiarizing people with their duty and responsibility towards nature.

THE FUTURE OUTLOOK

In general it is still hard to evaluate the effect of the population explosion on the exploitation of natural resources and the conservation of the environment. This depends to a great extent on the behaviour of future generations and on whether they will realize their responsibility and the need for proper and timely action. If they do not have recourse to more advanced technology and only follow in our footsteps, the result would be the total destruction of these resources. It is awe-inspiring even to think of the consequences. Undoubtedly, future techniques and know-how will have progressed adequately to allow wishful thinking about a brighter prospect.

I can clearly imagine the day when a special board for the control of illicit distribution of clouds subject to impregnation will deal with complaints from various countries to the effect that their portion of clouds has been illegally derouted to one of the neighbouring territories.

But until such a day comes, each and every one of us should consider it a duty to shoulder part of the responsibility with regard to conservation of natural resources and live up to this vital duty as devoutly as one would submit to the teachings and doctrines of a religion.

OPENING ADDRESS

by
Mr. S.A. Aleem,
Inspector General of Forests,
Islamabad

WE IN PAKISTAN have been looking forward to a conference of this nature, where we would get an opportunity to discuss some of the common problems facing our three countries, namely Pakistan, Iran and Turkey. We are grateful to the Government of the United States and to CENTO authorities for financing and organising our participation in this conference. We greatly value the association of reputed foresters from the United States and Britain.

In this age of atoms, computers and satellites, our society is passing through a period of transition from dogmas and conservatism. In fact, throughout the world, science and technology are moulding our thoughts and actions. Management of natural resources such as forestry has to adapt itself to the new ways of life — man is planning for himself. Forests are not only to give us products which a modern society needs, but in recent years some other values of forests are being increasingly recognised — the provision of recreation and environment free from pollution of air, water and soil — all of which are so vital for our existence on this planet.

For many years foresters in our country, perhaps in other countries, have worked in isolation. The result is that there is little understanding of our role in society, particularly when every piece of arable land is needed for increasing production of food for our growing population. We have failed to project the values of forestry before society adequately, and have forgotten many of our traditions associated with the forests and trees. A tree, with its diverse usages, is the greatest divine bounty, and has been repeatedly described in the Holy Quran. The imagery of the tree has been used for such objects as the Divine Light, which is "*Kindled from a Blessed Tree — an olive that is neither of the East nor of the West — whose oil well nigh would shine — even if no fire touched.*"

In chapter Al-Rahman of the Quran, it is mentioned "*To one of them we assigned two gardens of vines and surrounded them with palm trees and between them, we set a sown field; each of the two gardens yielded its produce and failed naught in any wise, and we caused to gush amidst them a river — abundance of wealth.*"

Our Prophet said, "*If a Muslim plants a tree:*

Whatever is eaten of its fruit shall be a Sadaqah unto the planter*
So shall be whatever is stolen of it
So shall be whatever any bee or bird eats of it
And if anyone refrains from doing any harm to that tree, it shall be Sadaqah unto him."

Jahangir, one of the great Moghuls who ruled the Indian subcontinent, was one of the greatest gardeners of the world. The state policy towards tree plantation is described in his "Tuzuk" in the following words:

"God be praised that in this age-enduring state, no tax has ever been levied on the fruits of trees and it is not levied now. In the whole of the dominion, not a grain on this account enters the public treasury or is collected by the state. Moreover, there is an order that whoever makes a garden or arable land, its produce is exempted. I trust that God will always incline this suppliant towards what is good."

Any student of Islam is familiar with the "Ghutta" of Damascus, which was a thickly wooded grove surrounding the Ummayad Capital and on all sides it was more than eight miles deep. Besides being a paradise on earth, it provided an effective defence against the attacks of the Crusaders. The Scriptures prophesied about the glories of the Cedars of Lebanon.

"It shall blossom abundantly — and rejoice even with joy and singing; and the glory of Lebanon shall be given unto it — the excellence of Carmel and Sharon."

Iran, Turkey and Pakistan have the heritage of a common culture and all these traditions have strong public relations value. By projecting the past we may safeguard the future.

Forestry is one of the bases of economic development, but it is not all. Sometimes we foresters fail to view the role of forestry against the background of overall national economy. In fact, like many other groups of technicians, we seem to act within watertight compartments. If we place a piece of wood before a forester, an architect, a polisher or a research chemist, each will describe the wood in his way — the result of which will be that a layman is likely to be confused about the nature of the wood. We must shake off the narrowness of our outlook — our activities, policies and understanding of our role should be subordinate to overall interests of the society.

The theme of this conference is "Forestry Development Policy" and I am sure our delegation is looking forward to considering the issues involved in the changing role of forestry and benefitting through discussions with brother officers from Iran and Turkey and other distinguished participants.

We are glad to be in Turkey — brotherly country — from whom we have had many inspirations in the past.

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* Alms.

STATEMENT

by
Mr. Joseph B. Robinson,
U.S. Economic Coordinator
for CENTO Affairs, Ankara

I WANT to associate myself with the Secretary General and the distinguished leaders of the several national delegations in thanking the Government of Turkey for the excellent manner in which this conference has been organized. Since my office has been involved in a minor way in the effort I know personally the vast amount of work and diligence that is required to get a conference of this kind underway.

The Secretary General mentioned the 1959 Seminar on Forestry held in Tehran. I notice through an examination of the list of delegates that one of the Turkish delegates here today, Mr. Eşref Soysal, also participated in the Tehran seminar. I am sure that he, like the rest of us, will be interested in evaluating the changes that have taken place in forestry in the regional countries during this 11-year period. In the event that any of you is interested in seeing the report of the 1959 seminar you will find copies here today.

The principal reason that I am here today is because my office is the mechanism through which United States Government support for this conference is supplied. This gives me the right to speak even though my knowledge of forestry is extremely limited. Through the office of the Economic Coordinator my Government supports a variety of activities aimed at the social and economic development of the CENTO regional countries. We have a strong and vital interest in all aspects of agriculture, of which we consider forestry one. Our interest in this general field is indicated by our support of this conference and our planned support of a series of workshops on range management to be held in the three regional countries later on this year.

Other speakers have pointed out the significance of forestry to economic and social development in the region, so I will not bear on that subject today except to point out a significant difference between forest resources and other natural resources such as minerals or petroleum. This is the fact that exploitation of the other resources lessens the amount available and eventually leads to exhaustion of that resource, whereas forest resources, when properly managed, are not only inexhaustible but can even be increased through proper use. For each tree removed another one, perhaps a better species, can be planted. Thus the resource remains alive for the genera-

tions that follow us. This replenishing characteristic of forestry will undoubtedly be a matter for discussion among you here this week.

I would like now to discuss briefly the ingredients needed to make this conference a success. You, the delegates assembled here, are all experts some on one aspect of the problem and some on another. Collectively, you probably cover every conceivable branch of knowledge associated with the broad field of forestry. In terms of geography, you represent the three regional countries, the United Kingdom and the United States. During the course of these meetings, selected experts from among you will deliver papers within the areas of your special competence. It is not, however, the quality of these papers or the force of delivery that will determine the results of the conference. Success or failure will be the result of the discussions that take place after the papers have been delivered. Success or failure will depend on the degree to which each of you contributes to these discussions, on the ideas that you put forth and the ideas that you absorb. But, in the long term, even your wholehearted participation here will not guarantee success. Only if valid conclusions are drawn and constructive recommendations made, and only if these recommendations are put into practice in the years to come can the major objectives of the conference be achieved. I urge you, therefore, to participate fully in the discussions that take place in this chamber, in the halls, and at the social gatherings which you will have during the next week. I further urge that on your return to your home countries you bear in mind the recommendations that will be made here and use your full energies and authority to insure that relevant recommendations are adopted and put into practice. In this way you will contribute not only to the conference, but more importantly to the social and economic development of the CENTO region and of your own countries.

KEYNOTE ADDRESS:

FORESTRY — A CHALLENGE

by
Mr. Paul M. Dunn, President,
American Forestry Association

IN THE BEGINNING, God created the heavens and the earth; the latter with all the richness of its water and land resources, both organic and inorganic. Man was then created with the capacity to use the resources of the earth for his existence and benefit; however, because of his intelligence, he became the custodian as well as the benefactor of those resources.

Man's numbers multiplied and with that increase came a broadened use of the resources and the necessity to adapt his surroundings to his needs. Over the years, Man stopped his wanderings to build cities and to link them together by vast networks of seaways, highways, railroads and airlines. Presently, he has a great system of communications, so that it is possible to know what is going on at most all points of the earth's surface. He is now exploring the universe of space — a result of his preliminary investigation of the scientific frontier.

The earth in its beginning was mostly covered with vast forests of many kinds of trees. The forests provided protection from the elements for both Man and animals, as well as food and materials for both. It was home, though simple and rustic. Later, as Man developed further intelligence, the forest materials formed the basic structures for homes and other facilities outside the forest. The forests became useful to Man in many ways, and since their vastness appeared endless, little thought was given to their conservation. The introduction of fire became one of the forest's worst enemies, and it still is; though Man himself ranks high on the list. When agriculture became an essential form of land use, it encroached on the forest land with high priority. Most of the other manmade developments, such as roads, highways, utility lines, urban areas and the like, also reduced the original forest acreage in every country in varying degrees. Actual figures can only be approximate; however, citing the United States as an example, it is estimated that when the first settlers arrived, 350 years ago, the forests extended over twice the present area. I presume that a similar situation prevailed elsewhere in the world.

To provide a forest area perspective, certain statistical data might be interesting:

- For the world as a whole, the forests now

occupy about four billion hectares, or 30 percent of the total land area, with 1.7 hectares of forest per capita.

- In Asia there are 520 million hectares of forests or 20 percent of the total land area, with 0.4 hectares per capita.
- In Europe, except the Soviet Union 38 percent are forested, with 1.8 hectares per capita.
- In Canada 38 percent are forested, with 27.2 hectares per capita.
- In the United States there are 253 million hectares of forests or 33 percent with 1.8 hectares per capita.

For the United States, the forest area breakdown is:

- All forests 33 percent of the area, or 927 million hectares.
- Commercial forests 22 percent of the land area, but 64 percent of the forest.
- The ownership pattern of the commercial forests shows:
  Federal 22 percent
  State 4 percent
  County and municipal about 1.5 percent
  Private forest industry 13 percent
  Farm and other private forest lands 60 percent.

In America, with the present day emphasis on recreation, it is most interesting to note that of the total publicly-owned commercial forest lands, there are 121 million hectares, or 46 percent, that are available for recreational use. In addition, more than 90 percent of the industrial forests are open to fishing and hunting by the public. Of the above, approximately nine million hectares are dedicated to Federal, state, county and municipal parks, of which 82 percent are Federal.

As one ponders on the point of "What happened to the forests that are not here today?" we have the benefit of history. We are able to look back and view the past, with some regrets, but mostly with a degree of justification. Through the years, the forest uses have been varied, often erratic, and often unwise. From the unrestricted use of the forests by early Man, to the very restricted use for hunting by the feudal lords during the Middle Ages, there has been, until recently, a rather open policy of multiple use of most public lands and a single-use policy on the private lands.

Historical evidence before us verifies the statement that "The rise and fall of certain nations was closely correlated with the treatment accorded their natural resources." Several very vivid examples in past civilizations, namely China and North Africa, have told their stories of land overuse and land abuse after the removal of the original forest cover.

As Man increased in numbers and moved from place to place, there is evidence that the forests, being dominant, were used and displaced to satisfy his needs for shelter, food and fiber. The procedure was mainly one of judgment or priority; associated with the fact that the forests appeared as never-ending expanses in areas.

The story of the settlement of the United States is a good example the early colonists, only 350 years ago, found a land with vast forests stretching from the ocean shore. These forests presented barriers to the establishment of towns, farms and industry. The trees, of course, provided materials for numerous needs, but in many instances, they were cut down and burned, solely because they stood in the path of land development for agriculture and the westward movement of the settlers.

We in the United States came to the realization, some years ago, that there was a limit to the forest area, and that it was vital to the future existence of our people that intelligent, constructive measures be understood, accepted and applied to the practices of proper land use, especially to those relating to the forests. The practice of forestry became a must.

Forestry is the science, the art and the practice of managing and using for human benefit the natural resources that occur on and in association with forest lands. These resources include trees, other plants, animals of all descriptions, the climate, the soil and the related air and water. Management of these resoarces is determined in a large measure by the concepts, policies and the means of the landowner, whether it is the people of a political unit, the shareholder of a corporation, or an individual.

The practice of forestry, with the objective of obtaining the maximum volume and quality of products per unit area, functions through the application of the best techniques of silviculture and management, and is defined as intensive forestry. But silviculture consists of silvics modified by economics, while silvics is defined as the ecology of trees. Forestry, in a sense, is applied silvics.

In the practice of forestry there are at least four characteristics. The harvest should be matched with the growth that is to say that the amount of timber removed from a property must not be more than the amount that will grow in the harvest interval. This is usually called "sustained yield." Where one is dealing with

virgin timber, this means continuous production at an even rate with the aim of achieving at the earliest practicable time an approximate balance between net growth and harvest, either annually or for longer periods.

Forestry gives proper attention to the harvest cycle or the rotation. This is the silvicultural or economic age of the trees at the time of harvest, plus the time required to insure re-establishment after the timber removal.

Another characteristic of forestry is tree selection management in preference to alternative methods, such as clear-cutting, where this is consistent with the silvics of the species involved. This implies frequent light harvests, generally removing only a percentage of the volume at one time. Where clear-cutting must be practiced, as in the management of highly intolerant species, the openings should be kept as small as possible. These should conform to the topographic and aesthetic features of the areas — an environmental point.

And lastly, forestry is characterized by infinite care to minimize damage to the soil, the all-important basic resource.

The maximum benefits to the economy and to society can be realized if the forest and related lands are administered under a multiple-use concept of management. This concept requires that all compatible uses, for which the land is suited, be combined in a manner that meets the economic and social objectives of the owner, either public or private.

Most types of use can be accommodated on forest lands because of their complementary or compatible nature. Some uses, however, are strongly competitive. In such instances, land managers should consider long-range projections of consumer needs when they prepare plans for optimum combinations of land use. The priorities and plans they establish should be reviewed periodically as changing conditions and public needs require.

The assignment of certain areas to special or exclusive use, such as national parks, military reservations, water reservoirs or wildlife refuges, is justifiable within the framework of multiple-use management. The dedication of lands to a single purpose should be approved only after careful study has determined that the social and economic benefits derived therefrom exceed those possible under multiple-use status.

Optimum use of forest land for sustained production of timber involves: a) determination of the products that are, or may become, available from existing stands — and inventory, b) periodic harvest of the timber crop, c) regeneration following harvest, and d) control of conditions that affect the composition and growth of the forest — silviculture.

In America, there is no doubt that the multiple-use concept is now a basic fact; however, proposals for modification are frequent. In my opinion, integrated resource management is a necessity, not a luxury. Few forest resource programs can be initiated and carried out today without concern for the recreation values, the wildlife values, the water values and the people values along with the timber values. The degree of involvement of each of these values depends upon the particular circumstances within the part of the country in which the situation occurs. I would challenge anyone today to say that one can pursue proper forest management exclusive of these other values or features.

Some say that the phrase "multiple land use" has been overused. However, I believe that no one today seriously believes that one can have every activity on every acre of forest land in equal proportions. Some uses will have and must have higher priority than others in certain areas, and indeed in some places, single use may be most essential to get the highest and best use. However, the larger tracts will still be managed, for the most part, on an integrated resource basis.

As an example of forest philosophy, The American Forestry Association has endorsed, for the past 95 years, three important goals of national forest policy:

1) *To meet the essentials of adequate forest protection.* This will require continued expansion, improvement and research on control of forest fires, with special emphasis on control by prevention. It is of equal importance that the control of forest insects and diseases be brought up to and maintained at a level of effectiveness comparable to the control of forest fires.

2) *To improve the national timber crop in volume and quality to a degree sufficient to wipe out all deficits and build up a reserve.* This can be accomplished practically and economically by utilizing more fully the productive capacity of all the public and private forest lands.

3) *To obtain the maximum of economic and social services from the forests by a realistic application of the principle of multiple use in their management.* This should include all forest uses and services, but must give consideration to national requirements in the conservation of water and the control of erosion.

The multiple use of land involves many adjust-

ments between conflicting uses and benefits. The grazing of watersheds and timber-producing lands by domestic livestock or the propagation of game animals often involves such conflicts. They can be resolved only by intelligent administration, which must be charged with the responsibility for determining the proper priorities of use on any given area.

I wish to emphasize that the protection of the forest, range and watershed lands against damage by all destructive agencies, man and animals included, is basic to any practical and successful long-range management program. Over the years, these lands provided a variety of commodities and services that were most essential to the economic and social welfare of the peoples of the world — water and land for vital domestic, agricultural, industrial and municipal uses; wood for lumber, paper and kindred products; forage for livestock; habitat for wildlife; minerals for basic industries and space for outdoor recreation. In America we sincerely feel that our country achieved its present status by capitalizing on the resource wealth of the land, in association with the ingenuity and the energy of the people.

Many lessons have been learned — many of them by the age-old method of "trial and error." Within the past century many nations, particularly the United States, have moved toward a definite program of conservation practices, based on the philosophy of "wise use." This is interpreted as the management of the natural organic resources with full and regulated utilization of all the respective products and services. I should say, however, that the dedication of certain unique areas to "non use" is accepted on a planned and limited basis.

The real foundation of conservation in America was forestry. It began with the foresters and the setting aside of the forest preserves, and the dedication of those lands for the public good in the late nineteenth century. The most credit must be given to a German-trained forester, Gifford Pinchot. At that time, the emphasis was on the timber aspect of the resources. Protection, controlled harvesting and regulated methods of regeneration were the dominant features of all forest management programs, as promulgated by the Federal and state agencies. The water, wildlife and recreational aspects were recognized, but not in a major sense.

It is important to recognize that the present day concepts of resource management and utilization are changing, and no doubt will continue to change in the future. We are coming to a clearer realization that the present and the future wealth of any country lies in its natural resources and, particularly, in the ability of its people to manage, develop and utilize them fully.

We admit that the extent of the forest resources is limited. There are no more frontiers. In America, for years, there was the opportunity to move westward across the continent; however, the major remaining timber volumes are now in the far West, bordering on the Pacific Ocean. Confronted by the fact that there are no more additional forest areas, we, also, see daily the continued shrinking of the present acreage by the demands for more urban growth, industrial development, extension of highways and utility lines, and the need for expanded agriculture. The U.S. Forest Service tells us that America's forest acreage is being reduced by at least one million acres each year. Also, it is of serious concern to the foresters to note the diversion of many forest acres from productive timber growth to meet the needs of the outdoor recreationists.

The situation that confronts us is understandable, but it presents a serious challenge to the forest land administrators. A major factor, as we all appreciate, is the continuing upsurge in population, which is basic to the aforementioned problems. Currently, for example, the North American population, which was less than 200 million in 1960, will be approximately 350 million by the year 2000. And it is predicted that the world population will more than double in the same 40-year period. The outlook is alarming, to say the least.

What will these multitudes of people mean in terms of forest land use? In spite of our evident trend to become increasingly urban dwellers, the pressures on the forest lands will grow at an alarming rate. It is time for all of us to commence preparing to meet these pressures, which, in the main, are justifiable needs of the people. These demands must be met. However, the natural beauty and the productivity of the lands can and must be maintained, as the managers cope with the many encroachments and the diverted uses. If the aesthetic and material needs of all the people are to be satisfied in the future, the current progress in the development of new techniques for management of the forest, range and wild lands, substantial as it has been, must be accelerated greatly. Hence, the goal of national policy must continue to be maximum sustained contributions from those lands to the national economy and to the health and spiritual well-being of all citizens.

The forest resources have little or no value except as they relate to people. Resource management must have as its central objective the needs of the people. Nothing in nature is used or saved for its own sake — only for how it can benefit Man. A major question then, to be answered in all resource management decisions, is: What is Man's best interest? Or what, in the long run, will benefit the people the most? You may recall the oft-repeated directive to the U.S. Forest Service by Secretary Wilson in 1905, "Manage the national forests for the greatest good of the greatest number of people over the long run."

A quality environment is Man's goal for his survival and for his own use and enjoyment. What is environment? It is everything. First of all, it is Man and his surroundings. It is the sky, the earth and everything in between, the living and the non-living, and the things that we see, hear, taste, smell and feel. Environment is our home — not only the one that we live in with our family, but the city and the countryside around us where we grow our food and our fiber. It is where we collect our water, go for a walk or a swim, or play, or go to and from work, or go to church, or to the place where we vote.

In many areas, especially in the Pacific Northwest of the United States, where I live, the environment is dominated by trees. Other areas and other countries are not so fortunate. These great living plants provide us with beauty and building materials for our homes and paper for our books, newspapers and other paper products. The trees give us comfort and enjoyment. They intercept the snow and the rain for our water supply. They provide food and shelter for the birds, fishes and animals. They furnish many kinds of outdoor recreation for our pleasure. Sometimes we are so close to the trees that we tend to overlook our dependence on them. The trees are harvested only to serve Man's needs, both environmentally and economically.

A major problem confronts the foresters and the forestry profession today. How will the pressures of the several needs of an expanding population and the pleas for an acceptable environment be met and satisfied from a forest area that is decreasing annually? These are the facts of life. In addition to the demands for increased recreational space, there is the very evident need for more fiber — lumber, plywood and pulp. To satisfy the housing shortage in the United States, it is estimated that at least 26 million homes will need to be built by 1975. Although forest growth in America now exceeds the drain by about 62 percent, this situation will come to an end by the year 2000, according to the latest predictions. Canada and the United States, together, now produce 20 percent of the world's lumber, 59 percent of all the plywood and 59 percent of the world's pulp. The two countries have the capacity to produce considerably more — but within 30 years, it is said that the national consumption will exceed the supply, if the present rate continues, which is now seven and a half times as high as the rest of the world.

How will this CHALLENGE be met? The forest land managers must make the fewer forest acres produce more tree growth. In the United States, over the past 60 years, much has been learned through research and experience. I understand that the same is true in the other countries of the world. The practices of protection, silviculture, harvesting and utilization must be improved and intensified. There is a slogan adopted by the 4-H Clubs of America — "Make the Best Better." The forest managers might well follow that advice.

I wish to emphasize certain features of the above four practices that are fundamental to the problem:

1) *Protection.* Research and development relating to the improvement of the methods of prevention, detection and control of forest fires must continue to have priority. The use of aircraft in detection and suppression efforts can be further programmed. Currently the losses from forest insects and diseases are greater than those resulting from fire. Better prevention and control techniques are being studied, along with more complete utilization of the forest materials during the harvest, which will reduce the sources of contamination.

2) *Silviculture.* Much data are at hand and more are forthcoming relative to projects relating to quality seed selection, tree breeding and propagation. The subject of forest tree genetics is being actively pursued. Most of the industrial forestry programs include seed orchards and quality seed selection areas, pointing toward producing trees of faster growth, higher fiber density and quality, and better form. These features are particularly important to the pulp and paper industry.

Regeneration studies are developing more efficient methods of site preparation and improved tree planting techniques. Aerial seeding is proving to be adaptable as well as economical. With more mobile equipment, precommercial thinnings and secondary harvests are now being practiced, especially when associated with a

planned spacing program in the plantation.

3) *Harvesting.* While economy is a major factor, more and more attention is being given to preplanning the timber harvest; road location, improved equipment and more efficient methods of timber removal, such as prelogging and post-harvest operations. These entail the use of smaller and more mobile mechanical equipment than is normally used in the main harvest. Better road systems, and skyline and balloon logging systems will not only permit more frequent harvests, but also will reduce the possible damage to the present and residual stands, as well as to the soil and the streams.

4) *Utilization.* The old adage "Waste Not Want Not" is a key phrase in the discussion of this topic, and it applies to all areas, especially in the woods and at the mills.

In many countries, particularly the United States, large quantities of additional fiber material are salvageable from the forest areas prior to, during and after the harvesting operation. Economics is a factor, of course, but the potential is great. The removal of substandard trees and species is one means where more fiber can be made available for fabrication. It will also improve the forest for regeneration and will aid in the protection activities.

At the wood processing plants, many new and unique methods of manufacture are not only producing new products, but are developing ways of using the smaller materials. The production of pulp chips from previously "unused" wood products' waste has been a boon to both the fabricating plants and the pulp mills. The use of laminated timbers is increasing, as well as the use of plywood with high-grade face stock on a low-quality base. During the past 20 years, we have seen the development of an active softboard and hardboard industry that has used, almost entirely, lumber and plywood plant "waste" — sawdust, chips, shavings and slabs. Much low-quality forest wood is going into this product, also. The Oregon Forest Products Laboratory at Corvallis, with which I was associated for 12 years, was instrumental in initiating the research on this program. The U.S. Forest Products Laboratory at Madison, Wisconsin, recently announced the production of a usable paper pulp from city garbage waste.

For years the meat packing industry in the United States had a slogan — "We use all of the hog except the squeal." Now the wood industry is saying — "We are using all of the tree, including the bark." Tree bark and sawdust are going into certain paper products. Bark has a wide use as a gardening compost and soil conditioner. The above types of "waste" wood utilization are distinct factors in the reduction of air pollution, as those materials were formerly burned in the woods or at the mills. All of these improved practices and others can and will extend the total wood supply, as well as benefit the forest economy in many ways.

While I am not well acquainted with the specific forest products and their related markets which are of concern to the member countries of CENTO, I feel I might make a few comments pertinent to those subjects.

From my past experience, both in education and with industry, I have learned the value of cooperative effort. In view of the geographical contiguity of the three countries, Pakistan, Iran and Turkey, it seems that there could be mutual advantages resulting from an interchange of ideas regarding timber products, either raw, semi-processed or processed, and associated marketable items, to the betterment of the economy of all. A regional approach to solving some of the present problems might be assessed. Perhaps this idea may already be in operation.

While in Chile during 1952-53, I became acquainted with the program of planting large areas to an exotic tree species, *Insignus pine*, for potential pulp and lumber markets. This effort was justified due to the tree's rapid growth quality as well as its usability as a pulp species. But at that time, there were few prospects for the utilization of the wood, since the Chilean economy could not absorb the expansion of pulp mills or lumber mills, and there was no export market in sight. However, in neighboring Argentina, there later developed an active demand for paper products, particularly newsprint, and also a desire to encourage the export of local agricultural products. Today, as a result of a mutual agreement, a most satisfactory interchange of several products is in effect. Chile, as a result of this opportunity, has expanded its pulp production and is now exporting newsprint to Peru, Central America and to Miami, Florida, as well.

It may be of interest to the group, if I refer to four examples of cooperation in the interest of furthering resource programs and reviews in the United States.

1) It is the policy of the U.S. Forest Service to periodically assemble current data relative to the status and condition of all forest lands, both public and private. Information on ownerships, acreages, timber volumes, species, degree of timber re-

moval, and forest land conditions is reported by the forest regions. The 1965 report, entitled "Timber Trends in the United States," is a most interesting document and is widely used as a reference. The private industry lands rated highest of all classes in respect to the quality of forest practices.

2) During 1958-62, an exhaustive survey of current recreational developments, with forecasts for the future, was made by the Outdoor Recreational Review Commission. The study produced a very valuable report. One of the recommendations resulted in legislation authorizing a new Federal Bureau of Outdoor Recreation. This agency is only advisory, as it has no lands to administer. The Wilderness Act of 1964 was an indirect result of this study. This legislation provided for the dedication of certain high mountain forest areas as recreational lands with very limited use — no roads, no utilities, and no timber harvest allowed.

3) Currently, The Public Land Law Review Commission is studying all legislation on record pertaining to the public lands in Federal ownership. The report will be available on June 30 of this year. It is certain to recommend changes in several present laws and make proposals for new legislation. Also, some recommendations regarding the reorganization of certain Federal bureaus may be included.

4) The American Forestry Association is sponsoring a major national program called "Trees for People." In looking at the total timber supply problem, the Association recognized an area with considerable potential: namely the 300 million acres of non-industrial, private forest land. These woodlands comprise 60 percent of the total commercial forest acreage and are controlled by over four million owners. Currently, these lands are mainly unproductive, but they can be made to enhance our future wood supply.

In all of the above studies and reports, there was active cooperation from all interested Federal, state, private industry and associated agencies. This method of assembling and documenting basic resource data has considerable merit and might be followed elsewhere.

As a forester, I have studied and worked with trees and their habitat over a period of 50 years, and I have a tremendous respect for them. Nothing is more dynamic than nature. It is ever-changing, ever-evolving toward a newer, different ecological relationship. Nature is reasonably static, but only when Man attempts to make it so, through artificial controls. However, even this pause in the ecological evolution is only partial and temporary.

Man must make adjustments and learn to work with nature rather than attempt to make it conform to his extreme desires. Nature should not be regarded as a servant, but as a willing friend and ally. Man is capable of helping nature provide the type of environment he is seeking; but Man cannot create — only God and nature have that power.

The land has the ability to overcome destructive forces and to recuperate from abuse. Man, working with nature for a change, rather than against her, can make restoration for his past mistakes. He can use nature's dynamic powers for his benefits, even for his survival.

The natural evnironment is just as vital to Man's well-being as his artificial environment. Today's civilization must have housing, production, transportation and all the other symbols of Man's dominance over his environment. Equally important are open space, trees, grasslands and actual physical contact with the outdoor scene. Without the refreshing and replenishing powers of nature, Man could be doomed to extinction.

How can we restore the natural environment? Man can help in many ways; but first and foremost, he must give nature a chance. Man can help speed up the process and even guide it in a preferred direction. But first he must control his own numbers. Until a formula is found for stabilizing the world's population, Man's life on this planet is in peril. By sheer numbers, Man continues to degrade the environment and make it less habitable for himself. There is a limit, and unless Man, himself, recognizes and controls his impact on the land, nature's balance will prevail in its own time and in its own way.

Conservation is defined in various ways, but in the final analysis it means living within the limit of nature's ability to heal and replenish itself. We can help nature in this renewal process through intelligent planning and controlled use. The opportunities are unlimited, and the needs are critical. The forests and forestry are key factors in this rehabilitation and conservation endeavor. The challenge is here. Are we ready to accept it? I believe we are.

CENTO REPORT OF THE CONFERENCE ON FORESTRY DEVELOPMENT POLICY

INTRODUCTION

AT THE MEETING of the CENTO Sub-Committee on Agriculture, Animal Production and Animal Health held in Islamabad, Pakistan from November 4 to 7, 1969, the Government of the United States offered organizational and financial assistance for a Conference on Forestry Development Policy. The conference was approved by the Economic Committee at its meeting in March 1970, and the Government of Turkey offered to act as hosts. The conference was held at the Forestry Research Institute in Ankara from June 8 to 12, 1970.

Conference Objectives

The conference had the following objectives:

1) To review and appraise the forest development policies in the CENTO regional countries, with special emphasis on the relationship of these policies to the economic and social development of the region
2) To disseminate information to participants by the various delegates and speakers so that a general exchange of policies and procedures among the CENTO countries could be accomplished
3) To consider the need and, if appropriate, prepare recommendations for changes in forest development policies in CENTO countries, as these policies relate to:
   a) the development of foreign markets for excess wood products
   b) the full sociological and economic development of forest land
   c) the dissemination of information relative to forest land use among CENTO countries.

In advance of the conference an expert nominated by the United States Government, Mr. George Spaur, visited the regional countries and with the aid of Country Coordinators, drew up an agenda and working schedule. In order to provide for more detailed discussion of individual subjects, the conference divided for part of the time into four working groups.

Inaugural Addresses

The conference was opened by the Secretary General of the Central Treaty Organization, His Excellency Mr. Turgut Menemencioğlu. The

Turkish Minister of Forestry, His Excellency Mr. Hüseyin Özalp delivered an opening speech on behalf of the Turkish Government.

The leader of the Iranian Delegation, Dr. Parviz Mehdizadeh, read to the conference an address prepared by the Iranian Minister of Natural Resources, His Excellency Mr. Nasser Golesorkhi, who was unfortunately prevented at the last moment from attending personally. The Leader of the Pakistan Delegation, Mr. S.A. Aleem, also made an opening statement. The United States Economic Coordinator for CENTO Affairs, Mr. Joseph B. Robinson, made an opening statement about the purposes and objectives of the conference.

Election of Chairmen

It was agreed that the chairmanship of the conference should rotate among the leaders of the three regional countries' delegations, Mr. Eşref Soysal of Turkey, Dr. Parviz Mehdizadeh of Iran and Mr. S.A. Aleem of Pakistan.

PAPERS PRESENTED

Keynote Address

A keynote address entitled "Forestry — a Challenge" was delivered by Mr. Paul M. Dunn, President of the American Forestry Association.

Country Situation Papers

A situation paper entitled "Present Status of Forestry and Related Fields in Iran" was presented by Dr. Parviz Mehdizadeh.

Mr. S.A. Aleem presented a situation paper on the "Status of Forestry in Pakistan."

A situation paper on "Turkish Forestry in General" was presented by Mr. Eşref Soysal.

Forest Management, Utilization, Economics and Marketing

A paper was presented by Mr. Ziya Günay on "Forest Management, Forest Production and Utilization in Turkey."

Mr. Muhammad Habib Khan presented a paper on "Forest Management Trends in Pakistan."

Mr. Turgut Bayyurt spoke on "Economic Aspects and Marketing in Forestry and Forest Industries in Turkey."

A paper was presented by Mr. M.R. Choudhury on "Development of Forest Industries in Pakistan."

FOREST MANAGEMENT

Forest management policies are based on multiple use of forest resources, such as:

a) watershed management, prevention of floods, control of soil erosion
b) maximizing of production of timber, fuelwood and secondary forest products in order to meet the requirements of the country and if possible for export
c) grazing management in forest ranges and other rangelands outside woodlands
d) maintenance of wildlife habitats for proper wildlife management and recreation.

FOREST UTILIZATION, ECONOMICS AND MARKETING: SUPPLY VERSUS DEMAND

Pakistan faces a serious deficit of domestic wood and wood products. This can to a large extent be offset if the undeveloped and partially developed forests of East and West Pakistan are utilized to the maximum capacity. It is possible only if forest operations are intensified by means of mechanization, setting up of industries and development of new roads and auxiliary facilities. Provision of adequate finances and objective planning are essential for the purpose.

Iran is more or less self-sufficient in forest products except pulp and paper. With the full development of forest resources it should be possible for Iran in the near future to export wood products.

In Turkey some of the forest products are available for export and more are likely to be so in the near future after the planned industrial units become operational.

The following tables reveal the current situation in different countries.

PAKISTAN

Demand category	1962	1975	1985
Timber and other industrial wood (in million m^3)	0.88	1.42	2.11
Paper products (in 1000 metric tons)	82	252	607
Fuel wood (in million m^3)	12.71	18.50	24.7[1]

1. Includes the farmyard equivalent of about 100m^3 which is intended to be replaced by wood for burning.

IRAN

	1968-69	1978-79
	(in 1000 cubic meters)	
Industrial roundwood	1,130[1]	3,500[1]

Average annual rate of growth is 14 percent excluding pulpwood. Wood consumed in the villages is not included in the above figures.

TURKEY

	1969	1972	1982
	(in million m^3)		
Industrial roundwood	4.4[2]	7.2[2]	14.6[3]

Average annual increase rate is about 12 percent.

1. Excluding pulpwood
2. Source: General Directorate of Forestry
3. Source: FAO, Turkey, Forest Industries Preliminary Development Plan.

PRODUCTION TRENDS AND TARGETS OF DIFFERENT FOREST PRODUCTS

PAKISTAN

Production category	1965	1975	1985
Timber and other industrial wood (in million m^3)	1.07	1.60	2.00
Paper products (in 1000 million tons)	90	235	400
Fuelwood (in million m^3)	13.1	14.3	17.1

IRAN

Production category	1968-69	1978-79
Industrial roundwood (in million m^3)	1.0	10.0

TURKEY

Production category	1968	1970	1975	1977
Industrial roundwood (in million m^3)	4.4	5.6	11.6	14.0

Industrial capacity

PAKISTAN (in 1962)

Roundwood	522,000 m^3
Plywood and veneer	5,500 m^3
Particleboard	300 m. ton
Paper products	81,800 m. ton

TURKEY (in 1968)

Pulp and paper	136,000 tons
Roundwood	3,500,000 m^3(r) *
Plywood	130,000 m^3 (r)
Particleboard	27,000 m. ton
Fibreboard	35,000 m. ton
Wooden box industry	193,000 m^3(r)

*m^3(r) cubic meters roundwood.

IMPORTS-EXPORTS

PAKISTAN

Small quantities of newsprint, sports goods, rosin and turpentine are being exported. Pakistan's imports in 1968 were:

Category	Value in dollars (Millions)
Timber	7.1
Panel material	11.8
Saw logs and veneer logs	1.2
Pulp and paper products	15.5

IRAN

Twelve and one-half million dollars worth of wood products were imported in 1969. Imports consist of sawntimber, veneers, particleboard and paper products.

TURKEY

Mainly sawnwood, sawlogs, railway ties and secondary forest products such as storax and paints are being exported. On the other hand, logs of exotic species and pulp and paper products are the main imports.

Total value of imports exceeds the value of exports. The main item being imported is pulp and paper products in respect of value. It is estimated that 20.5 million dollars worth of pulp and paper products will be imported in 1970.

Reafforestation, Range Management and Watershed Management

A paper was presented by Mr. Fereidoon Niknam on "Range Management Problems in Iran." A paper was presented by Mr. İhsan İşikli on "Plantation and Watershed Management in Turkey."

National Parks, Wildlife Management and Forest Recreation

A paper was presented by Mr. John J. Moseley of USAID/Turkey on "The Role of National Parks and Forest Recreation in Today's World."

Dr. Ehsanollah Nayebi spoke on "Preserving a National Heritage in Iran."

A paper was presented by Mr. M.M. E. Karim on "Recreation in the Forest Areas in Pakistan."

Mr. Nejat Özbaykal spoke on "National Park Development in Turkey."

The group which was constituted to consider the situation regarding forest recreation, nature conservancy (which includes establishment and maintenance of national parks and wildlife management), considered that Pakistan, Iran and Turkey being the seat of very ancient cultures and civilizations and having scenic beauty and diversities in geographical and topographical features of outstanding nature, offer excellent conditions for development of national parks and forest recreation. In olden days this region had rich flora and fauna. Due to neglect over the centuries, this flora and fauna are now deteriorating. It is necessary that conditions should be created in these countries through conservation of nature, to ameliorate the mistakes made in the past.

Forest Administration, Research, Education and Public Relations

A paper was presented by Dr. Parviz Mehdizadeh on "Research in Forestry and Related Fields in Iran."

The paper presented by Dr. M. Omar Ali dealt with "Development of Forest Research in Pakistan."

Mr. W.A. Kermani spoke on "Forestry Education and Public Relations in Pakistan."

ADMINISTRATION

The working group studied the administrative pattern of the CENTO regional countries in detail. It is observed with interest that in certain countries, forestry and allied subjects such as range management, wildlife, fisheries and similar renewable natural resources are grouped together under a separate organization for efficient performance and protection of these natural resources. In certain countries, these natural resources are grouped with agriculture.

RESEARCH

The group studied the forest research programs of the CENTO regional countries and observed that considerable work is in progress which is of common interest to the member countries.

EDUCATION

The group studied the forest education system and training facilities existing in the CENTO regional countries. It was observed with interest that in certain countries the universities have started forest faculties and are producing graduate foresters who form the basis of recruitment to the Forest Service. Training institutes are also set up by the Forest and Natural Resources Organizations to give training to the staff below the level of graduate foresters against the requirements of the Organization. In Turkey, the Forest Workers' Training Program has successfully functioned since 1962.

PUBLIC RELATIONS

The group notes that lack of information has resulted in people not being conscious of forest and other renewable natural resources. Thus the necessary steps must be taken in order to familiarize the general public with the importance of these resources.

RECOMMENDATIONS

The basic forest development policy for the CENTO countries should be forest land use development to achieve the greatest economic and sociological returns to the people commensurate with scientific forest land management principles.

FOREST MANAGEMENT

1) Consideration should be given to increasing the forest area in the three countries in national land use plans. In any case, there should be no encroachment on already scanty forest areas.
2) The vacant or partially stocked areas should be rehabilitated and low-value woodlands converted to valuable commercial forests.
3) Emphasis should be shifted from conven-

tional species to fast-growing trees in man-made forests.

4) Modern methods of forest inventories and management plans should be adopted and existing management plans should be reviewed with the help of photogrammetry in order to assess the potential of the resources and to utilize it to the optimum extent.

5) Because facilities available for forest inventories and management plans are inadequate additional equipment and specialist services should be provided.

6) Forest operations should be intensified by means of:
   a) lowering the rotations
   b) use of mechanical equipment in suitable situations
   c) relying mainly on artificial reforestation as opposed to the natural regeneration that has been the practice so far
   d) development of requisite infrastructure in the form of roads, wood-based industries, etc.
   e) emphasis on raising fast-growing species in manmade forests in order to meet the increasing demand for industrial wood
   f) liquidation of overmature growing stock.

7) In all forest development activities the requirements of the rural population for grazing, fuelwood and timber must be duly provided for.

FOREST UTILIZATION, ECONOMICS AND MARKETING

1) All operations relating to the establishment, maintenance and harvesting of the forest should be streamlined so as to effect maximum economy in cost of production of forest products.

2) Long-term plans should be developed to cater for macro planning of the forest industries in each country, taking into consideration the economic availability of raw material, internal and external demand for wood products and present situation of the forest products industries. This exercise could also fruitfully result in regional planning.

3) Mechanization in forestry and associated activities should not be indiscriminately adopted. Special care should be taken to meet the social and economic requirements of the local communities. In situations where for these reasons mechanization is not advisable, forest labor should be trained in the use of improved tools and techniques in order to reduce waste and secure a high standard of efficiency. In many cases, however, machinery will be required for road construction.

4) In establishing wood-based industries emphasis should be on integrated complexes in order to reduce cost of production and secure optimum usage of raw material.

5) Standardization of the wood products should be enforced with a view to reducing waste and to create export possibilities.

6) Possibilities of utilizing forest products of these countries should be explored for mutual benefit. For this purpose a forum should be created to establish and maintain close liaison between the foresters of the regional countries. This arrangement should also result in a mutual exchange of technical knowledge, personnel and expertise.

REAFFORESTATION

Because it is unlikely that the existing reserves of wood in the region will be sufficient to supply the requirements of increasing populations and increasing per capita consumption by the end of this century, and bearing in mind considerations of soil and water conservation, amenity and wildlife development, there is an urgent need to initiate substantial reafforestation programs as soon as possible.

RANGE MANAGEMENT AND RANGE IMPROVEMENT

1) Because such problems as shortage of feed, excess of animal populations and low precipitation over large areas are common to the region, which also shares certain edaphic and floristic characteristics, considerable advantages would accrue to all three regional member countries from a range resource survey covering the whole region and coordinated by a central agency to be set up with regional staff together with expert and material assistance from CENTO.

2) The range resources of the region can only be efficiently developed to their highest potential if the responsibility for all range management is placed under one authority in each country.

3) Every effort should be made to utilize rangelands under management plans as soon as possible. Where research data are lacking, as is the case throughout most of the region

at the present time, only simple plans can be applied, but these should be revised and elaborated from time to time in the light of new information obtained from subsequent research programs. It is essential, too, that the grazing community should be as closely associated as possible with the various stages of range management planning.

4) In order to facilitate the introduction of range management plans special attention should be given to the implementation of supporting research programs at an early date. The possibility of a coordinated approach to such research within the region with the assistance of CENTO should be explored.

Watershed management

Because the responsibility for watershed management in the countries of the region at the present time is in the hands of a number of separate agencies whose activities are not always well coordinated, a specially constituted coordinating authority containing representatives of all interested disciplines should be set up in each country as necessary to coordinate watershed management activities at both policy and field levels.

National parks, wildlife management and forest recreation

1) The system of national parks should be created immediately in suitable areas within the definition of the International Union for the Conservation of Nature and Natural Resources (IUCN) with such local variations which are justified under local circumstances, along with such other measures necessary for conservation and protection of wildlife and other natural and cultural features. The conference feels that in implementation of these proposals suitable legislation wherever necessary should have the highest priority.
2) Considering the importance given by the states of Iran, Pakistan and Turkey to the quality of their environment, and considering the need for trained personnel at various management levels to help protect and enhance environmental quality, an interdisciplinary institution should be established under the auspices of the Central Treaty Organization to be known as the Institute of Environmental Conservation which will be dedicated to the advancement of knowledge and understanding of conservation, and to the preservation and development of natural resources for public use.
3) Any program in nature conservancy should include programs on education of the general public in all these three countries through curriculum in schools and colleges on national parks, wildlife, outdoor recreation, commemorating stamps, audio-visual projections, seminars and other ways. There is scope of cooperation among the three countries through regional wildlife appeals, regional associations and promotion of tourism.
4) At the technical level there should be free exchange of specimens of animals and plants, documentary films, technicians and students, through joint educational and research programs, common publications of periodicals in English, regional inventories and maps on national parks, outdoor recreation and wildlife resources.
5) The objectives of national parks and wildlife conservation as enunciated by the IUCN should also be nationally reflected in the forest management plans.
6) These recommendations should be examined by a working committee of experts to be organized by CENTO to examine the feasibility of financial and technical implications and early implementation of the aforementioned recommendations through the aegis of CENTO and other international bodies, trusts and foundations, etc.

Administration

1) The CENTO regional countries should give serious consideration to the advantages of grouping all the agencies responsible for renewable natural resources under one independent Ministry or Department.
2) With the advancement of technology, the efficient functioning of different branches of natural resources is highly dependent on research. Research activities in the various renewable natural resource disciplines should be grouped together with an autonomous status in order to ensure that their facilities are utilized to best advantage.

RESEARCH

1) CENTO regional countries may consider certain research programs of common interest on a joint venture basis. CENTO may consider organizing and financing of such schemes within the member countries.
2) CENTO may consider development of a technical documentation center in respect to forestry and allied subjects in any one of the member countries for dissemination of research information to various member countries.
3) Exchange of visits of research workers of CENTO regional countries should be organized and financed by CENTO for better understanding of the research problems and techniques in respect to these fields.
4) It is observed that the research organizations of CENTO regional countries lack in certain essential research equipment and spares for efficient functioning. CENTO may consider financing such essential equipment and spares for research to the member countries.

EDUCATION

1) The requirements of personnel for the next 10 years for forest and other renewable natural resource development may be worked out in each of the member countries.
2) Forest workers' training programs should be initiated in CENTO regional countries more or less on the same pattern as is being followed in Turkey. CENTO may consider organizing and financing such training programs in order to produce trained workers in the various fields of operations.
3) CENTO may consider specialized training facilities to graduate foresters of CENTO regional countries particularly in the field of forest industries which are developing rapidly in these countries.

PUBLIC RELATIONS

1) It is recommended that comprehensive programs utilizing all available communications media be developed in order to educate all classes of people concerning the need to conserve renewable natural resources.
2) The daily necessities for forest produce of the villages may be met from the forest at concessional rates and their conditions be improved by providing adequate facilities.
3) Suitable syllabus in the elementary and other classes explaining the necessities and importance of forest and forest conservation should be introduced.

ADOPTION OF REPORT

The conference unanimously adopted this report to the Sub-Committee on Agriculture, Animal Production and Animal Health.

CLOSING SESSION

A closing address was made by His Excellency Ali Karaağaç, Turkish Under-Secretary of Forestry, in which he thanked delegates for their efforts over the last few days and expressed his pleasure at the successful conclusion of the meetings.

Closing statements were made by the Leader of the Iranian Delegation, the acting Leader of the Pakistan Delegation, the United States Coordinator, Mr. George Spaur, and by the final day's Chairman, Mr. S.A. Aleem. Thanks were expressed to the Government of Turkey for acting as host and for the excellent facilities provided, to the Government of the United States for its administrative assistance and to the CENTO Secretariat for its efficient servicing of the meeting. All the speakers agreed that the conference had been extremely useful and that its recommendations were both realistic and practical.

FIELD TRIP

The last day of the conference, June 12, was spent on a visit to the Turkish Experimental Range and Forest Area in the Bolu Region arranged by the Turkish Ministry of Forestry.

COUNTRY SITUATIONS

PRESENT STATUS OF FORESTRY AND RELATED FIELDS IN IRAN

by
Dr. Parviz Mehdizadeh,
Director, Research Institute of Natural Resources, Tehran

INTRODUCTION

FORESTS COVER 11 percent of the total area of the country, namely 18 million hectares, of which 3,400,000 hectares are situated along the Caspian Sea. These forests are the most productive as well as the most valuable forests of Iran. Of these forests 1,400,000 hectares are considered as commercial forests. The main species are: *Quercus castaraefolia*, *Fagus orientalis*, *Acer insigne*, *Ulmus montana*, *Ulmus carpinifolia*, *Alnus subcordata*, *Buxus sempervirens*, *Carpinus betulus*, *Cupresus sempervirens* and some other commercial species.

The remaining 14,600,000 hectares spreads over the Zagros Range and in the Fars and Kerman Provinces as well as along the Persian Gulf, Oman Sea and in the central desert zone. The tree species composing these forests are mostly, *Quercus*, *Tamarix*, *Zizyphus*, *Prosopis* and *Acacia*.

In 1964 in compliance with the White Revolution of the country, the forests and forest lands as well as rangelands of the country were declared national property.

In order to exploit the commercial forests in the Caspian Zone, since 1961 a series of forest management plans have been prepared and executed and a number of forest roads constructed. For better organization and regulation of forest exploitation programmes in the country the Forest and Range Protection and Exploitation Law was passed in 1967 and in December of the same year the bill for the formation of the Ministry of Natural Resources was passed and approved in order to bring all forest resources under a single administration. Accordingly forestry and range management, watershed management, soil protection, fisheries and wildlife management activities became the responsibility of the newly organized ministry. Generally it can be asserted that since nationalization of the forests and rangelands and formation of the Ministry of Natural Resources many outstanding achievements have been made in the field of exploitation, afforestation, range management, soil protection, wood industries as well as a number of research programmes in various fields of natural resources.

Land Ownership and Tenure

In order to ensure the full utilization of forest resources the system of land ownership and tenure is of utmost importance. According to the Forest

Nationalization Law private ownership of forests was abolished in Iran and all the natural forest rangelands, natural woodlands and forest lands became the property of the Government.

Organization of Forest Resources Administration

At present there are several types of activities under the Forest Resources Administration. Generally matters directly related to utilization, protection and development of forests, range, watersheds and soil conservation, are undertaken by various sections of the Ministry of Natural Resources through the respective general directors of the Ministry and through regional offices in each province. However, matters related to wildlife management, though administered by the Game and Wildlife Management Department remain under the overall control of the Ministry of Natural Resources. In matters connected with fisheries, day-to-day control is in the hands of the Fisheries Company of Iran, in which, however, the Minister himself represents the majority of the company's shareholders.

Finance

The annual budget for technical activities amounts to a total of $13,000,000 which is provided through various sources such as:

1. Government aid
2. Income of the Ministry of Natural Resources
3. Credit from the Fourth Development Plan.

Development Plans

Upon organization of the Ministry of Natural Resources a development plan for protection, utilization and management of forest resources was drawn up. Based on this plan, forest development policy in Iran is based on two principles:

1. Systematic exploitation of forests along the Caspian Sea according to appropriate management plans and with due regard to their capacity in order to ensure a sustained yield.
2. Protection, conservation and regeneration of forests in other parts of the country in order to benefit by their positive influences on the climate and in order to increase relative humidity, surface and underground water resources. At the same time to enhance water and soil protection and to create game reserves and recreational parks and finally to produce fuel wood and benefit from byproducts of the forests.

Necessary action has already been taken in order to prepare and execute forest management plans in all commercial forests with an area of 1,400,000 hectares on the Caspian. At present the number of management plans already in operation exceeds 71 with an area of 300,000 hectares. These projects are fully equipped with all types of necessary machinery for exploitation such as bulldozers, cableways, chain saws and trucks.

Legislation

Simultaneously with the approval of the Law for the Nationalization of Forest Resources, it was realized that some contradictory regulations had resulted in connection with exploitation and tax collection. Thus a legal decree was sanctioned through which it was hoped to solve all the problems faced. Yet problems such as these remained:

1) Difficulties arising from not having an exact definition for nationalized forest resources and how to distinguish them
2) Necessity of felling trees and providing wood, fuel wood and charcoal when urgently needed from forests not having management plans as yet
3) The necessity of ceding well determined and limited areas of the nationalized resources to government organizations for their general needs
4) Difficulties arising from regulation of rangelands located within village limits.
5) Conflicts between executors of forest management plans and owners of neighbouring lands with regards to road construction
6) Difficulties in connection with pricing trees when dealing with executors of forest management plans.

In order to solve them it was necessary for the Ministry of Natural Resources to prepare a number of laws such as the Forest and Range Protection and Exploitation Law and its amendment, a law decreeing the formation of the Research Institute of Natural Resources related to the Ministry of Natural Resources, etc.

Organization of Logging and Forest Industries

It is a general policy of the Government that all ways and means should be provided in order to enable the private sector to have a major share in exploitation and utilization of forest resources. At present the Ministry of Natural Resources is

giving technical guidance and help to private executors of forest management plants, private wood industries in feeding their plants with raw materials at reasonable prices. These plants consist of the Guilan Plywood Factory, Hassan-Road Fiberboard Plant, Babolsar Fiberboard Factory as well as the Gorgan and Chamkhaleh Particleboard Plants and several small sawmills throughout the country. In addition, the Guilan Wood Company, an affiliate body to the Ministry of Natural Resources, exploits an area of 32,000 hectares of the Caspian forests producing 175,000 cubic meters of wood per annum. Meanwhile the Ministry of Natural Resources also provides for the needs of the National Railway of Iran by producing and delivering an annual number of 1,000,000 sleepers.

At present 6,000 labourers are engaged in felling and exploitation of forests and 109 cubic meters are cut by each labourer per year. In 1969 as a result of an increase in the areas having forest management plans the total wood exploitation increased to more than 75,000 cubic meters thus increasing the amount of cut per labourer to 121.5 cubic meters per year.

Logging costs and transportation charges up to the main wood markets of the country for every cubic meter of converted wood of various species such as: *Fagus*, *Quercus*, *Fraxinus*, *Ulmus*, *Acer*, *Prunus Alnus and Tilia*, are on an average, 2,370 Rials (about $31.50). However, this cost in respect to species like: *Ulmus*, *Populus* spp., *Diospyros*, *Carpinus*, and others is about 1,950 Rials ($26.00). Transportation costs of these species to the forest roadside average over 1,245 Rials (about $16.50). It must be noted, however, that this figure does not include profit on capital investment and administrative charges. Losses occurring as a result of transforming the logs into lumber average about 30 percent although in some species this figure rises to over 60 percent. To reduce the amount of losses in this respect a number of integrated wood using complexes has been sought in the Caspian Zone. The first one of these has been initiated by implementing the joint project of Iran and Roumania for the exploitation of 79,000 hectares of "Neka" forests. The management plans prepared for this area consist of road construction, logging of 250,000 cubic meters per annum and establishment of sawmills and plants for producing plywood, veneer, particleboard, wooden flooring, furniture and standardized chairs, tables, doors, windows and prefabricated panels. When this project becomes fully operational (1973) as many as 2,900 persons will be employed. The total investment for this project exceeds 1,750,000,000 Rials (about $24,000,000). In the meantime studies are underway to bring 232,000 hectares of the western portion of the Caspian forests under exploitation in order to feed a 100,000-ton paper mill to be established in the near future.

FOREST RESOURCES AND THEIR MANAGEMENT

Forest Management

In 1961 the forest inventory using aerial photographs for 3,400,000 hectares of Caspian forests was completed. Up to now 300,000 hectares of these forests have been brought under forest management plans.

In order to establish a permanent boundary around the commercial forests in the Caspian Zone, to produce agricultural goods for an ever-increasing population and to meet the demand for more agricultural goods caused by a higher standard of living a law was passed permitting clearing and converting degraded forest lands of the Caspian forests into agricultural lands, citrus and poplar plantations, forage production, etc. This project was initiated in 1969, and according to the plans approximately 100,000 hectares of such lands having less than 100 cubic meters of growing stock per hectare will be converted into land producing agricultural goods, wood and fodder over a period of five years.

The protection of the remaining forests is the responsibility of the Forest and Natural Resources Guard. This unit's responsibility includes protecting the forests against fire outbreaks, destruction, encroachment and conversion of forest lands into agricultural lands, etc. The Forest and Natural Resources Guard constitutes one of the units of the Ministry of Natural Resources and is composed of servicemen who have taken a special course for this purpose. This unit consists of 2,148 soldiers, 238 officers and noncommissioned officers, and is well equipped with all necessary transportation and communication facilities, training centers, etc.

AFFORESTATION

Protection and exploitation of forests is supplemented by afforestation activities. Since 1967 more than 12,000 hectares of plantation have been established and almost 70,000 hectares of desert lands have been seeded or planted.

Large-scale afforestation projects have been

established in the provinces of Guilan, Nowshahr, Shahsavar, Mazandaran, Gorgan, the Central Province and Azarbaidjan, Fars, Khuzistan, Kerman, Khorasan, Esfahan and some islands in the Persian Gulf.

In the provinces of Kerman, Khorasan, Sistan-Baluchistan, Khuzistan, Semnan and Damghan about 100 kilometers of windbreaks have been erected. Meanwhile, in Kerman Khorasan and Central Provinces 58,300 hectares of the desert zone have been sown with various drought resistant trees and about 13,000 hectares have been planted with various species of *Calligonum*, *Haloxylon* and *Atriplex*.

Government organizations and municipalities as well as individuals are encouraged to plant trees by being given free seedlings and necessary instructions on how to plant and take care of them. Meanwhile every year on arbour day those who have played a leading role in enhancing tree plantation in the various provinces are awarded a special medal and the overall winner will be honoured by receiving a gold medal from his Imperial Majesty the Shahan Shah Ariamehr. This has proved most effective in encouraging people to plant trees in the country.

There are some severe difficulties in respect to afforestation in arid and semi-arid zones of the country. Iran is very short of adequate water resources. Thus wherever there is some water available, municipalities and industries get the first priority. Even in those areas blessed with ample amounts of water tree planting in some areas around cities becomes very expensive (about $1,500 per hectare) because of the costs of land preparation and establishment of irrigation canals. For this reason, and because of the need for establishing green belts around cities, conservation of barren soils and production of fuel wood, dry afforestation is one of the most important projects of the Research Institute of Natural Resources. Extensive research and detailed studies are being conducted in these matters and significant results have been obtained.

Watershed Management

Watershed management activities comprise one of the main activities of the Ministry of Natural Resources, although two other ministries, namely the Ministry of Agriculture in respect to improvement in methods of plantation, management of saline soils and drainage, and the Ministry of Water and Power in respect to protection of dams against siltation and soil erosion in each dam's catchment area, carry some responsibilities.

As a result of enacting laws concerning dry-farming on steep slopes the Ministry of Natural Resources has been shouldering a heavy responsibility and since conservation and exploitation of rangelands is also a part of its duties it has therefore made proper range management plans for this purpose. By issuing special grazing permits, it has brought exploitation of rangelands under close supervision and control. In watershed management, the Ministry of Natural Resources is conducting research on the amount of running water as well as soil erosion at the Sirachal Research station in the Karadj Dam watershed basin (80 kilometers NE of Tehran) and the Gochak area (15 kilometers NE of Tehran). Meanwhile some watershed management activities are already being conducted near Karadj. In the catchment area of Mohammad Reza Shah Dam some management activities have been undertaken by the Ministry of Water and Power.

Wildlife Management and Natural Parks

Wildlife management in Iran is the responsibility of the Game and Fish Department, an independent government organization. There are over 600 people employed in administering the game laws and regulations and conserving animal habitat, particularly in the many wildlife parks and protected regions.

At present there are 18 protected regions and seven wildlife parks, representing every major habitat in Iran, with a total area of 3,665,156 hectares. This is an area equal in size to Switzerland, or one forty-fifth of the entire country.

The Department's Division of Research and Development is charged with the responsibility of undertaking research and field investigations pertaining to the ecology, taxonomy, population dynamics, etc., of the country's wildlife and its wise management.

These studies include rehabilitation and protection of endangered species and habitats; major efforts aimed at preserving the famous Persian Fallow Deer *(Dama mesopotamica)*, seasonal counts of *Gazell subgutturosa* in selected regions, protection of Persian wild ass and cheetah, preparations for the preservation of the remaining crocodile population in several rivers bordering West Pakistan.

Wildlife Parks and Protected Regions

Investigations are in process in every wildlife park and protected region concerning animal behaviour, lambing, waterfowl migration, etc. Each area must have a management plan to regulate animal numbers in relation to their habitat. The only way to formulate such a plan is through detailed accurate information. As a result, pertinent information on habitat, fauna, flora, weather and topography have already been compiled.

Big Game Species

Investigations are underway in order to study the seasonal movement, ecology, behaviour patterns, herd sizes, herd structure, reproduction and mortality factors of urial sheep in the Mohammad Reza Shah Wildlife Park. Studies are being conducted to determine genetics and morphology of the wild sheep population spanning the mountains in the northern part of the country.

Wetland survey and waterfowl census indicates that Iran is blessed with a large and diversified waterfowl population which has an international importance due to the migratory habits of these birds. For this reason there is close cooperation between those international agencies that are coordinating the activities of all Eurasian and African countries in studying and trying to manage these populations. Two important aspects of this programme involve counting the number and kinds of waterfowl present at different times of the year and ringing the waterfowl so that their movements can be traced. Another important facet of the overall programme is locating and classifying all wetlands as to their importance for breeding, wintering and passage.

Iran will be host to a large International Conference on Waterfowl and Wetlands at Ramsar in late 1349 (January 1971). Preliminary plans have been discussed with members of this division and the planning committee.

Training and Employment

At present three levels of training provide the Ministry of Natural Resources with professionals, technicians and workers in the fields of forestry, range management, watershed, wildlife and fisheries.

In 1966 the Forestry Department was separated from the Faculty of Agriculture of Tehran University and became an independent faculty under the name of Faculty of Forestry and Range Management. This faculty enrolls 30 students a year. The Technical School of Range and Forestry of Gorgan which formerly enrolled only 30 students before the formation of the Ministry of Natural Resources has since 1968, enrolled 200 students each year. An institute which was established in 1969 in order to train technicians needed in the fishery industry enrolls 45 students a year. Skilled labourers are trained in a six-month course in a special school in Chalus. Every year 100 students enroll in this school.

Research

After the establishment of the Ministry of Natural Resources, the policy of development and better use of forest resources was assigned the first priority. With the establishment of the Research Institute of Natural Resources the first specific action was taken to organize a nucleus to incorporate the research needed to devise a better plan for more efficient use of forest resources.

At present there are 117 research projects under execution as follows:

1) 25 projects concerned with introducing various native and exotic species into afforestation, and plant physiology studies
2) 21 projects in poplar breeding and the selection of fast growing clones less susceptible to pests and diseases
3) 15 projects in the field of soil protection and watershed management
4) 56 projects in range ecology, fodder crop agronomy, range improvement by artificial means and grazing management.

Research work is also being conducted in various research stations around the country on methods of sand dune fixation and erection of windbreaks with a proportionate height, length and width as well as use of petroleum mulch in sand dune fixation.

In the current year a pilot project for sand dune fixation with the use of petroleum mulch and dry afforestation is being implemented over an area of 600 hectares in order to study its economic feasibility. All research projects mentioned above are conducted on the basis of statistically sound experimental designs.

Due to the fact that only two years have elapsed since the establishment of the Research Institute of Natural Resources, it has not been possible to develop the research programmes to any great

extent. But with the current establishment of the plant and soil laboratories at the Alborz Natural Resources Research Center it is now possible to make a close study of field experiments in these laboratories under controlled conditions, and if difficulties arise during the experimentation they can be studied and practical solutions provided.

Meanwhile the Research Institute of Natural Resources is executing some joint projects with the assistance of various universities and other organizations. It is expected that these cooperative projects will expand even further in the future.

STATUS OF FORESTRY IN PAKISTAN

by
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Inspector General of Forests,
Islamabad

PAKISTAN HAS an area of 365,529 square miles and a population of over 112 million. It has two separate parts — West Pakistan, comprising the Indus Basin, and East Pakistan, located in the Ganges-Brahmaputra Delta. Climatic conditions are contrasting. East Pakistan is moist and distinctly tropical or subtropical. West Pakistan is dry, arid or semi-arid and mountainous in the northwest. Under these conditions forest types, their distribution and density are diverse.

Over 3,600 million rupees worth of forest produce were obtained from roughly 8.9 million acres of national forests in Pakistan over the last 20 years. The present production per annum is worth over 470 million rupees. Roughly 50 percent of this production is in the form of industrial raw material. Present scarcity of forest produce is artificial as reserves of timber stocks are not being fully exploited. Present output can be raised by roughly 142 percent. With the population growth and accelerated growth of the economy, Pakistan is likely to face a serious shortage of forest products by 1985. Intelligent management operations to induce optimum increment in the resources, rational utilisation of the produce, purposeful development of industries and adoption of a vigorous plantation policy are some of the steps urgently called for. It is estimated that by 2000 A.D., Pakistan's dependence on national plantations will be significantly high.

Forest industries with an estimated investment of Rs. 1,000 million directly employ about 5,000 men and offer job opportunities to thousands of people through cottage industries, transportation of products and sales activities. In the field of pure forestry, about 6,000 persons are on the Government's payroll and thousands find employment through plantation and forest improvement operations. With mobilisation of resource utilisation, and new investments, job opportunities will multiply.

The forest's indirect contribution to the national economy comes through forest influences in the protection of watersheds and water regime, maintenance of topographical features of the country, promotion of tourism, recreational facilities and conservation of wildlife.

FOREST TYPES, THEIR DISTRIBUTION AND GROWING STOCK

The northwestern part of Pakistan is characterised by subtropical pine and Himalayan moist temperate forests. The common conifers are *Pinus roxburghii*, *Cedrus deodora*, *Pinus wallichiana*, *Abies pindrow* and *Picea morinda*. In the irrigated plantations in the Indus basin, *Dalbargia sissoo* is planted on an extensive scale. Besides these,

subtropical dry evergreen forests below 3,000 ft. and thorn forests in desert and semi-desert areas contain scattered trees of *Acacia modesta*, *Olea cuspidata*, *Prosopis Sp.* and other xerophytic plants. *Acacia arabica* occurs in riverine areas and there is a degraded mangrove forest in the Indus estuary. In East Pakistan, in the southwest, tropical rain forests with massive *Dipterocarps* and *Sacintonias* are characteristic. There are large numbers of mixed tropical hardwoods in different canopies. Bamboos occur in mixed crops or as pure crops. Teak is planted on a large scale as normal routine plantation work. In the central flat lands, "Sal" or *Shorea robusta* occurs in patches while in the Sundarbans, one of the finest mangrove forests is located.

Distribution of different types of forests is as follows:

EAST PAKISTAN

Type	Sq. miles	Percent
Tropical wet evergreen forests in the southeast	2,314	42.2
Mangrove forests in the Sundarbans	2,340	42.7
Low level "sal" forests in the centre and north	828	15.1
Total	5,482	100.0

WEST PAKISTAN

Type	Sq. miles	Percent
Coniferous forests	3,439	40.0
Coniferous forests in Azad Kashmir and Gilgit Agency	1,900	22.0
Riverine forests, lower Indus basin	1,073	12.5
Manmade forests	601	7.0
Irrigated blocks, plantations along roads, canals, etc.	259	3.0
Coastal forests (degraded mangrove)	1,332	15.5
Total	8,604	100.0

Various inventories have been made in most of the areas, partly by ground survey and partly by aerial photography. An aerial inventory of West Pakistan's coniferous forests is in progress at the present time. From these surveys, growing stock in major forest areas is estimated as follows:

EAST PAKISTAN (Part only)

	(1,000,000 cu. ft.)
Chittagong Hill Tracts	630
Sangoo Matamuri	270
Sundarbans	595
Total	1,495

WEST PAKISTAN

	(1,000,000 cu. ft.)
Reserved coniferous	2,100
Coniferous village forests	300
Total coniferous	2,400
Irrigated, riverine, scrub and coastal forests	920
Total	3,320

The potential annual supply from these areas under the present system of management is about 100,000,000 cubic feet. Shortening of rotation in management practices will no doubt increase annual yield but this has to be partly offset against conservation needs of watersheds.

CONSUMPTION TRENDS AND SUPPLY OF FOREST PRODUCE

In recent years, some investigations were made on the consumption trends in the use of forest produce. This is briefly indicated as follows:

Category	1962	1975	1985
	Unit: cubic feet (thousands)		
Sawnwood	18,305	29,540	42,560
Plywood and veneer	175	665	2,275
Particle and fibreboard	70	420	2,555
Industrial roundwood	12,530	19,145	26,635
Total	31,080	49,770	74,025
Paper products (1,000 metric tons)	82	252	607

The trend indicates that by 1985, the requirement of industrial wood will be doubled and that of paper will be more than seven times that required at present.

In the case of industrial wood, actual production rose from 37.45 million cubic feet in 1965 to 46.2 million in 1970. It will thus appear that con-

siderable attempts will have to be made to bridge the widening gap between supply and demand which will be increasingly large with the inclusion of raw material demands for pulp.

Consumption of fuel wood in 1962 was placed at 445 million cubic feet. An FAO study using 1962-based figures assessed the demand in 1975 at 647.5 million cubic feet and in 1985 at 864.5 million cubic feet or nearly twelve times the requirements for all forms of industrial wood, excluding paper products. While fuelwood is normally small wood, a consumption of this magnitude represents a very heavy drain on the forest, invites misuse of forested areas and offers competition for raw material needed or intended for more sophisticated use.

FOREST POLICY

Pakistan's forest policy had to be designed on the basis of facts as presented in earlier paragraphs. The policy statement of 1962 is summarised as follows:

1) Maximisation of production wood through shortening of rotation, mechanisation of production techniques, elimination of wastes as far as practicable, form short-term steps to be taken. Introduction of quick-growing species, afforestation of new lands which will lead to a new base for industrialisation will constitute the long-term programme.
2) Grazing, shifting cultivation and unregulated fellings are some of the practices which continually threaten existing tree cover in the country. Legislation, introduction of current land use, purchase of rights in village forests and introduction of scientific management of the affected areas are some of the recommendations enunciated in the forest policy.
3) To combat soil erosion, intensify watershed management and soil conservation practices, policy guidance is indicated. As a preliminary step, a survey of watershed areas has ben emphasised. Particular emphasis is also laid on the creation of shelter belts and windbreaks against desiccating winds and duststorms, plus tree plantation in private holdings to improve farm forestry and thereby better socio-economic conditions of the peasants.

It is to be noted that implementation of the forest policy has not progressed at the desired pace, due to these facts:

1) Greater emphasis had to be put on other sectors of the economy such as food production and growth of certain essential industries. This meant comparatively lower priority to forestry projects, and
2) Institutional arrangements for the implementation of forest policy could not be completely finalised.

DEVELOPMENT ACTIVITIES

Development activities over the last 10 years generally conformed to guidelines as indicated in the Policy Statement of 1962. Important development features of the period are reflected in emphasis on afforestation and establishment of forest industries.

AFFORESTATION

In addition to normal regeneration activities in the cutover areas, intensive afforestation activities were taken in hand in new areas over the last 10 years. The following is a summary:

	1960-65	
	Acres	
West Pakistan:	280,000	(Excludes 4,550 miles of linear plantations)
East Pakistan:	60,000	(Mostly teak, plus 3,000 acres of rubber)
Total:	340,000	

	1965-70	
West Pakistan:	Acres	
Irrigated plantations	82,000	(Excludes 19,400 miles of linear plantations)
Hill afforestation	200,000	
Afforestation in riverine areas	75,000	
Total:	357,000	
East Pakistan:	Acres	
Wasteland afforestation	80,000	
Afforestation in "Jhumed" areas, Chittagong Hill Tracts	40,000	(Excludes 12,000 acres of rubber)
Total:	477,000	

Introduction of quick growing species in plantation is still in the experimental stage. The pace of afforestation is expected to be maintained during the Fourth Plan (1970-75).

FOREST INDUSTRIES

LOGGING

Logging is mostly done by contractors with short-term leases (one to three years). Logging methods are primitive. Felling and cutting are done by axes, and extraction to the main transportation point is by manpower, slides or animals. Mechanisation has been introduced into the Chittagong Hill Tracts with tractors, into the Thor Forest in northern West Pakistan by ropeways, and by tramways in Changamanga, West Pakistan. Major transportation is by a variety of means ranging from camels, carts and trucks to boats and barges, floating, rafting and rail.

SAWMILLING

There are no reliable data on the number, capacity or output of sawmills. The number of small sawmills was estimated some 10 years ago to be 550, each with an input of approximately 100 cubic feet per day, but they operate intermittently. Their number has increased in the last decade, but to what extent is not known. They mostly consist of one or two light vertical or horizontal band saws or small-to-medium circular saws. New large sawmills are being built or are planned at Kaptai in the Chittagong complex, in the Sangoo Matamuri Forest industrial complex in East Pakistan, in the Dir complex in West Pakistan and at Mirpur in Azad Kashmir.

WOOD PROCESSING

Seasoning, preservation, furniture and joinery manufacture are included under this heading.

In East Pakistan the Forest Industries Development Corporation (FIDC) plays a leading role. It operates eight kilns associated with government factories at 90 percent of capacity and is installing another two to bring total capacity to one million cubic feet.

The capacity of two wood preservation plants under FIDC control is 450,000 cubic feet but they are not operating at full capacity. A further two units are being built by FIDC with a capacity of 1,070,000 cubic feet. In addition, the railway and the East Pakistan Water and Power Authority operate two preservation plants of 1,000,000 cubic feet capacity, making the total East Pakistan capacity approximately 2.5 million cubic feet.

In West Pakistan the level of activity is lower with a 50,000 cubic feet seasoning plant at Changamanga, and two seasoning and preservation plants administered by the West Pakistan FIDC capable of handling 140,000 cubic feet. In addition, major consumers of timber such as railways, shipyards and engineering firms have their own arrangements for conversion, seasoning or preservation.

PLYWOOD

Plywood is manufactured in 3-, 5- and 7-ply, in thicknesses from 3mm. to 19mm. for flush doors, wall panels and furniture and for tea chests.

In East Pakistan there are five plants geared mainly to the production of tea chests, with 20 percent of capacity assigned to commercial plywood. Output on a one-shift basis is calculated to be 30 million square feet (3/16").

In West Pakistan six plants are operating where because of shortage of raw materials production is limited. Plants were established without consulting government authorities (a situation no longer allowed to develop) and without assessing resources. Some plants now have to resort to obtaining intermittent supplies from farmers and to importing at considerable cost from East Pakistan. As a result only 20 to 50 percent of peeling capacity is used.

BUILDING BOARDS

In addition to a particleboard plant in East Pakistan using jute sticks, there are three plants in West Pakistan using wood waste. Total installed capacity is 19,200 tons a year.

A particleboard factory with a capacity of 6.4 million square feet of 3/4" board is being erected by the East Pakistan FIDC. The board will be veneered and the product used in furniture manufacture to replace solid wood.

Two hardboard plants have been constructed in East Pakistan. One, privately owned, with a capacity of 15 million square feet (1/8" basis), is currently not in production because of technical difficulties; the other, run by the East Pakistan FIDC, has a capacity of 45 million square feet (1/8" basis).

MATCHES

There are 19 factories in all, 18 in East Pakistan and one in West Pakistan. They are small and many of them have run into difficulties through not assuring continuity of supply of suitable raw material. Production is on the order of 15 million gross boxes a year.

MISCELLANEOUS

The sports goods industry consists of some 20 factories on an industrial or semi-industrial scale, with many more units on a cottage industry basis. It meets the demand for sports goods within the country and makes a contribution to export earnings.

There are small installations in both East and West Pakistan for the manufacture of pencils, cotton mill accessories, etc.

PROPOSED INDUSTRIAL DEVELOPMENT

Four schemes to boost forest-based industry have been designed, with three already approved by the Government. They are based on the concept of integration.

East Pakistan

CHITTAGONG HILL TRACT MECHANICAL TIMBER EXTRACTION

Sponsored by FIDC, this project is designed to double the extraction of timber within the next two years by providing tractors and other logging and hauling equipment, and ultimately to increase it fourfold. It is expected to give impetus to the construction, furniture manufacture, boat building and other wood-based industries in East Pakistan.

SANGOO MATAMURI FOREST INDUSTRIES COMPLEX

This integrated complex will comprise a logging unit, a sawmill, seasoning and preservation plants, plywood, chipboard and wood wool slab factories, a prefabricating section for house building and a pulp and paper mill. Finance has yet to be arranged.

West Pakistan

AZAD KASHMIR LOGGING AND SAWMILL PROJECT

This scheme embraces ropeway extraction of logs, water transport and a sawmill with an input of 2.9 million cubic feet a year. Sawmill residues are to be supplied to a privately owned chipboard factory.

DIR FOREST INDUSTRIES COMPLEX

Initiated by the West Pakistan Industrial Development Corporation (WPIDC), the project will involve an annual input of 3.5 million cubic feet of coniferous logs and a complex consisting of a sawmill, a veneer slicing unit and plywood and chipboard plants.

PROBLEMS FACING FOREST INDUSTRIES

The basic problem in the development of forest-based industries is that of supply of raw material. Forest resources are confined to areas of extremely difficult terrain and their exploitation depends on well organised mechanical logging enterprises. These in turn require heavy capital outlay with assistance in foreign exchange financing.

Because of the overall lack of entrepreneurial experience, technical know-how and capital available in the private sector, the emphasis has been on public sector investigation and investment. The industrial development corporations have been most active, adopting a policy of subsequent disinvestment when enterprises become profit earning.

To ensure the efficiency of the major projects in particular, training is urgently required in the fields of logging, manufacture and management.

WATERSHED MANAGEMENT

Another recent development in forestry in Pakistan is the growing awareness of the need of watershed management. In West Pakistan 76 percent of the area suffers from water or wind erosion in some form or other. Soil erosion, in particular, is constantly threatening some of the dams and it is felt that unless immediate conservation measures are undertaken, many of these will soon be silted up. Recently a team of U.S. experts visited Pakistan in this connection and on their recommendation, a master plan is under compilation. Some of the highlights of the proposed master plan are as follows:

1) Making the watershed management and soil conservation measures in the affected areas compulsory
2) Organising the landowners in the affected areas into associations which should be responsible for the execution and maintenance of facilities to be set up with government help
3) Creation of a single administrative agency who should be responsible for the planning and execution of watershed management and soil conservation programmes and for surveillance of the maintenance of facilities provided and the activities of the landowners' associations.

It is hoped that in the next decade, watershed

activities will be greatly intensified. During 1970-75, about 180 million rupees have been earmarked for watershed management.

CONSERVATION OF WILDLIFE

Pakistan had, in olden days, wide and rich varieties of fauna but due to continued and unscrupulous hunting for pleasure and trade, as many as 61 mammals, 36 birds and 12 reptiles are now on the point of extinction. The International Union for Conservation of Nature and Natural Resources had earlier placed about 20 of these species in its Red Data Book indicating need of national and international efforts to prevent their total extinction from our planet. Proposals for setting up a chain of wildlife sanctuaries, national parks and game reserves, providing institutional facilities and introducing stringent game laws are under government consideration.

FOREST EDUCATION AND RESEARCH

PAKISTAN FOREST INSTITUTE

The Pakistan Forest Institute, Peshawar, at present comprises a forest college and nine research branches, viz., the Silviculture Branch, the Botany Branch, the Entomology Branch, the Chemistry Branch, the Medicinal Plants Branch, the Utilisation Branch, the Range Management Branch, the Watershed Management Branch, and the Forest Economics Branch. The Utilisation Branch came into existence in 1948, the Botany Branch in 1949, the Entomology Branch in 1950, the Medical Plants Branch in 1951 and the Chemistry Branch in 1952. The Silviculture Branch was established in 1956, and the Range Management Branch in 1964. The Watershed Management Branch was started in 1965, the Forest Economics Branch in 1966, and the Wildlife Management Branch was introduced in 1968. The Institute was until recently a UNDP development project.

PAKISTAN FOREST COLLEGE

The Pakistan Forest College is mainly concerned with the education and training of students both for the degree and diploma classes. So far, since 1947, out of 146 students enrolled in the degree classes (Forest Officers' Course), 144 have passed out, and out of 379 students in the diploma classes (Forest Rangers' Course), 360 have passed out. They form a substantial number of the existing professional and technical personnel of the East Pakistan, West Pakistan and Azad Kashmir Forest Departments. This Institution has also had the privilege of imparting training to students from foreign countries such as Hyderabad (Deccan), Zanzibar, Iraq, Somali Republic, Sudan and Nepal.

ADDITIONAL INSTITUTES

In East Pakistan, a forest institute with almost a parallel set-up is functioning separately. The emphasis in this institute is on utilisation research. The institute is now currently being developed under a UNDP project. There is also a Forest Rangers' College in Chittagong which awards diplomas in forestry.

FOREST ADMINISTRATION

Forestry in Pakistan is a subsector in the Department of Agriculture. Separate forest directorates function in the various provinces. The Forest Industries Development Corporation for industrial utilisation of forests has been set up within the Commerce and Industries Department in East Pakistan. In West Pakistan, the Pakistan Industrial Development Corporation looks after forest industries. The Inspector General of Forests attached to the Ministry of Agriculture, Central Government, coordinates the activities of the various provinces, advises the Government on the formulation of forest policy and its implementation and furnishes the forum for international cooperation.

TURKISH FORESTRY IN GENERAL

by
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GENERAL POLICY

Area, Rate and Situation of Existing Forests

TURKEY is a peninsula surrounded on the north and southwest by the Mediterranean, Aegean, Marmara and Black Seas. It is located in the Northern Hemisphere between north latitudes 36 and 42 and east longitudes 26 and 45 . The total area is 780,580 square kilometers. The country is divided into: agricultural lands, 282,860 square kilometers; meadows and rangelands, 130,900 square kilometers; highly developed truck farms, fruit orchards and olive gardens, 22,490 square kilometers; forest lands, 105,840 square kilometers, while the remaining 130,960 square kilometers consist of rocky or unproductive lands.

Under Turkey's present land definitions, 18,273,000 hectares have been designated by the Government as forest lands. This comprises 23.4 percent of the total land area of the country.

Turkey's forest lands are roughly divided into the following general groups:

4.9 million hectares of mature high productive forests
4.6 million hectares of productive coppice
2.5 million hectares of unproductive high forests
6.2 million hectares of unproductive coppice.

Ownership

In 1945 a comprehensive forest law was enacted by the Grand National Assembly. This law nationalized the majority of the forests of Turkey. When the forests were nationalized 1,892 hectares owned by the judiciary and 12,832 hectares in private ownership were exempted. Forests planted or those to be planted in the future do not come under the forest management law, but remain completely under private ownership and management.

General Forest Policy

Forestry policy was created in the Turkish Republic, after 1937 when the new laws began to be organized and the forest and forestry became modern in concept.

Turkey cannot lay claim to having generous natural resources. In some regions of Turkey the more accessible forests, primarily those near or adjacent to villages, have been overcut or in many instances, completely destroyed by clearing the land for agriculture, which in most cases is of a subsistence nature, overgrazing and forest fire. The last census indicated that Turkey has a population of 35,000,000 of which some eight or nine million live in 13,000 villages in or adjacent to the national forests. The principal source of income of these villagers is from primitive agriculture and livestock grazing, although they derive some income from employment in the forests.

In 1945 when Turkey's national forests were created, the boundaries were not delimitated on the ground, a policy which has resulted in encroachment by the forest villagers who are constantly pushing the boundaries further back and clearing more forest land for agriculture and grazing. Also the black goat is a natural destroyer of the forests, and Turkey has 20 million of them as well as six million Angora goats which also eat young trees. The depletion of the forests and other vegetative cover from Turkey's watersheds has resulted in erosion, floods, and in many cases deterioration of agricultural lands, excessive siltation of dams and loss of irrigation water.

Turkey is faced with several immediate problems:

1) The eight or nine million villagers living in or adjacent to the national forests who have a low standard of living and are using national forest lands for agriculture and grazing
2) Accelerated boundary settlement and delimitation
3) Improvement and rehabilitation of pastures within the forest boundaries
4) Erosion control and watershed rehabilitation
5) Improvement of the standard of living of the forest villagers by introduction of industries, handicrafts, tourism, or creation of new jobs in the national forests.

Turkey's forests are being managed not only to provide a source of wood, but to secure the maximum use of the forest land through multiple forest land use.

Organization

ESTABLISHMENT OF THE MINISTRY OF FORESTRY

The Ministry of Forestry was established on August 7,1969 in order to realize the aims and measures foreseen by the Second Five-Year Development Plan in a more rapid way and as a consequence of the ever-increasing requirements and needs.

ORGANIZATION OF THE MINISTRY OF FORESTRY

1) Ministry of Forestry
2) Under Secretary
3) Assistant Under Secretaries (4)
4) Inspection Committee
5) Department of Research, Planning and Coordination
6) Department of Organization and Method
7) Department of Marketing
8) Directorate of Foreign Relations
9) Legal Advisory
10) Directorate of Personnel

ORGANIZATIONS TO BE ESTABLISHED

1) Secretariat of Defence
2) Department of Statistics, Publication and Collecting Data
3) Department of Technical Research
4) Directorate of Construction
5) Directorate of Supplies
6) Directorate of Documents and Archives
7) Chief of Office Duties
8) Directorate of Accounting

GENERAL DIRECTORATES

1) General Directorate of Forestry
2) General Directorate of Afforestation and Erosion Control
3) General Directorate of Forest Products Industries
4) General Directorate of Forest Villages Development

General Directorates are completing sub-organizations within their own structures according to requirements and needs.

FIELD ORGANIZATION

A. Central Organization
   1) Directorate of Forest Management-Photogrammetry Bureau
      a) Photogrammetry (Interpretation)
      b) Evaluation (Cartography)
      c) Field Planning, Study and Control
   2) Leadership of Forest Management Teams (30)
   3) Directorate of Forest Research Institute
   4) Directorate of Izmit Poplar Research Institute
   5) Directorate of Forest Technical Schools of Düzce and Trabzon
   6) Directorates of Forest Guards Schools of Araç and Muğla

7) Directorate of Forest Seed Laboratory
8) Directorate of Bolu Forest Maintenance School
9) Directorate of Eskişehir Forest Nurseries School

B. Regional Forest Offices
1) Regional Forest Offices (24)
2) Supervisory Offices (187)
3) District Rangers (1,213)
4) Department Chief of Delimitation (27)
5) Rangers of National Parks (7)
6) Directorate of Pest and Disease Control Groups (3)
7) Sawmills (21)
8) Directorate of Main Repairshops (2)
9) Directorate of Repairshops (9)
10) Repair Workshop (1)
11) Directorate of Spare Parts and Depots (1)
12) Responsible Accountancy Offices (25)
13) Directorate of Soil Laboratory (1)
14) Chiefs of Wireless Repairshops (4)
15) Directorates of Road Network Planning Group (24)
16) Purchasing Commission (1)
17) Chief of Forest Protection (1)

EXPANSION AND DISTRIBUTION OF NATIONAL FORESTS — DELIMITATION, MANAGEMENT AND SILVICULTURAL ACTIVITIES

Principal Tree Species

Turkey's forests are composed of approximately 54.4 percent conifers, and 45.6 percent hardwoods.

Climate and Forest Regions

Turkey can be divided into roughly five major climatic forest regions, with two of these regions divided into sub-classes.

1) North Anatolia-External belt, Beech region This region is further divided into three sub-regions:
   a) Fagus-Quercus underbelt
   b) Fagus-Abies (*A. bormulleriana*) underbelt
   c) Fagus-Abies (*A. nordmanniana*) Picea underbelt
2) North Anatolian Internal belt Pinus silvestris region
3) Mediterranean belt, Pinus brutia Pinus nigra regions
   a) West coast, Pinus brutia Pinus nigra region
   b) South coast, Pinus brutia Cedrus — Abies underbelt
4) Transitional belt Quercus Juniperus — Pinus nigra
5) Southeast Anatolian belt Quercus — Juniperus region

Delimitation Activities

The Turkish Forest Service conducts its own forest delimitation since cadastral work has not been completed in the mountain regions.

Between the years 1937-65, 3,882,058 hectares of forest lands had been delimitated using classical methods. The classical methods were not only slow, but expensive, so in 1965 the use of aerial photography was adopted. This method is accurate, faster and much cheaper. In addition, 4,962,000 hectares of forest land was delimitated in 1968.

Forest Management

The Turkish Forest Service completed management plans for 5,887,186 hectares of national forest land at the close of 1963, using classical methods. In 1964 the use of aerial photographs was adopted for forest inventory and management work. Inventories and management plans are now being completed on from 1,300,000 to 1,500,000 hectares annually. Turkey will have current inventories and management plans for all forest lands by 1973 or 1974.

Silvicultural Activities

Considerable areas of the forest land of Turkey are degraded and must be improved. Other large areas are stocked with overmature stands, long past the rotation period, which are showing little or no annual increment. The goal of the Forest Service is to harvest the old overmature timber and replace it with vigorous growing young stands in the next 50 years. It is a big undertaking but it can and will be done.

SOIL CONSERVATION AND RANGE IMPROVEMENT ACTIVITIES IN FOREST AREAS

Soil Conservation

When forestry development and its effects on the national economy are considered today, the regulatory function of these effects on the national water and land resources, as well as the various

aspects of the country's timber requirements have to be considered. Similar to most European countries, Turkey has, through past centuries, come under the influence of various economic trends as well as different types of civilization. This has awakened a national awareness of the dangers of erosion, in addition to a gradual awakening to the proper use of forest land, rangeland and arable land.

The rough, undulating structure of Turkey's lands, centuries-long application of excessive unregulated livestock grazing and the ravages of population movements have been the main reasons underlying the deteriorated soil, plant life and water supply that exist in this country. This situation causes surface runoff, landslides, erosion and floods. Soil conservation as a branch of forestry development and management not only tends to eliminate the dangers enumerated above, but also they are closely related to projects of vital importance for Turkey such as watershed development, water resources, storage, irrigation, and ports.

In 1957, an Erosion Control Division was created in the General Directorate of Forestry. At the present time, the work is carried out by the General Directorate of Reforestation and Erosion Control.

Range Improvement Activities

The area covered by the forest ranges is approximately 1.5 million hectares. Ranges outside of forest areas cover around 28 million hectares. The number of livestock grazed in these ranges is around 76 million head. Of these, 20 million are black goats.

IMPROVEMENT OF DEGRADED FOREST AREAS AND REFORESTATION ACTIVITIES

Restoration and Improvement of Degraded Forests

Technical procedures for the improvement of degraded forest areas include the following:

Regeneration measures, such as cuttings for the purposes of conversion of degraded coppice into productive coppice and high-forest; selective clearing of young trees to encourage natural regeneration; soil protection of such areas from every type of intervention.

Reforestation of degraded areas where natural regeneration is not possible

Application of soil conservation measures: By the end of 1965 around 50,000 hectares of degraded forest land were improved yearly. During the succeeding years, it is hoped that this type of activity can be accelerated.

Seed and Nursery Activities

SEED

To realize plans and programs for the expansion of the areas to be reforested, it is essential to collect good seed of known origin for the production of the required number of seedlings on a timely basis.

In 1964, a Forest Seed Laboratory was created in Ankara with the specific purpose of improving seed collection from domestic sources. With the establishment of this laboratory, various stands have been selected in different areas of Turkey as seed sources.

The Second Five-Year Plan provides for the construction of four seed cleaning plants near the best stands of black pine, fir, scotch pine, pinus brutia, cedar and spruce. Since the use of exotic species is still in the experimental stage, only small quantities of seed are imported.

NURSERIES

There are 42 permanent and 97 temporary nurseries in Turkey. Since it is expected that demand will increase during forthcoming years, the annual production capacity of these nurseries will be doubled, and new temporary nurseries shall be established as needed in the proximity of areas marked for reforestation. The rotation plans and the irrigation facilities of the nurseries are nearing completion. Seedlings (coniferous and nonconiferous) of various ages are being produced in these nurseries, which meet the requirements of the general public at a low cost and those of official organizations free of charge. There are no private forest tree nurseries in Turkey at this time.

Aims, Techniques and Scope of the Reforestation Program

REFORESTATION PLAN

Six and seven-tenths million hectares of degraded forests shall be converted to productive forests. The reasons why an effective reforestation program presents a difficult problem may be summarized as follows:

1) Land cadastral surveys have not been completed to date in Turkey, land classifica-

tion has not been started, and areas where reforestation should be done have not been determined.

2) Unlike the northern countries, Anatolia is not located in an optimum forest climate, but is situated on the terminal boundary line.
3) Bare areas that could be designated for afforestation are mostly on steep slopes subject to erosion. The establishment of new forests will be difficult and expensive. All afforestation projects must necessarily be long-term programs. Accordingly the greatest effort is being concentrated, at this stage, on the improvement of degraded forests where conditions are most favorable for replacing low grade trees by fast-growing species of greater economic value.

The total area planted from the beginning of the reforestation program including the year 1968 is 242,000 hectares. A major section of this area was burnt-over forest land. In 1968, 19,500 hectares was planted.

EUCALYPTUS PLANTINGS

Temperature variation is the main factor hindering the large-scale growth of eucalyptus trees in Turkey. As high mountain ranges rise up from the seacoast of Turkey, there occur great changes in temperature in relatively short distances. This has handicapped government forestry operations up to this time.

Accordingly an average of 700 hectares per year has been planted with eucalyptus trees during this phase of the development plan.

THE POPLAR RESEARCH INSTITUTE

For many centuries poplars have been chosen for landscaping Anatolian villages because they develop easily and quite rapidly.

The Poplar Research Institute, which was established in 1962 at Izmit, has established a poplar area of 5,000 hectares on the Black Sea coastline and is encouraging the local people to use improved varieties of poplars.

FOREST PROTECTION

Control of Forest Fires

Above one half (54 percent) of Turkey's forests are covered with conifers, of which the main species are pines. The hot dry summer creates a severe fire hazard especially in the south of Turkey.

The Turkish Forest Service has been spending great efforts in the past few years on control of forest fires. The positive results of these efforts can be seen from the following table:

Year	Hectares damaged by fire (Yearly average)
1937-1939	51,620
1950-1962	27,794
1963-1965	8,989
1966-1967	8,441

Pest Control

Pest control in forest areas is carried out by groups of specialists in pest control. Biological and chemical controls are also maintained.

Control of Other Forest Offences

As stated earlier in the report, one of the most complicated problems that is encountered in connection with forest management in Turkey is the adjustment of forest/forest villagers relations.

Protection measures designed to prevent all types of offences (land clearing, overgrazing, etc.) have not been wholly successful. Accordingly, the following remedial measures have been recommended in addition to the protection measures that are enforced:

1) Reducing the number of black goats, and orientation of villagers toward livestock production where possible
2) Taking necessary social and economic measures to raise the standard of living of villagers living in the vicinity of forests
3) Prevention of wasteful use of timber and fuel
4) Improvement of ranges located within the forest
5) Meeting the individual requirements of villagers on a timely basis
6) Explaining the economic benefits to be derived from forest wealth to the forest villagers.

During recent years the Turkish Forest Service has been allocating credits worth TL 20 million to villagers each year from its own budget to promote the beekeeping industry, to finance lignite mining and to encourage construction of tile-kilns for roofing.

FOREST MANAGEMENT AND PRODUCTION

Timber production in government-owned forests is a function of the Government of Turkey

and is carried out by the Turkish Forest Service. This includes logging, transportation, storage in forest depots and sales.

Activities Related to Production

Parallel to construction of forest access roads and the increase in consumption, production has been steadily increasing. The following numbers show the production of state-owned forests in 1968:

Logs	3,440,068	cubic meters
Poles	56,095	" "
Mine props	404,418	" "
Packaging	168,236	" "
Total wood	4,068,817	" "

Road Construction

Lack of forest roads suitable for all-weather transportation is one of the main factors hindering large-scale production in Turkey's forests. However, rapid progress has been made in construction of access forest roads during the past 10 years.

Under the terms of the First Five-Year Plan, the 50,590 kilometers of forest roads that existed at the end of 1968 (616 million TL was paid) were to be increased by 4,000 kilometers each year. This target has been achieved and surpassed. The Forest Service constructs the forest roads of Turkey, and owns a motor pool valued at TL 180,000,000. Seventy-five percent of the forest roads are built by use of mechanized equipment and 25 percent by manpower. The Second Five-Year Plan is being prepared on the same principles. There are 29 aerial lines for use on high gradients.

Standardization

Standardization of forest products was first started in the technical sense in 1956, and was completed in 1965.

Today the standards (norms) have been prepared for logs, pitprops, fuel and packing wood, to be processed from every species of timber, as well as for every type of conifer. Of the hardwoods, standards have been completed for beech, lumber and for some secondary products such as storax. In the preparation of these norms, standards adopted by other countries and their local conditions have been considered.

Sales, Imports and Exports

The Forest Service effects sales of products stored in forest depots in conformance with a sales tariff determined under forestry regulations and within terms of the law covering selling. Bidding is the underlying principle. In exceptional cases such as in meeting the requirements of the villagers (in excess of those granted under the existing legislation), or to cover the requirements of the government sector, of beech processing plants, of veneer and plywood factories, etc., sales may be effected at fixed rates without bidding.

During the past few years, studies have been conducted to determine outlets for excess production. The main forest products which are exported are the following: beech and oak timber and lumber, cedar (only Turkey has Cedrus libani forests of commercial value in the world). In 1970 the following will be exported:

Abies-picea	48,500	cubic meters
Pinus	140,000	" "
Quercus	21,000	" "
Cedar	11,400	" "

Secondary Forest Products

Turkey is rich from the standpoint of secondary forest products, most of which are exportable. Among these products are: storax, acorn cups, gall nut and bay leaves. Pine resin production can be stepped up and efforts are being directed towards this end. Whereas the total resin requirements of Turkey were being imported in 1956, today all of her requirements are produced locally, and some surplus is being exported. Resin production in 1968 was 4,232 tons.

Turkey is the world's major exporter of storax.

Industrial Processing of Forest Products

There are 21 sawmills belonging to the General Directorate of Forest Products Industries. The capacity of these mills is 455,000 cubic meters. In 1968, 188,000 cubic meters of lumber and 230,000 cubic meters of parquette have been produced.

Other Services Related to Forest Management

The Turkish Forest Service has 53,133 kilometers of telephone lines, 9,692 buildings and guard stations, and 2,108 motor vehicles, as well as other equipment to facilitate the activities of Forest Service.

TRAINING IN THE FORESTRY BRANCH

Higher Education Facilities

At present there is only one university faculty providing higher education in forestry. Another forestry faculty has been established at Trabzon Technical University which will provide five years of training and will be in operation in the near future.

Secondary Training Facilities

To raise technical personnel with secondary training, two forestry schools providing four years technical training each have been established, one at Düzce, established in 1958, and the other at Trabzon, opened in 1964.

Training Assistant Personnel

Two schools providing one year's training after primary level education have been established with a view to training personnel to be employed in forest protection. The first of these was set up in Araç in 1953, and the second at Muğla in 1964. Establishment of a similar school for training forest guards in Maras Province is projected.

Training Forest Workers

Workers' training camps were established at 18 stations in 1962, and more in the following years. Villagers of the age group 20 to 30 enroll in these camps for a period of two to three months to acquire practical and theoretical knowledge in various types of forest work, such as winter transportation.

Community development problems are explained to the camp workers in simple language. These camps also train candidates for the forest protection schools, as well as provide employment for villagers living near the forests.

Forestry Research Activities

All research work is administered by the Forest Research Institute in Ankara.

The Forest Research Institute has eight research units attached to it, one library, one herbarium, one greenhouse, one nursery and several laboratories.

The provincial organization of the Institute covers research stations and research forests attached to these stations or to the central organization. Field operations constitute the center of gravity of their activities. The Antalya (southern Anatolia), and Trabzon (eastern Black Sea), Erzurum (eastern Anatolia), and Bolu (western Black Sea area) research stations are in operation. There are also seven research forests in various regions of Turkey.

NATIONAL PARKS, RECREATION CENTERS, AND WILDLIFE RESERVATION AREAS

National Parks

National parks were first established in Turkey in 1958. The necessary plans for 10 reservation areas have been completed, and these areas have been established.

It is proposed that five other national parks of touristic interest should be established.

National parks and forest recreation centers are being created to meet an ever-increasing public demand, and to increase tourism. Turkey is rich in historical sites, many of which are located in or near the forests.

Forest Recreation Centers

Recreation studies were first initiated in the year 1958, and to date these centers have been established in 164 different areas with a yearly increasing rate of 20 percent, and are made available for the benefit of the general public.

Conservation Forests

To date, 146,247 hectares of forest land, and 131,664 hectares of clearing have been designated as conservation areas, making a total of 277,911 hectares.

Hunting and Fishing Activities

A draft of a bill has been submitted to the Turkish Parliament for the establishment of game refuges to increase breeding and to provide protection for wildlife.

There exists a restricted area of 80 hectares within the Belgrade Forest (in the vicinity of Istanbul), another of 100 hectares at Uludağ, and a third in Bolu in the Abant Forest for the express purpose of breeding game. Twelve different game reproduction sites had already been designated in various parts of Turkey.

A breeding station has been established at

Seven Lakes National Park to breed 50,000 trout annually, and thus improve fish breeding, plantation and sportive fishing in waters within forests.

BUDGET

The Turkish Forestry Service administers the forests of Turkey on behalf of the Government of Turkey under two different types of budgets:

1) *The Supplemental Budget:* Expenses relating to the protection of Turkey's forests against pests, reforestation, administration of nurseries, establishment of forest boundaries, and research work. These amounted to 180 million TL in 1969.
2) *The Revolving Funds Budget:* This budget covers Forest Service operational expenses which include cutting, yarding, loading and transportation of forest products, location, construction and maintenance of all Forest Service facilities, such as access roads, trails, buildings, telephone lines, and radio communication. The income for this budget is derived from the sales of forest products. Forest development and production is steadily progressing and is reflected in the increase in the Revolving Fund Budget. In 1969 this amounted to 1,182 million TL.

EFFECTS OF THE TURKISH FORESTRY DEVELOPMENT EFFORTS ON THE NATIONAL ECONOMY

Benefits Ensured to Villagers Living Within or Adjacent to the National Forests

The economy of these villages and the needs of villagers living within or adjacent to the national forests must be considered in the administration and development of these areas. This country's forests provide the main source of income for these people, and encompass livestock production, farming and employment in forest industries.

The Turkish Forest Service meets the wood requirement of forest villagers. This forest benefit is supplied free of charge, or at a minimal price. The Turkish lira equivalents of the assistance provided to villagers in the form of subsidies or aid in kind, are shown in the following table:

Year	Total lira equivalent of forest benefits received by villagers
1960	103,074,269
1964	100,096,203
1968	148,000,000

In no other sector of the Turkish economy are so many benefits ensured for neighboring villagers as under forestry. The table below indicates the amount of money paid to villagers each year during the performance of services such as erosion control, transportation of logs, storage, road building, and nursery care:

Year	Total funds paid to villagers against labor (in TL)
1960	183,489,929
1964	326,559,724
1968	592,000,000

Place and Importance of Forestry Within the National Economy

Turkey is in the midst of progressive development and economic development efforts have made a rapid increase during the recent years. The strategy and basic objectives of development have been provided under First and Second Five-Year Plans. In conformance with the Five-Year Plan targets which set up the rate of development at 7 percent per year, it is projected that this rate should be 4.3 percent in the agricultural sector and 8.2 percent in the industrial sector.

Turkey's forests have a significant potential role in the economic and social development of this country despite the fact that her forests have been exploited and therefore are not in optimum condition today.

The main targets aimed at under Turkey's forest development program will be: endeavoring to meet the increasing requirements for forest products on the one hand, while on the other hand eliminating the burden created by overmainre forest wealth. This can only be achieved through setting up local industriel plants capable of processing this accrued wealth of forestry assets.

FOREST MANAGEMENT, UTILIZATION, ECONOMICS AND MARKETING

FOREST MANAGEMENT TRENDS IN PAKISTAN

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BACKGROUND

SCIENTIFIC FOREST management in the Indo-Pakistan subcontinent dates back to 1894 when for the first time forest policy was enunciated by the Government of India. By and large, the forests were extensive except in the Indus and Gangetic plains where the pressure of population was heavy and, as might be expected, forest area correspondingly low.

The main demands on the forests were the protection of the catchments for soil and water conservation and provision of constructional timber for buildings, railway sleepers and shipbuilding. The policy, therefore, outlined the objectives as protective for the former and productive for the latter category. In view of the limited demands and high costs of conversion and carriage only important timber species and large-sized trees thereof were harvested, in comparatively accessible areas. This was the common system which, over the years, has changed in places with the increase in demand for forest products. Consequently, more and more species were utilized for timber, harvestable sizes were lowered and intensification of forest industries ensured the development of roads, waterways and mechanical devices.

Basic interdependence of forests and agriculture was recognized, and has been the keystone of management to date. Logical though this approach was, emphasis on agriculture for production of food and cash crops progressively relegated forestry to a relatively unimportant position.

Whereas united India had adequate forest resources to meet the requirements of the country, the partition of the subcontinent in 1947 confronted Pakistan with a serious shortage of forest materials. In East Pakistan, though the forests occurred extensively, constituting about 15 percent of the total area, they were mostly uninventoried and undeveloped. In West Pakistan, the resource was extremely scarce, being about 2 percent of the land surface, the bulk of which occurred in high hills. The latter also suffered from the handicaps of lack of management plans and communications.

Since the introduction of a forest policy by the

Government of India, production of wood seems to have been the principal service that the forests were supposed to render. In the course of time, however, other demands followed. They were particularly highlighted after independence (1947), with recurrence of floods, siltation of the large-scale irrigation works and the disruption of communications following in the wake of denudation of and erosion in the catchments. Also a high-powered Food and Agriculture Commission set up by the Government in 1959 questioned the policy whereunder the forests were being treated more or less as sanctuaries, without regard to the requirements of the people who reside in their vicinity. The forests were to provide grazing and fodder to the livestock. In other words, emphasis was shifting to the multiple role of the forests. These changes have been reflected in the policy directives issued by the Government of Pakistan in 1952 and 1965.

Lately, as a result of the surveys carried out by the World Wildlife Fund Expeditions in 1966 and 1967, the disconcerting fact came to light that wildlife in Pakistan had been reduced to alarmingly low limits. It was a cause of concern for everybody. The protection of the wildlife and its development has, therefore, come to be recognized as another important objective of forest management.

Notwithstanding these developments, the management techniques have generally remained static since the beginning of the century, except for the changes that have been effected in small measures from time to time, to provide for the requirements that devolved on the Forest Service and the resource. Conservative systems are still in vogue. In the context of rising demands for raw material for wood-based industries, the need for management of the watersheds for production of water, prevention of floods and provision of grazing and fodder for domestic livestock, and food and cover for wild animals and birds, the old pattern is now out of date.

MANAGEMENT TRENDS

Due to basic differences in the composition and condition of the forests, it seems advisable to deal with each forest type, detailing the management process that the forests have been subjected to and the indications that have emerged for future line of action.

Pakistan consists of two wings, East Pakistan and West Pakistan, separated by about 1,000 miles of land mass of India. Climatic and topographical conditions of the two wings are vastly different and extremely variable within each wing, resulting in a large number and distinct types of forests. East Pakistan lies within the wet tropical zone and is characterized by a hot and humid tropical climate. The rainfall which is confined to the hot monsoon months varies from 50 inches to about 300 inches. Altitudinal differences are not significant, and rise in elevation from sea level to the highest peak in Chittagong Hill Tracts at 4,000 feet. West Pakistan, on the other hand, lies in a dry subtropical and temperate Himalayan region. Precipitation varies from about 2 inches in the southwestern region to about 50 inches in the Himalayan foothills. It occurs in the summer months during the monsoons up to the foothills of the mountain ranges. Higher hills and mountains also receive spring showers though the bulk of precipitation falls in winter in the form of snow. The elevation ranges from sea level to well over 20,000 feet in the Karakuram range.

Different types of forests and their management are discussed in the following paragraphs.

EAST PAKISTAN

Tropical Wet Evergreen Forests

These magnificent forests with a variety of large-sized trees and bamboos and characterized by dense evergreen undergrowth remained untapped for a long time. The main species, namely *Dipterocarpus*, was the only one in demand and was exploited sporadically in accessible areas, primarily for local use.

In 1955, aerial inventory surveys, with the help of the foreign technicians and equipment, were undertaken and feasibility reports prepared. Based on these reports large areas were clear felled with the aid received for the extraction of timber, leaving belts of original stands at intervals as insurance against climatic hazards.

Though mechanized logging and planning of industries based on the wood material available, reduced waste to a large extent, there are still a large number of the species which have not yet found favour in the market. Consequently, large volumes of wood are left in the forests and are burnt when preparing the area for afforestation. By and large, the clearances are being planted artificially with teak (*Tectona grandis*), a renowned tree species of established utility. In sites that are not suitable for teak and suffer from adverse soil conditions, species like jarul (*Lagerstraemia speciosa*) are planted.

Bamboos which form a large component of these forests had remained unutilized. Establishment of a large paper mill at Chanderghona provided an outlet for bamboos. The bamboos, however, suffer from a serious handicap, in that they die after flowering. This happened in 1962, resulting in a shortage of raw material supply for a few years.

The fact must be recognized that in spite of these changes, a large volume of wood still continues to be wasted, and in clear felling evergreen forests and in the introduction of a species not indigenous to these localities, drastic changes in the ecology of the vegetation are being introduced. What the future of such plantations is likely to be is open to speculation.

With the development of technology and industries based thereon, many woods that had no market about two decades back, have been utilized. Waste is thus being progressively reduced. Techniques are being developed in the Research Institute, Chittagong, to find new and varied uses for the lesser known timber species.

Tropical Semi-Evergreen Forests

Unlike the evergreen forests, the semi-evergreen forests occur near habitations. There are, therefore, understandable difficulties in reafforesting cleared land, due to interference from the population in the form of cattle grazing and damage to the tree crop. About 2,000 to 3,000 square miles of these forests which have been under shifting cultivation for decades, have been completely denuded and pose a serious problem of rehabilitation. They constitute veritable sources of floods and sediment.

Parts of the areas, other than those under shifting cultivation, have been planted with indigenous species to supply firewood to the local population. Some have been brought under rubber plantation which shows promise in climatic conditions obtaining in East Pakistan. Teak and some soft hardwood like *Gmelina arborea*, *Beschofia javanica*, etc., which are suitable for veneering are also being planted on a large scale.

Tropical Moist Deciduous Forests

These are almost pure forests of gregarious sal *(Shorea robusta)*. They are intensively worked as compared to other forests of East Pakistan, because of their location, occurring as they do in thickly populated tracts. Old crops have been replaced by young stands of coppice origin. In view of the pressing demand for small-sized material, the management provides for short rotation as the material finds ready sale for use in furniture, agricultural implements, constructional timber and firewood. As the pressure of population increases, viability of these forests progressively recedes against inroads of cultivation and livestock.

Mangrove Forests

The tidal mangrove forests extend over 3,500 square miles and constitute the largest block of a single type of forests in Pakistan. They occur in the Ganges-Brahamaputra delta known as Sundarbans. Sundri *(Heritiera minor)* is the principal species. It occupies sites with comparatively less brackish water while *Rhizophoraceae* mainly represented by Gewa *(Excoecaria agallocha)* occupy the seacoast where the water is brackish.

Until 1950 the utilization of these forests was low. The main produce was: small-sized timber and firewood of sundri, tannin from *Ceriops spp.*, and Nipa palm for thatching the huts. It was in the fifties that the aerial survey of the forests was carried out to determine the extent of the resource and the availability of timber. Experiments showed that Gewa, which covers large parts of the forests and was considered as a useless species, was suitable for low-grade pulp. A newsprint factory was established at Khulna, based on raw material derived from Gewa.

Regular exploitation of other mangrove species has also been taken up for raw material for hardboard and tanning factories. Due to uncertainty about the establishment of regeneration in harvested areas and the rate of growth of the species, it has not yet been possible to fix, with any measure of certainty, the exploitable size, compatible with the requirements of silviculture of the main species.

Coastal Plantations

In order to mitigate the destruction brought by tidal waves, large-scale afforestation projects have been launched on the seacoast. Supported by the engineering structures, these plantations are intended to reduce the severity of the tidal bores, which have become more or less a recurrent feature in some coastal areas in East Pakistan.

Farm Forests

East Pakistan has a very high density of population including the rural areas. Though the cli-

matic conditions are extremely favourable for the growth of trees, the pressure of population is a serious impediment. Need for trees to provide firewood and building material for the village huts has led to an effort at farm forestry in all available lands in the rural areas. The Forest Service of East Pakistan has an extension wing assigned to the task.

Experience shows that after an educational process to attune the villagers to the importance of trees in the village economy, they do show interest in this drive and try to put trees on as much of the vacant land as they can spare for this purpose. Technical advice and planting material are furnished free by the Forest Service.

WEST PAKISTAN

Main forest types of West Pakistan and methods of management are briefly described below.

Coniferous Forests

Coniferous forests are comprised of Chir *(Pinus roxburghii)*, Kail *(Pinus wallichiana)*, Spruce *(Picea smithiana)*, Deodar *(Cedrus deodara)* and Fir *(Abies webbiana)*. They occur at elevations ranging from 1,500 feet to 10,000 feet. Parts of foothills and the high hills in the north of the province are occupied by these forests.

These are the most extensive and productive forests of West Pakistan, and are managed exclusively for timber. In the beginning, cuttings were selected under a modified form of selection system. A harvestable lower limit was fixed, and besides improvement fellings in the crop below that size, big trees were cut, mainly near the rivers and floating streams. High costs of production, characteristic of hilly terrain, restricted the areas which could be economically worked. In early years only the most valuable species, namely Deodar was exploited near the rivers and in other accessible localities. As the demand for timber increased, not only Deodar forests away from floating streams, but also less valuable species like blue pine, chir pine, spruce and fir were taken up. The system continued to be the same, viz., fixation of harvestable size and periodic cuttings spaced at 10- to 20-year intervals. It is still in vogue in most of the coniferous forests. The rationale for the conservative operations is that by-and-large the forests occur on steep slopes, and as requirements of conservation outweigh other considerations, adequate funds are not available for artificial regeneration — reliance being on natural regeneration — and for want of roads, it is not economical to market small-sized material. It will thus be seen that the potential of the forests is not fully utilized. Besides the above handicaps, another inhibiting factor is the lack of knowledge to regenerate fir which is quite an important component of softwood forests. Technique for its regeneration has not yet been developed.

Discernible change has, however, come about in the gradual reduction of the exploitable size — against about 36 inches D.B.H. (Diameter Breast Height) originally adopted for exploitable trees, it has now been scaled down to 24 inches in most of the forests.

Low-level pines, viz., Chir and Kail, occurring in easier slopes have been managed under the uniform system. Though these species are easy to regenerate, the system has not been a complete success, because of the difficulty in keeping out the village livestock from the areas under regeneration and the incidence of fires. Moreover, reliance has largely been on natural regeneration for which long periods (20 to 30 years) had been adopted, thereby dissipating responsibility. No wonder most of the areas worked under the uniform system have not been successful.

The techniques for regenerating coniferous forests except for fir are well known, and more or less standardized. Scarcity of productive forests in West Pakistan has generated pressures for maximum utilization of coniferous forests. Some of these, particularly in Dir, Swat, Chitral and the upper reaches of the Indus, which were unsurveyed, have recently been inventoried by means of modern photogrammetry and sampling methods. It has been ascertained that there is vast potential available for exploitation. Based on these inventories, industrial complexes have been planned and are in the process of being established.

In short, drawbacks of the conservative system which stand identified, are being eliminated. The future management envisages:

1) Intensive working of the forests under short rotations of 80 to 100 years, followed by artificial regeneration within 2 to 5 years
2) Construction of roads and rides to facilitate the use of the machinery, for the transport of timber
3) Use of mechanical devices like ropeways and skidders for extraction of timber from the forests to the river bank/roadside.

In localities where the resource is not large enough to justify big wood-based industries, emphasis will be on the construction of roads, in

order to make the exploitation of the small-sized material economical. Shift in emphasis from natural to artificial regeneration will tend to concentrate efforts on the regeneration areas, and ensure their stocking within a short time.

It is expected that during the next decade, it will be possible to raise the current yield of 5 to 10 cubic feet per acre per annum from the coniferous forests to about 30 to 40 cubic feet.

Manmade Irrigated Forests

These forests occur in the compact blocks in sizes varying from a few thousand acres to 19,000 acres, scattered in the irrigated tracts over the entire Indus plain. They also include linear plantations along the roads, the railsides and the vast canal system that sprawls over the Indus plain.

Irrigated plantations were started in West Pakistan about 100 years back when the development of the arid tracts in the Indus plain was taken up for farming on an extensive scale under the irrigation system. Justification for these forests lay in the scarcity of firewood for steam locomotives that were then in use. It was also envisaged that with the growth of farming communities and markets for agricultural products, requirements for firewood and timber would have to be met locally. In order to achieve these objectives, the Government followed the policy of setting apart blocks of land in colonized tracts and earmarking the requisite quantities of water for irrigated plantations. During the last century, about 350,000 acres of irrigated forests have been created in the Indus plain. In the upper half of the region, the principal species are shisham *(Dalbergia sissoo)* and mulberry *(Morus alba)*, while in the lower half kikar *(Acacia arabica)* is the dominant tree.

The systems of irrigation and the management of the stands continue to be more or less the same as were in vogue about a century back. Shisham is treated under coppice with standards, with 20 years as rotation for coppice — used as firewood — and 60 years for standards grown for timber. Rotation for kikar which supplies mining timber and firewood is 16 to 20 years.

In view of the scarcity of the forest resource in West Pakistan, the Government in its recent policy directives has provided for the continuance of the old policy of allocating land and water for irrigated forests. Due, however, to keen competition for land for agriculture, implementation of the policy has been somewhat tardy. Under the prevailing stresses, it is natural that competing demands for land and water be conditioned by considerations of economic returns. The Forest Service which has so far managed these forests on a traditional pattern is faced with the problem of streamlining the management in terms of the species, management techniques and utilization standards to meet the requirements of the wood-based industries. The problem is somewhat complicated as far as the economic viability of these forests is concerned. There is, however, no denying the fact that these plantations have a place in the economy of the province, as, besides meeting the requirements of the local population for timber and firewood, and need of industrial wood, they exercise a wholesome influence on the micro climate, and protect the agricultural crops against desiccating winds and storms. This is particularly true of the linear plantations along the canal, railsides and highways which criss-cross the entire Indus plain. Special attention has recently been focused on the utilization of all available land along the canals. When fully developed, they will constitute a sizeable resource.

Regardless of the justification of forests versus agricultural crops in absolute economic terms, future management of these forests has to be governed by the overriding consideration of making these lands as productive in terms of wood and money as possible. It will involve overhauling the entire complexion of management. Checks and balances will have to be applied. At present they are lacking under the clear felling and coppice-with-standards systems. It seems the emphasis has to be on the production of the maximum quantity of wood, rather than the production of the quality wood, as at the present stage of technological development, wood in any shape or form can be utilized through chemical processing.

Trials with the fast-growing species like eucalyptus and poplars which have been underway for about eight years have also given promising results. Parts of the irrigated plantations in the upper regions are under conversion from conventional trees to the fast-growing species, that will be managed on shorter rotations, i.e. 10 to 15 years. The same holds good for the canal plantations where the growth of trees is faster because of a favourable water supply situation.

Scrub Forests

Scrub forests are of two distinct types: 1) scattered Tamarix and mesquite stands found in the south on saline soils — they have low economic

value; 2) subtropical evergreen forests in which the main species are *Acacia modesta* and *Olea cuspidata*. The range of distribution is from about 1,500 feet to 3,000 feet in the northern and northwestern foothills.

The tropical thorn forests have low economic value and are used only to meet the requirements of the local population for firewood.

The evergreen scrub forests, in the context of the changing role of forests in the economy, are considered suitable more for watershed value and leaf fodder, rather than firewood, for which they have so far been utilized. Over the last 50 years, these forests have been worked under the coppice system, as two principal species are reputed to be good coppicers. While initially the exploitable size was fixed at 18 inches at one-foot height from the ground level, it has progressively been brought down to six inches in diameter. There is ample evidence to show that the stumps had coppiced, but, burdened as these forests are with grazing and browsing pressure, the coppice could not be protected. Thus the forests failed to regenerate. Artificial regeneration being an expensive operation for the low potential sites that these forests cover, consideration is now being given to managing these forests for water conservation and supply of leaf fodder for the livestock of the rural communities, rather than for production of firewood.

Riverine Forests

The riverine forests occur in the inundated plains of the river system, mainly in the southern part of the Indus basin. They consist primarily of Kandi *(Prosopis spicigera)* and Kikar *(Acacia arabica)*.

These are natural forests which depend on the vagaries of rise and fall of water in the rivers during the summer season. Comparatively high-lying banks that receive water only during floods carry Kandi as the principal species. On the other hand, areas that are subject to periodic inundations, produce an excellent crop of *Acacia arabica*.

The system of management used is clear felling followed by seeding during the inundation period.

In some of the raised flats Bahn *(Populus euphratica)* is found in pure stands. The species is difficult to regenerate. Research is underway to develop a technique for its artificial regeneration. The tree has a great commercial value as a soft hardwood.

Loss of water from the three eastern rivers of West Pakistan (Sutlej, Beas and Ravi) under the Indo-Pakistan water treaty, necessitated the construction of big dams and link canals in West Pakistan. The frequency and the intensity of the floods in the Indus plain has thus been considerably reduced. As a result, the riverine forests which depended for their growth on the availability of water, have started showing signs of fatigue. Some of them have even dried up. This important source which furnished timber for mining, tannin for the leather industry, and charcoal for burning has been adversely affected. Future management will have to identify the areas where the riverine forests of kikar can still be successfully grown, and others in which the reduction in the quantity of water will require replacement of conventional species by more xerophytic ones.

Coastal Mangrove Forests

These forests occupy the deltaic region of the Indus. They consist of *Avecenia spp.* and *Ceriops spp.* Growth is stunted and scattered.

Though the forests extend over 1,182 square miles, their importance from a commercial standpoint is limited. They furnish poor quality firewood, used by an indigent class of consumers in Karachi. Regeneration of the species is also a problem. Intensity of management in these forests is, therefore, extremely low.

Rangelands

A major portion of West Pakistan being arid, over 60 percent of the land is not suitable for agricultural crops, due to nonavailability of water for irrigation.

As pointed out in the preceding paragraph, over 60 percent of the land surface in West Pakistan is unfit for farming and can be utilized only for grazing. The majority of these lands are classed as "forests" under forest legislation. Accordingly, the responsibility for their management rests with the Forest Service. The Service has within its fold a large number of technicians trained and experienced in range management.

Research on the management techniques of the rangelands was started in 1954. Experience gained has been highly rewarding, and the results are being applied in many areas.

Whereas seeding of the ranges is generally not feasible, the results not being commensurate with the investment, improvement can be achieved through regulated use, under deferred and rotational grazing systems. The graziers, used to indiscriminate grazing for generations, cannot

be easily brought round to accept restrictions on the established practices and habits. Efforts are, therefore, being made to organize them into associations. Grazing management plans are being drawn up in consultation with them and enforced through them, along with technical advice and assistance from the Forest Service. The Government undertakes to provide, besides technical guidance, financial support for establishing water points, trails and other facilities of like nature that are beyond the resource of the graziers.

These vast territories are important not only for domestic livestock, but they are also the habitat of many important wild animals. Improvement of these lands, therefore, assumes special importance in connection with the preservation and development of wildlife.

ECONOMIC ASPECTS AND MARKETING IN FORESTRY AND FOREST INDUSTRIES IN TURKEY

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INTRODUCTION

General Background

FORESTRY AND FOREST INDUSTRIES in Turkey today are considered as parts of an important sector in Turkey's economic development programme, and it is believed that this sector will play an important role in contributing to the gross national product (GNP) in terms of output and services. It is also expected that in the near future this sector will be able to employ a great number of the rural population in forestry and forest industries' operations.

Since the Turkish Government has realized the importance of this sector to the national economy, a separate Ministry of Forestry has recently been established. In addition a new decree for the "Encouragement and Development of Forestry and the Export of Forest Products Project" was enacted in June 1969, setting up a system of refunds and tax rebates which may bring wood export prices to the world market price level.

Upon the recent announcement of new forestland areas and of potential wood production, there has been an increasing interest from domestic and international forest industries, including pulp and paper industries, to speed the development of Turkey's forest industries.

Public and private sectors of the forest industry in Turkey have prepared a number of projects to meet domestic and foreign market requirements.

The Turkish Government has taken action to reach the 1982 forest production target at an earlier date by improving forest management, forest infrastructure and also financial and accounting policy with regard to wood costs.

The woodland area of Turkey is estimated to be 18 million hectares, based on new surveys with more accurate mapping and inventory work. It is believed that the forest area of which only 27 percent is normal high forests covers 22 to 23 percent of the total land area of the country.

Forestry and Forest Industry Contribution to GNP

It is estimated by several organizations, both domestic and international, that forestry and the forest industry sector should significantly increase its contribution to gross national product. Contribution of this sector may increase from 2.5 percent to 4.2 percent between 1968 and 1982.

Purpose of the Study

The purpose of this paper is to consider in some detail the economic aspects of forestry operations, including marketing of forest products both manufactured and nonmanufactured. It also considers briefly the interrelationship between forestry and rural population.

INTERRELATIONSHIP BETWEEN FORESTRY AND RURAL POPULATION

Growth in Population

Turkey's population at the present time is estimated to be about 35 million, with some 10 million peasants living in the mountain villages in or adjacent to the forest areas. Over the quarter century before 1965 Turkey's population increased from 17.8 million in 1940 to 31.4 million in 1965 at an average 2.5 percent rate of growth which is one of the highest in the world.

Thanks to migration from rural areas to urban centers, the rate of growth in rural population has been lower than that in urban population. The following figures drawn from the 1960 population census illustrate the number of mountain villages and the population.

	Number of Villages		Population (in millions)	
In the forests	5,270		2.42	
On the edge of the forests	7,982	13,252	4.23	6.65
Within 10 km. of forests		7,795		3.35
TOTAL		21,047		10.00

Source: Report to the Government of Turkey on Forestry and Forest Industries Development, Rome, 1969

A majority of the people living in the above-mentioned villages display subsistence economy. They farm and raise livestock on steep slopes gained from woodland.

Growth in Income Per Capita

Although over the past 10 years there has been a rapid and sustained growth in the per capita income of Turkey, recent studies indicate that the growth rate of per capita income is lower in the mountain villages and the average per capita income of a mountain villager is less than 20 percent of the national average. A rapid increase in population and the scarcity of sources to obtain livelihood in the mountain villages are the main reasons for this low rate of per capita income.

Increase in Employment

It is estimated that within a fairly short period of time the annual rate of removal of industrial wood from Turkey's forests could be increased from the present volume of about 5 million m^3 per annum to 15 million m^3 by 1976 and 20 million m^3 in 1982.

It is believed that this increase in forestry operations from felling to marketing will present wide opportunities of employment. The Turkish Government is planning to employ at least one from each family living in mountain villages in or adjacent to forestland. It is likely that in line with the new forest harvesting programmes, these people may be employed in expanded logging, road building, transportation, reforestation and afforestation, conservation and other activities. Thus their living standards may be raised. An employment problem which the Forest Service may face is the limited number of skilled workers who are required for efficient forestry operations. The Forest Service prefers the training of native rural people to bringing skilled people from other regions, since training of rural people with experience in forests and mountains seems to be an easier task compared with the efforts needed if people do not have any experience of this kind.

Since most of the people living in the mountain villages farm their own land, it is not likely that they will be able to join a labor force in forestry the year round. As the forest production reaches 10 million m^3 per annum, it is possible that 200,000 workers with an average of 200 working days would be employed if the present state of technique and mechanization is sustained. However, as labor-saving techniques are adopted in forestry operations, the number of workers to be employed

may drop substantially.

The particular aim of the Ministry of Forestry is to give the mountain villagers with no land or insufficient arable land or pastureland full-time employment as forest workers.

On the other hand, it is likely that mountain villagers may be employed on a larger scale in reforestation and soil erosion control activities as these activities are expanded. In addition to these opportunities, mountain villagers may find work in road building, which will be required to open up the forests for commercial exploitation. It seems to be impossible for these mountain villagers to start a massive exodus from the mountains since there is no additional cultivable land available. Also, the pace of industrialization in town centers is so slow and the growth rate of rural population is so fast that it is hard to create new job facilities immediately to reduce the danger of such an exodus. Since the agricultural output per capita on arable land and pastureland is not at a satisfactory level, pressure on these exploding populations has further expanded agricultural and grazing activities into the forest areas on poor soils and steep slopes.

The Ministry of Forestry has been encouraging mountain villagers who use forest land as a meadow for their large goat flocks to replace these goats with other milk or meat animals. There are currently 21 million of them and they are very destructive to forest land. The Ministry has offered to provide the villagers with credits to be used in purchasing the above-mentioned animals from which they may easily obtain their livelihood.

PRODUCTION OF WOOD

Industrial Wood Production Targets and Balances

Although industrial wood production targets have been announced by the Ministry to be 6.3 million m^3, 10.3 million m^3 and 14.6 million m^3 in 1972, 1977 and 1982 respectively, the existing methods of logging and transportation and the system of wood depots scattered throughout the regions would be unsuitable for a large-scale operation. Present logging methods seem to be costly and time consuming. Because of unsuitability of forest roads year round, logs usually remain in depots for many months, sometimes resulting in considerable loss of quality. In a survey conducted in cooperation with FAO Forestry and Forest Industries Special Fund Project it is indicated that since 1950 the output of sawlogs in Turkey has averaged some 81 percent of all industrial wood production.

As mentioned earlier, present actual removals of industrial roundwood are only a third of the production targets.

Cost of Production

Cost of wood production in Turkey seems to be very high as compared with the other European countries. This is because of the methods used in setting prices and because of the high logging and transportation costs. Among the measures being considered to reduce costs is the separation of social and other costs not strictly related to commercial timber production. The Forest Service has already begun to apply a programme for improved wood harvesting methods which may reduce the cost price to a large extent.

Other reductions in costs can be expected from improved methods of management. Improvement of hand tools, introduction of modern equipment, improvement of the skill of workers employed in logging and transportation are considered to be the main factors in reducing wood cost.

The average wood price at depot, including felling, bucking and barking, skidding to roadside, hauling and stocking at depot is about 250 TL/m^3 (r).[1] Delivery cost from depot including taxes at a rate of 18 percent of wood cost at depot adds up to 300 TL/m^3.

PRODUCTION OF WOOD-BASED PRODUCTS

Sawnwood

Eighty-one percent of the total industrial wood production in Turkey is being used in the sawnwood industry. At present sawnwood is the main production item. Coniferous wood species constitute approximately three-quarters of the industrial wood used in the country. Beech sawlogs are the main broadleaved species used in the sawmilling industry. Production of sawnwood in 1968 exceeded 2.5 million m^3 (s).[2] Combined annual capacity of 14 state-owned sawmills working on a one-shift basis is 320,000 m^3 (s). Presently, 200,000 m^3 (s) is being sawn in those state-owned mills. With the implementation of expansion plans and modernization programmes the annual capacity will reach 400,000 m^3 (s).

1. m^3 (r) cubic meters roundwood.
2. m^3 (s) cubic meters sawn.

A survey cooperatively conducted in 1968 by the FAO Special Fund Forestry and Forest Industries Project and the Ministry of Forestry reveals that there are 5,900 privately-owned sawmills of different size in Turkey with a combined annual capacity on a one-shift basis exceeding 7.5 million m^3 (r). It appears that state-owned mills are consuming only 10 to 12 percent of the total sawlog production while the remaining part is consumed by the privately-owned sawmills.

A comparison of the figures obtained from the 1964 Forest Industries Survey conducted by the Forest Service and the 1968 Survey conducted by the FAO Special Fund Project in cooperation with the Forest Service shows that there has been a very rapid increase in the number of privately-owned sawmills.

In 1968, actual sawnwood output by the private sector was 2.3 million m^3 (s). Most of the private mills are of small capacity with an average of 3.5 workers. The same survey reveals that working capacity in those mills is only 40 to 45 percent. Every additional million cubic meters of log production has resulted in 640 new mills. It also appears that there has been a slight increase in the average capacity of the privately-owned mills.

Panel Products

Main types of wood-based panel products produced in the country are plywood, fibreboard and particleboard. Production of these products both as groups and separately has been growing faster than production of sawnwood. Production of plywood rose from 35,000 m^3 in 1962 to 46,000 m^3 in 1968 while production of particleboard and fibreboard rose from 3,000 tons and 27,000 tons in 1962 to 28,000 tons and 32,000 tons in 1968 respectively.

The figures given above indicate that the production of particleboard has grown faster than any other wood-based product.

The gross value of production for this industry increased from 70 million TL in 1964 to 120 million TL in 1967.

Plywood is produced from beech of saw timber size while all fibreboard and particleboard mills use nonindustrial wood from the fuelwood category, including coppice wood. It is believed that in particleboard and fibreboard industries fuelwood and plywood, and sawnwood residues would be used as production increases.

Although none of the previously established plants had used Turkish machinery, newly established plants are using machinery manufactured in the country to some extent. Almost all of the privately-owned panel products plants do not seem to have any possibility of increasing capacity. The only possibility to expand capacity seems to be working on more than a one-shift basis.

The depot prices for beech industrial roundwood for plywood production was 272 TL/m^3 (r) in 1969. Since overmature beech sawlogs used in the plywood industry lay in the forest depots for more than a year, yields in private plywood production average only 40 percent which seems to be very low as compared with European countries. The wood price at the mill appears to be very high because of the low quality of wood used.

Presently, panel products are being used mainly in the furniture industry. However, some is used in construction and box industry. It is expected that in a few years they may be a good substitute for sawnwood. In Turkey, panel products production per capita is one of the lowest in all of Europe.

Wooden Boxes

According to the same cooperative survey the wooden box industry comprised 1,557 establishments with a total output of slightly over 44 million boxes. Output per plant averaged 28,000 boxes. This industry has developed particularly along the Mediterranean and Aegean seacoasts where wooden boxes are required by the fruit and vegetable industry and in Istanbul.

Raw material requirement of this industry was 408,300m^3 (r) u.b.[3] in 1968. In most of the box plants fuelwood is being used to produce shooks rather than sawnwood of any quality. In many of them industrial wood of short length which may be used in pulping is being used to produce boxes. Since the price of the latter is higher than fuelwood, boxmaking people prefer fuelwood to short pulpwood.

A large state-owned box plant with a 1.5 million box capacity has recently begun operation in Antalya on the Mediterranean coast. Although the quality of boxes being produced in this plant is preferable on the market, the cost price of boxes seems to be high as compared with those produced in European countries. But it is likely that a reduction in cost price can be obtained by reducing raw material prices and increasing efficiency in operating the plant.

The net value of production in the box industry in 1967 was 40 million TL. It is expected that box

3. m^3 (r) u.b. — cubic meters roundwood under bark.

production will increase sharply as fruit and vegetable production increases.

Pulp and Paper Industry

Nearly 90 percent of the total paper and paperboard production is produced by SEKA, a state economic enterprise. In 16 privately-owned mills of smaller size the remaining part is produced. Production of paper and paperboard accounts for not more than 50 percent of the total consumption. In 1967, 127,000 tons of paper and paperboard were produced in the country. Another 103,000 tons were imported in the same year. Cayeuma Mill recently began operation. It produces kraft pulp, kraft paper, paperboard and NSSC pulp. Another two are currently under construction by SEKA, one at Dalaman to produce kraft pulp, printing and writing papers, paperboards and dissolving pulp, and one at Aksu to produce newsprint. Feasibility surveys for a mill to produce kraft paper and paperboard are nearly completed. Also in Afyonkarahisar and Balikesir two other mills are to be built. If all of the plants being considered begin operation, an additional 769,000 tons of paper and paperboard would be produced.

The average depot price of pulpwood supplied by the Ministry of Forestry is 150.51 TL while the total price at the plant is 241 TL on an average. The pulpwood prices have not increased for some seven years. However, deflated pulpwood prices display a steady decrease.

On the other hand, paper and paperboard cost prices seem to be very high as compared with the North American and European countries. It is a fact that the high cost of raw material is not the only reason for these high prices. Deficiency in know-how, overstafling and high cost of water and electricity are important reasons effecting the cost price of paper and paperboard. Actual cost price of pulpwood might have been higher than 150.51 TL/m^3, if there were no government subsidy.

The difference between the cost price of pulpwood and the sale price charged to SEKA is added to the sale price of the other wood products sold by the Forest Service. This is the danger, that if SEKA requires some millions of cubic meters of wood in the years ahead, reflection of this subsidy on the sale price of the remaining products would be higher than that at the present time and would be more significant.

Although SEKA is complaining of high wood prices, import prices of both pulpwood and pulp are much higher than the domestic prices. Therefore, supply of wood from domestic sources seems to be more economical than importing wood from other countries.

The net value of the pulp and paper and paperboard was 137 million TL in 1962 and 170 million TL in 1967. This industry's contribution to the gross national product is 0.2 percent at present. With the completion of new pulp and paper plants, the contribution of this industry to the gross national product will be much higher than that at the present time.

THE DEMAND FOR WOOD AND WOOD-BASED PRODUCTS

Sawnwood

Sawnwood is the simplest of the processed wood products to produce. For that reason it is widely used throughout the world.

In Turkey 81 percent of the total industrial wood production is used in the sawmilling industry while the world average is about 65 percent.

Over the past 10 years sawnwood consumption in Turkey has increased very sharply because of the higher level of sawlog supply by the Forest Service. A survey conducted some months ago indicates that sawnwood consumption is closely related to the increases in the gross national product. However, the rate of increase in sawnwood consumption is faster than that in the real gross national product. The same survey reveals that there has been a slight decrease in real sawnwood prices since 1952 while wholesale price indices have gone up. The decrease in price is a factor affecting the demand for sawnwood but it is not as significant as the increases in GNP.

As known in a number of countries, and most notably in those in which sawnwood had previously been used heavily, its use has declined not only in proportionate but also in absolute terms.

There are a number of factors which separately or together can cause this. In the housing sector multi-dwelling buildings in densely populated centers use less sawnwood per unit. Secondly because of new patterns of use, sawnwood is used more economically. Another factor is the actual substitution of other materials, mainly panel products, for sawnwood. Changes in the nature and technology of the sectors traditionally using sawnwood have also tended to diminish or eliminate its uses. Therefore we believe that sawnwood

consumption in Turkey will continue to rise but at a decreasing rate.

Panel Products

Consumption of these products both as a group and separately has been growing faster than consumption of any other wood product group. In part this remarkable growth was due to the introduction of particleboard to the market. Plywood consumption is growing but at a slower rate than particleboard. The same holds true in fibreboard.

It is believed that panel products may and will be very good substitutes for sawnwood. Prices of panel products are higher than sawnwood prices, but it is believed that prices will go down and improve its competitive position. More important than price advantage has been the labor-saving and technological advantages of them. As labor wages rise, these more easily handled materials have an increasing cost advantage.

Therefore demand for panel products may continue to grow at an increasing rate for some years until a better material is found as a substitute for them.

Pulp and Paper

Over the last 20 years paper and paperboard consumption in Turkey has grown very sharply. As mentioned earlier, only about 50 percent of the total consumption is being produced by SEKA. Several analyses indicate that paper and paperboard consumption is affected by the increases in GNP and literacy rate and decreases in price. We believe that average per capita paper consumption figures, if the demand calculations are based on them, may be misleading. This is the fact that illiterate people are not expected to use cultural papers. Literacy rate is an important factor effecting the change from primitive packing materials to modern packing materials namely wrapping paper and paperboard used in packing. There has been a fivefold increase in paper and paperboard consumption but, according to our calculations, demand will continue but at a slower rate than that in the past 15 to 20 years. Also high cost prices of paper and paperboard should be regarded to be the factors affecting the demand.

FOREST INDUSTRIES VERSUS PULP AND PAPER INDUSTRY

The previous section has considered the nature and evolution of demand for wood and wood products. In terms of requirement for wood, capital and labor, wood-using industries may differ widely. The sawmilling industry is the heaviest user of roundwood with 81 percent of the total wood production and of labor, but employs less capital per unit of labor or raw material than any of the other primary forest industries.

We realize that growth in the pulp and paper industry in Turkey will satisfy the domestic demand and help Turkey's foreign trade balance.

However, we also believe that the nature of the economy and social structure should be thoroughly examined before going into large industrial capacities. This is the fact that idle labor force both in rural areas and in densely populated town centers are a burden on the Turkish economy. These large masses of people should be employed. On the other hand, statistics show that the pulp and paper industry is the one which requires the smallest labor force. It means that no matter how big the pulp and paper mill is, we still have only a poor chance to employ more people. Investment requirements in the pulp and paper industry as a whole and per unit of output are very high as compared with the other wood-using industries. Although sale prices of paper are very high as compared with sawnwood and panel products sale prices, the profit margin in the pulp and paper industry is narrower than the latter. Prices of sawnwood and panel products produced by both state-owned sawmills and privately-owned mills are very high in the domestic market. It is apparent that a slight increase in pulpwood price may result in a loss in the pulp and paper industry. As we said earlier if the pulp and paper industry requires 40 percent of the total wood raw material it will be indispensable not to subsidize wood prices since its effect on the price of other wood products would be intolerable. Since only 20 percent of the total wood production is classified as pulpwood, an allocation beyond this proportion would not be justified. Therefore it is not economically justifiable to allocate raw materials amounting to more than 20 percent of the total output.

INTEGRATION

For the time being there is no significant integration, horizontal or vertical, among forest industries of different or similar type. Integration, as commonly known, may reduce the cost of production to a large extent. For that reason it should be encouraged strongly in forest industries. Presently most of the residue of saw-

mills is being consumed as fuelwood. As integration among the sectors of forest industries develops, residues are used as raw material. As we mentioned in the previous chapter, the wood raw material requirement of the pulp and paper industry would be more than 20 percent of the total output. Here integration seems to be the only possibility to supply raw material at a low price. Unless integration is realized the raw material cost remains very high. It is possible to reduce consumption of sawmilling residues as fuelwood by replacing them with lignite, coal, natural gas and other kinds of fuel.

SEKA and the Ministry of Forestry should examine the possibilities of establishing integration. Integration between sawmill and plywood plants and pulp and paper plants may be mentioned as an example of improving economics of mills. Sawmill and particle or fibreboard integration can also be mentioned. It is also advisable to build chippers next to the sawmills from where chips are shipped directly to the pulp and paper mills. The only integration sample in the forest industries is in Istanbul with an integrated plywood and particleboard complex.

EXPORT POLICY

The Ministry of Forestry aims at creating possibilities of exporting forest products in order to increase export earnings. It is estimated that in five years export earnings from forest products may reach 80 million TL. The Ministry of Forestry is taking measures in order to curtail domestic consumption of forest products so that they may be exported. As mentioned earlier some legislation has been passed to increase incentives in exporting forest products.

REAFFORESTATION, RANGE MANAGEMENT AND WATERSHED MANAGEMENT

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RANGE MANAGEMENT PROBLEMS IN IRAN

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INTRODUCTION

IRAN is an old country with more than 4,000 years of history. Animal husbandry, especially sheep breeding, is one of the oldest industries in this country. Most particularly mutton, and bread constitute the major diet of not only Iranians, but people of all Middle Eastern countries. Within the last two decades competition between sheep and wheat production has created socio-economical, technical, political and administrative problems. Most of the marginal land which formerly was rangeland has been converted to dry farming for wheat, even though unsuited to this use. This practice has caused a significant decrease in rangeland while a buildup of livestock numbers has taken place.

A reasonable management plan for such a situation requires knowledge of rangeland and its surrounding living and nonliving environment. Analysis of local problems is a very urgent need, before preparing any management plan. Previous experience has led the Range Department of the Ministry of Natural Resources to the stage where range management planning has become its highest concern.

PHYSIOGRAPHY

Iran covers approximately 1,650,000 square kilometers (628,000 square miles). It lies between 25° and 39° 45′ North Latitude, and 44° and 63° East Longitude. Due to the influence of several mountain ranges, variation in elevation and prevailing winds, the country does not have a large area of uniform environment. Various climatic, vegetational, and soil types can be distinguished within short distances. Four main physiographic provinces are distinguished in Iran (Dewan 1964): the Alborz and Zagros Mountain ranges, the Caspian Littoral, southern coastal plain of Khuzistan, and finally the Central Plateau.

CLIMATE

The absence of a large area of highly productive range is a result not only of mismanagement but also of climatic factors. Not only is the quantity of precipitation low for most of the country, but its distribution is irregular thus producing long periods of drought.

The climatic classification used by Pabot (1967) consists of the three following major climatic zones:

CASPIAN ZONE

This zone has Caucasian and Medio-European affinities and shows a Mediterranean influence on the coast. Precipitation increases from east to west as there is 585 mm. in Gorgan (East) and

1,850 mm. in Pahlavi (West). No significant drought has ever been experienced in this zone. The mean July temperature is 30 to 34°C and the mean for January is 3 to 5°C.

The perennial grasses such as *Dactylis glomerata*, *Phleum boemeri*, *Melica* spp., *Festuca montana*, *Agropyron panormitanum*, *Bromus* and *Poa* spp., are common. Legume, such as *Trifolium repense*, *Trifolium pratense* and *Lotus corniculatus* are fairly common.

BALUCHI ZONE

This zone has high relative humidity (60 to 80 percent) due to the proximity of the Persian Gulf and the Oman Sea. Arid affinities exist with less than 200 mm. of precipitation at sea level.

Grasses include: *Panicum antidotale*, *Pennissetum dicotomum*, *Cenchrus ciliaris*, *Hyparrhenia hirta*, *Chrysopogon ciliolatus*, *Cymbopogon laniger*, *Aristida* spp., and *Aeluropus repense* (a stoloniferous and rhizomatic, salt resistant grass). A few species of Astragalus and other woody legumes are common.

IRANO-TURANIAN ZONE

This zone has a dry summer and a temperate continental climate and covers more than 90 percent of the entire country. It has the lowest relative humidity of the three major zones (10 to 20 percent in summer and 65 to 80 percent in winter). Based upon average annual precipitation this zone is divided into five climatic sub-units which are more fully described in Table I.

Vegetation consists of xerophillic forest species where precipitation exceeds 450 mm. and drought and salt resistant herbacious plants in sub-units of desertic and steppic zones. Plants of Chenopodiaceae family such as *Salvesola herbacea*, *Haloxylon* spp., *Suaeda* spp., are well distributed.

Land Use

Relatively reliable statistics on land use are available in Iran. In Table II the latest data in land use are presented. In this table rangeland refers to those grazing lands which are in reasonably good condition.

RANGELAND

Different sources have produced different estimates according to their own definitions of the term "range." These vary from 10 million hectares (Ministry of Agriculture, 1960) up to 106 million (Pabot).

For a meaningful estimate a definition[1] has been given to the term "range" and based on such definition, a total of 100 million hectares (Niknam, 1970) has been suggested as rangeland and divided into three different production classes as shown in Figure 1.

1) Good to fair range including forest rangeland 19 million hectares
2) Fair to poor range 25 " "
3) Poor to very poor range 56 " "

TOTAL 100 million hectares

1. Large naturally vegetated areas which are grazed by domestic livestock and game animals.

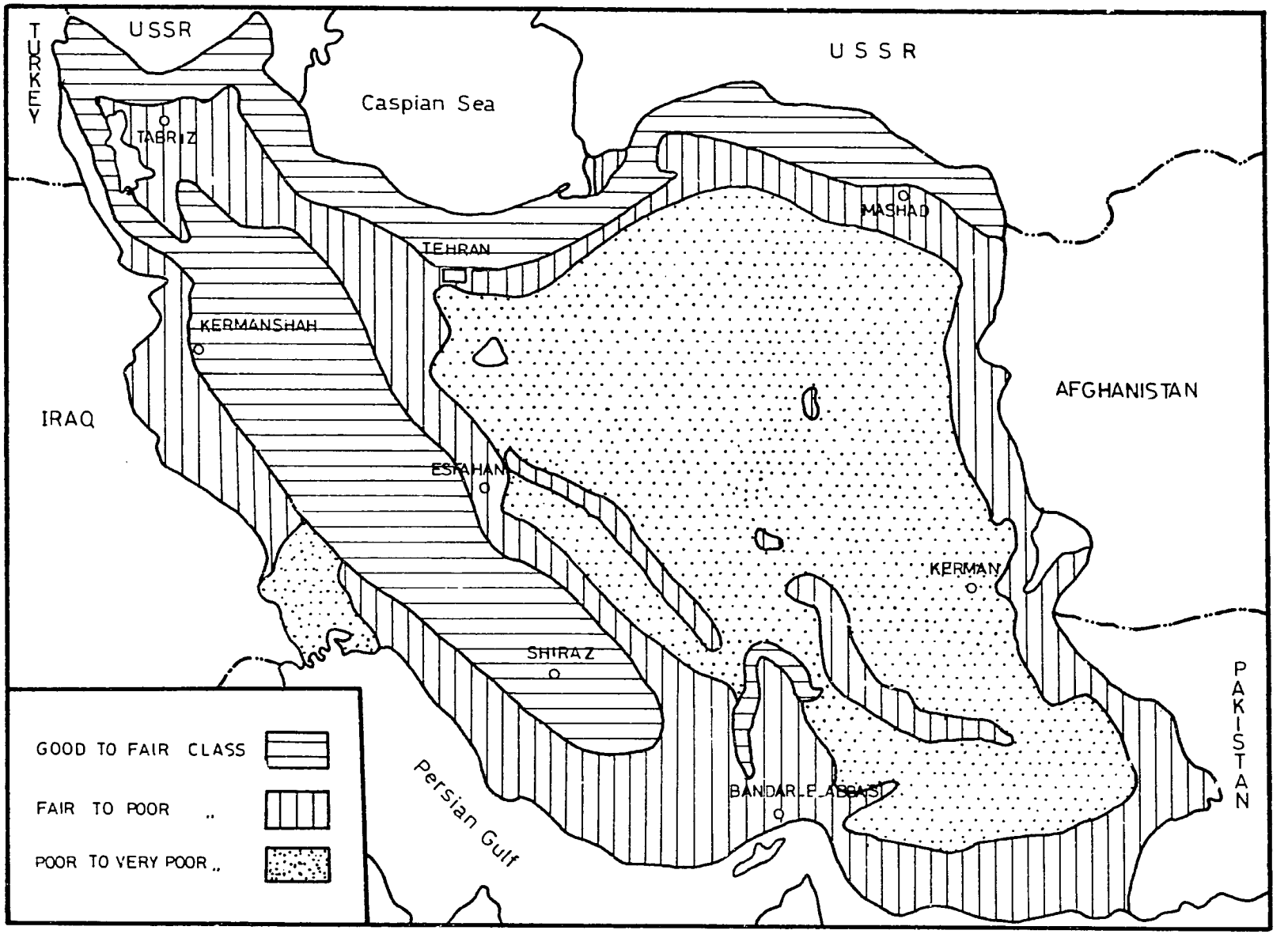
TABLE I

CLIMATIC ZONES OF IRAN

Zones	Area sq. km. (Thousands)	Percent of Entire Country	Precipitation in mm.	Mean Temperature C° January	July
Irano-Turanian	1,510	91.5	—	—	—
Sub-desertic	355[1]	21.5	< 100	4-10	29-34
Steppic	495	30.0	100-200	1-26	26-37
Sub-steppic	400	24.0	200-400	-4-12	25-35
Xerophilous ferest	180	11.0	400	-7- 5	18-30
High mountains	80	5.0	?	-2	< 20
Caspian	50	3.0	500-2000	< 8	< 26
Baluchi	90	5.5	300	>15	> 34
TOTAL	1,650	100.0	—	—	—

1. Sub-desertic Zone includes 100,000 sq. km. of salt flats and 40,000 sq. km. of sand dunes.

Figure 1 . Range Production Classification Map of Iran .



Class 1 produces an average of 400 to 500 kg. usable forage per hectare. Average production for Class 2 is 150 to 200 kg. and 30 to 40 kg. for Class 3.

LIVESTOCK

Traditional food habits have minimized the substitution of other food ingredients for livestock products in the major segments of the Iranian population. In general, all demand indicators point toward an expanding market for livestock products.

In 1966 total investment in meat animals production, including 20 million chickens, was estimated at $1.1 billion (Sattary, 1966), 43 percent of which was invested in sheep production. Demand-livestock-range interrelationship in Iran requires immediate attention by policy makers. Already more than 80 percent of the livestock forage is supplied by the rangelands.

In general, the number of livestock has increased rapidly since 1950 with a significant shift from sheep to goat production, resulting in lower quality meat. This growth can easily be seen in data given by the Food and Agriculture Organization (Table II). In Figure 2 the amount and percentage of meat kind slaughtered in 1968 are shown.

Figure 2. Meat Kind Slaughtered in 1968.

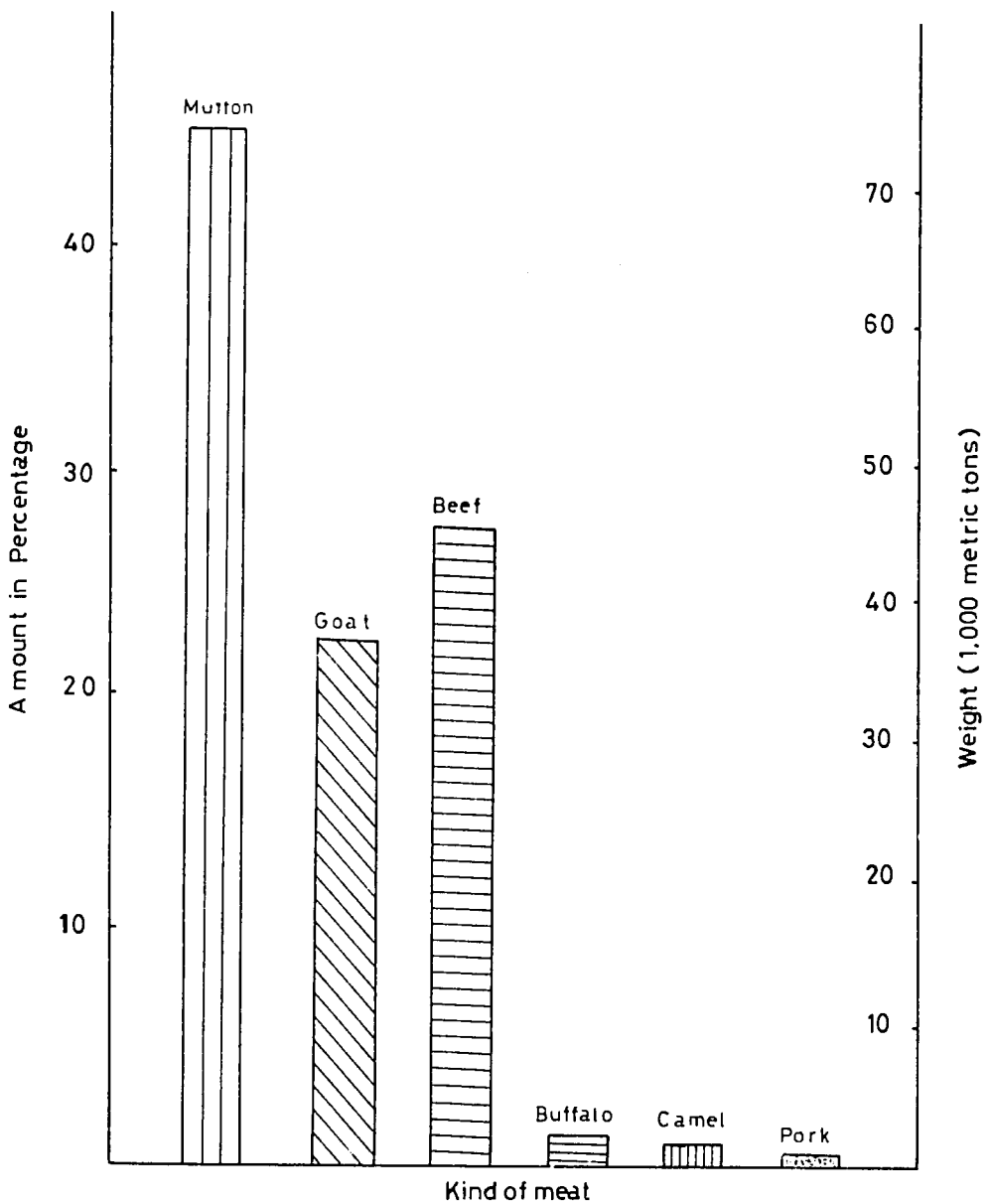


TABLE II

LIVESTOCK NUMBER IN IRAN (in thousands)

No.	1946-52	1952-56	1962	1963	1964	1965	1966	1967-68
Sheep	11,727	14,383	21,000	22,000	23,300	24,500	26,000	28,000
Goats	11,000	11,729	16,000	16,900	17,200	17,600	18,000	18,200
Cattle	3,388	4,410	5,600	5,715	5,830	5,945	6,065	5,200
Buffalo	111	120	380	385	385	390	395	230
Asses	1,230	1,242	2,000	2,000	2,000	2,000	2,000	2,000
Horses	358	365	470	470	470	470	470	470
Mules	126	128	130	130	130	130	130	130
Camels	450	371	250	250	250	250	250	250
Pigs	5	6	7	7	7	7	7	8

Source: The yearbooks of the Food and Agriculture Organization of the United Nations.

Present Range Management Problems

Before nationalization of forests and rangelands in Iran (1963), the majority of the lands was in the hands of private owners who had no interest in range management. The result of private ownership by non-interested landlords has left us a very large area of low production grazing land. Nomads with no fixed home or residence, who lead a migratory life, are the first users of rangeland as their basis for existence. These people were, and are, fully dependent upon domesticated livestock. In respect to grazing use, nomads follow the best management practices among range users in Iran. Their methods of range use are approximately as old as the history of Iran.

Semi-nomads are another group who have a fixed home where they farm and leave all or part of their family at home during migration to summer rangelands. In general, range used by semi-nomads is in poor-to-fair condition. Villagers have the poorest knowledge of range use and the most depleted grazing land is around the villages. They are not economically dependent upon livestock, but they try to benefit from range as much as possible.

Decrease in Range Acreage

As a result of the population increase in villages, attempts have been made to convert both degraded forests and marginal farm lands to farm use for supposedly higher returns. Due to the ignorance of the farmers, and sometimes as a result of wrong administration and regulations, most of the conversion programs, especially those for dry areas, failed in the past. Mechanization of agriculture although benefitting agricultural production was the main accelerating factor in this respect.

Conversion of range to other uses has affected rangelands by increasing pressure on the remaining grazing areas. An analysis of livestock numbers (Table III) and estimated range forage production showed that present livestock population of 66 million sheep units with 80 percent dependence on 100 million hectares of rangelands needs an extra 14 million tons of forage to make up for more than 55 percent of livestock overstocking (Niknam, 1970).

TABLE III

LIVESTOCK POPULATION OF IRAN CONVERTED TO SHEEP UNITS (thousands)

Species	No. of Livestock[1]	Conversion Factor	Sheep Units
Sheep	20,000	1.0	20,000
Goats	14,500	0.7	10,000
Cattle	5,000	5.0	25,000
Buffalo	180	8.8	1,580
Camels	34	8.0	270
Horses and Mules	625	7.0	4,375
Asses	1,200	4.0	4,800
TOTAL			66,025

1. Numbers are rounded to nearest thousand.

Decrease in grazing land has resulted in the shift to goat production from 30 percent in 1960 to 42 percent in 1967. This practice causes a serious problem by promoting use of steeper slopes and in the long run causes destruction of watersheds and degradation of soils.

Technicians and Specialists

A personnel problem is faced from both quantitative and qualitative points of view. Lack of sufficient technicians and specialists with the required level of education in range science is quite visible, especially when it is compared with the vast areas of rangelands in the country.

Socio-economics

The migration of nomads, who in some cases travel more than 600 km. on the way to summer range, creates economic and social problems. Conflicts of interest between nomads and seminomads and the villagers also cause serious problems.

Intensive cutting of woody plants for fuel (Tisdale, 1967) in much of the range areas is one of the major problems. The uprooting of these shrubs, which are used for heating, cooking and bakeries, especially where the rainfall is a limiting factor, accelerates desertification and soil erosion. As a result of this practice, surrounding areas of central deserts in Iran are threatened, and deserts are marching outwards.

APPROACH TO SOLVING PROBLEMS

RESEARCH

The importance of research in solving problems has been long realized. A five-year project of range research conducted by FAO and the Range Research section of the Research Institute of Natural Resources provided some valuable information for the present use. At present 56 research projects in range ecology, fodder crop agronomy, range improvement by artificial means and grazing management is underway.

FORAGE PRODUCTION

In order to protect and improve the remaining rangelands it is considered that the grazing of some rangelands should be prohibited (Iranfar, 1967). For this purpose a new source or sources of fodder should be sought, and forage production of irrigated and dry farmed crops is the most promising solution to this problem. An intensive forage production program has already produced an increase of more than 10 percent in less than 10 years.

RANGE MANAGEMENT PLANS

For a better utilization of range areas in Iran, management plans are required for different allotments. Such plans consist of three stages: primary, short-term and long-term plans which have already been proposed as the key solution to range problems in Iran. For implementation of the above objective, pilot range management projects for the different climatic zones of Iran are already in progress.

Qualified technicians to carry out these programs can be sought through graduates of Gorgan Forestry and Range School, and the College of Forest Management in Karadj. It is suggested that these graduates would serve as members of the range planning teams and after some practical training will serve as team leaders.

NATIONAL PARKS, WILDLIFE MANAGEMENT AND FOREST RECREATION

81

Outdoor Recreation

National parks provide a natural setting for outdoor recreation. The activities depicted in these photos can all be enjoyed in the national parks of the CENTO regional countries.

THE ROLE OF NATIONAL PARKS AND FOREST RECREATION IN TODAY'S WORLD

by
Mr. John J. Moseley,
Landscape Architect,
Park Planner,
USAID/Ankara

IN ORDER to bring my assigned topic into the field of recreation activity with which I have had some experience, I have elected to make a slight revision in the program topic. I would like to discuss with you the increasingly important role of outdoor recreation in today's world, how it relates and how it differs in the development and management of national parks and forests.

Outdoor recreation can be defined in terms of what people do in their leisure time outdoors. Outdoor recreation can be active as exampled by skiing or it can be passive as exampled by bird watching. It can be organized as with group sport activities or unorganized as with a family picnic. Outdoor recreation can be for the spectator or it can be for the participant. Regardless of the specific pursuit, outdoor recreation has become an important part of the kind of life an increasing number of people in the world today find rewarding and worthwhile.

Someone has said that recreation is anything a person does that he does not have to do.

As the world gains population and the development that supports this population, the need for national parks and forest recreation becomes an increasingly important part of our socio-economic structure. I need not tell a group of foresters the requirements of a successful forest enterprise which will meet this need, but as a national park planner I think it important to discuss with you the requirements for national parks, some of which have common application in forest management.

National parks are among the great refinements of our time, representing an intelligent and planned use of natural and cultural resources. Around the world it is recognized that the growth and development of national park programs is important to the welfare of all nations and all people. As nations become more industrialized and urbanized, so grows the need for man to seek relief from his crowded, congested and often polluted environment. For those people who have left the villages and farms for high density city living, parks and related forest recreation areas give soothing release.

Today across our planet the national park movement and the establishment and development of forest recreation or equivalent areas is

part of the great movement toward the conservation of nature and the preservation of our cultural heritage. In this sense conservation is international and has as its aim the greatest good for the greatest number of people for the longest period of time.

National parks should represent the finest examples of scenic, scientific, educational and inspirational features of a nation. From a management standpoint they should be tourist destination areas of such importance that they merit commitment to central government care.

The United Nations, long interested in the national park movement, has published an official list of national parks and equivalent reserves in 81 nations throughout the world. Unfortunately, however, because of the absence in the past of a clear cut definition of a national park, several nations have established national parks which are national parks in name but not in concept.

Throughout the world it has become a truism that tourism follows national park development. Conversely, national park development does not come as a result of increased tourism.

It is also recognized that the actuality of national parks is a powerful stimulus to national pride, enhancing the country's prestige in the family of nations. At the same time, it is important to note the deplorable tendency in some nations to apply the name "national park" to inferior, unqualified areas in order to attract foreign exchange earnings from tourism. This has been of much concern to the National Park Commission of the International Union for Conservation of Nature and National Resources.

Consequently at their Tenth General Assembly at New Delhi in 1969 the following national park definition was adopted with a recommendation that all governments agree to reserve the term "NATIONAL PARK" to areas answering the following characteristics. **A national park is a relatively large area: *1*) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty, and *2*) where the central authority of the country has taken steps to prevent or to eliminate as soon as possible exploitation or occupation in the whole area, and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment and *3*) where visitors are allowed to enter under special conditions, for inspirational, educative, cultural and recreative purposes.**

Forest management policies normally permit a wider spectrum of land uses than are allowed in national parks. In forests, recreation takes its place along with other compatible land uses. Here the key word is *compatible*. And, where there are conflicts of use, management practices must be introduced which through fencing or other controls will limit forest lands to their highest uses. To illustrate: we know that cows are not compatible users of picnicking and camping areas. Shooting is not compatible with water recreation. Clear-cutting, for aesthetic reasons is not compatible with high impact recreation sites. Ironically, in the competition between outdoor recreation and other uses of our land and water resources much of the strongest controversy occurs between competing kinds of outdoor recreation use. In general, this is the conflict between preservation of an area in its natural state for limited public use as in national parks, and recreation development to accommodate intensive use. This is a conflict that is very real in Turkey today in the preparation of this country for the increasing number of international visitors. Here I think it is interesting to note that in the last two years Turkey's income from tourism has almost tripled, going from $15.7 million in 1967 to $50 million in 1969. Much pressure is now on the development of Turkey's wonderful Mediterranean and Aegean shorelines to accommodate intensive recreation use. Uncontrolled, this development could turn these great natural shorelines into a continuous and devastating ribbon of hotels, motels, casinos, campgrounds, roadways, billboards and autoparks.

Fortunately, however, the Government of Turkey is profiting by mistakes that have been made in Europe and America where, by and large, little remains today of shorelines which have not been altered by human habitation, commercial development and exploitation. Although Turkey is welcoming the development of large recreation-oriented resort developments, these developments will not indiscriminately be placed along Turkey's shorelines, but instead will be carefully located to complement great expanses of open beaches, thus preserving Turkey's natural and historical heritage.

I am pleased to report that the National Park Department of the Ministry of Forestry is playing a leading part in the preservation of these shorelines. However, outside of the Park Department's

limited areas of jurisdiction there remains a need for a comprehensive study of all Turkish shorelines that will identify and classify Turkey's shore lands according to their highest social and economic use.

The orderly and wise use of land in any nation in any time cannot take place on a piecemeal basis without consideration of the whole. Regardless of how ill-conceived and potentially detrimental land development schemes may be they are difficult to stop without well documented plans establishing a higher and more beneficial land use in the national interest.

As foresters and planners instead of guarding the status quo we must manage change along with our other management responsibilities. Our increasing technology, our increased expectations, our increasing urbanization, our increasing leisure time and our increasing mobility define problems that we will have to address ourselves to if we are to keep pace with the increasing demands for outdoor recreation. Outdoor recreation is big business today and all indicators point to even bigger business tomorrow.

However, the competition for outdoor recreation and the competition for other land uses also is on the increase. Yes, the race is on and if we as outdoor recreation managers are not to be passed we must accelerate the progress that our professions historically have been noted for.

PRESERVING A NATIONAL HERITAGE IN IRAN

by
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Wildlife Management Expert,
Iran

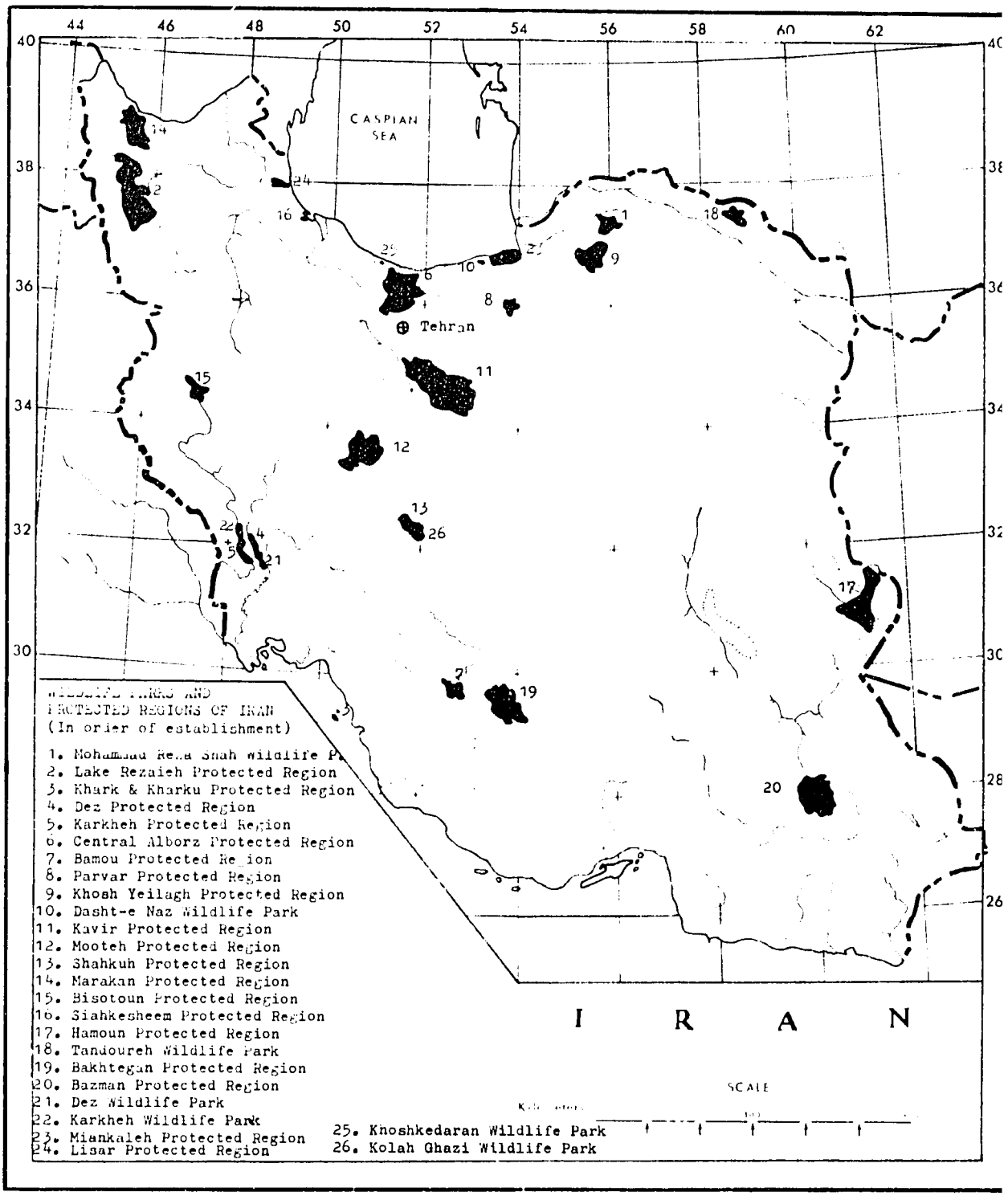
IRAN'S TOTAL land area approximates 1,625,000 square kilometres, or an area nearly as large as Italy, Spain, France and the British Isles combined. It is a land of extremes. Altitudes range from 26 metres below sea level on the shores of the Caspian Sea to 5,774 metres on Mt. Damavand's crest, which is, per se, higher than any peak to the west of it in Eurasia. Over half of Iran is mountainous with major ranges oriented more or less parallel to its international borders. These mountains disappear in coastal plains along more than 50 percent of Iran's frontier. Proximally they enclose large, arid interior basins.

Climatic differences are also great. Mean January temperatures range from 20 C along the Gulf of Oman to -1 C (and lower) in northwest Iran. Lush Caspian forests may receive an annual rainfall of 1,950 mm., while the lifeless sand dunes of the "Lut" remain dry. These topographical and climatic contrasts are further accentuated by Iran's geographical position.

Situated between the Eurasian, African and Indian faunal realms, Iran possesses a variety of fauna unequalled in other parts of the Middle East, including 125 species of mammals, 450 species of birds (including migrants), at least 215 species of fish (including 33 endemics) in the Caspian Sea. A recent checklist compiled by Neil Armantrout in 1969, lists over 1,000 species of fish as either being found in or potentially occurring in Iranian waters. Too, Zohary remarks, "It is a bridge between four major plantegeographical regions: the Irano-Turanian, the Euro-Siberian, the Saharo-Arabian and the Sudanian regions, and also one of the large speciation centres of the Holarctic desert flora." Bobek notes: "More than 10,000 plant species have been recorded in Iran..."

Such diversity also manifests itself in species not usually thought of as native to Iran, such as coastal mangroves, fan palms, and endemic robin, Caspian seals, flamingos, crocodiles, cobras, cheetahs, and three species of forest-dwelling deer including the rare Mesopotamian Fallow Deer.

For millenia these and other uniquely important resources have been exploited with little or no consideration for the future. Aided by an abusive technology, this environmental deterioration has accelerated markedly during the past generation. Indeed, whether through the agency of hunting, woodcutting or grazing, the destruction wreaked by man was, by the mid-1950's, of such intensity as to alert a group of conservation conscious individuals who, encouraged by His Imperial Majesty the Shah, and led by his younger brother, His Highness Prince Abdorreza, initiated measures for the preservation of Iran's wildlife and its habitat.


CASPIAN SEA
Tehran
I R A N
SCALE
WILDLIFE PARKS AND
PROTECTED REGIONS OF IRAN
(In order of establishment)
1. Mohammad Reza Shah Wildlife P
2. Lake Rezaieh Protected Region
3. Khark & Kharku Protected Region
4. Dez Protected Region
5. Karkheh Protected Region
6. Central Alborz Protected Region
7. Bamou Protected Region
8. Parvar Protected Region
9. Khosh Yeilagh Protected Region
10. Dasht-e Naz Wildlife Park
11. Kavir Protected Region
12. Mooteh Protected Region
13. Shahkuh Protected Region
14. Marakan Protected Region
15. Bisotoun Protected Region
16. Siahkesheem Protected Region
17. Hamoun Protected Region
18. Tandoureh Wildlife Park
19. Bakhtegan Protected Region
20. Bazman Protected Region
21. Dez Wildlife Park
22. Karkheh Wildlife Park
23. Miankaleh Protected Region
24. Lisar Protected Region
25. Khoshkedaran Wildlife Park
26. Kolah Ghazi Wildlife Park

LEGAL HISTORY

Given the socio-political climate of the day the first law passed in 1956, creating the Game Council of Iran, proved to be inadequate. But the perspective and methods pursued on the basis of this law were fundamentally sound, and have been the mainspring for all major work thenceforth undertaken for the conservation of Iran's natural resources.

In view of the large size of Iran, and the limited funds at the disposal of the Game Council, it was recognized from the inception that if a significant percentage of the available resources was allocated to areas of special importance from an ecological or a faunistic point of view, the efficacy and success of such conservation measures would be greatly enhanced. Thus was born the concept of "Protected Region." In these regions hunting was prohibited unless a special license (severely limiting bags) was obtained from the Game Council, while utilization of rangeland and forest incorporated within their confines was subject to restrictions promulgated by this organization and the Ministry of Agriculture. The degree of success in the enforcement of the latter restrictions was often ad hoc, depending as it did on the local stature and initiative of the game officer in charge of a protected region. Nevertheless, through the selection of suitable personnel and appropriate regions, results were generally good and sometimes outstanding.

Proposals for the creation of "wildlife parks" were advanced in later years, and shortly prior to the submission of a new bill to Parliament, which when enacted into law in 1967, created the present independent governmental organization named the Game and Fish Department of Iran. This new law in concert with its regulations, has incorporated and clearly defined the concepts and legal aspects of both wildlife parks and protected regions.

In brief, protected regions are created to provide conditions conductive to the regeneration and amelioration of representative habitats and/or endangered species. Such regions are also envisaged as centres of breeding stocks for the repopulation of wildlife species on the wane in adjacent areas. Accordingly, any part of Iran may be declared a protected region by the Game and Fish Department. At present an effort has been made to exclude villages and other habitations. Restrictions on hunting or fishing are severely enforced as described above, while grazing and woodcutting are curtailed in accordance with regulations enacted jointly by the Game and Fish Department and the newly established Ministry of Natural Resources.

Circumstances may necessitate a change in the legal status of a protected region, or any parts thereof. In practice, although the areas of certain protected regions have been revised (upward or downward), the Department has never relinquished such an area in toto.

A wildlife park enjoys much the same status as a national park elsewhere. A notable difference is that there are provisions for both culling or cropping of wildlife through the use of authorized Department personnel or licensed hunters.

At present there are eighteen protected regions and six wildlife parks, representing every major habitat in Iran (see Table I), with a total area

TABLE I

A CURSORY CLASSIFICATION OF THE MAJOR WILDLIFE HABITATS IN IRAN

	Vegetation			
Topography	1 Desert and semi-deserts	2* Steppe	3 Deciduous forest	4 Riparian and/or marsh
A Mountains, foothills and valleys	A1	A2	A3	A4
B Hillocks, plains and basins	B1	B2	B3	B4

* Includes open steppe forest, which, if extant, will be noted.

TABLE II

THE GENERAL NATURE, SIZE, AND FUTURE STATUS OF IRAN'S WILDLIFE PARKS AND PROTECTED REGIONS

Reserve*	Major habitat Classification**	Size in hectares	Date(s) of establishment	Future Status
1. Mohammad Reza Shah W.P.	A2/A3	91,890		
a) Almeh & Ishaki P.R.			10 Aug. 1957	
b) Almeh Protected Region			12 Feb. 1962	
c) Mohammad Reza Shah Park			28 Aug. 1963	
d) Present status			11 Apr. 1964	
2. Lake Rezaiyeh P.R.	A2/B4	483,000		W.P. by 1972
a) Ghoyoon Daghi Island P.R.			19 Feb. 1960	
b) Present status			29 Aug. 1967	
3. Khark & Kharku P.R.	B1	2,438	29 May 1960	
4. Dez Wildlife Park & P.R.	B4	18,812		
a) Dez Protected Region			23 Nov. 1960	
b) Present status			11 Jan. 1970	
5. Karkheh Protected Region	B4	18,125	23 Nov. 1960	W.P. by 1971
6. Central Alborz Protected Region	A2/A3	423,250		
a) Dashtenazir & Varvasht Protected Region			14 Jan. 1961	
b) Kandavan Protected Region			12 Feb. 1962	
c) Present status			11 Apr. 1964	
7. Bamou Protected Region	A2	67,188		
a) Established			8 Aug. 1962	
b) Reduced to present status			3 Dec. 1968	
8. Parvar Protected Region	A2/A3	37,937		
a) Parvar Reserve			9 Dec. 1962	To be enlarged towards the west
b) Present status			16 Aug. 1965	
9. Khosh Yeilagh Protected Region	A2/A1/A3,B2B	208,937	26 Aug. 1963	W.P. by 1973
10. Dasht- Naz Wildlife Park	B3	55	11 Apr. 1964	
11. Kavir Protected Region	A1/B1	609,438	20 June 1964	W.P. by 1971
12. Mooteh Protected Region	A1/A2/B1	343,940	20 June 1964	
13. Kolah Ghazi Protected Region	A1/B1	90,000	20 June 1964	W.P. by 1971
14. Marakan Protected Region	A1/A2	235,070	9 Feb. 1966	
15. Bisotoun Protected Region	A1/A2	121,937	9 Feb. 1966	
16. Siahkesheem Protected Region	B4	33,515	29 Aug. 1967	W.P. by 1971
17. Hamoun Protected Region	B4/B1	201,062		
a) Established			29 Aug. 1967	
b) Reduced to Present Status			28 Aug. 1969	
18. Tandoureh Protected Region	A2	73,435	3 Dec. 1968	W.P. by 1971
19. Bakhtegan Protected Region	B4/A2/A1	310,438	3 Dec. 1968	W.P. by 1974
20. Bazman Protected Region	A1/B1	324,688	28 Aug. 1969	W.P. by 1974
21. Dez Wildlife Park	B3/B4	3,837	11 Jan. 1970	
22. Karkheh Wildlife Park	B3/B4	1,538	unofficial	
23. Miankaleh Protected Region	B4/B3	66,625	6 May 1970	W.P. by 1974
24. Lisar Protected Region	A3/B3	32,000(app)	unofficial	W.P. by 1974
25. Khoshkedaran Wildife Park	B3	227	6 April 1970	

* W.P. : Wildlife Park
P.R. : Protected Region

** A slash - / - represents the transition zone (ecotone) between any of these habitats, e.g., A2/A3 denotes montane steppe and forest vegetation and the transition zone between these associations. For prescribed areas, the most prevalent habitat (A2 in the foregoing example) is listed first.

aggregating to 3,665,156 hectares, an area equal in size to Switzerland. These reserves are illustrated in Figure 1. Their major habitat, size, date of establishment and future legal status is listed in Table II.

GOOD HUNTING

The national conservation and protection policy does not mean that hunting in Iran is forbidden. Indeed, the country still offers some of the finest and most exciting hunting, fishing and shooting to be found anywhere in the Middle East. But it is subject to license control. This is to prevent excessive and indiscriminate bagging of game and overfishing of the rivers and lakes.

There are three types of permits issued: ordinary, special and commercial.

Ordinary licences are subdivided into the following categories: bird, fish and general hunting (birds and mammals).

Special licences are for the hunting and fishing of protected species including: goitered gazelle, jebeer gazelle, red deer, pheasant, black partridge, grey partridge, swan, houbara bustard, great bustard, flamingo, pelican, salmon, trout and crocodile.

Listed under the protected heading are also the tiger, cheetah, fallow deer, Indian axis deer and wild ass, but no hunting permits for these are issued. Commercial licences are for the purchase and sale, export or import, the capture and trapping, raising or hatching of all animals or birds, but are valid only for specific periods in each year.

Where They Roam

The wild boar, or pig, is abundant in Iran and is usually to be found in lowland marshy areas from the Caspian to quite high in the mountains. There is no closed season for hunting this animal.

Another animal popular with hunters is the wild sheep, which can be found all over the country. Less abundant, but found in approximately the same locations, is the wild goat or ibex. It provides excellent sport.

The maral, or red deer, is common in the forested areas of the Alborz Mountains in the north, and the roe deer is restricted to the lower altitude forests in the same region.

Special licences are required to hunt both these species. The roe deer is particularly timid and is rarely to be seen. It requires a patient huntsman to bag one of these fleet-footed animals.

Another elusive animal, and therefore highly prized, is the Asiatic brown bear. They are quite common, but seldom seen. The brown bear roams over a large area of Iran, but prefers the higher, uninhabited and open country.

The leopard usually prowls at night, and this makes it a much sought after animal for the late evening and early dawn hunters.

The gazelle is usually found in the plains and basins of central Iran. It was once considered rare, but has staged a rapid comeback due to protection. A special licence is required for hunting this animal.

The conservation of wildlife, such as outlined, is largely dependent on a balanced programme of land and forest areas being available for the rehabilitation of animal and plant life.

One of the objectives of the Fourth Plan is the identification, preservation and correct utilization of land. The scheduling of certain sites as protected zones enables the Iran Game and Fish Department to continue its work in the field and may eventually mean that Iran will possess some of the finest wildlife parks to be found anywhere in the world.

RECREATION IN THE FOREST AREAS

by
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EVERY COUNTRY in the world inherited immense areas of natural forests which nature bestowed upon man not only for his living but also for his food and economic progress. Nature is still in its grandeur, soothingly peaceful, and aesthetical since the time of evolution from the ages of the primate. With the march of time and growth of early behaviour of man, forest resources became the first victim. Although civilization progressed and human relations gradually grew complicated, leading from various ages to the modern space age, yet man's inherent mental attachment to nature beckons him to relax in scenic abodes in the forest. Thus during mental agitation man is still very much receptive to the whispering calls of the primaeval nurse of mankind, i.e. the forests. It is, therefore, a sacred responsibility of man to preserve his original "Nursing Home" if he has to survive under present day mental strains and the ill effects of the industrial and space ages.

There is still rare beauty in the timber slopes of the forests, in the lakes and clear flowing streams, and wilderness still echoes the rhythms of wild beauty. There is so much natural beauty in the forests that no one needs to look far to find delights from scenic sites. From the panorama of mountain peaks and lakes to the playground of light and shadow on the forest floor, there are many elements of wild and unstained natural beauty and it is freely available to all, irrespective of class, caste or creed.

The physical and mental strain and exhaustion experienced by modern man invariably compel him to seek a few days of recreation in order to recuperate from his mental and physical depressions. Every state has, therefore, a national responsibility to provide wider ranges in forest areas for the recreation of its people. Many nations realized this responsibility much earlier and created national parks, mostly in the forest regions, having outstanding scenic beauty and of spectacular landscape and solitary places.

But all such areas need to be developed in a well planned way so that human pressure and uncontrolled use by thousands of people may not spoil only scenic beauty but also its sustaining resources.

The rising need is for administrative actions to be taken in response to new conditions and challenging problems. The changing patterns of recreation; the need for skillful interim management of potential development sites; the rapid growth of construction programmes; the widening base of maintenance, sanitation cleanup and safety responsibility; the need for better distribution of visitors; increasing competition among recreationists — all affirm the certainty that more incentive and positive management of both resources and visitors must be achieved within the shortest period.

Changing patterns of recreation also form a part of the planning ahead. Equipment, facilities and activities are becoming more sophisticated. More leisure, technical advances, higher mobility, more disposable income, higher standards of living, and better education combine entirely new activities and reshape the character of traditional activities like picnicking, hunting, boating, swimming, road travel, and water sports. Travel trailers, camping units of pickup trucks, power boats, scooters, telephoto lenses and aqualungs are a few examples of sporting goods used with outdoor recreation. Water skiing, sailing, spear fishing, adventure canoeing in mountain streams, bird and wildlife watching, lonely trailing are but a few of the new rapidly growing recreational habits of the people of this modern age.

In order to meet all these demands of the complex human mind and at the same time improve economic exploitation of forest resources a nation must utilize expertise and scientific planning. For the most part, outdoor recreational activities are compatible, or can be made compatible with other uses, and the reverse is also true. Hunting and fishing provide good illustrations. Hunting is an effective means of protecting big game habitats from overuse. Each forestation of soil from burned off washout areas has obvious benefits for the fish population dependent upon clean water. Protection of the forests from fire, insects and disease, benefits recreationists in terms of travel safety and aesthetic values. Use of broad expanses of forests and rangeland for special purposes requires skillful management to assure maximum total benefits for the public. This coordination of use specially improves a specific area even though the supply of a certain type of resource is limited. Timber harvesting may have to be limited in areas of recreation use. Forage in some areas may be necessary to sustain both livestock and big game animals. Recreational and other use of areas adjacent to lakes for productive national economy may also have to be modified.

Forests include many of the nation's most important watersheds, since rainfall is usually heaviest in the forest zones. They not only yield huge volumes of water, they are essential in protecting streams and reservoirs from sedimentation. The protection of wildlife and fish is an important use of forest resources which is closely related to improved forms of outdoor recreation. Thousands of acres of forest regions and hundreds of miles of fishing streams and hundreds of square miles of lakes provide habitats, productive nurseries for not only big game, but small game, game birds, waterfowl, song birds and other species which also constitute resources available for the enjoyment of the people.

Responsibility for management of fish and wildlife rests with the local states. On the other hand, production, management and development of fish and wildlife habitat in the forest systems is the responsibility of the Forest Service. Close cooperation would result in effective utilization of the forest resources for continuing yields of fish and wildlife. Special productive actions are, therefore, necessary for specific resource management products designed to maintain and improve the resources.

Construction and maintenance of many miles of road and trails would provide access for hunters and fishermen — access that is vital for scientific fish and game management. Such access routes, *inter alia* contribute to the fullest enjoyment of these resources by sportsmen, nature lovers, students, recreationists and others. Commercial exploitation of forests is necessary in order to supply forest industries with raw materials. For many nations it may serve as the mainstay of the local economy. Reforestation and other cultural streams related to timber production have significant benefits to the recreationist. Moreover, visitors are interested in the scientific aspects of regeneration, logging and other activities. They enjoy observing and learning about timber management practices. Logging roads are immediately used by sportsmen and nature lovers as new avenues into backwoods areas previously inaccessible by car and difficult to reach either on foot or on horseback.

The significance of forest recreation and the magnitude and character of other lands, waters and facilities available for public recreation should not be overlooked, as they give a much needed insight into the characteristics of the recreationist.

Most outdoor recreationists plan their trips and activities with little regard for the ownership or management of land or facilities. They visit parks and forests, lakes and streams, mountains and swamps, motels or campsites, restaurants or picnic sites, and other attractions or facilities depending on their interest and convenience.

There is close association of forest lands with other adjacent development works such as the creation of large dams, lakes or water reservoirs. Recreational use in these areas can generally be planned and administered as incidental to the main purposes of flood control, navigation and water management, as some of these large reservoirs are within or near forest areas. Consequently camp grounds, picnic sites and other facilities can be opened up for people visiting the reservoir area. A typical example in this case is found in the Karnafuli Hydroelectric Project at Kaptai in East Pakistan and the formation of the huge Kaptai Lake, the shoreline of which has penetrated into the far reaches and the most scenic and rich tropical forest regions of the Chittagong Hill Tracts. Ancillary attractions of fishing, hunting and wildlife watching in the national parks and game reserves in that area are going to be mainly for the promotion of tourism and recreation.

Significant changes in the pattern of recreation in the forests have become evident only in recent years. In almost every activity in other regions of the world, the length of stay by most visitors at a particular area is decreasing. In the past, families usually camped or took extended vacation trips only on their annual one- or two-week vacation. Travel was relatively slow, equipment was less mobile, scenic spots less accessible and interests less diverse. Relatively few families had either the time or the funds for a long-term cross-country vacation. The pattern now is tending towards more weekend trips, more one- or two-day stops at several areas, more use of boating, swimming sites, or other specific areas where visits are typically short. Day use is becoming much more common as people travel from their homes more readily and more frequently stay overnight at motels or similar accommodations. Mass movement of vacationers and recreationists in any country today in fast vehicles is gradually compelling the forest and park management authorities to respond to these demands for development of mass recreation areas where they can be provided amenities at a reasonable cost per visit.

This particular changing pattern of visitor preference is accompanied by the need to guard against too heavily used sites. Parking areas, complex water and sanitary systems and other costly improvements are often needed to assure visitor safety, adequate sanitation, reasonable maintenance cost and protection of the site itself.

The characteristics of visitors to forest areas are also changing perceptibly. Today visitors are typically in a family group instead of being alone or with a group of their own age and sex. Their average age is greater. Outdoor camping, especially with trailers and other mobile units, is no longer the prerogative of the young, hardy and athletic person. The camper is often on his way to some far-off destination or on his way back home. He is usually in a hurry, having a lot to see and do scheduled for each day. His interests are varied. His skills often are remarkable. His thirst for knowledge is insatiable.

Frequently picnic units are crowded and overused near the road or parking lot while more distant tables in the same area are unused. Even hunters tend to use motels and restaurants as a base of operations instead of the traditional hunting camp. Paddles and oars are being replaced by gasoline cans and outboard motors. Chairlifts and rope towers have become as essential as ski wax and ski poles. The physical impact on forest resources is also gaining new significance as recreation visits increase. The trampling effect alone can eliminate vegetation growth and create water runoff problems. A basic concept of management is recognition of the carrying capacity of forest soils, vegetation and water resources. Management practices such as irrigation, fertilization and "resting" heavily used areas for several reasons may become necessary to maintain or rehabilitate sites and protect investments which cannot be shifted to new locations. Recreation resources are often fragile, and aesthetic qualities can deteriorate rapidly with excessive recreation use and littering, vandalism and fire damage. These are obvious impacts, but there are many others less noticeable. For example, uncontrolled use of secondary roads which become deeply rutted in wet seasons often creates severe erosion and maintenance problems. Fish and game populations in certain areas may be endangered unless the hunting and fishing pressures in prospect are skillfully handled. Even greater dispersion of visitors throughout the forest can also be visualized in the near future. The construction and improvement of forest roads will be a prime factor in achieving better use of recreation resource and better distribution of visitors. This purpose will be served also by more effective uses of science

literature, visitors' information service, and other modern devices.

Distribution of recreationists in the forest areas can be divided into two broad categories: 1) those concentrated at developed sites, and 2) those extensively dispersed throughout undeveloped areas.

Further development of sites for camping, picnicking, winter sports, recreation and residential areas, observation and information centres, should logically occur in the more developed areas.

CAMPING

Most camping in forest areas takes place at developed sites. Some wilderness travellers, hunters or organized groups make camp without benefit of the usual facilities, but they are greatly outnumbered by more typical campers whose camps are near or even attached to their cars. Despite the trend toward day use and motel accommodation, many visitors consider an overnight stay to be an essential part of their forest vacation. One unique feature of a forest camping opportunity is that it extends throughout the country. The variety and attractiveness of the camping sites mirror the changing landscape. Many of the sites are unsurpassed in natural beauty. Every one of them can be a convenient base of operations for a host of outdoor recreation experiences.

Planning of camping sites throughout Pakistan differs from region to region. The mountainous regions of northern Pakistan have a number of beautiful forest areas suitable for large camping grounds. In West Pakistan camping grounds invariably fall on the sides of highways linking forest areas and borders of metropolitan cities. In East Pakistan planning for camping grounds is being conceived on an entirely different basis. The vast scenic forest areas are suitable for campers and holiday makers, but projects in these forests are in such remote areas that any communications link is almost nil. To reach such camping grounds visitors would have to be transported by land as well as water, which necessarily entails greater expense. A few forest patches which adjoin the districts of Dacca and Mymensingh are under development as camping and picnic sites. All-weather metal roads are linking up these camping grounds in the forest areas. The Madhupur National Park in Mymensingh District, established a few years ago, is now frequented by scores of visitors, both foreign and domestic. This park has inspired us to undertake more schemes of a similar nature. Forest areas adjoining the city of Chittagong and the idyllic islands in Kaptai Lake are being developed as excellent picnic and outdoor camping centres.

A picnic table near a fireplace is the centre of attention for most families visiting the forests. Travellers passing by, nearby residents seeking relief from the heat, and others enjoying a brief outing in a forest environment make picnicking the most popular single use of the forests. All indications point toward a continuation of this popularity because of the close ties between picnicking and driving for pleasure.

Group picnicking is a traditional activity at many forest sites. Shelters or other special facilities are often maintained for the convenience of large groups of visitors.

Picnic areas are often developed near amphitheatres, swimming sites, or other locations especially valuable for day use or group activities. On the other hand, relatively isolated picnic sites are developed at scenic locations along forest roads. These small units provide convenient rest areas where families can experience the forest environment in relative privacy.

In addition to the development of camping grounds a number of picnic sites have also been developed, mainly on the sides of the highways. Water reservoir areas and patches of forests along the River Indus are opening up attractive picnic sites in West Pakistan. For attracting the people of Karachi a number of picnic sites are fast developing near the Kalri and Haliji Lakes as well as in the forests on Indus River shorelines. Large picnic centres are also being established around Lahore, Rawalpindi, Islamabad and Peshawar. The Gallies around Murree in West Pakistan have already become popular tourist spots for motorists and holiday makers. Development of picnic or camping sites near water reservoirs, mountain streams or river banks in West Pakistan would provide facilities for swimming, boating, sailing, fishing, and so forth.

In East Pakistan scenic forests adjoining major cities attract picnickers and weekend travellers both for relaxation and recreational enjoyment having quiet and peaceful surroundings. Similarly water areas and smaller lakes developed in such areas offer excellent swimming, boating and fishing opportunities. A projected road over the hills connecting Kaptai and Rangamati along the shoreline of the lakes, with beautiful lookout points at intermediate stages, is under consideration for opening up excellent outdoor recreational opportunities to the road travellers and week-

enders from Dacca and Chittagong and from their adjacent industrial zones.

Recreational use of forest land by organized groups has been a traditional activity in every country. These group campsites are primarily used by Boy Scouts, Girls Guides and other character building groups in the promotion of youth tourism, which is fast becoming one of the primary responsibilities of any country. However, many groups benefit from amphitheatres, informational services, swimming facilities, shelters, and other facilities which are available to the general public and which may be reserved for group use on a day-by-day basis. Organized groups are often assisted by rangers in planning and undertaking camping or similar activities in undeveloped areas.

"Mouchak," literally meaning a beehive, is 27 miles from Dacca on the Dacca-Mymensingh highway in East Pakistan, and has become extremely popular with young groups for holiday camping. This idyllic area has also become the National Training Centre for Boy Scouts. It is frequented by young and organized groups for picnicking, camping and other outdoor recreation. Similar centres for organized groups are popular in Abbottabad and the Murree hills in West Pakistan. Cox's Bazaar in East Pakistan has the longest sea beach in the world with the blue water of the Bay of Bengal on one side and the dense forest hills overlooking the sea on the other. It has the possibility of being developed into one of the most attractive picnic and camping areas for students and youth groups in Pakistan. The scenic valley of Swat in West Pakistan, with its spectacular landscape is another outstanding region for all types of holiday makers and large groups of youth travellers. Basic facilities are being developed in both these places.

In many countries where there are mountains covered with snow in winter, ski centres have been developed. Chair and ski lifts are provided for the enjoyment of visiting skiiers. Development of such skiing centres invariably involves a survey by experts and an expenditure of millions of dollars in addition to the use of unique forest resources among the snow capped mountains. Pakistan has already undertaken the development of a winter skiing resort in Swat, known as the Malam Jabba Skiing Resort Scheme. It is expected to be in operation by 1971.

RESIDENTIAL AREAS

Construction of cabins or summer homes should be permitted in selected areas on certain restricted terms and conditions.

Construction of such summer homes should be in keeping with local conditions and surroundings without disturbing the natural environment. At the same time facilities in these summer homes should be made available to tourists who wish to stay overnight or for a short period for their enjoyment. Permission to construct such homes should be given on the condition that other visitors be permitted to use them when they are not occupied by the owners. This would generate economic activity in those forest areas, besides offering an excellent opportunity for secluded privacy and enjoyment of nature. The Chittagong Hill Tracts, with vast forest areas and 265 square miles of lake offer an excellent opportunity for constructing such summer homes along the fringes of the lake and on the myriads of islands. Floating cottages built on barges and towed to isolated and scenic lagoons in dense forest surroundings would be ideal for holiday visitors for swimming, skiing, sailing and fishing in exclusive privacy and peace.

OBSERVATION SITES

Observation sites should also be developed along the roadside, waterfront zones and wildlife national parks to refresh and inspire forest visitors.

Ideally these sites would include informational signs or structures to assist visitors in orienting themselves and in understanding their environment. In many cases picnic tables and other facilities are placed nearby. Magnificent views are typical of these vantage points. Observatory towers, overlooking both the tropical rain forest of the Chittagong Hill Tracts in East Pakistan and the majestic glaciers in the Gilgit areas in West Pakistan, would be unique points of interest for visitors to these forest areas. Similarly in the dense undergrowth and swampy forests of the Sunderbans in the southern districts of East Pakistan, observatory towers in the Tiger National Park will be one of the unique attractions for visitors to this wildlife national park. They will provide splendid chances for observation and general enjoyment of wildlife and will prove to be a delight to generation after generation. Besides such attraction as wildlife in the national parks, the landscapes and waterscapes viewed from these observatories enhance the aesthetic values and would amply justify their construction. Recorded sounds of the jungle captured on tapes and films from towers or treetops are cherished prizes in the lifetime of any man. A large portion of the total enjoyment gained by visits to these

forests results from the constantly changing vistas, both near and far, or when seen in travel along the way. Opportunities for construction of observation sites can also be created as new road development improves access to areas of outstanding scenic beauty. Much of the most spectacular scenery and behaviour of wildlife in their natural environment in the forests can be viewed while cruising, boating, hiking, or driving through such forest areas. Recorded calls of multitudes of songbirds are now my only "sleeping pills" whenever I lose my sleep under extreme tension of busy time.

INFORMATION CENTRES

Visitor information centres provide a source of interpretative service, on-the-ground assistance, and information to thousands of visitors. These centres also include exhibits, nature trails, a forest naturalist, and other interpretative service. Visitors are helped and encouraged to learn about changing vegetation zones from the desert floor to the snowy mountain crest to the lush green of the tropical forests. Nature trails, campfire talks, exhibits, and other interpretive and informational media are gradually becoming available to visitors of national parks in the forest area. A visitor's trip is meaningful and enjoyable in almost direct proportion to what he understands about the area he is visiting. This fact underscores the importance of explaining and interpreting history, geology, ecology, zoology, botany, archaeology, and the resource management activities in the forests.

HIKING AND RIDING

A hike through the woods along some inviting trail or a short walk to a particular scenic area are a part of almost every forest experience regardless of the primary purpose of the visit. But hiking for its own sake is commonplace along the trails and back roads which lace the forest. Scout groups and other visitors sometimes pack their equipment on their backs and journey through the forests for days or weeks at a time. Horse and pack stock are traditional in cross-country travel. Frequently pack animals are used to reach a remote area and visitors then spend a week or two on foot in the back country. After World War II, jeeps became quite popular for off-road travel in the forests. The cross-country scooter is the latest development in travel in roadless areas. Nature and interpretative trails are giving new impetus and purpose to hikers through the forest. For self-guidance by visitors, these trails are to be equipped with labels, signs, and interpretative displays along the way.

MOUNTAIN CLIMBING

Mountain climbing is a highly specialized activity closely allied with hiking. Challenges range from a short-winded scramble up a steep hill to technical problems of ascending sheer cliffs. In popularity, walking for pleasure is only exceeded by driving for pleasure and by swimming.

HUNTING

The traditional use of forests as public hunting grounds has never diminished. These forests, lands and water are the home of uncounted numbers of game animals and birds, large and small. Big game is the objective of most forest hunters. Laws of a country are generally effective in developing and maintaining thrifty populations. In some cases the harvest by hunters should be markedly increased to prevent deterioration of the habitat through overuse and decimation of oversize herds through starvation and malnutrition. After a long, steady increase, the population of big game animals in the forest and the number harvested annually appear to stabilize. The increase in big game population is the direct result of more favourable habitat situations created by timber harvesting, fire protection, and improved game management techniques.

After independence, Pakistan accelerated her development programmes for improving the national economy and launched various schemes seriously affecting its vast forest resources. The extraction of timber, the creation of a huge water reservoir with a dam for a hydroelectric project and the establishment of industries based on forest produce have rapidly upset the ecology of these areas. Added to these pressures an increasing population found their way for rehabilitation in the lands adjoining the forests and gradually encroached further into them. This impact affected vegetation, and animal habitat. With the vanishing of the jungles and disturbed habitat, wildlife moved to remoter areas or migrated to more congenial habitats in the bordering country. Infiltration of man took heavy tolls of game animals and birds. Cattle and goats belonging to the nomadic population marched into the cleared areas of the forests. Excessive grazing by domestic animals also deprived the grazing wildlife of food. Absence of any wildlife management organization offered ample opportunities to poachers and trappers for an unbridled hunting spree. Within a decade, the wildlife population dwindled almost

to extinction. Actually a number of rare species of wildlife has now been listed as extinct.

Immediately on realization of this bleak picture, Pakistan set up a high-powered wildlife enquiry committee, which conducted field surveys in order to assess animal population status. Local experts were assigned to recommend suitable enforcement laws amending the existing outdated and ineffective legal provisions. They recommended establishment of wildlife sanctuaries, national parks and game reserves and also the creation of powerful and effective wildlife management organizations both at the central and provincial government levels.

Accordingly, under the Fourth Five-Year Plan, Pakistan is soon launching ambitious programmes for the establishment of wildlife sanctuaries, national parks and game reserves both in West and East Pakistan. These sanctuaries and national parks would, therefore, provide suitable habitats and undisturbed growth of wildlife population and yet, after a few years of stringent restrictions, it is hoped, would open up attractive hunting grounds for hunters under controlled shooting permits. This will not only arrest unlawful poaching but offer assured and excellent opportunities to big game hunters in the game reserves areas. It is expected that, with the implementation of the newly recommended measures, Pakistan will emerge within the next 10 years as one of the most attractive countries with excellent and exclusive types of wildlife national parks and big game hunting grounds.

In Pakistan we have some of the finest and rarest species of mammals, reptiles and birds. We have in the Gilgit areas the magnificent Marco-polo sheep *(Ovis ammon polii)*, snow leopard, brown bear, manual or golden pheasant, chinkara and black buck antelopes in the Punjab and Bahawalpur areas; ibex, great Indian bustard and black partridges, famous in the Sind, and wild ass in the Rann of Kutch border are but a few names to cite. The royal Bengal tiger in the Sunderbans, the clouded leopard, panther, black bear, elephant, barking deer, hog deer, serow or wild goat, wild dog, gibbon or hoolock and a horde of other animals species; the colourful jungle fowl, peafowl, the talking myna bird and about five hundred more species of wild birds, including the world's rarest and almost extinct "white winged wood duck" are still the most prized wealth of East Pakistan. Reptiles like crocodiles, king cobra, and other venomous snakes and lizards, though very few, are still found in the country.

Fish and wildlife resources and their management present one of the sharpest challenges of forest administration in the years immediately ahead. Managers of the fish and wildlife populations, and the forest service as manager of the fish and wildlife habitat in the forests, must meet the challenge together. The outlook for scientific management of wildlife habitat and population holds promise of creating more favourable opportunities for the future.

FISHING

The opportunity to fish in clear, sparkling streams, lakes and reservoirs is one of the most important recreational attractions. The variety of game fish species and prize fishing waters, records of fish caught, and the enthusiasm of fishermen for their favourite spots are some of the factors which tend to increase the number of visitors. In Pakistan we have trout in the mountain streams, and big carp fishes in the fresh water areas, together with a multitude of other fishes. Countless visitors fish more casually while on hunting trips, travelling through the wilderness, picnicking, or engaging primarily in other types of recreation. Public access routes to recreational waters, the forest environment, water purity, intensive fish management practices, and the availability of campsites and other facilities contribute greatly to the popularity of fishing in the forests.

The importance of fish and wildlife in forest recreation can hardly be overstated. Three characteristics in particular influence policies concerning management of fish and wildlife populations and their habitats. First wildlife and forest departments or comparable agencies are responsible for managing fish and wildlife populations. Forests managers are responsible for managing habitat on forest lands within each of the provinces concerned. Second, the values of wildlife as a recreation resource are based in large part upon sustained harvests of fish and game from the forests. Third, fish and wildlife populations are strikingly responsive to change of habitat and to changes in biological factors including hunting and fishing.

Besides, wildlife service policy is to manage the habitat so that wildlife populations, including non-game species, will be maintained at a level consistent with their recreational and other values and consistent with all other values and uses of forest resources. Forest Service personnel should cooperate with wildlife national parks service personnel in the enforcement of laws and regula-

tions for the protection of wildlife. They should determine the extent to which forest resources may be directed specifically to wildlife production in combination with other uses and services. They should also work with other groups in planning ways and means to secure and maintain desirable population of wildlife species including orderly sustained harvests of crops of fish, game and fur-bearing animals as permitted under laws and other management practices.

A specific policy of long standing is to preserve rare or endangered species by special management practices. Also, development of natural populations of native species is encouraged in preference to artificial stocking of fish or game, introduction of exotic species or similar management techniques.

Although the policies outlined above may have to be modified and new ones added, forest resources management policies will be maintained in the same general pattern that has prevailed in the past.

For effective conservation of wildlife wealth and scientific management, the proposed new setup of a wildlife management organization in Pakistan is being established as a completely independent Department of Forestry and Wildlife. The head of the Wildlife Division would be directly under the Secretary of Forestry and Wildlife. Important forest regions will be manned at various levels by qualified wildlife wardens, a wildlife superintendent and game scouts or watchers. It is envisaged that at the centre a high powered board for the conservation of wildlife will be set up for coordinating actions and supervising implementation of policies of the various regional wildlife directorates. A more detailed survey will be carried out in every region and population status of wildlife reassessed properly. Financial requirements of the various regions will be met both by the centre and the provincial governments. Assistance of international organizations and other aid-giving agencies will be sought, including services of experts for preparation of feasibility reports and master plans for efficient and scientific management of the sanctuaries, national parks and game reserves.

SWIMMING AND BOATING

The growing importance of water-related recreation is to be emphasized repeatedly. The rise in recreational boating is well documented by outboard motor and boat sales trends. Water areas of the forests can be expected to share fully in these growing activities.

A large percentage of boating and swimming takes place without benefit of boat launching ramps, bathhouses, or other facilities. They are essentially dispersed recreation activities even though site development is sometimes involved.

Site development in waterfront areas depends directly on the volume of use. In areas of a long warm season such as in Pakistan and heavy use, concessioner-operated marinas, bathhouses, and other facilities become necessary. Boat launching ramps are built where access to the water is difficult and the demand is great enough to justify the investment.

In Pakistan, water transport is more important in the east wing. East Pakistan, being one of the world's largest riverine areas, and having water transport routes about 20 times longer than its surface routes. The famed Sunderbans Forest lies to the south, ending on the Bay of Bengal. Its estuarine area has a unique forest vegetation unlike any other country in the world. It is also famous as the last stronghold or home of the royal Bengal tiger. The Department of Tourism has ambitious programmes, under the Fourth Five-Year Plan, to develop the famous Tiger National Park as one of the finest wildlife parks and provide visitor facilities with quick and comfortable water transport, luxury motor launches, resthouses, motels, treetop observatories, creek cruisers, and visitor centres. Boating and fishing opportunities will be unbounded.

Similarly, the Wildlife National Parks Schemes at Pablakhali are already under implementation in the northern part of the Chittagong Hill Tracts. Access to this region of spectacular scenic forests from Kaptai or Rangamati is only by water transport such as motor launches and speedboats. Tourist complexes at Kaptai and Rangamati have fleets of speedboats and motor launches for water skiing, lake cruising, fishing, camping and transportation to the above wildlife national park. Provision is also made for the setup of a suitable tourist complex at the entrance point of the above park, along with land and water transport for visiting park areas, and treetop observatories at suitable sites. Boating in this part of the lake area is limitless with added attractions of viewing wildlife, camping, tenting and nature study during the winter season.

In the days ahead, I am sure resort management will be the predominant factor in creating and maintaining the quantity and quality of recreation opportunities that will be needed for generations to come. We are, however, trying to design and construct recreation centres in Paki-

stan to meet the specific needs and requirements of the visitors and tourists. As things stand today in Pakistan some of these recreation centres may encompass vast areas of forest regions without impairing or affecting the basic objectives of conservation policies, while the rest of them will be informal groupings of facilities in a loosely knit combination of recreational opportunities with large forest areas in various regions and provinces of Pakistan. The idea is to develop them in collaboration with local and other interested groups prepared to invest in ventures and to combine the best available factor of private and public resources into a well planned complex for public use and enjoyment by visitors and tourists.

NATIONAL PARK DEVELOPMENT IN TURKEY

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TODAY men are feeling a growing interest in their environment. The subject of this interest is nature, not only within the boundaries of a traditional nature protection concept, but with all its relations with the world we live in.

Modern science and technology have recently given performances that can be called miracles and have given men various possibilities, like going to the moon and further on. Yet science doesn't have the capability to add more natural areas to the world, areas that give awe and inspiration to mankind because of their natural beauty. At this stage a very important point emerges: that is the desire and need to leave our sons, grandsons and the future generations that are to come, nature itself, in its pure state, not a world full of technique and synthetic heaps.

Thus, because of growing ideas on the protection of nature and natural resources, many organizations have been founded — such as the United Nations, the International Union for Conservation of Nature and Natural Resources (IUCN), UNESCO, the European Council, the European Committee of Nature Protection, the World Wildlife Fund, the International Wildfowl Research Bureau, Royal Society for the Protection of Birds, the Sierra Club, and the Nature Protection Society of Turkey — and are trying to concentrate private, official, national and international means on this subject. One of the most recent and influential campaigns is the 1970 European Conservation Year.

It is accepted that by creating and developing the "national park" concept, the United States has added a new dimension to world culture. In 1872 the Yellowstone area was used by a rich group of people for hunting purposes only. In time this group realized that this place was a most precious gift, with its valuable flora, fauna and geological structure, one that they can leave to the coming generations. They prepared a bill that stopped grazing, hunting and logging and brought in a well planned nature protection program that permitted recreational, educational and scientific use. The bill was approved and thus the national park concept was born. Today

in the USA, the National Parks System covers 250 parks of different characteristics, providing people with possibilities concerning health, morale, education and recreation. It is estimated that 200 million people will visit these parks in the 1970's.

The undisturbed natural areas and hunting reserves in Europe are gaining shape as nature parks, which serve as a sanctuary for the people of the twentieth century who need to escape from the noisy and tiring routine of everyday life that has grown parallel to industrialization and urbanization.

Until now a national park has been defined as an area of a certain size, which contains biological (flora-fauna), geological, morphological, historical and archeological features of national or international significance.

In order to designate an area as a national park, according to the criteria of the U.S. National Park Service, the area should have one or more of the natural, recreational, historical or archeological resources. Natural resources cover undisturbed forests, huge mountains, deep canyons, deserts, lakes, places with outstanding scenery and so forth.

Historical and archeological resources are sites, buildings, areas where the ancient culture of many nations has flourished, and where many important events took place.

During the last few years in some countries the term "national park" has been used to designate areas with widely different standards and objectives. Because of this fact and considering the importance given by the United Nations to the national park concept, as a sensible use of natural resources, the tenth General Assembly of IUCN, meeting in New Delhi in November 1969, recommended that all governments agree to reserve the term "national park" for areas answering the following characteristics, and to ensure that their local authorities and private organizations wishing to set aside nature reserves do the same:

A national park is a relatively large area: 1) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest, or which contains a natural landscape of great beauty, and 2) where the central authority of the country has taken steps to prevent or to eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological o aesthetic features which have led to it establishment and 3) where visitors ar allowed to enter under special conditions for inspirational, educative, cultural an recreative purposes.

According to research done in Turkey, th earth and vegetation of our country has bee valued as of poor natural quality. Since 9000 B.C people have lived on this land and there have bee many stages that affected its quality. There hav been many harmful uses of nature throughout th centuries. Very recently some useful program like "land use capability classification" and "lan use planning" have been started. According t a survey done on one-third of our country it ha been understood that in 31.5 percent of this are water erosion creates a serious problem and in 3 percent of this area erosion is in an extreme degree

The earth under the climax vegetation is dee and strong. Yet, detrimental uses of this plan cover, such as overcutting, grazing, and fire giving a poor quality to the earth which will the be open to wind and water erosion.

Today foresry personnel in Turkey are com mitted to a rational and functional forestry polic based on multiple use.

The Ministry of Forestry, with appropriat management and silvicultural procedures is trying to achieve high production from unit areas i normal forests. Also to cure the wounds that wer inflicted over the ages, and to gain new forests erosion control and afforestation attempts ar being made. Besides these, the Ministry, throug improvement of pastures, is trying to increas animal breeding by increasing the grazing forc per unit in suitable locations under Ministry jurisdiction.

All these attempts are concentrated in a direc tion that would improve the economic possibilitie of 11,586,138 villagers (according to the 196 general census) who have close relations wit forests, within a watershed management whic will eliminate the harmful effects on forests an bring useful effects instead. Of all these, of cours the most important is to have sufficient protectio in the areas that are subject to the forestry regime

Under a policy of multiple use the forest area are also evaluated by their wildlife, habitat an recreational uses. It's sad to say that uncontrolle hunting and various other uses through the year have destroyed much of the potential and specific kinds of fauna that our country has. The Ministry has taken a close interest in these resources which have a self-renewing quality (Appendix 1).

EXISTING NATIONAL PARKS IN TURKEY

The national park concept began with the publication of a book by Dr. Selahattin İnal[1] in 1948, entitled "Nature Conservation and Our Forestry." This concept found a basis for legal implementation in the Forest Law (No. 6831) enacted by Parliament in 1956. It stated:

"The General Directorate of Forestry has the authority to designate forests and areas that are subject to the forestry regime, as national parks, in order to enlarge the chances of touristic activities, to protect nature, to meet the recreational and sportive needs of the public, or to help scientific development. The selection principles are applied according to the regulation of protected forest lands."

The first national park in Turkey was designated and established in 1958. Since then, the Ministry of Forestry has established seven national parks, and has completed long-range development plans for eight other national parks and has started their implementation. Also, as of this date, 164 recreation areas, 12 wildlife reserves, eight game reproduction areas and two nature protection areas have been selected, planned and partially implemented.

At the present time Turkey's national parks, in various stages of authorization and development, are as follows:

1) YOZGAT NATIONAL PARK

This small area of 294 hectares, located approximately 220 kilometers east of Ankara, was established in 1958 to preserve and display the remnants of a virgin black-pine (*Pinus nigra*) which covered much of this region centuries ago. Recreational facilities have been developed for park visitors.

2) KARATEPE-ASLANTAŞ NATIONAL PARK

This area of 7,715 hectares located about 100 kilometers from Adana preserves excellent neo-Hittite structures in a forested setting. Two open air museums display carved reliefs of the civilization that was important to the development of the country. This national park was established in 1958.

3) KIZILCAHAMAM-SOĞUKSU NATIONAL PARK

Located only 81 kilometers from Ankara, this area offers excellent recreational opportunities for the people of the second largest city in Turkey. The area is well forested. This national park was established in 1959.

4) KUŞ CENNETI NATIONAL PARK

This willow-fringed lake close to the south shore of the sea of Marmara, midway between Çanakkale and Bursa, is a breeding place for nearly 200 species of birds that migrate between southeastern Europe and northeastern Africa. The park area is 52 hectares, and includes some recreational facilities and a bird museum. This national park was established in 1959.

5) ULUDAĞ NATIONAL PARK

This area was set aside and developed as a national park in 1961 because of its outstanding geological, botanical and recreational resources. Uludağ, the fabled Mount Olympus of Mysia, reaches an elevation of 2,543 meters and offers excellent skiing from late December through April. A number of vegetation zones are found within the park and an area of 20,060 hectares on the eastern slopes has been left in its natural state for research and study. Numerous hotels, campgrounds, trails and a téléférique[2] have been established. Located near Bursa, the park contains 27,000 hectares.

6) YEDİ GÖLLER NATIONAL PARK

Located just off the major Istanbul-Ankara highway near Bolu, this national park was established in 1965. The area displays all species of plants common to the forests of northwest Turkey. Seven small lakes and a stream provide a scenic setting for this virgin forest area.

7) DILEK PENINSULA NATIONAL PARK

This mountain peninsula juts out into the Aegean Sea close to the tourist centers of Kuşadasi and Ephesus and contains an unusual variety of plants and wildlife, including a small number of leopards. The mountain spine of the peninsula is slashed by numerous canyons. Present activities include the development of a road and a vacation village on the north coast. The park was established in 1966.

By 1967, seven national parks had been determined and established in the areas which are under the control of the Ministry of Forestry. Activities to date include the preparation of master plans by the Department of National

1. Professor of Forestry, University of Istanbul.
2. A system of small cable cars which carry visitors up and down the mountain.

Parks for Manisa-Spil Dağı and Munzur Vadisi areas. Further, in the fall of 1967 the services of a team of planners from the U.S. National Park Service were provided through the U.S. Agency for International Development for preparation of a master plan for the protection and use of the proposed Göreme National Park. The National Parks Department of the Ministry of Forestry in Turkey was assigned to this task by the Under Secretary of the State Planning Organization. In the Department of National Parks, a special coordination board has been set up including the specialists of related government bodies, such as the Ministry of Tourism and Information, the Ministry of National Education, the Ministry of Construction and Settlement, and the Ministry of Public Works.

Following completion of the Göreme National Park master plan, the U.S. team returned to their park planning project in Jordan. On completion of their assignment in Jordan at the end of 1968, four members of the team returned to Turkey for a one-year project, to prepare master plans for an additional five proposed national parks which are within the touristic development zone and have priority according to the Second Five-Year Development Plan. The team of Turkish counterparts who were assigned to assist in the planning were at the same time developing their own park planning capabilities. In the light of these successfully prepared master plans mentioned above the assignment period of the American planning team has been extended to 18 months by the Turkish Government and USAID. Master plans for six new proposed national parks described below, will be prepared in 1970-71.

GÖREME NATIONAL PARK

This area is located near Nevşehir, southeast of Ankara, and displays a classical example of man's use of a specific environment. Early in the Christian era a monastic group settled in the Göreme area, carving churches and dwellings in the pinnacles and cliffs of the soft volcanic stone. Artist-monks decorated the interiors of many of the chapels with biblical scenes. Many of these still retain their brilliant color. Although abandoned by the monks hundreds of years ago, farmers today still follow the same farming techniques of the monks and use the abandoned caves for houses, pigeon cotes, and storage of fruits and vegetables.

PAMUKKALE NATIONAL PARK

Ancient Hierapolis, Pamukkale displays Roman and Byzantine ruins and the travertine terraces formed by the highly mineralized warm springs of the site. The presence of these springs was responsible for the development of ancient spas and today attracts many tourists for the same use of water. The proposed park is a few kilometers north of Denizli in the Aegean region.

TERMESSUS NATIONAL PARK

High on the slopes of Güllük Dağ north Antalya are the remains of a city, home to a highly individualistic group of people during Greco Roman times. Abandoned during late Roman times, the site was never reoccupied and shows only the ravages of time and the elements. The remoteness of the city in rugged terrain gives this site importance.

KOVADA LAKE NATIONAL PARK

This narrow lake hemmed in by heavily forested ridges offers excellent water-oriented recreational possibilities. Located north of the touristic site along the Mediterranean coast, this area will provide a cool summer retreat from the heat of the coastal areas.

TROY HISTORICAL NATIONAL PARK

Little needs to be said of the importance of this internationally known site of the Trojan Wars of ancient times.

EPHESUS HISTORICAL NATIONAL PARK

For centuries Ephesus was a major city of the Aegean region and each period of its history was marked by structures of worldwide fame: the Temple of Artemis of the Greek period, the classical Roman city, and the Basilica of St. John of the early Christian era. Nearby is the supposed House of Mary.

Areas proposed for planning in 1970-71:

Bergama
- site of the important Greco-Roman City of Pergamum

Koprülü Kanyon
- the site of ancient Selge on the south coast with scenic canyons and forests

Olympus National Seashore Park
- the rugged coastal area west of Antalya with many historic points of interest

Bodrum
- the site of ancient Halicarnassus

Kapıdağ Peninsula
- an area of recreational value on the south shores of the sea of Marmara. Wildlife and geology are important features.

Boğazköy Alacahöyük
- the capital of the ancient Hittite Kingdom which flourished from 2000 B.C. to 1200 B.C.

National park evaluation and planning in Turkey has shown rapid development in recent years, and has become one of the most important functions of the Ministry of Forestry. With the support of the State Planning Organization, the National Parks Department receives the participation of many ministries, whose responsibilities within government complement park development. At present, the National Parks Central Office of the Ministry of Forestry is organized as follows:

a) Inventory and Documentation Section
b) National Park Planning and Implementation Section
c) National Park Management and Operation Section
d) Protected Forest Lands Section
e) Recreational Areas Planning and Operation Section.

The National Parks Department, working in cooperation with the foreign national park experts, is actively functioning with its staff of forestry engineers, agricultural engineers, landscape architects, geologists, architects, physical geographers, biologists, archeologists, legal advisers, draftsmen, secretaries and interpreters. In the seven national parks that have been established, field offices have been founded.

Where long-range development plans are required for national parks, construction designs are prepared for immediate implementation.

A National Parks bill is already under examination in Parliament. When this bill is passed, the National Parks Department will have complete authority to establish and administer national parks and equivalent reserves all over the country.

PROBLEMS

A number of problems must be overcome in the national park program:

- The concept of the national park is not clearly understood by the public, even those who are well educated.
- Most of the areas that qualify as national parks have been seriously affected by uncontrolled adverse uses in the past.
- The National Parks Department does not yet have a sufficiently qualified staff.
- Financial resources are insufficient, as the investments needed for the first stage of master plan implementation were quite high.
- In some cases, local authorities concerned with highly qualified areas that can be designated as national parks, react against National Park Department activities, claiming that the initiative concerning these areas should be left to them.
- Although attempts at improvement have been made by various state organizations from time to time, there has not been a well planned coordinated effort which would gather all these scattered forces together.

In the face of these problems, it is necessary to have an interpretation and propaganda program which will revive the people's already existing interest in nature conservancy.

APPENDIX I

WILDLIFE AND GAME MANAGEMENT

Works have recently been organized on an effective basis by the Division of Wildlife and Game Management of the Department of National Parks in the Ministry of Forestry, controlling and improving wildlife, habitat and game reserves which have been almost destroyed by uncontrolled and excessive hunting throughout centuries in Turkey.

Today, the wildlife species that should be protected in the country can be shown as follows:

Fallow deer	*Dama dama*
Gazelle	*Gazella subguttrosa*
Wild sheep of Anatolia	*Ovis m. anatolica*
Mountain goat	*Rupicapra rupicapra*
Deer	*Cervus elaphus*
Ibex	*Capra aegagrus*
Roe deer	*Capreolus capreolus*
Leopard	*Felis pardus tuliana*
Bold ibis	*Geranticus eremita*
Partridge	*Tetraogallus caspius*
Wild cock	*Lyrurus mlokosiewiczi*
Pheasant	*Phasianus colchicus*
Francolin	*Francolinus francolinus*
Great bustard	*Otis tetrax*

In fact, these animals are under the control and sponsorship of the Hunting Law (no: 3167) which was enacted in 1937.

The efforts of the Ministry of Forestry in this field are to preserve the wildlife species in their natural habitat, establish closed reproduction areas to prevent their becoming extinct, pursue the legal limitations of hunting, and to carry out a complete inventory for the country.

Within the contents of game management activities, 12 wildlife reserve areas and eight game reproduction areas have already been established.

Wildlife Reserve Areas

1) Antalya-Düzlerçami fallow deer reserve area
2) Konya-Bozdağ wild sheep reserve area
3) Marmaris-Karadağ ibex reserve area
4) Munzur valley game animals reserve area
5) Karaman bayırı deer and roe deer reserve area
6) Kovada-Kasnak game animals reserve area
7) Karacabey-Karadağ roe deer reserve area
8) Adana-Pos-Çatalan fallow deer reserve area
9) Eskişehir-Çatacik deer reserve area
10) Mersin, Çoçak-Cahennemdere ibex reserve area
11) Samsun-Gölardi pheasant reserve area
12) Tarsus-Turan Emeksiz Forest francolin reserve area

Game Reproduction Areas

1) Istanbul-Belgrade Forest reproduction area
2) Bursa-Uludağ reproduction area
3) Bolu-Abant reproduction area
4) Yedigöller reproduction area
5) Antalya-Düzlerçami reproduction area
6) Samsun-Celemen pheasant reproduction area
7) Karacabey-Ovakorusu pheasant reproduction area
8) Tarsus-Karabucak francolin reproduction area

Besides the game management works mentioned above, fresh water fishing which has been entirely neglected until recent years has been taken in hand and an inventory of the streams and lakes within the forest areas has been started to define the fish species, distribution, potential and breeding capacities. Following this, natural and artificial breeding and improvement works and also the development of a legally controlled fishing system have been organized.

Kovada Lake lies in the "Lake Region" of Turkey which contains all of the attributes necessary for the development of a high quality outdoor recreation area.

This pure stand of Mediterranean cypress, Cypressus sempervirens, *located in southwestern Turkey, will become one of the principal attractions of the proposed Köprülü Kanyon National Park.*

FOREST ADMINISTRATION, RESEARCH, EDUCATION AND PUBLIC RELATIONS

RESEARCH IN FORESTRY AND RELATED FIELDS IN IRAN

by
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of Natural Resources

INTRODUCTION

ALTHOUGH RESEARCH in forestry and related fields in Iran may have a rather long history, it has never enjoyed sufficient continuity to establish a permanent status because of its long-term nature.

After the establishment of the Ministry of Natural Resources the policy of development and better use of natural resources, especially forest resources, was assigned the first priority. With the establishment of the Research Institute of Natural Resources, the first specific step was taken to organize a nucleus to incorporate all the research needed to fulfill the need for better and more efficient use of forest resources.

In order to enable this Institute to function independently and cope with day-to-day problems arising from general formalities common to most government bodies, a bill was passed by both houses of Parliament Majlis Shoraie Melli and the Senate. This bill authorizes the Research Institute of Natural Resources to function as an autonomous and affiliate body of the Ministry of Natural Resources.

It is hoped that this will ensure the continuity in research activities, eventually contributing to better management and use of forest resources in Iran.

FOREST RESOURCES RESEARCH POLICY

Right from the beginning the need to recruit and train the proper type of personnel for the Research Institute was visualized. Thus a 10-year plan was drawn up and an intensive correspondence was taken up with Iranian research workers in the field of natural resources in and out of the country.

In this respect assistance was also received from FAO and other international agencies. Also, a number of international research workers were invited on the basis of multilateral or bilateral aid programmes to work with Iranian experts to initiate research projects in the most needed areas of protection and utilization of Iran's forest resources.

At present the research policy pursued by the Ministry of Natural Resources is based mostly

on applied research in the hope that the basic research will be carried out by the Faculty of Forestry of the University of Tehran and other concerned academic bodies.

It is the general policy of the Ministry of Natural Resources that all the development projects in the areas of natural resource development must be principally based on intensive research in the related fields. For this reason a two-way communication system has already been established between all sections of the Ministry and the Research Institute in such a way that all the operations and fundamental problems are relayed to the Institute to find proper solutions to the problems set forth by various branches. Research is then set up in the appropriate field to solve the problems. Moreover, a number of research projects are designed to evaluate interrelations existing between indigenous plants, animals, soil, water, mechanism of soil erosion, etc., in order to find the best ways and means to maintain and utilize the forest resources and recommend the proper methods to the executive branches of the Ministry in the related fields.

At present, research projects are in operation in the fields of forest management, improvement of degraded forests, trial of indigenous and exotic species, wood industry, forest protection against fire and disease and forest byproducts. An attempt is made to discuss some of them in more detail in this paper.

In order to study the feasibility of some biological methods to prevent soil erosion and at the same time to produce timber and fuel wood, the species trial programme is well underway. This is part of an overall programme of applied research into the problems of dry zone afforestation. This programme covers research into all aspects of soil conservation, sand dune fixation, grazing management, etc., as well as investigation of species suitable for the establishment of unirrigated plantation.

Indeed, research into the requirements and economics of irrigated plantations is also in progress. Such plantations are of importance in the primary phase of the dry zone afforestation programme in Iran since there is an urgent need to establish limited "green belts" near the major population centres. Thus investigation of suitable species, minimum and economic water requirements and fertilizer applications have been initiated and are already yielding useful results.

Unirrigated species trials in arid regions have, since the creation of the Institute, received a high priority. Thus during 1963, six specialized research nurseries were established in various climatic zones of the country. These nurseries provided plants for the establishment of the first series of three statistically designed trials which were planted in 1969. These trials already include 61 local and exotic tree species and it is planned to extend this number to over 120 by the establishment of 10 further trials in 1970. The selection of species for trial has been made after a very careful study of the range of climatic and edaphic factors encountered in the arid and semi-arid zones of Iran. Three major climatic zones have been recognized.

1) *Northern Zagros:* Average annual rainfall 300 to 400 mm. Minimum temperatures -10 to -15 C. Three to four months dry period per year.
2) *Central Zagros:* Average annual rainfall 350 to 550 mm. Minimum temperatures to 0 C. Four to five months dry period per year.
3) *Southern Zagros:* Average annual rainfall 250 to 350 mm. Minimum temperatures to 3 C. Five to six months dry period per year.

Obviously within each zone there is a range of sites at different altitudes, each level requiring separate investigation. Soil factors also change within each zone especially with topography. Generally all soils of the arid and semi-arid zones are more or less alkaline but a wide range of types between near neutral to saline condition again influences the choice of species within each zone.

Equally specialized plantation has been applied so that there is every chance that the programme will succeed in the proving of suitable species under even the most harsh conditions. Thus the use of polythene potted planting stock, autumn planting and particularly deep ploughing techniques at trial sites are applied as standard procedures for all the trials. Species under trial and proposed for trial in each zone are given in appendix I, II and III.

In parallel with the above work a study of shrub, tree and grass species suitable for unirrigated plantation on sand dunes is in progress. This study also covers the investigation of stabilizing and plantation techniques. Already some 25 species are under trial at two sites and it is intended to increase the number of species to more than 40 during 1970.

It is worth mentioning that basic research on problems of soil stabilization and water requirements in relation to dry zone afforestation is not neglected. Soil stabilization techniques by terracing, application of petroleum byproducts, etc., is already providing useful information as a

result of several investigations conducted near Tehran during 1969.

RANGE RESEARCH ACTIVITIES

With a total area of about 165 million hectares, Iran is estimated to cover 80 million hectares of rangeland and a total of 106 million hectares of grazed area.

To develop effective programmes of development and exploitation of these rangelands, many detailed decisions regarding what to do and how to do it in the light of existing conditions had to be made.

The first research projects in this respect were developed with the assistance given by FAO through a joint cooperation project of the Ministry of Natural Resources and Food and Agricultural Organization in 1964. At present Iranian personnel trained under the above project are assigned to the Range Research Section, a unit of the Research Institute of Natural Resources.

The work of this section is divided into four projects:

1 Range Ecology
2 Range Improvement by Artificial Means
3 Fodder Crop Agronomy
4 Grazing Management.

Range Ecology

This project provides the essential botanical information concerning the plants and plant communities. It will provide a basis for studies of range reseeding, range management, establishment and use of pasture and fodder crops and for application in field programmes.

Six studies have been made under this project. A herbarium of over 8,000 sheets containing specimens of many important forage plants of Iran has been established and is housed in the office. The bio-climatic zones of Iran have been identified, described and mapped, and many other ecological observations have been made and interpreted. Response of range vegetation to protection, and phenology of important native and reseeded range plants have been studied.

Range Improvement by Artificial Means

This project seeks to provide all the information needed for a practical action programme aimed at artificially rehabilitating depleted rangelands. Among other things, it should provide answers to questions of where to plant, what to plant, when to plant, and how to plant.

Ten studies have been made under this project. Among the perennial species, close to 400 ecotypes of native and introduced forage species have been screened so far. Ecological amplitudes of 70 promising dryland species at different sites have been tested. Adaptability of dryland species to saline and/or saline alkaline soils have been studied, and response of dryland forage species to season, method, depth and rate of planting have been determined. Water requirements for germination and emergence of dryland species have been studied, and herbicide control of weeds has been tested successfully.

Fodder Crop Agronomy

This project provides the basic information on which a greatly expanded forage crop programme can be developed on cultivated lands. Information is needed on the most suitable species and varieties, and on the best methods of production, harvesting, storage and use. This is especially needed to provide greatly increased supplies of forage to supplement range grazing during the critical periods of early spring, mid-summer and winter.

Under this project, a comparative study of fields of promising irrigated species has been made. A study of a legume-cereal rotation system for rainfed cultivated land has also been carried out and is still continuing.

Grazing Management

The principles of proper grazing management are based on the physiological needs of the growing forage plants and the attaining of a balance between the plants and the animals using them. Each range area is best suited to one of the several classes of livestock, grazed at the proper season, by the proper number and with appropriate periods of rest and regrowth when such information is known for each range unit, then management plans can be devised to best meet the needs of the vegetation, the soil, the animals and the owner.

Four studies are being made under this project. Response of selected range plants to time and degree of utilization has been studied. Different methods of grazing on reseeded and natural rangelands have been used and finally, utilization scales for important range plants have been made.

WILDLIFE MANAGEMENT RESEARCH

Wildlife management research is carried out by the Division of Research and Development,

at present a unit of the Iran Game and Fish Department. The research projects undertaken by this division include ecology, taxonomy and utilization of the country's wildlife. These projects can be summarized as follows:

1) Protection of endangered species and habitats; studies are underway to preserve the famous Persian fallow deer *(Dama mesopotamica)*, to conduct seasonal counts of *Gazelle subgutturosa* in selected regions, and the protection of the once almost extinct Persian wild ass, cheetah, etc.
2) Investigations in 18 protected regions and seven wildlife parks with an area of 3,665,156 hectares, concerning animal behaviour, lambing, waterfowl, etc. Each area must have a management plan to regulate animal numbers in relation to their habitat. The only meaningful way to formulate such a plan is through pertinent information. At present, information on fauna, flora, weather and topography is being compiled.
3) Investigations to study seasonal movement, ecology, behaviour patterns, herd size and structure, reproduction and mortality of Ural sheep in the Mohammad Reza Shah wildlife parks. Studies are also conducted to determine genetics morphology of wild sheep population spanning the mountains in the northern part of the country.
4) A project is underway to study the kinds of waterfowl present at different times of the year and ringing them in order to trace their movements. In this respect there is close cooperation with those international agencies that are coordinating the activities of all Eurasian and African countries in studying and attemping to manage these birds.

APPENDIX I

INV.No.2/013 (Northern Zagros Zone)

Species planted 1348 (1969-70)

Ailanthus glandulosa
Celtis australis
Cupressus arizonica
Fraxinus syriaca
Pinus brutia
Pinus eldarica
Pinus nigra var. caramanica
Pinus nigra var. laricio
Quercus persica
Robinia pseudacacia
Cedrus libani
Cedrus deodara

Species in preparation for trial in 1349 (1970-71)

Ailanthus glandulosa
Celtis australis
Cercis siliquastrum
Cupressus arizonica
Elaeagnus angustifolia
Fraxinus syriaca
Juniperus macropoda
Pinus brutia
Pinus eldarica
Pinus nigra var. caramanica
Pinus nigra var. hispanica
Pistacia khinjuk
Quercus persica
Quercus pubescens
Robinia pseudacacia

INV.No.2/014 (Central Zagros Zone)
Species planted 1348 (1969-70)

Acacia modesta
Celtis australis
Cupressus arizonica
Fraxinus oxyphylla
Fraxinus syriaca
Pinus brutia
Pinus nigra var. caramanica
Pistacia khinjuk
Quercus persica
Robinia pseudacacia

Species in Preparation
for trial in 1349 (1970-71)

Acacia baileyana
Acacia cultriformis
Acacia cyanophylla
Acacia modesta
Acacia saligna
Ailanthus glandulosa
Callitris preisii
Cedrus brevifolia
Celtis australis
Cercis siliquastrum
Cupressus arizonica
Cupressus sempervirens
Elaeagnus angustifolia
Eucalyptus astringens
Eucalyptus behriana
Eucalyptus camaldulensis
Eucalyptus crebra
Eucalyptus gracilis
Eucalyptus leucoxylon
Eucalyptus oleosa
Eucalyptus papuana
Eucalyptus populnea
Eucalyptus rossii
Eucalyptus salmonophloia
Eucalyptus salubris
Eucalyptus sideroxylon
Eucalyptus stuartiana
Eucalyptus tesselaris
Eucalyptus wandoo
Fraxinus oxyphylla
Fraxinus syriaca
Gleditshcia tricanthos
Pinus brutia
Pinus halepenois
Pinus nigra var. caramanica
Pinus nigra var. hispanica
Pinus pinea
Pistacia khinjuk

INV.No.2/019 (Southern Zagros Zone)
Species planted 1348 (1969-70)

Acacia acuminata
Acacia aneura
Acacia arabica
Acacia cyanophylla
Acacia cyclops
Acacia salicina
Acacia saligna
Acacia senegal
Acacia stenophylla
Ailanthus glandulosa
Casuarina glauca
Cercis siliquastrum
Cupressus arizonica
Cupressus sempervirens
Eucalyptus behriana
Eucalyptus brockwayi
Eucalyptus campaspe
Eucalyptus crebra
Eucalyptus dumosa
Eucalyptus dundasi
Eucalyptus fruticetorum
Eucalyptus gillii
Eucalyptus gracilis
Eucalyptus intertexta
Eucalyptus kondiniensis
Eucalyptus oleosa
Eucalyptus salmonophloia
Eucalyptus salubris
Eucalyptus sargenti
Eucalyptus striaticalyx
Eucalyptus stricklandi
Melia azardarach
Parkinsonia aculeata
Prosopis juliflora
Prosopis spinigera
Robinia pseudacacia
Tetraclinis articulata
Zizyphus spina-Christi
Fraxinus oxyphylla

Species in preparation
for trial in 1349 (1970-71)

Amygdalus communis
Cedrus atlantica
Robinia pseudacacia
Quercus persica
Ulmus pumila
Acacia acuminata
Acacia albida
Acacia aneura
Acacia arabica
Acacia baileyana
Acacia cultriformis
Acacia cyanophylla
Acacia cyclops
Acacia modesta
Acacia pendula
Acacia peuce
Acacia raddiana
Acacia salicina
Acacia saligna
Acacia stenophylla
Acacia seyal
Acacia victoriae
Acer cinerescens
Ailanthus glandulosa
Argania spinosa
Callitris preissii
Casuarina glauca
Casuarina decaisiana
Cersis siliquastrum
Conocarpus lancifolius
Cupressus arizonica
Cupressus duprezziana
Cupressus sempervirens
Eucalyptus behriana
Eucalyptus brevifolia
Eucalyptus calcicultrix
Eucalyptus camaldulensis
Eucalyptus campaspe
Eucalyptus cladocalyx
Eucalyptus brockwayi
Eucalyptus crebra
Eucalyptus dumosa
Eucalyptus dundasi
Eucalyptus flocktoniae
Eucalyptus fruticetorum
Eucalyptus gillii
Eucalyptus gracilis
Eucalyptus kondiniensis
Eucalyptus largiflorens
Eucalyptus le souëffii
Eucalyptus longicornis
Eucalyptus microtheca
Eucalyptus occidentalis
Eucalyptus pachyphylla
Eucalyptus salmonophloia
Eucalyptus salubris
Eucalyptus sargenti
Eucalyptus stricklandi
Eucalyptus striaticalyx
Eucalyptus terminalis
Eucalyptus torquata
Fraxinus oxyphylla
Melia azardarach
Parkinsonia aculeata
Pinus brutia
Pinus eldarica
Pistacia mutica
Pistacia khinjuk
Prosopis spicigera
Quercus persica
Robinia pseudacacia
Schinus molle
Zizyphus spina-Christi
Zizyphus communis

APPENDIX II

SPECIES TRIALS IN SAND DUNES

Species trial in 1348 (1969-70)

Acacia greggii
Acacia ligulata
Acacia nubica
Acacia senegal
Acacia tortilis
Acacia victoreae
Atriplex halimus
Calligonum sp.
Elymus gigantea
Eucalyptus camaldulensis
Crotolaria burhia
Parkinsonia aculeata
Lencena glauca
Maloxylon persicum
Panicum antidotale
Pennisetum dichotatum
Lasiurus sindicus
Schinus molle
Mimosa hamata
Ricinus communis
Prosopis juliflora
Prosopis cineraria
Tamarix pallisii
Tamarix stricta
Zizyphus spina-Christi

Species for trial in 1349 (1970-71)
Besides those of 1348 the following further spec
are proposed for trial:

Amorpha fruticosa
Amygdalus communis
Armeniaca vulgaris
Celtis caucassica
Cerasus mahleb
Gleditschia triacanthus
Colutia arborescens
Craetaegus turkestarica
Cotinus coggygria
Maclura aurentica
Malus sieversii
Caragana arborescens
Ligustrum arborescens
Lonicera talarica
Dalbergia sissoo
Rhus orientalis

APPENDIX III

SPECIES ON TRIAL IN ANTI-EROSION STUDIES

Ailanthus glandulosa
Atriplex cannescens
Celtis australias
Cercis siliquastrum
Cupressus arizonica
Ficus spp.
Pistacia mutica
Pyrus communis
Pinus eldarica
Pinus brutia
Robinia pseudacacia
Morus alba
Vitus vinifera

DEVELOPMENT OF FOREST RESEARCH IN PAKISTAN

by
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INTRODUCTION

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 a national basis, less than 10 percent of the total land area is classified as forest and rangeland. In East Pakistan, however, 17.3 percent of the land area is forest land of which approximately 10 percent is under scientific management and the remaining 7.3 percent 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 rangeland. The types of forest land and their distribution are given below:

Type	*East Pakistan* Area (Sq. miles)	Distribution
1) Hill or moist deciduous forests	2,698 (Reserved) 3,494 (Unclassed)	Tertiary hills in the northeast and southeast
2) Low grade deciduous forests	443	Pleistocene terraces in the north and centre
3) Tidal or mangrove forests	2,340	Tidal plains in the Sundarbans
	8,975	

Type	*West Pakistan* Area (Sq. miles)	Distribution
1) Coniferous forests	5,339	Occupy hills ranging between 5,000 and 10,000 feet, including Azad Kashmir and Gilgit Agency
2) Riverine forests	1,073	Lower Indus basin
3) Manmade forests	860	Irrigated forests, blocks along roads and canals
4) Degraded mangrove forests	1,332	Along coastal plains
5) Rangeland	20,557	
	29,161	

	Total land area (Sq. miles)	Forest area (Sq. miles)
East Pakistan	54,501	8,975 (including unclassed state forest)
West Pakistan	344,073	29,161 (including rangeland)
	398,574	38,136

It will be seen from the 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 4 percent of the total land area in Pakistan whereas at least 15 percent, gradually rising to 25 percent, 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 are 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 a large-scale afforestation programme, increased exploitation, intensive management of existing forests and an 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 of 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 the Agricultural College and Research Institute, Lyallpur, with a few staff members of the Indian Forest Research Institute who had opted for Pakistan. In March and April 1948, the Paki-

stan Forest Institute was shifted from Lyallpur to Upper Topa in the Murree Hills, and was temporarily housed there 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. In 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 148,000 square feet. The institute estate contains a botanical garden, experimental plots, a medicinal plant farm, an insectory, nurseries and other facilities.

Until June 1965, the Pakistan Forest Institute was controlled and financed by the Central Government. It is now 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 with the rank of Chief Conservator of Forests.

General Directorate

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

The various research branches are grouped into three research divisions as shown below:

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

Division of Biological Sciences Research

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

Division of Forest Products Research

1) Utilization Branch (1948)
   a) Wood Anatomy Section
   b) Wood Seasoning and Timber Physics Section
   c) Timber Mechanics Section
   d) Composite Wood Section
   e) Sawmilling and Woodworking Section
   f) 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 up to 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 parentheses against each. Out of a total of 11 branches, five branches were set up prior to the First Five-Year 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 wildlife management.

The development of the Pakistan Forest Institute is being assisted by a United Nations Development Programme Project which has been in operation since February 1964 with a total estimated cost of approximately Rs. 20 million spreading over a period of five years. The initial contribution from Pakistan's own resources for the same period is nearly Rs. 15 million.

A brief account of some of the important research activities of the Pakistan Forest Institute follows:

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 will have 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 of 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 layout 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 rangeland exist in West Pakistan. The various problems associated with the management and improvement of this rangeland 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 cooperation 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, kail 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 suppy 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 an nematology.

The Botany Branch carries out studies on th ecology, mycology and physiology of plants forest origin, and is engaged in the preparatio of flora for different regions of West Pakistan Part I of the Peshawar District Flora has alread been published by this branch. Work on th preparation of flora in the Swat State is in pro gress. A correct identification of various specie growing in the forests and elsewhere is essenti for the future development and utilization various tree species, shrubs and medicinal plant The Botany Branch has, so far, collected ove 21,000 plants from various localities and abou half of this number has been properly classifie identified, mounted and incorporated in th institute herbarium. The mycological section ha collected more than 2,000 specimens of fung most of which belong to the wood-rotting group

In the Chemistry Branch, chemical analysis carried out on various types of forest soil to dete mine their physico-chemical constituents, o vegetable tannins to determine their yield, o medicinal plants to determine their alkaloi content and on forage grasses to evaluate the nutritive value. The bark of a 12-year-old babu tree has been found to contain as high as 14 per cent tannin of superior quality.

The Medicinal Plants Branch has conducte a number of qualitative and quantitative survey of medicinal plants in various parts of Pakista and is undertaking cultivation of medicinal plan in forest areas. The Medicinal Plants Branc herbarium contains over 5,000 specimens medicinal plants and 300 drug specimens collecte from different areas of Pakistan.

The Utilization Branch has yet to be develope and manned properly to undertake a compre hensive research programme on different aspec of forest products. The work of this branch in th past has been mainly industry counselling an furnishing technical information to governmen departments. The branch has a large collectio of wood specimens from Pakistan and severa foreign countries. Some of the research works don in the Utilization Branch include anatomica studies on local timbers and reaction wood, effec of physico-chemical treatments on the shrinkag and absorption behaviour of wood.

The Pakistan Forest Institute has to its credi nearly 200 publications of various categori published in foreign and home journals and a government publications.

The Forest Research Institute, Chittagong

Development of forest research in East Pakistan has its special problems and limitations as follows:

1) Forest areas are very poorly distributed, the principal forests being situated in Chittagong Hill Tracts and Sundarbans region.
2) Scope for the expansion of forest land is limited, due to heavy pressure of the agricultural population and the demand for more agricultural land.
3) To feed the existing industries and to help the growth of new industries based on forest products, as well as to meet the requirements of overall forest product development, gradual expansion of exploitation activities entails equally large-scale regeneration activities, these should be mainly in the form of raising pure and mixed plantation of indigenous and exotic species to get maximum high quality turnout.
4) While the productive role of forests has to be increased for economic development, it is of vital importance to the agricultural economy of East Pakistan to retain a protective role of forests by maintaining watershed areas in the hilly areas and coastal embankments.

Dr. R.K. Winters, Forestry Adviser 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 the 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 U.S. Government for conducting research in the following broad fields:

1) 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
2) Utilization of byproducts of extracted timber, including the usual range of chemurgic studies covering the entire field of forest products utilization
3) Economic aspects of timber extraction and byproducts 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:

1) Woodworking and Timber Engineering
2) Wood Preservation and Wood Chemistry
3) Seasoning and Timber Physics Including Wood Anatomy
4) Veneer, Plywood and Composite Wood Products
5) Pulp and Paper Technology Including Hardboard.

A sum of Rs. 4.8 million was spent out of the total estimated cost of Rs. 7 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. 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 with the following objectives:

1) To provide for adequate research for proper land use and management of watersheds so that effective influence of forests on water supply and climate is manipulated
2) To provide for research for a better technique of raising an improved quality of forest crop and to obtain increased production from the soil capital
3) To prevent losses due to insects, rot and other diseases
4) To conduct a survey for development of various minor forest products of economic importance like medicinal plants
5) To find various economic uses of available forest produce according to the latest technological development in different branches of forest utilization
6) To carry out research in the economics of forestry by different methods of harvesting, conversion, manufacture and marketing of forest products.

The above objectives are based on long-range

planning. It is, therefore, not possible to achieve the desired goal during one or two plan periods. The development scheme in the Third Plan emphasized the development of the Forest Management Wing of the Institute with the assistance of the U.N. Special Fund, but due to the delay in execution of the plan of operation of the 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 work 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

Forest Management Wing

1) Silviculture and Management Division
   - Silviculture Section
   - Mensuration Section
2) Forest Economics Division
   - Forest Economics Section
   - Market Survey Section
3) Forest Botany Division
   - Wood Anatomy Section
   - Botany Section
4) Forest Genetics Division (planned, but not yet activated)
5) Forest Protection Division
   - Forest Pathology Section
   - Forest Entomology Section
6) Soil Chemistry Division

Forest Products Wing

1) Woodworking and Timber Engineering Division
   - Woodworking Section
   - Timber Engineering Section
2) Wood Preservation and Wood Chemistry Division
   - Wood Preservation Section
   - Wood Chemistry Section
3) Seasoning and Timber Physics Division
   - Wood Seasoning Section
   - Timber Physics Section
4) Veneer and Composite Wood Products Division
   - Veneering Section
   - Composite Wood Section
5) Pulp and Paper Division
   - Hardboard Section
   - Paper Technology Section
6) Minor Forest Products Division
   - Minor Forest Products Section
   - Medicinal Plants Section

The Silviculture and Research Division of the Development Circle of the East Pakistan Fores Directorate has been transferred to the Institute and has been functioning under the Forest Management Wing since May 1969. This division has 10 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 o 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 Rs.)
1) Study of forest soil in East Pakistan (already approved)	0.314
2) Survey and study of insect pests found in the forests and their economic utility	0.336
3) Survey and study of pathogenic organisms found in the forest and their economic utility	0.385
4) Study of silviculture of cane and bamboos	0.389
5) Study on role of wildlife in the regeneration of the forests	0.259
6) Study on cytogenetic variability in forest species for evolution of superior strains	0.671
7) Studies on the ecological factors governing the development of forests	0.737
8) Studies on the effect of land use on erosion of Karnafuli, Sangu and Matamuhari Rivers.	0.454

The Forest Research Institute campus at Chittagong consists of an area of approximately 70 acres of land. Construction work of the new institute building where different research divisions of the Forest Management Wing and the

central facilities like the library, the 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 the research division by a divisional officer. Since July 1965, the Institute has been administered by the Forest Directorate of the Agriculture Department, Government of East Pakistan. Out of a total of 15 divisions (including two in the General Services and the Silviculture and Research Divisions), only four divisional officers were recruited in the past, one of whom has been abroad for higher studies since 1966. Recently three positions of divisional officers have been filled by promotion and the resultant vacancies have not yet been filled. The Institute has, therefore, a serious shortage of trained research personnel at the higher level.

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 the Forest Products Wing and the 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. 1.5 million. In the Fourth Plan Development Scheme, provision has been made for two supervisory research positions with 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 silviculture, 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 only about 10 years ago, 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:

1) Bleaching and finishing studies of garjan timber for manufacture of quality furniture
2) Investigation of the suitability of eight East Pakistani wood species for pencil manufacture
3) Cooperative studies with Pakistan Eastern Railway on the treating schedule of garjan sleepers
4) Treating schedule of sundri and garjan poles
5) Suitability of sundri and civit timbers for the manufacture of rayon pulp
6) Extraction of tannin from mangrove species
7) Development of kiln drying schedules for indigenous timber species
8) Manufacture of hardboard from garjan, civit, champa, chapalish, gewa, kadam and gamar
9) Manufacture of quality tea chests out of hitherto unused timbers of East Pakistan
10) 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
11) Suitability of Sylhet grasses (ekra, khagra and nal) for pulp and paper manufacture
12) Preparation of a hand lens key for the identification of eighty timber species of East Pakistan
13) Building up of an authentic wood herbarium
14) Evaluation of strength characteristics of important timber species of East Pakistan and their suitability for construction work.
15) 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.

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 today and which need immediate attention are: the acceleration of natural regeneration; development of effective artificial propagation methods; production of industrial softwood for pulp, paper, match, plywood, synthetic rayon, hardboard, etc.; afforestation of dry, saline and water-logged lands in West Pakistan; barren hills, wasteland, roadside and railway-side land in East Pakistan; evolution of genetically superior strains; development of arid and semi-arid rangelands in West Pakistan; growing of forests and trees along the coastal belt, riverside, canal side, and in "haor" areas in East Pakistan; replaning the existing forest with short-rotation crops to meet the growing demand for industrial wood; intensification of mechanized exploitation from the virgin forests; and to find the most economical utilization of wood.

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 the latest technological knowledge needs to be investigated. Wood waste like sawdust, wood shavings, edgings, veneer clippings, cuts, limbs, branches and stumps all have to be properly utilized so that nothing goes to 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 o 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 requires proper planning of the forestry research programme on a short-term and a long-term basis, both of which need to be pursued simultaneously. This programme can be summarized as follows:

Short-term programme

1) Scientific management of existing forests
2) Economic utilization of forest products
3) Land use classification survey
4) Survey and development of minor forest products.

Long-term programme

1) Afforestation of barren areas
2) Range development and improvement in West Pakistan
3) Watershed management
4) Protection of forests and forest products from pests, diseases and natural calamities
5) Wildlife management.

Pakistan is spending only 0.13 percent of gross national product (GNP) on scientific research, whereas in technologically developed countries in the West, 2 to 3 percent 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 percent of our GNP on scientific research in order that this sector can make meaningful contributions to our national economy and the society.

APPENDIX

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
Kail	*Pinus wallichiana*
Babul	*Acacia arabica*, Willd.
Garjan	*Diperocarpus*,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*

FORESTRY EDUCATION AND PUBLIC RELATIONS IN PAKISTAN

by
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AS IN FRANCE, forestry education in Pakistan is sponsored by the Government. The National Forest Service decides how many forest officers will be needed in a particular year and announces these vacancies. The candidates apply for these positions and a competitive examination is held under the auspices of the Public Service Commission, which selects suitable students who meet the set standard of academic qualification. The selected candidates are sent to the Forest Institute to undergo a two-year forestry course where they get a stipend from the Government.

The Forest Institute is affiliated with the University of Peshawar. The courses operate under the Director of Forestry Education who works under the control of the Director General of the Forest Institute. There is a separate forest ranger school in East Pakistan at Chittagong, but the forest officers from East Pakistan are educated and trained in the Forest Institute at Peshawar.

Peshawar University is the examining body for all forestry students. After successful completion of the examination in the prescribed subjects the university awards a B. Sc. Hons. Forestry degree to the officers and a Diploma in Forestry to the rangers. In the final examination the students are obliged to appear before the Board for an oral examination.

The basic qualification needed for the forest officer's course is at least a second division Bachelor's Degree in natural/physical sciences or agriculture from a recognized university. The rangers who choose the diploma course must have passed the intermediate examination in at least the second division with science subjects. While these are the basic requirements, competition is very keen and therefore those who choose the officer's course generally possess a M. Sc. Degree and the rangers generally hold a B. Sc. Degree.

This system has stood the test of time and good students generally enter the Forestry Service. However, it is now felt that the generalistic training given to the forestry officers should give way to more intensive training in specialized fields. In other words, the forestry officers were trained largely for protection and forest management. But now since the Forest Service has taken the responsibility of range management and watershed management, education must also be given in these subjects. It is felt that the scope of

specialized training should be further enlarged to cover more fields such as forest industries, wildlife management, inland fisheries, aerial forest inventory and park and recreational management.

Considering the pace of progress and development in the country the Forest Service is being increasingly burdened with greater responsibilities than before. The range management and watershed practices for which the Forest Service has been made responsible have brought the forestry officers into the limelight and dealings with the public have become incomparably closer than in the past. The pressure of population and the exacting demands of the people for grazing of cattle, sheep and goats appear to be in direct conflict with the scientific concepts. Thus the forest officers not only come under pressure of public opinion, but are often obliged to make compromises with the technical requirements. They frequently find themselves working under an unsympathetic attitude of politicians and administrators. This means that while the responsibilities of forestry officers have increased, on the other end of the scale a gulf has come to divide the Forest Service from the general public, administrators and politicians. Under such circumstances the need for harmony and understanding between these various groups cannot be overemphasized. A pattern therefore must be evolved to educate the public, and understanding must be brought about between these various groups. The Forest Institute must therefore start a course in public relations.

At the present time, while the role of forestry is becoming multipurpose, the forest officer is not made fully aware during his training of the public relations problems he will have to face in the field. Those who are already in the service, on the other hand, still continue to work largely by exercising authority rather than understanding the public mind. Indoctrination is, therefore, a vital need of the time.

Those in the Forest Service engaged in range management, for example, must have undergone prior training to work with the public and win their cooperation. They should also have the knowledge and ability to educate the public about the value of trees, the value of watershed, t benefits of deferred rotational grazing and t benefits of wildlife conservation.

The farmer will have to be taught the inte dependence of agriculture and forestry, that o is the handmaid of the other, that if the latter neglected, the former inevitably suffers. T common man inhabiting the watershed areas w have to be effectively told and convinced th forestry conservation practices would result increased unpolluted water supplies, mitiga the occurrence and intensity of floods, preve erosion, enrich the soil and increase productivit Such are the aims yet to be achieved by the Fore Service. In short an extension service within t Forest Service is likely to attain the ultima objectives through modern audio-visual publici techniques including movies, slides, etc.

The responsibility also devolves on the fore officers to educate the administrators, politicia and the land use planners. The administrat must be made aware of the direct and indire benefits that are likely to accrue with scientif practices of forestry, range management an watershed management. The politician must b fully informed about the long-term benefits tha the people will gain from the various forestr works carried out in the national interest. Th land use planners must be convinced whic discipline is to be most beneficial under a set given circumstances and conditions, and whic topographical and climatic areas are particularl suited to various disciplines.

The educational institutions all over the coun try should add basic courses in conservatio practices, similar to those the United State adopted several years ago. This will lay th foundation for the awareness of the people con cerning the benefits that conservation brings t a country. It is thought now that various inservic training institutes like the National Institute o Public Administration and the Rural Academy and Administrative Staff College should also pro vide regular courses in conservation practices Such a plan would go a long way toward creating an understanding and bringing about harmony between the forestry officers and the men serving in other branches of national service.

AGENDA

JUNE 8, 1970

Opening Remarks
H.E. Mr. Turgut Menemencioğlu,
Secretary General, CENTO

Welcoming Address
H.E. Mr. Hüseyin Özalp,
Minister of Forestry,
Government of Turkey

Opening Address
Dr. Parviz Mehdizadeh,
Head of the Iranian Delegation, on behalf of
H.E. Mr. Nasser Golesorkhi,
Minister of Natural Resources,
Government of Iran

Opening Address
Mr. S.A. Aleem,
Head of Pakistan Delegation

Statement
Mr. Joseph B. Robinson,
United States Economic Coordinator
for CENTO Affairs

KEYNOTE ADDRESS:
Forestry — a Challenge
Mr. Paul M. Dunn,
President,
American Forestry Association

The Role of National Parks and Forest Recreation in Today's World
Mr. John J. Moseley,
Landscape Architect,
U.S. Department of the Interior

Present Status of Forestry and Related Fields in Iran
Dr. Parviz Mehdizadeh,
Director of Research,
Institute of Natural Resources,
Tehran

JUNE 9, 1970

Turkish Forestry in General
Mr. Eşref Soysal,
Adviser,
Minister of Forestry,
Ankara

Status of Forestry in Pakistan
Mr. S.A. Aleem,
Inspector General of Forests,
Islamabad

Discussion on country situations

Meeting of Working Groups

JUNE 10, 1970
Meeting of Working Groups

JUNE 11, 1970
Consideration by full conference of final reports from the four Working Groups

Presentation by Group Chairmen of their final reports

Adoption of Report

Closing Remarks
H.E. Mr. Ali Karaağaç,
Under Secretary,
Ministry of Forestry,
Turkey

JUNE 12, 1970
Field Trip to Turkish Experimental Range and Forest Area,
Bolu Region

COMPOSITION OF WORKING GROUPS

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Mr. Turgut Bayyurt
Mr. Fevzi Kiliçaslan
Mr. Özdemir Demirtaş
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Mr. Okan Elgin
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LIST OF U.S.-SPONSORED CENTO ECONOMIC PUBLICATIONS

1. Seminar on Cattle and Sheep Breeding, 1959
2. Seminar on Land Classification and Soil Survey, 1959
3. Seminar on Forestry, 1959
4. Conference on Minerals, 1959
5. Progress Report, Coordinating U.S. Action for CENTO, 1959-60
6. Conference on Development Programming, 1960
7. Symposium on Chrome Ore, 1960
8. Conference on Teaching of Preventive Medicine, 1961
9. Conference on Industrial Development Banking, (1) 1961
10. Symposium on Coal, 1961
11. Progress Report, Coordinating U.S. Action for CENTO, 1961-62
12. Traveling Seminar for Increased Agricultural Production, 1962
13. Conference on Agricultural Development Banking, 1962
14. Conference on National Income Accounting, 1962
5. Conference on Development Planning, 1962

* 16. Conference on Teaching Health Centers, 1962
* 17. Conference on Industrial Development Banking (2), 1962
* 18. Conference on Establishment of National Scientific Organizations, 1962
* 19. Symposium on Industrial Rocks and Minerals, 1962
20. Seminar on Cost and Return Ratios for Major Agricultural Products, 1963
21. Conference on Teaching of Science, 1963
* 22. Symposium on Rural Development, 1963
* 23. Symposium on Iron Ore, 1963
* 24. Symposium on Consumer Expenditures, 1963
25. Conference on Agricultural Development Policy, 1963
26. Symposium on Management Training in Public Administration, 1964
27. Conference on Nursing Education, 1964
28. Conference on Hospital Administration, 1964
29. Traveling Seminar on Range Management, 1964
* 30. Conference on Manpower Needs and Training of Environmental Sanitation Personnel, 1964

*31. Symposium on Mining Geology and the Base Metals, 1964
32. Traveling Seminar on Agricultural Credit and Cooperatives, 1964
33. Symposium on Industrial Statistics, 1964
34. Symposium on Scientific and Industrial Research, 1964
*35. Second CENTO Veterinary Pathology Seminar, 1964
36. Symposium on the Role of Local Government in National Development, 1965
*37. Symposium on Tax Administration, 1965
38. Symposium on the Development of Capital Markets, 1965
39. Traveling Seminar on Veterinary Education and Animal Health, 1965
*40. Traveling Seminar on Fresh Fruit and Vegetable Marketing, 1965
*41. Seminar on Field Techniques for Mineral Investigation, 1965
*42. Progress Report, Coordinating U.S. Action for CENTO, 1962-65
43. Symposium on Hydrology and Water Resources Development, 1966
44. Conference on Land Classification for Non-Irrigated Lands, 1966
45. Symposium on Household Surveys, 1966
46. Summer Training Program in Geological Mapping, 1966
47. Traveling Seminar on Farm Tools and Implements, 1966
48. Symposium on Mine Health and Safety, 1966
49. Conference on Engineering Education, 1966
50. Conference on Agricultural Extension, 1967
51. Traveling Seminar on Processing and Marketing of Fruit and Vegetable Products, 1967
52. Summer Training Program in Geologi Mapping, 1967
53. Conference on National and Regio Agricultural Development Policy, 19
54. Symposium on Agricultural Statistics, 19
55. Traveling Seminar on Marketing Livestock and Livestock Products, 19
56. Conference on Combating Malnutrit in Preschool Children, 1968
57. Symposium on Development and Utilization of Mineral Resources, 196
58. Conference on Industrial Vocational Education, 1968
59. Conference on Earthquake Hazard Minimization, 1968
60. Report of the Ad Hoc Working Party Fertilizers, 1968
61. Decade of Development, a Ten-Year Compendium, 1959-69
62. Symposium on Demographic Statisti 1968
63. Progress Report, Coordinating U.S. Acti for CENTO, 1965-69
64. Geology and Ore Deposits of Lakan Lea Zinc District, Iran, 1968
65. Symposium on Manpower Planning a Statistics, 1969
66. Conference on National and Regior Livestock Development Policy, 1969
67. Geology and Ore Deposits of the Sizn Ladik Mercury District, Turkey, 196
68. Conference Series on the Teaching Public Health and Public Health Practice, 1970
69. Conference on Broadening Public Parti pation in Equity Investment, 1970
70. Traveling Seminar on Management a Financing of Marketing Cooperatives, 1970

*Out of print

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