TREES OF PAKISTAN

Mahmood Iqbal Sheikh

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FOREWORD

M.I. Sheikh started loving trees at a very young age and this led him to a masters degree in botany. The same spirit prevailed when he selected the fascinating career as a forester. After graduating in forestry, his first taste in practical life was the challenge of greening the desert in Thal. Since then he has never looked back. After having performed as a field forester for a couple of years, he made an important decision in life and switched to research in forestry and ancillary disciplines. It is in this sphere that his talent further flourished and he developed a flair for writing. Over a period of time he became a prolific writer and according to the latest count his publications include books, reports, studies, technical articles, guides, brochures and notes which number more than 360. His first and last love has always been forests and forestry. Whether it is raising of nurseries of local and exotic species, afforestation, reforestation, regeneration, landscape improvement or conservation, he deals with these subjects with authority. As a matter of fact in his capacity as a researcher he managed to obtain tree seeds from all over the world and many an exotic species now seen in Pakistan can be traced back to his personal effort.

Mr. M.I. Sheikh in the form of this publication on "Trees of Pakistan" has provided a lasting gift for all those who admire trees and forests. It is a job well done. Although this has been a major undertaking, knowing Mr. Sheikh, he will continue to prepare useful literature on forestry because he is blessed with such an insatiable desire to share his knowledge and wisdom.

In this endeavor he has been very diligently supported by Dr. Charles R. Hatch, Chief of the Party, Forestry Planning and Development Project. He is a renowned professor of forestry in his own right and we are grateful to him for his contribution.

Abeedullah Jan
Inspector General of Forests/
Additional Secretary, MINFA

PREFACE

Trees are the most precious gift of God to mankind. It is a resource much superior to other bounties and blessings because not only is it renewable but it also makes a very healthy contribution towards improvement of the environment. The immense impact of trees on the stability and development of a country like Pakistan cannot be denied. The countries which have thoughtfully preserved and regulated the use of their tree wealth are the most prosperous countries of the World today but those which have squandered their resource ruthlessly are mourning their loss and people are paying a very high price for their blunders.

Apart from their productive and protective benefits, trees have always played a very important role in the behaviors and mental resurgence of man. Poets, Sufies, mystics, and writers have drawn inspiration from trees and the environment there in. As the population grows and cities become congested, the need for open spaces, parks and gardens is increasingly being felt. The psycho-physiological influence of trees in the form of purified air, clean water, rest and recreation, scenic enjoyment, reduced noise levels, and spiritual replenishment are being fully appreciated. Trees are obviously making very positive contribution in this regard.

In the wake of this realization it was felt that a description of the trees of Pakistan should be prepared in the form of a book together with background material on forests and forestry in Pakistan so that readers are acquainted with trees and forests growing around them. The information contained in this book has been gathered from several sources, duly supported by personal observations.

I hope the readers find "Trees of Pakistan" an enjoyable and useful reference.

Mahmood Iqbal Sheikh
Policy and Management Specialist

INTRODUCTION

The trees of Pakistan are as diverse as its landscape. The sandy beaches, the blue lagoons, the mangroves along the Arabian Sea, the sandy deserts, the desolate plateaus, the Indus basin, the high mountain ranges and the picturesque valleys each have their own vegetational complexes which have developed over time.

ENVIRONMENTAL SETTING

Pakistan is an oblong stretch of land bordered on the south by the Arabian Sea to the north by the Himalayan mountains, to the east by the plains of India and to the west by the mountains and deserts of Afghanistan and Iran (Figure 1). It is located diagonally between 24° and 37° north latitude and 61° and 75° east longitude, with a total area of 87.98 million ha. Within this area is the large, fertile Indus plain that is fed by snow and glaciers of the northern mountain systems. These mountain systems are made up of the Karakoram range, the greater Himalayas and the Hindu-Kush range. This area has 100 peaks of over 5,400m, including "K2" (8,563m) the second highest mountain in the world. The western mountain ranges, the Sufed Koh and the Sulaiman are not as spectacular and slope into the southwestern Balochistan Plateau. Characteristically, the mountain slopes are steep, forming extremely important but fragile watershed areas. The Indus basin consists of two features, the alluvial plain and the sand dune deserts.

The country is drained by six rivers, the Kabul, the Indus, the Jhelum, the Chenab, the Ravi, and the Sutlej. These rivers join the Indus as it flows south to the Arabian Sea; they provide the water for the agriculture production and hydroelectric power that sustains the economy. The Indus plain, given life by this water, forms the granary of Pakistan. Agriculture is a major land use and a mainstay of the economy, contributing about 30% of GNP and employing 55% of the labor force.

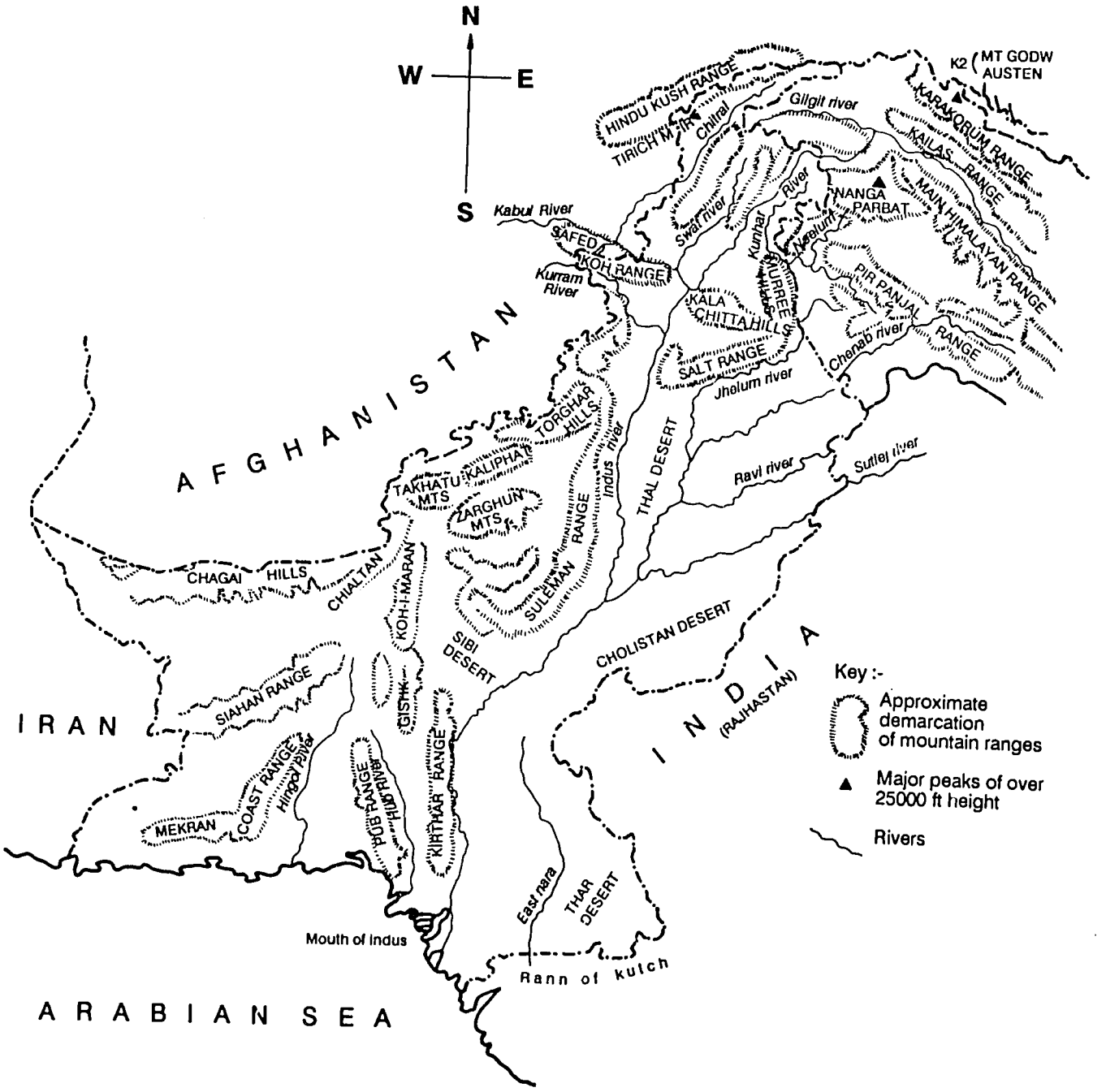
CLIMATE

The climate is also as varied as Pakistan's landscape. It is characterized by scarce and erratic rainfall, low relative humidity, extreme temperatures and strong hot and cold winds.

Precipitation

Precipitation ranges from 50mm in western parts of the Balochistan highlands to about 1500mm in the Himalayan region. The country can be considered as arid or semi-arid with more than 75% of it receiving less than 250mm of the annual precipitation. A

Fig 1 - Map of Pakistan showing main rivers, hills and mountain ranges.



humid zone occurs in the Punjab and a wet zone is found on the southern slopes of the northern highlands. Figure 2 gives mean annual rainfall zones for Pakistan.

Precipitation is characterized by a summer monsoon that dominates the eastern and southern areas and a winter rainy season that prevails in the south-western, western and north-western regions. Monsoon (July-September) is considered the most important season of precipition because of the quantity of moisture it produces, approximately 70 to 80% of the annual total. The winter wet season, lasting from December to February, is the result of western atmospheric disturbances which are also the sources of snowfall in the Himalayas, Hindu Kush and Karakoram. The western half of the Balochistan Plateau receives more than 40% of its annual precipitation during this season.

Temperature

Temperature will range from below 0°C to as high as 52.2°C (recorded in Jacobabad, Sindh). June is the hottest month, with the summer in the plains lasting from May to August. Daily maximum temperatures can exceed 40°C, being as high as 45°C in Upper Sindh.

Although temperatures are high in the plains and go as low as -12°C in the mountainous regions, most of the plains are not frost-free. The mean minimum January temperature in much of the Indus Plain is 4°C. However, when cold north-westerly winds blow in December and January, a widespread frost is common for a few weeks, the only strictly frost-free area is the narrow coastal strip along the Arabic Sea.

Humidity

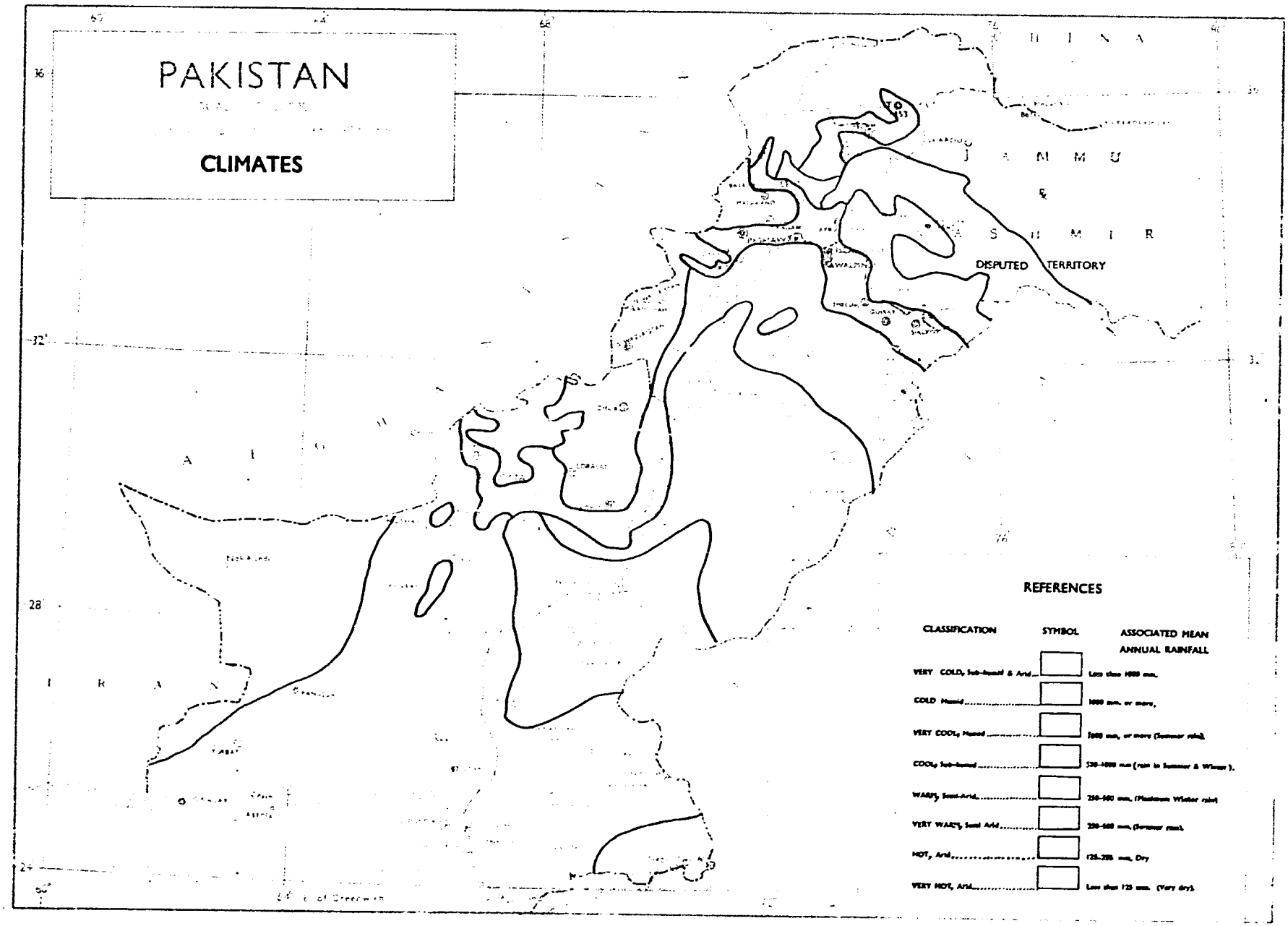
A 64 km inland coastal belt has very high relative humidity, especially during August. The relative humidity in most parts of the country is moderate, although sometimes falling below 10% in the plains. High humidities can occur in the plains, but seldom last longer than a month.

Winds

Hot, desiccating winds are common from April to September consequently, decreasing the already meager moisture supply. Wind speeds up to 80 to 96 km per hour have been recorded. In the deserts, dust storms are a regular feature during summer.

SOILS

The Indus basin comprises a vast area of alluvial soils, formed mostly by the deposits of the Indus river and its tributaries. A smaller portion of the basin has loessal soil. These soils are deep and fertile, and rocks are not usually encountered. The alluvial material is dominantly a calcareous silt


PAKISTAN
CLIMATES
DISPUTED TERRITORY
REFERENCES
CLASSIFICATION
SYMBOL
ASSOCIATED MEAN ANNUAL RAINFALL
VERY COLD, Sub-humid & Arid
COLD Humid
VERY COOL, Humid
COOL, Sub-humid
WARM, Semi-Arid
VERY WARM, Semi Arid
HOT, Arid
VERY HOT, Arid

loam, brown in color, of mixed mineralogy. The organic matter content of these soils, is generally between 0.5 to 0.8% to a depth of 75 to 100cm. Organic matter drops to about 0.3% at lower depths. The calcium carbonate content is between 6 and 10%, and has leached into the deeper layers, forming a zone of lime nodules (Kankar) at about 90-120cm depth. The pH usually ranges from 8 to 9.

Water logging, salinity and sodicity are serious problems that have been aggravated with improper irrigation water management techniques. Reclamation of some of these soils is possible, however much of these areas will not support normal farming. All possible combinations of water logging, salinity and sodicity can be found both in irrigated and un-irrigated areas.

The deserts of Siahan, Thar, Cholistan and Thal extend over an area of 12 million ha. The Thar and Cholistan are part of the great Indian desert and occupy the area east of the southern half of the Indus plain. The Thal desert lies between the Jhelum and Indus rivers, and the Siahan desert touches Iran and Afghanistan. Most of the Cholistan and Thar deserts comprise dune land consisting of ridges of sand, drifted and piled by wind. The ridges are about 6 to 10m high and run parallel to one another, separated by gaps approximately as broad as the ridges. The general orientation of these dunes is determined by the prevalent wind. They are devoid of vegetation.

The sandy area of the Thal desert also has an array of longitudinal sandy ridges, alternating with narrow valleys. The ridges are stabilized by vegetation. The inter-ridge valleys have sandy loam soils which support vegetation.

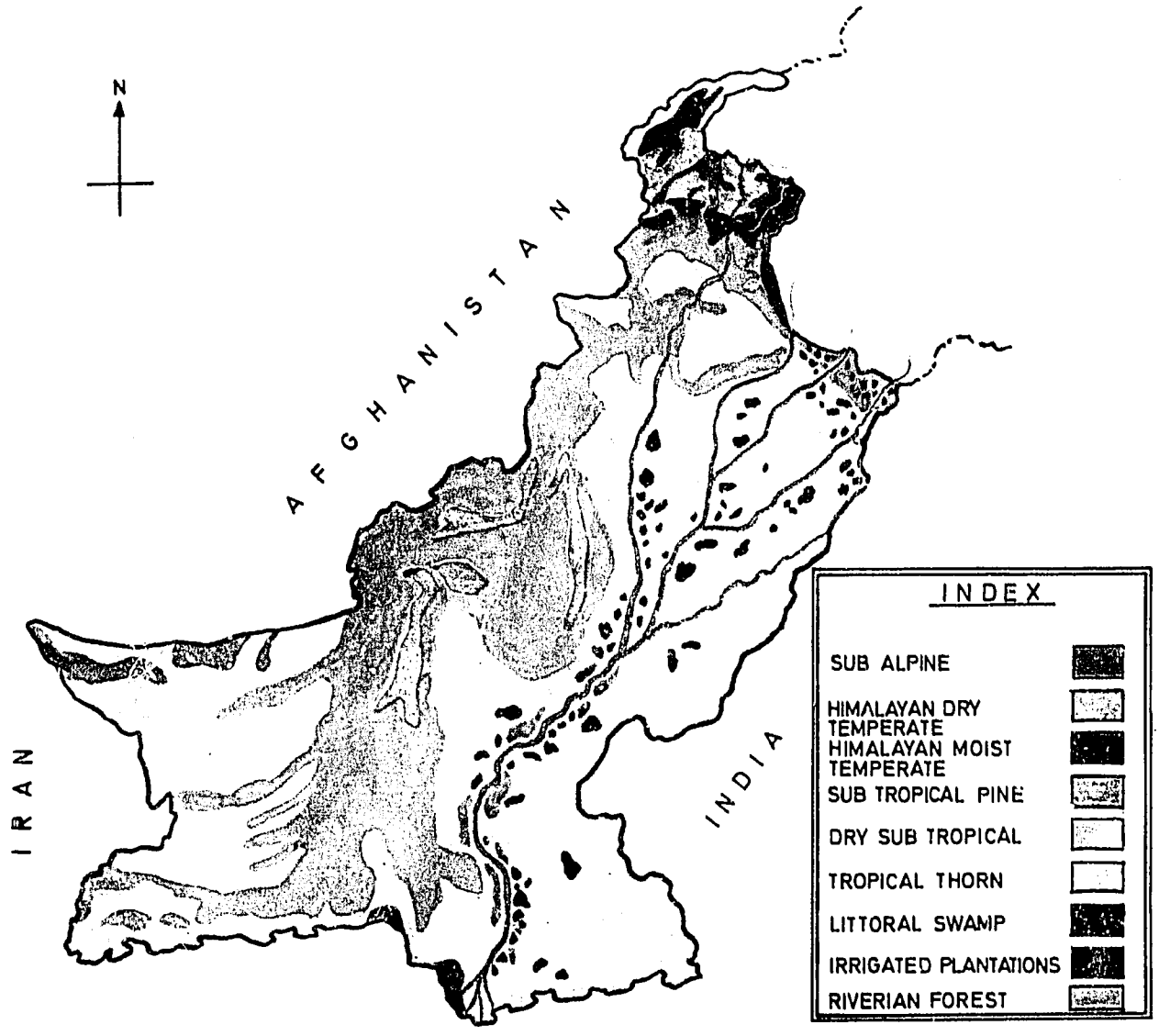
FOREST TYPES

The distribution of forest vegetation in Pakistan is primarily governed by climatic and edaphic factors and is reflected in the diversity of forests types. While large areas are under natural coniferous and broad-leaved forests, some of the forests are entirely man-made. From the alpine forest in the northern Himalayas, to the mangrove forests in the Indus delta swamps there is a variety of different forest types (Figure 3).

Coniferous Sub-alpine Forests

This is the upper-most tree formation in the Himalayas located at an elevation of 3,350 to 3,800m. It occurs in Azad Kashmir, Dir, Swat, Chitral, Northern Area and Hazara. Abies pindrow and Pinus wallichiana stand singly or in groups with a under storey of broad-leaved trees in which Betula is typically prominent with Pyrus and Salix. The ground cover is completed by Viburnum and Salix. The conifers are stunted, attaining heights of up to 8m. The broad-leaved trees reach heights of about 7m.

DISTRIBUTION OF FOREST TYPES



There is a spring flush of herbaceous flora, among which Primula, Ranunculaceae and many Composites are conspicuous. Ferns are also in abundance. Aconitum heterophyllum, Aconitum chasmanthum, Aconitum laeve, Saussurea lappa, Rehum emodi and Podophyllum hexandrum are the common medicinal plants.

Coniferous Dry Temperate Forests

These forests are distributed throughout the dry inner mountain ranges, beyond the effective reach of the monsoon, in the Northern Area, Chitral, Nilam and Kaghan Valleys, and Takht-i-Suleman, Shinghar and Ziarat in Balochistan. They occur at elevations of 1,525 to 3,350 m and often higher.

Free standing low branchy trees of Cedrus deodara, Pinus gerardiana, Juniperus excelsa, Pinus wallichiana, Picea smithiana and Quercus ilex predominate as pure stands. With them are found, Fraxinus and Acer. The shrubs include xeromorphic species of Daphne, Lonicera, Prunus, Artemisia, Astragalus and Ephedra. Medicinal plants like Ephedra nebrodensis, Artemisia maritima, Carum bulbocastanum, Thymus and Ferula are harvested commercially. Dried nuts of walnut (Juglans regia), Chilghoza (Pinus gerardiana) and Unab (Zizyphus sativa) are collected in sizable quantities.

Coniferous Himalayan Moist Temperate Forests

This forest is chiefly characterized by the extensive growth of conifers. The formation extends along the whole length of the outer ranges of the Himalayas between the sub-tropical pine and the sub-alpine forests, at an elevation of 1,373 to 3,050m, varying markedly with aspect and configuration in Murree, Galies, Kaghan and Azad Kashmir. Precipitation is between 630 to 1,500mm/year. Mean annual temperature is 12.2°C. Most of the precipitation is derived from the south-eastern monsoon, received from July to September. An appreciable amount of moisture is also received from the westerly disturbances during the winter and spring months, and in the form of snow.

The main coniferous species are Pinus wallichiana, Cedrus deodara, Picea smithiana and Abies pindrow. The canopy formed by these species is 24 to 36m high while individual tree diameters will be up to 1.5m. Taxus also occurs locally in the lower canopy. Among the broad-leaved trees, Quercus incana, Quercus dilatata and Quercus semecarpfolia are prominent in the outer margins of the zone with Rhododendron arboreum as their commonest associate. The temperate deciduous tree genera, Acer, Aesculus, Prunus, Ulmus, Fraxinus, Corylus and Alnus, are fairly common forming local communities. Litsaea and Machilus are locally found in the moister niches. Evergreen Euonymus and Ilex are commonly associated with the oaks. Among the shrubs, Indigofera, Lonicera, Rosa, Desmodium, Rubus and Viburnum are typical, while Strobilanthus spp. may be part of local communities.

A large number of important medicinal plants occur in this zone. These include Zizyphus vulgaris, Punica granatum, Berberis lycium, Skimmia laureola, Viola serpens, Dioscorea spp., Valeriana wallichii, Atropa acuminata, Colchicum luteum, Asparagus racemosus, and Mentha piperita. Sizable quantities of these medicinal species are harvested commercially.

Coniferous Sub-tropical Pine Forests

In this forest Pinus roxburghii forms practically all of the forest canopy. Individual tree heights up to 37.5m with diameters of 0.8m are not uncommon. Broad-leaved species include Quercus incana mixed with an occasional Lyonia ovalifolia, Rhododendron arboreum, Pistacia integerima, Syzygium cumini, Mallotus philippinensis, Xylosma longifolium, Quercus glauca, Ficus spp. are also part of this zone. The western limits of the chir forests (Pinus roxburghii) are found in an elevation range of 925 to 1,675 m on comparatively steep slopes. On south aspects chir pine forest borders may be as high as 2,150m. Examples of these forests are found in Hazara, Murree Hills and Azad Kashmir.

Scrub Dry Sub-tropical Broad-leaved Forests

These forests are classified as arid forests. These are low forests of branchy trees, varying in density from complete closure under the most favorable conditions to scattered single trees or groups on the dry sites with a fair amount of shrubs. Generally speaking these forests are characterized by conspicuous erosion, gullies and deep ravines. Rocks and boulders are a common feature. Weathering of sandstone produces small areas of infertile soil which support only limited vegetation. The climate is one of extremes; winters are cold and summers very hot. Winds blow all through the summer. Precipitation is received in July and August and again in January and February but it is erratic. There are long periods of drought.

The species are mostly thorny and often with small evergreen leaves. The larger trees can be seen in valleys where deep soil and adequate water are available. These forests grow in the foot-hills and lower slopes of the Himalayas, the Salt Range, Kala-chitta and the Suleman Ranges. They also may be seen throughout the country at suitable elevations, merging downwards with the tropical thorn forests and upwards with the sub-tropical pine and temperate forests. The main tree species are Olea ferruginea, Acacia modesta, Tecoma undulata, Pistacia integerima while Dodonaea viscosa, Reptonia buxifolia, Capparis aphylla, Gymnosporia royleana and Zizyphus spp. form the shrub cover.

Scrub Dry Tropical Thorn Forests

This forest is called the "Rakh" forest in the upper Indus plain and the Desert forest in the lower Indus plain. It is reported to be the native vegetation of the Indus basin. To the north and west it merges into the sub-tropical broad-leaved forest of the lower hills. It has the capacity to survive and grow in areas where temperatures of 45°C are often recorded and the precipitation varies from 75 to 140 mm/year. Precipitation occurs on the average of 16 days a year.

This forest consists of trees which are usually thorny, stunted, and dominated by Acacia spp. The usual species are: Acacia modesta, Acacia nilotica, Salvadora oleoides, Prosopis cineraria, Tamarix aphylla, Zizyphus spp., Capparis decidua, Tecomella undulata, Calotropis procera, Acacia senegal, Commiphora mukul, Euphorbia spp. and Acacia jacquemontii. Of these, Acacia modesta grows in the sub-tropical semi-arid continental region, while Acacia senegal, Acacia jacquemontii, Commiphora mukul and Euphorbia occur in the subtropical semi-arid maritime region. The

sand dune tracts are over-grown by Calligonum spp., saline sites are occupied by species of Suaeda, Salsola and Haloxylon, Salvadora persica. Areas periodically inundated with water are occupied by Tamarix dioica. Among the grasses, species of Aristida, Eleusine, Panicum, Cenchrus and Lasiurus are prevalent on relevant habitats.

Irrigated Plantations

These forests are the outcome of human effort on submarginal lands where irrigation water is available. These plantations are planted after the site has been cleared of the thorn forest. Irrigated plantations are located in the plains of Pakistan, primarily in the Punjab and Sindh. Size of such plantations varies from 200 to 8,000 ha. Major species in these forests include Dalbergia sissoo, Morus alba, Bombax cieba, Eucalyptus camaldulensis, Acacia nilotica, Melia azedarach, Populus spp. and Salix spp.

Riverain Forests

These forests, commonly known as the "Bela Forests" occur on the flood plains and banks of the major rivers of the Indus Basin. Flooding for about 6 weeks/year appears to be necessary to sustain the growth of these forests. The main species are: Acacia nilotica, Tamarix dioica, Prosopis cineraria, Dalbergia sissoo and to some extent Populus euphratica.

Mangrove Forests

These forests occur in the Indus delta swamps. The native species are extremely slow-growing and there is very little natural regeneration. The major species are Avicennia marina, Rhizophora tylosa and Ceriops tagal. These species are gregarious, evergreen trees with leathery leaves. On the best sites trees will reach 6 to 7 m in height and are found where mud limits access. If access is not limited tree height have been reduced to 3 m or less. Most of the trees have been badly lopped or grazed so they appear as stunted bushes. Avicennia marina is the most important species but currently occurs as stunted individual trees or groups of bushy trees.

Linear Plantations

Several tree species have been planted as borders along roads, canals and railway tracks. The most common species are Dalbergia sissoo, Acacia nilotica, Eucalyptus camaldulensis, Albizzia spp., Azadirachta indica, Tamarix aphylla, Populus spp., Morus alba, Salix spp., and Melia azedarach.

Farm Forests

For decades trees have been planted on farms in Pakistan. They are planted in lines around field boundaries and irrigation channels, and individually or in blocks around homes and in fields. This convention has received a big boost due to several social forestry programs launched by the government, the most successful being the Forestry Planning and Development Project. The most common species planted by the farmers are Dalbergia sissoo, Acacia nilotica, Eucalyptus camaldulensis, Populus spp., Bombax cieba, and Melia azedarach.

FOREST AREA

Area of Pakistan's various forest types as well as its rangeland area are shown in Figure 4. Table 1 gives province-wise estimates of area by forest types.

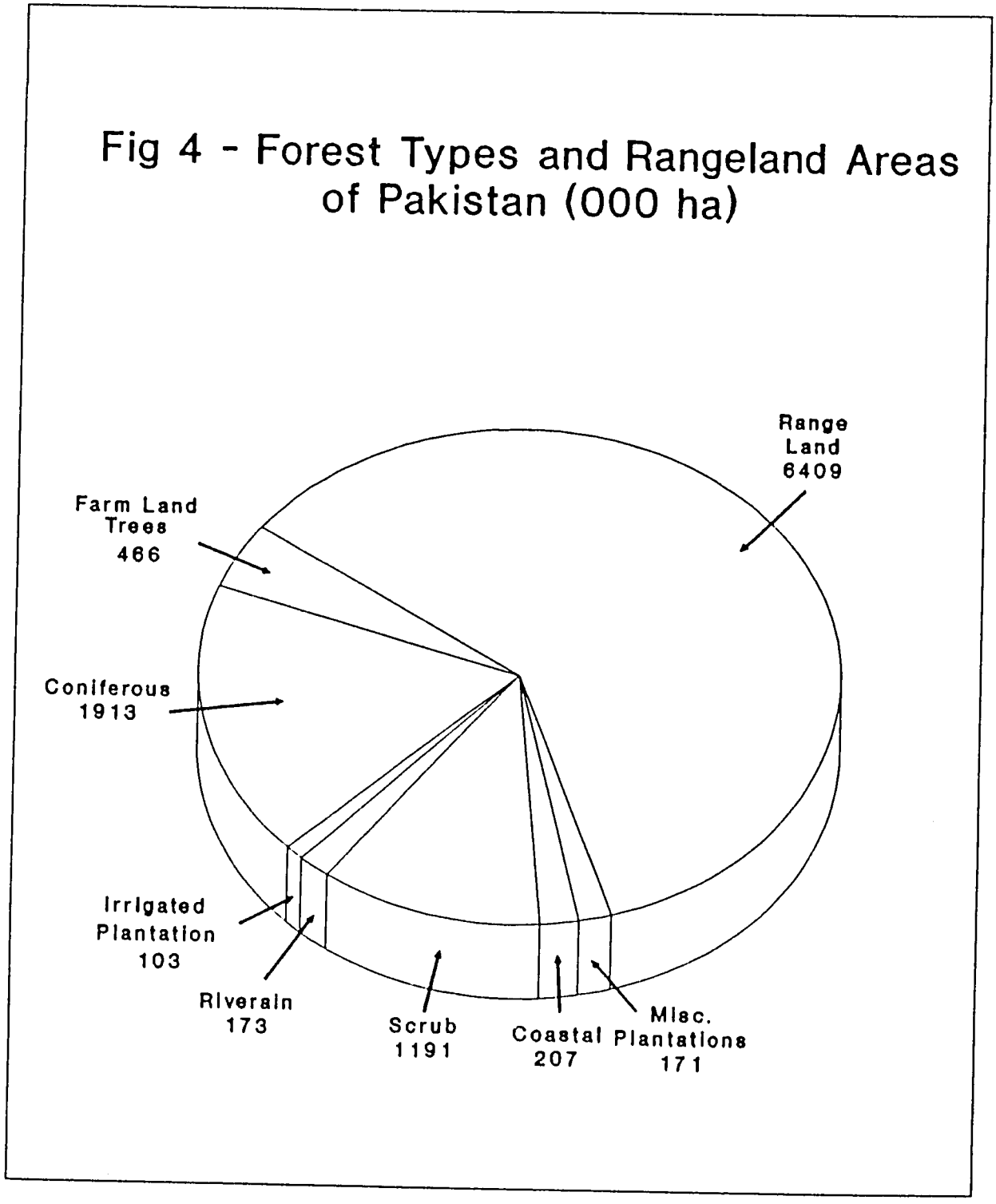


Table 1. Province-wise Forest Type/Tree Cover in Pakistan (000 ha)

Forest Type/ Tree Cover	Azad Jammu & Kashmir	Baloch-istan	Northern Areas	NWFP	Punjab	Sindh	Total
FOREST/TREES							
Conifers	241	42	660	940	30	---	1913
Scrub	16	504	---	539	132	---	1191
Riverain	1	20	---	13	27	112	173
Mangrove	---	2	---	---	---	205	207
Irrigated plantations	---	1	---	---	79	23	103
Farmland trees	7	23	6	70	306	54	466
Linear planting	---	---	---	2	14	---	16
Miscellaneous planting	10	---	---	120	20	5	155
TOTAL:	275	592	666	1684	608	399	4224

Source: Forestry Sector Master Plan.

FOREST PROTECTION

The forests are open to a multitude of adverse factors. These include grazing and browsing by the livestock, and lopping and cutting by the people living in and around the forests. The insects, diseases, wild animals and fires also cause damage to forests.

Insects

Insects are an essential part of the forest ecosystem. Some are beneficial; quite a few are serious pests of trees. Dalbergia sissoo is defoliated by a caterpillar (Plecoptera reflexa), a leaf miner (Leucoptera splimograpta) and leaf roller (Dichomeris eridantis). The Populus spp. are attacked by a leaf sticher (Gympsonoma haplosarca), a casual defoliator (Ichthyura anastomosis) and stem-borers (Apriona cinerea, Melanophila picta, Aeolesthes sarta, Aegiria spp. and Cossus spp.).

Tonica niviferana, a Bombax cieba shoot borer, Ascotis imparata, a Melia azaderach defoliator and Margaronia pyloalis, a defoliator of Morus alba are serious pests of other tree species grown in forest plantations.

Cultural, biological and chemical control measures for many insect pests have been developed by the Pakistan Forest Institute for the protection of forests.

Diseases

Trees are susceptible to diseases throughout their life. Young trees are attacked by leaf diseases. Mature and overmature trees are also subject to cankers, decays and other maladies caused by fungi, bacteria, mistletoes and viruses.

Leaf-spot diseases attack a number of trees, including conifer and broad-leaved species. They are particularly serious on the latter when the plants are in the nursery stage. Cercospora spp. are commonly associated with leaf spot diseases on Eucalyptus spp., Morus alba and Melia azedarach. Two rust diseases, Ravenelia acacia-arabicae and Melampsora epitea have been reported on Acacia nilotica seedlings in Sindh and on Salix spp. respectively. Ganoderma lucidum, a destructive facultative root-parasite of Dalbergia sissoo, is a threat to irrigated plantations in the plains.

Fomes pini, the incitant of red-ring-rot is one of the most important diseases of conifers. It is particularly serious on Pinus wallichiana, causing 15 to 20% loss in terms of volume of wood. Lopping and logging injuries provide infection points for the pathogen.

Leafy mistletoes and dwarf mistletoes are semi-parasites on a number of conifer and broad-leaved species. Two destructive dwarf mistletoes, Arceuthobium oxycedri and Arceuthobium minutissimum have recently been reported to cause considerable damage in terms of reduced vigour and growth rate of the effected trees of Juniperus excelsa in Balochistan and Pinus wallichiana respectively. Viscum album, a leafy mistletoe has also been found on Juglans regia, growing in the valleys of Swat and Dir.

Wild Animals

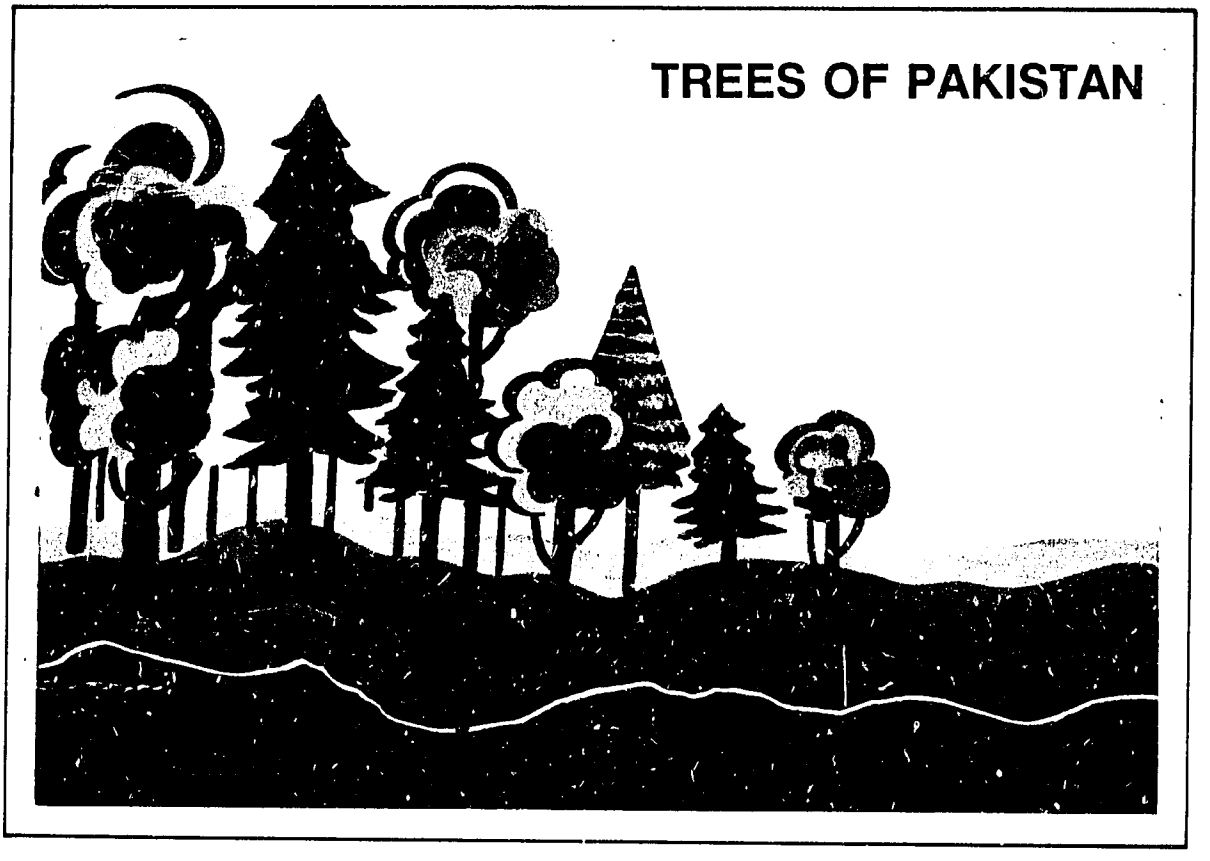
Porcupines do considerable damage by girdling trees. Wild boars are in abundance in the irrigated plantations and do a lot of damage by uprooting young forest crops. Monkeys damage young plantations in the hill forests and rabbits damage young seedlings.

Fires

Accidental fires are usually rare, but fires deliberately caused by local people are frequently encountered in coniferous sub-tropical pine forests. These fires are very destructive to young regeneration.

Climatic Causes

Frost, occurring with varying intensities, adversely affects frost-tender species like Acacia nilotica and Bombax Cieba. Drought is common over extensive forest areas, especially in the plains and scrub forests, damaging the young seedlings. Snow, wind and erosion are also a cause of considerable damage to trees.


TREES OF PAKISTAN

Abies pindrow Royle
(Pinaceae)

COMMON NAMES: Partal, Paludar, Silver Fir.

DESCRIPTION: A large, evergreen, tree 45 to 60 m tall with a diameter of 1.8 to 2.4 m. The crown extends to the ground with the branches drooping, forming a conical crown. The leaves are needles 2 to 4 cm long. The needles are arranged in two rows.

It is monoecious. The male flowers or cones are in clusters on the lower sides of the last years shoots.The female flowers are in ones or twos, erect along the tops of the branches. They bloom between April and May. The fruit is the female cone, 10 to 16 cm long and 5 to 6 cm in diameter. When the cone mature it breaks apart allowing the winged seed to be distributed by the wind. The seed is 1 to 1.2 cm long with a thin, papery wing that is 2 to 2.4 cm long.

DISTRIBUTION: The tree is native to the Himalayas of the subcontinent including Pakistan, Afghanistan and India. In Pakistan it is found at high elevation in Azad Kashmir, Murree Hills, Hazara, Swat, Dir and Chitral.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is a tolerant tree that will grow fairly well in shade. It grows on a variety of deep, rich soils, formed from various parent materials. It grows on steep, cool, northern exposures. It avoids poor soils, especially if they are poorly drained. It is adapted to a precipitation zone of 1100 to 2500 mm/yr. It prefers a humid cold temperate climate with a temperature range of -10 to 30°C, within an elevation range of 2000 to 3000m. It is susceptible to a number of wood rotting fungi.

REPRODUCTION: It is reproduced from seed. There are 6000 to 7000 seeds/kg. Seed in air tight containers, cold stored will remain viable for 2 to 3 years.

PRODUCTIVITY: It grows slow. MAI of 4 to 6 m^3/ha/yr has been recorded.

MANAGEMENT IMPLICATIONS: The tree is a valuable member of the coniferous forest that grows on steep sites. It is difficult to regenerate and logging probably should be restricted until regeneration methods have been perfected.

WOOD PROPERTIES:

GRAIN: Straight, even.

COLOR: Wood is white, turning to light brown with age.

DENSITY: Specific gravity of 0.48 with a calorific value of 4500 kcal/kg.

STRENGTH: Light, soft.

USES: Construction, fuel, fodder (winter), watershed protection, packing cases, and plywood.

Acacia albida Del.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Sufed Kikar, Sudani Kikar.

DESCRIPTION: A small to large, deciduous tree, 6 to 30 m in height with a spreading crown. The leaves are compound. The bark is rough, greenish gray to dark brown.

The flowers are in bunches 3.5 to 14 cm long. Flowering occurs between February and April. The pods are 6 to 25 cm long and 2 to 5 cm wide. The pods mature between March and May.

DISTRIBUTION: The tree is native to tropical and subtropical Africa. In Pakistan it is planted along the Kurram Garhi Canal and in botanical and research gardens.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is an intolerant, drought hardy tree that is very adaptable and will grow on a variety of coarse textured soils that are well drained. It requires precipitation of 250 to 400 mm; it will grow in zones of less rainfall along river banks or where there is a shallow water table. It will grow in arid subtropical to tropical areas up to 2400 m. It has a temperature range of -5 to 45°C, which indicates some frost hardiness. At present no disease or insects problems have been identified.

REPRODUCTION: It is easily reproduced from seed or by vegetative means. Seed stores for at least 12 months treated with insecticides and sealed in air tight drums.

PRODUCTIVITY: It has a fairly rapid growth rate, but does not take the form of a tree for several years. A MAI of 2 to 3 m^3/ha/yr has been recorded.

MANAGEMENT IMPLICATIONS: This is a very useful tree in arid areas of Pakistan. Ideally suited for planting along river banks and canals. In Africa, it is reported to shed its leaves in the wet seasons and provide fodder during the dry period. This characteristic, along with its ability to fix nitrogen makes it a good farm forestry tree.

WOOD PROPERTIES:

GRAIN: Smooth.

COLOR: Whitish gray.

DENSITY: Wood is soft, with a specific gravity of 0.59 and a calorific value of 4910 kcal/kg.

STRENGTH: Wood is light and not very strong.

USES: Fodder, fuel, and timber (construction, boat building).

Acacia aneura F. V. Muell.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Australian Kikar

DESCRIPTION: A slow growing shrub to small tree, 4 to 5 m tall. Diameters to 20 cm are average. Leaves are phyllodes 3 to 7.5cm long by 2.5 to 7.5 mm wide.

The flowers are in bunches 1.5 to 2 cm long, appearing in June. The small pods are 2 to 3.5 cm long and 7 to 15 mm wide. The pods mature between July and August.

DISTRIBUTION: This tree is native to the dry interior regions of Australia. In Pakistan it is planted in gardens and has been used in arid zone afforestation trials.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought hardy tree that grows on a variety of soils including heavy clay that are well drained. It requires precipitation of 250 to 750 mm. It will grow in arid to semi-arid regions within a temperature range of -5 to 40°C, which indicates some frost hardiness. At present no disease or insects problems have been identified.

REPRODUCTION: It is easily reproduced from seed. Seed stores for at least 12 months when treated with insecticides and sealed in air tight drums.

PRODUCTIVITY: It is slow growing, but has been reported to have a MAI of 2 to 3 m^3/ha/yr.

MANAGEMENT IMPLICATIONS: This could be a very useful tree in arid and semi-arid areas of Pakistan. It produces fodder and fixes nitrogen; consequently it potentially is a good farm forestry tree.

WOOD PROPERTIES:

GRAIN: Not available.

COLOR: Dark brown contrasting with golden yellow.

DENSITY: Wood is heavy.

STRENGTH: Wood is hard and durable.

USES: Fodder, fuel, apiculture, spears, clubs, and boomerangs.

Acacia catechu (Linn. F.) Willd.
(Leguminosae, sub family Mimosoldeae)

COMMON NAMES: Khair, Katha, Cutch Tree.

DESCRIPTION: A medium sized, deciduous tree, 9 to 15 m tall. Diameters of 29 to 31 cm have been reported. The bole and branches are armed with thorns. Leaves are compound 7 to 17 cm long. The bark is dark grayish brown, peeling in narrow strips.

The flowers are in bunches 7 to 17 cm long. The yellow Flowers occur between May and August. The small pods are 5 to 9 cm long. The pods mature between December and January.

DISTRIBUTION: The tree is native to the Subcontinent in the western regions of the Himalayas. Specifically it is found in Malakand, Hazara and Rawalpindi Districts. It is also planted in the Punjab and Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought hardy tree which grows best on rocky, stony, gravelly, sandy alluvium, loamy, clayey, well drained soils. It will grow on acid soils (pH 5.9) and can grow on wet or swampy sites. It requires precipitation of 500 to 2700 mm/yr and grows up to 1200 m of elevation. It will grow in a sub humid cool to subtropical climate within a temperature range of -5 to 40°C, which indicates some frost hardiness. Young plants can be damaged by frost. At present no disease or insects have been identified.

REPRODUCTION: It is easily reproduced both from seed and by vegetative means. Seed can be stored for at least 12 months when treated with insecticides and sealed in air tight drums.

PRODUCTIVITY: It is relatively slow growing, but has been reported to have an MAI of 4 to 7 m^3/ha/yr. In India trees of 21.6 m in height and 31.2 cm diameter have been produced at 70 years.

MANAGEMENT IMPLICATIONS: This is a valuable commercial tree because of the wood extract, much of which is smuggled into Pakistan from India. Large areas of Pakistan could be reforested with this tree as it would provide employment opportunities in the timber and extraction industry. It produces fodder and fixes nitrogen; consequently it potentially is a good farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight grain with a medium texture.

COLOR: Sapwood is creamy white to reddish. Heartwood is dull pink to reddish brown.

DENSITY: The wood has a specific gravity of 1.0 and a calorific value 5200 kcal/kg for dry wood.

STRENGTH: Wood is heavy, hard and very strong. It is also resilient.

USES: Fodder, fuel, agricultural implements, tool handles, wheel hubs and spokes, tannin, medicinal extracts, and timber.

Acacia cyclops A. Cunn. EX G. Don.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Rooikrans

DESCRIPTION: A small, dense, evergreen, bushy shrub or small multi-stemmed tree, 3 to 8 m tall. Leaves are phyllodes. The phyllodes grow in downward vertical position. The foliage is light green, smooth and shiny when young.

The flowers are yellow growing in showy heads, and appear between April and May. The pods are small and mature between June and August.

DISTRIBUTION: The tree is native to southwest Australia. It can be successfully planted in sand dunes and coastal areas of Pakistan. It is growing well in Peshawar.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought hardy tree which grows best on soils from calcareous and quartzitic parent materials. It is adapted to coarse sandy soils and will even grow on sand dune crests. It will tolerate salt spray, saline sites and high winds. It requires precipitation of 200 to 800 mm/yr. It prefers a semi-arid, warm mediterranean climate, within a temperature range of 5 to 30°C. It exhibits some frost hardiness. At present no disease or insects problems have been identified.

REPRODUCTION: It is easily reproduced from seed. Pre-treating the seed with abrasion, acid soak or a hot water soak will increase germination. Seed is stored for long periods in the soil surface. Birds will also spread this aggressive tree.

PRODUCTIVITY: It is relatively slow growing, but will yields 12 kg dry biomass from a tree with a basal diameter of 10 cm. It should reach harvestable size between 7 to 10 years on protected sites. Under harsh conditions along the coast this tree will take the form of a hedge.

MANAGEMENT IMPLICATIONS: This is a very aggressive tree and once established in an area it is difficult to remove. It grows well in a salty environment and has been successfully used to stabilize sand dunes.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Grayish white.

DENSITY: Heavy.

STRENGTH: Wood is heavy, hard and very strong.

USES: Fodder (goats), fuel, ornamental, and apiculture.

Acacia farnesiana (L.) Willd.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Gu-Kikar, Vilayati Kikar.

DESCRIPTION: An evergreen, thorny shrub or small tree, 3 to 5 m tall. Leaves are compound 1.2 to 5.5 cm long.

The flowers are yellow growing in showy heads. The fragrant flowers mature between November and March depending on geographic location. The pods are small, 4 to 7 cm, and mature between April and August.

DISTRIBUTION: This tree is native to tropical America. It has been successfully planted and is adapted to many areas of Pakistan up to an elevation limit of 1200 m.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows best on a variety of loose sandy soils. Prefers well drained sites along water courses. It will tolerate saline, alkali sites. It grows in precipitation of 250 to 1200 mm/yr. It prefers a semi-arid, sub-humid climate within a temperature range of -5 to 35°C. It exhibits some frost hardiness. At present no disease or insects problems have been identified.

REPRODUCTION: It is easily reproduced from seed. It will seed naturally on sites where it is adapted.

PRODUCTIVITY: It is relatively slow growing, but will yield 1 to 3 m^3/ha/yr.

MANAGEMENT IMPLICATIONS: This nitrogen fixing tree is adapted to a variety of arid sites including saline, sodic soils. It is an aggressive tree because it can tolerate some shade. It should have potential as a farm forestry tree particularity in areas where salinity and/or sodicity is a problem.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Sapwood is white, heartwood is red.

DENSITY: Quite dense.

STRENGTH: Wood is heavy, hard and very strong.

USES: Fodder (goats), fuel, perfume, nitrogen fixing, hedge, windbreak, and lac production.

Acacia modesta (Linn.) Wall.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Phulai, Palosa.

DESCRIPTION: A deciduous, thorny moderate-size tree, 3 to 9 m tall. Diameters up to 2 m have been recorded. Leaves are compound, 1.2 to 5 cm long. The bark is rough with irregular cracks.

The flowers are pale white to pale yellow, fragrant growing in bunches and appear between March and May depending on geographic location. The pods are small, 5 to 7.5 cm long, and mature between May and November.

DISTRIBUTION: This tree is native to Pakistan, Afghanistan, and India. In Pakistan it is found below 1200 m in the foothill ranges of the Himalayas, Salt Range, Sulaiman Hills, Balochistan and Kirthar Range. It is also found in the plains close to these mountains.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant, drought resistant tree that grows on a variety of soils, including dry shallow soils. It grows in precipitation range of 250 to 1300 mm/yr. It prefers a semi-arid, sub-humid climate within a temperature range of -5 to 40°C. It exhibits some frost hardiness. At present no disease or insects problems have been identified.

REPRODUCTION: It is easily reproduced from seed and by vegetative means. Seed remains viable for 1 year.

PRODUCTIVITY: It is relatively slow growing, but will yield 4 to 6 m^3/ha/yr in 50 years. Average height and diameter for 50 year old trees is 6 m and 23 cm respectively.

MANAGEMENT IMPLICATIONS: This valuable tree is adapted to a variety of arid sites. It is aggressive because it can tolerate some shade. It is important in the Barani region and has great potential for reforestation projects. Young plants need protection from grazing. It has great potential as a farm forestry tree and can be easily managed with a coppice system.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Sapwood is white, heartwood is dark brown with black streaks.

DENSITY: Specific gravity of 0.96 and a calorific value of 5500 kcal/kg.

STRENGTH: Wood is durable, heavy, hard and very strong.

USES: Fodder, fuel, agricultural implements, hedge, apiculture, and gum.

Acacia nilotica (Linn.) Delile
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Kikar, Babul.

DESCRIPTION: An evergreen, thorny, moderate-size tree, 20 m tall. Diameters up to 1 m have been recorded. Leaves are compound, 2.5 to 7.5 cm long. The crown form varies from conical to spreading.

The flowers are fragrant, yellow to bright yellow growing in bunches and mature year around depending on sub-species and geographic location. The pods are variable 4 to 22 cm long, and also mature year around depending on sub-species and geographic location.

DISTRIBUTION: This tree is native to Pakistan and is found in the Sindh, Punjab, Balochistan and NWFP. It is wild as well as extensively cultivated throughout the world, usually below 600 m in elevation.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought resistant tree that grows on a variety of sites. It will tolerate saline, sodic sites if adequate soil moisture is available. It requires precipitation of 125 to 1300 mm/yr. It prefers a semi-arid, sub-tropical/tropical climate within a temperature range of 1 to 45°C. It exhibits distinct differences between sub-species as to frost hardiness and drought resistance. At present there are minor problems with seed insects.

REPRODUCTION: It is easily reproduced from seed. Pre-treatment of seed with boiling water increases germination. Keeping in cowdung for a week also helps.

PRODUCTIVITY: It is relatively fast growing, and will yield 4 to 15 m^3/ha/yr in 20 years. Average height and diameter for 20 year old trees is 10 m and 15.7 cm respectively.

MANAGEMENT IMPLICATIONS: This valuable tree is adapted to a variety of arid sites. It is aggressive and is easily established. It is important in the central and southern regions of Pakistan and its wood is valued for fuel and charcoal. Young trees need protection from grazing. It has great potential as a farm forestry tree. It is useful for controlling erosion in gullied areas and also can be grown on saline, sodic sites for soil reclamation and biomass production.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Sapwood is white, heartwood is pinkish white turning to reddish brown.

DENSITY: Specific gravity of 0.75 and a calorific value of 4900 kcal/kg.

STRENGTH: Wood is durable, heavy, hard and very strong.

USES: Fodder, fuel and charcoal, agricultural implements, pit props, apiculture, gum, lac production, tannin, fencing, land stabilization, nitrogen fixing, and medicinal (bark for diarrhoea and dysentery).

Acacia saligna (Labill.) H. Wendl.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Sunehri Har, Golden Wreath Wattle.

DESCRIPTION: An evergreen, dense, bushy shrub usually 2 to 5 m tall which may grow as a tree to heights of 8 m with a diameter up to 30 cm. Leaves are phyllodes 6 to 12 cm long.

The flowers are yellow growing in head like bunches appearing between March and April. The pods are 11 to 14 cm long, and mature during May and June.

DISTRIBUTION: This tree is native to Western Australia and has been planted extensively throughout Africa, Central and South America, and the Sub-continent. In Pakistan it has been planted on the plains of Sindh and Punjab. It has also been planted in the hills of NWFP up to 900 m.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant, drought resistant tree that grows on a variety of sites. It will tolerate saline, sodic sites and tolerate salt spray. It requires precipitation of 250 to 1000 mm/yr. It has no specific disease or insect problems.

REPRODUCTION: It is easily reproduced both from seed and by vegetative means. Seed will remain viable for several years if cold stored in sealed containers. Pre-treatment of seed with boiling water, breaking the seed coat, soaking in sulfuric acid, or exposing the seed to dry heat will increase germination.

PRODUCTIVITY: It is relatively fast growing, and will yield 1 to 10 m^3/ha/yr at 10 years of age depending on the site.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of arid sites and soils. It is aggressive and is easily established. It coppices readily and under certain conditions it can become a serious problem since it is difficult to eradicate. Young plants need protection from grazing. It has potential as a farm forestry tree. It is useful for controlling erosion and stabilizing sand dunes, and is adaptable on saline, sodic sites.

WOOD PROPERTIES:

GRAIN: Not available.

COLOR: Light.

DENSITY: The wood is sappy and light.

STRENGTH: Not available.

USES: Fodder, fuel, gum, and land stabilization.

Acacia senegal (L.) Willd.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Khumbat, Gum Arabic.

DESCRIPTION: Commonly a small, thorny deciduous shrub, that will take tree form with a height up to 8 m. The thorns typically occur in threes, with the central ones curved. The leaves are compound 2 to 5 cm long. The bark is smooth, pale greenish gray, and peels off in flakes.

The flowers are fragrant, white to pale yellow growing in bunches and occur between August and December depending on geographic location. The pods are 5 to 7 cm long, and mature between January and March.

DISTRIBUTION: This tree is native to Pakistan and is found in lower Sindh and Balochistan. It has been planted extensively throughout Africa, Central and South America, the Subcontinent, and other parts of the world.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought resistant tree that grows on a variety of very harsh sites, usually below 1700 m in elevation. It will not tolerate waterlogging and requires precipitation between 200 to 800 mm/yr. It prefers an arid to semi-arid, hot sub-tropical, maritime climate with a temperature range of -4 to 48°C. It can tolerate periods of drought up to 8 to 10 months. Mature trees are susceptible to termite attack during periods of stress.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. It is best reproduced from seed or planted seedlings. Pre-treatment of seed with an over night soak in water will increase germination.

PRODUCTIVITY: It is relatively slow growing, with a life span of 25 to 30 years. Yields of 1 to 4 m^3/ha/yr at 25 years of age, depending on the site, have been recorded.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of arid sites and soils. It is aggressive and is easily established. It coppices readily and under certain conditions it can become a serious problem because it is difficult to eradicate. In South Africa and Australia it is considered a "noxious weed" and polices have been established to eradicate it and prevent its further introduction. It is a good nitrogen fixer and has potential as an erosion control tree on very harsh sites. With care this could be a useful farm forestry tree. Young trees need protection from grazing.

WOOD PROPERTIES:

GRAIN: Coarse textured.

COLOR: Sapwood yellowish white and heartwood is black.

DENSITY: The wood is heavy with a calorific value of 3200 kcal/kg.

STRENGTH: Very strong.

USES: Fodder, fuel, gum (food, beverages), land stabilization, nitrogen fixing, poles, and agricultural implements.

Acacia seyal Del.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Talh, Shittim.

DESCRIPTION: A shrub or small tree up to 12 m tall. The crown is often flat and sometimes branching near the base. It is a deciduous tree with compound leaves. It has sharp thorns usually in pairs and straight. The bark is rough, cream to greenish yellow, or dark gray, reddish brown, or black. It flakes off exposing a powdery undersurface.

The flowers are yellow, fragrant and appear between March and June. The curved pods are 7 to 22 cm long, and 0.5 to 0.9 cm wide. They mature between September and November.

DISTRIBUTION: This tree is native to Africa. It has been introduced to D.I.Khan and Bund Korai in NWFP. It is also used as a roadside tree planted extensively throughout the hottest areas of Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought resistant tree that grows on a variety of very harsh sites, usually below 2100 m in elevation. Some varieties of this tree tolerate waterlogging and can even stand inundation for part of the year. It requires a precipitation zone of 300 to 800 mm/yr. It prefers an arid to semi-arid, hot, climate with a temperature range of 5 to 45°C. It can tolerate long period of drought, 8 to 10 months. It is relatively free from insect and disease problems; however, felled logs may be severely damaged by wood borers.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. It is best reproduced by seed and planted seedlings. Pre-treatment of seed by nicking the seed coat, by an overnight soak in water, or a soak in sulfuric acid will increase germination.

PRODUCTIVITY: It is relatively slow growing, with a life span of 25 to 30 years. Yields of 3 to 6 m^3/ha/yr, depending on the site, have been recorded.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of arid sites and soils. It is aggressive, is easily established, and can tolerate waterlogging and inundation. It is a good nitrogen fixer and could be used for erosion control on very harsh sites. With care it could be a useful farm forestry tree. It has the added advantage of having some fire resistant characteristics. Young plants need protection from grazing.

WOOD PROPERTIES:

GRAIN: Close and rough.

COLOR: Light cream to dark.

DENSITY: Heavy, dense.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel, gum, land stabilization, nitrogen fixing, poles, and agricultural implements.

Acacia tortilis (Forsk.) Hayne
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Samor, Umbrella Thorn.

DESCRIPTION: A fast growing small tree 4 to 15 m tall. The crown is often flat, and umbrella like supported by several stems. Foliage is feathery-like and the leaves are compound. Leaves are small 1.25 to 3.5 cm. It is easily identified by its two kinds of thorns: the first type is long, straight and white, and the second type is small, brownish and hooked. Deep tap root.

The fragrant flowers are white, and appear singly or in clusters in the spring. The pods are twisted, yellowish brown and mature in early summer.

DISTRIBUTION: This tree is native to Africa. It has been introduced in arid and semi-arid areas of Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, drought resistant tree that grows on a variety of very harsh, lowland sites that have good drainage. It favors alkali soils and will tolerate salinity. It requires a precipitation zone of 100 to 1000 mm/yr. It prefers an arid to semi-arid, hot, climate with a temperature range of 3 to 45°C. It can tolerate periods of drought of 8 to 10 months. It is relatively free from insect and disease problems. However, its seed may be attacked by insects.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. It is best reproduced by seed and planted seedlings. Pre-treatment of seed by nicking the seed coat, by an overnight soak in water, or a soak in sulfuric acid will increase germination.

PRODUCTIVITY: It is relatively fast growing. Yields of 2 to 4 m^3/ha/yr, depending on the site, have been recorded. A 12 year old plantation, in India, produced 54 tons of fuel wood from one ha. Strong coppicer.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of arid sites and soils. It is best suited to well drained, alkali soils. It coppices readily, but can create problems by sending roots into farmers fields. It is an good nitrogen fixer and could be used for erosion control on very harsh sites. With care it could be a useful farm forestry tree. Young plants need protection from grazing and frost.

WOOD PROPERTIES:

GRAIN: Coarse, spiral.

COLOR: Heartwood is red.

DENSITY: Heavy, dense and dry heartwood has a calorific value of 4400 kcal/kg.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel, gum, honey, land stabilization, nitrogen fixing, poles, and agricultural implements.

Acer caesium Wall. Ex Brandis
(Aceraceae)

COMMON NAMES: Trekhan, Maple.

DESCRIPTION: A slow growing, deciduous tree 20 to 24 m tall. The crown is closed and oval shaped and stem diameters of 47 to 95 cm have been reported. Leaves are simple, alternate 3 to 5 lobed, and 8 to 20 cm wide.

The flowers are small, yellowish-green and are arranged in small, dense bunches. It flowers between March and May. The seed are borne in pairs. The seeds are flattened, joined and each seed has a thin papery wing. The seed matures between June and October.

DISTRIBUTION: This tree is native to Pakistan, India and Nepal. In Pakistan it is found in association with conifers at elevations between 2000 to 3500 m. Specific locations are Chitral, Dir, Swat, Hazara, Murree Hills, and Azad Kashmir.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately shade tolerant (at least at an early age) tree that grows on a variety of well drained sites. Since it is quite adaptable, it will grow on fertile soils from clays to sands. It requires a precipitation zone of 750 to 1500 mm/yr. It prefers a humid cool, to cold temperate climate with a temperature range of -20 to 35°C. and an elevation range of 2000 to 3500 m. It is frost hardy. Grazing is not a problem, as cattle seem to avoid this tree. A leaf rust, tar-spot can cause severe premature defoliation.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: Initial growth is slow, but increases with age to approximately 0.2 to 0.5 cm of diameter growth/yr.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of sites and soils. It is a valuable component of the coniferous forest and is being harvested without replacement. It is easily established by planting. Its harvest should be limited and if harvested, it should be replaced with planted seedlings. It has limited potential as a farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight, fine even textured.

COLOR: Sapwood and heartwood are not distinct and are creamy to pinkish white.

DENSITY: Dense, with a specific gravity of 0.63.

STRENGTH: Strong, tough.

USES: Furniture, bobbins, flooring, carving, and ornamental.

Acer oblongum Wall. Ex D.C.
(Aceraceae)

COMMON NAMES: Panhgor, Kirmola.

DESCRIPTION: A slow growing, deciduous tree 12 to 15 m tall. The crown is closed, oval shaped and stem diameters of 40 to 50 cm have been reported. Leaves are simple, alternate, oblong to lance shaped, 5 to 18 cm long and 2 to 8 cm wide. The older leaves may drop as new leaves are formed so the tree may never appear leafless. The bark is gray, smooth with vertical wrinkles, and the trunk often irregularly swollen at the base.

The flowers are small, yellowish-green and are arranged in small, dense bunches. It flowers between February and April. The seed are borne in pairs. The seeds are flattened, joined and each seed has a thin papery wing(double samara). The seed matures between May and November.

DISTRIBUTION: This tree is native to Pakistan, India, Nepal, Bhutan, and South China. In Pakistan it is found in a sub-Himalayan tract, eastward from the Indus river. It is grown as an ornamental in the plains.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately shade tolerant (at least at an early age) tree that grows on a variety of well drained sites. It is quite adaptable on porous soils. It requires a precipitation zone of 750 to 1500 mm/yr. It prefers a humid cool, to sub-tropical monsoon climate with a temperature range of -3.5 to 40°C. and elevation range of 600 to 2000 m. It is frost hardy. It has no significant insect or disease problems.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: Initial growth is slow, but increases with age. Average height growth for 4 years is 2 m and a MAI of 2.25 m^3/ha/yr has been recorded.

MANAGEMENT IMPLICATIONS: This tree is rare or hard to find in Pakistan. Because it can be used as a fodder tree and is good for shade and fuel, it has potential as a farm forestry tree. It is a valuable component of the mixed coniferous forest and is being harvested without replacement. It is easily established by planting. Its harvest should be limited and if harvested, it should be replaced with planted seedlings.

WOOD PROPERTIES:

GRAIN: Straight, slightly interlocking, very fine textured.

COLOR: Sapwood and heartwood are not distinct and are white to grayish brown.

DENSITY: Dense, with a specific gravity of 0.70.

STRENGTH: Weak, not strong.

USES: Fodder, agricultural implements, fuel, and ornamental.

Aegle marmelos Linn.
(Rutaceae)

COMMON NAMES: Bael.

DESCRIPTION: A small or medium sized deciduous tree. Its branches are armed with sharp straight axillary thorns, 2.4 cm long. The aromatic, alternate, compound leaves, are mostly trifoliate; with leaflets lance shaped, 7 to 8 cm long. The two lower leaflets are almost without a petiole while the terminal leaflet has a petiole of 2 cm. The edges of the leaflets have rounded teeth. The bark is gray and rather corky with long vertical scales. The base of the bole may be flute on older trees.

The perfect flowers are greenish white and sweet scented, about 2.4 cm across, in short axillary bunches. Flowering occurs between April and May. The fruit is 5 to 17 cm in diameter, globose, gray or yellowish, with a woody shell. The seeds are embedded in a thick, orange-yellow, sweet pulp. Fruit development requires a year after flowering.

DISTRIBUTION: Native to the sub-Himalayan tract including Burma, central and southern India, Pakistan and Nepal.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is a very intolerant tree that will not grow well in shade. It is cultivated on a large variety of sites, but does best on sandy loam soils. It is adapted to an elevation zone of 0 to 1200 mm with a precipitation range of 600 to 1000 mm/yr. It grows well within a temperature range of 0 to 40°C in a dry, sub-tropical climate.

REPRODUCTION: It is reproduced easily both from seed and by vegetative means. It will coppice.

PRODUCTIVITY: Growth is slow.

MANAGEMENT IMPLICATIONS: An aggressive tree that will grow wild. As it will coppice, it is easily lopped for fodder, and fuel. It is cultivated as a garden tree. It has potential as a farm forestry tree in semi-arid areas.

WOOD PROPERTIES:

GRAIN: Closed grained, aromatic.

COLOR: Yellowish or grayish white.

DENSITY: Hard.

STRENGTH: Strong and tough.

USES: Ornamental, fodder, food, small timbers, and medicinal.

Aesculus indica (Wall. Ex Camb.) Hook. f.
(Hippocastanaceae)

COMMON NAMES: Ban Khor, Horse Chestnut.

DESCRIPTION: A large, deciduous tree, 20 to 30 m tall and with a diameter of 1.2 to 1.3 m. The trunk is short and the crown is broad, spreading and rounded. The leaves are compound, with the leaflets in groups of 5 to 7 at the end of a stalk. The leaflets look like the fingers on a hand. The leaflets are large, 15 to 25 cm long and 5 to 8 cm wide. The leaflet are oblong-shaped, pointed and the edges are sharply toothed. The bark is gray and smooth gradually becoming rougher and darker with age. The older bark will peel off in strips 60 cm long.

The white tinged, yellow flowers are borne in large upright bunches, 15 to 35 cm long, which are quite showy. The flowers occur between April and June. The fruit is a capsule. Each leathery capsule is about 5 cm long and contains one seed. The seed is smooth, shiny and dark brown in color. The fruiting period is May to November.

DISTRIBUTION: This tree is native to India, Pakistan, Nepal and Afghanistan. In Pakistan it is found in the Himalayas mountains. Specifically, it is found in Swat, Hazara, Murree Hills, and Azad Kashmir. It is also planted in gardens and along streets in cities because of its shade and flowers.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that can stand some shade. It grows on deep, rich, moist soils, but prefers moist, shady sites. It requires a precipitation zone of 700 to 1500 mm/yr or more. It prefers a humid, cool, temperate climate with a temperature range of -20 to 35°C, in an elevation range of 1200 to 3300 m. It is easily coppiced and coppice shoot and seedlings are readily browsed. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The fruit is a solitary nut with low viability. Storage is difficult. Seed must be planted as soon as possible after collection.

PRODUCTIVITY: Fast growing with reported MAI's of 0.5 to 2.0 cm in diameter. Height growth of 60 cm in the first year is not uncommon.

MANAGEMENT IMPLICATIONS: This tree is an important component of the coniferous forest. Planting programs may be needed to preserve this tree and insure its position as a member of the coniferous forest.

WOOD PROPERTIES:

GRAIN: Straight to very fine even-textured.

COLOR: Light pinkish, white turning pinkish brown when exposed.

DENSITY: Specific gravity of 0.53.

STRENGTH: Light, soft, resilient.

USES: Fuel, handles, furniture, fodder, buckets and bowls, bobbins, medicinal, and ornamental.

Ailanthus altissima (Mill.) Swingle
(Simarubaceae)

COMMON NAMES: Asmani, Tree of Heaven.

DESCRIPTION: A deciduous tree that sometimes grows with a crooked trunk to a height of 20 m but heights of 6 to 10 m are more common. The crown is usually open. The leaves are pinnately compound, long approximately 30 to 40 cm.

It is dioecious. The flowers are borne in terminal panicles. The fruit is 3.5 to 5 cm in diameter. Flowers occurs in April and June, while fruit matures between May and June.

DISTRIBUTION: The tree is native to China and Japan. It has been successfully cultivated throughout the world. It has become naturalized in Pakistan and can be found almost anywhere you travel from 0 to 1700 m elevation.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that will stand some shade, and is extremely aggressive. It grows well on all kinds of soils including porous, dry, hard, wet, acid alkaline, rocky, swampy and marginal sites in general. It is adapted to a precipitation zone of 350 to 600 mm/yr or more, in a temperature range of -10 to 40°C and is frost hardy. It prefers a semi-arid temperate, sub-tropical, sub-humid, cool, sub-tropical monsoon climate from 0 up to 1700 m elevation. It appears to be disease and insect free with the exception of some tent caterpillar defoliators.

REPRODUCTION: It is reproduced from seed, cuttings and root suckers. Seed is small and can be keeps in cold storage in closed containers for 2 years without loss of viability.

PRODUCTIVITY: A fast growing tree that grows to a height of 3 to 4 m in a period of 5 months. Reports of 25 year old stands with average diameters of 36 cm and height of 13 meters are not uncommon.

MANAGEMENT IMPLICATIONS: A very aggressive tree that will do well on very harsh sites. It has survived air polluted environments and consequently is planted in densely populated urban area and large cities. Ideally suited for shade, shelterbelts and erosion control, especially in areas of high industrial air pollution. Useful farm forestry tree on harsh sites.

WOOD PROPERTIES:

GRAIN: Coarse textured straight grained.

COLOR: White to pale yellow.

DENSITY: Specific gravity of 0.40 and a calorific value of 4885.

STRENGTH: Soft non-durable.

USES: Erosion control, furniture, charcoal, and tannin.

Ailanthus excelsa Roxb.
(Simarubaceae)

COMMON NAMES: Maharukh.

DESCRIPTION: A large, deciduous, fast growing tree. It reaches heights of 18 to 24 m with diameters of 0.9 to 1.37 m. The leaves are compound, and long, approximately 30 to 90 cm. The bark is rough and grayish brown in color.

The white tinged flowers are borne in large panicles. The fruit is a papery, winged samara 3 to 5 cm wide. Each samara containing one or two seeds. Flowers occurs in February and May, while fruit matures between April and June.

DISTRIBUTION: The tree is native to India. In Pakistan it is occasionally planted in Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that will stand some shade. It grows best on well drained soils. It does not do well on heavy soils or water logged sites. It is adapted to a precipitation zone of 400 to 600 mm/yr or more, in a temperature range of 2 to 40°C and is frost hardy. Young seedlings can be damaged by frost. It prefers a semi-arid sub-tropical, to sub-humid, hot tropical climate usually at low elevations. It is moderately disease and insect free, subject to defoliation by caterpillars and attack by white ants (termites). Stem breakage by strong winds is not uncommon.

REPRODUCTION: It is reproduced from seed, cuttings and root suckers. Seed can not be removed from the samara without some damage.

PRODUCTIVITY: A fast growing tree.

MANAGEMENT IMPLICATIONS: Used as an avenue or garden tree in the Sindh. It would have some value as a farm forestry tree since it is ideally suited for shelterbelts.

WOOD PROPERTIES:

GRAIN: Fairly even to coarse textured, straight grained.

COLOR: White to pale yellow.

DENSITY: Specific gravity of 0.43.

STRENGTH: Soft, non-durable.

USES: Fodder and food, packing boxes, shelterbelts, and medicinal (bark as a tonic and febrifuge).

Albizzia lebbek (L.) Benth.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Kala Sirin, Black Siris.

DESCRIPTION: A fast growing deciduous tree 12 to 30 m tall. Diameters to 1 m are not uncommon. The crown is open flat, and umbrella-like. Foliage is feathery-like and the leaves are compound. Leaflets are small 3cm long. The bark is dark gray, rough and irregularly cracked.

The fragrant flowers are yellow or greenish-white, in dense clusters, appearing between April and May. The pods are broad, flat and about 25cm long. They are yellowish brown when ripe. The pods mature between June to September.

DISTRIBUTION: This tree is native to the sub-Himalayan tract. In Pakistan it grows in a narrow belt from Sialkot to Hazara, Bajaur, Buner and Malakand. It has been planted throughout the plains of Sindh & Punjab.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant, tree that grows on a variety of moist sites. It favors well drained loamy soils, but will tolerate saline and sodic conditions (pH 8.7 to 9.4). It requires a summer precipitation zone of 400 to 1000 mm/yr. It prefers a sub-humid, cool, warm, sub-tropical and tropical climate with a temperature range of 4 to 40°C and an elevation range of 0 to 1600 m. Several fungus diseases attack the leaves and pods of this tree. Indarbela quadrinotata, a bark beetle, is a serious threat to plantations and roadside plantings. Grazing can be a problem with this tree. Seedlings are susceptible to frost damage.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. Pre-treatment of seed by an overnight soak in water will increase germiration.

PRODUCTIVITY: Relatively fast growing. Yields of 5 m^3/ha/yr, depending on the site, have been recorded over rotations of 10 to 15 years.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of moist sites and soils. It is best suited to well drained, alkali soils. It coppices readily. It is a good nitrogen fixer and has the potential as a good erosion control tree. With care this would be a useful farm forestry tree. Young plants need protection from grazing and frost. It also has potential as a tree for saline, sodic sites. Heavily lopped for fodder.

WOOD PROPERTIES:

GRAIN: Figured, attractive, interlocked, texture medium to coarse.

COLOR: Sapwood is yellowish-white, heartwood is dark grayish-brown turning to rich dark brown on exposure.

DENSITY: Dense with a specific gravity between 0.55 and 0.64, and a calorific value of 5100 kcal/kg.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel, land stabilization, nitrogen fixing, poles, agricultural implements, shade, and apiculture.

Albizzia procera (Roxb.) Benth.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Sufed Sirin, White Siris.

DESCRIPTION: A fast growing, deciduous tree 12 to 30 m tall. Diameters to 1 m have been recorded. The crown is open, and umbrella-like. Foliage is feathery-like and the leaves are compound. Leaflets are small, 3 cm long. The bark is smooth, light yellowish or greenish gray. It peels in flakes which are red on the undersides.

The fragrant flowers are yellow or greenish-yellow and occur in loose clusters, appearing between June and August. The pods are narrow flat and about 15 cm long. They are dark red brown when ripe. The pods mature in September.

DISTRIBUTION: This tree is native to central and southern India, Bangla Desh and Burma. In Pakistan it has been planted in the Punjab and NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of moist sites. It does well in low lying, moist savannas and tolerates saline and sodic conditions. It requires a summer precipitation zone of 500 to 1000 mm/yr. It prefers a sub-humid, warm, sub-tropical climate with a temperature range of 1 to 45°C and an elevation range of 0 to 1200m. Grazing can be a problem with this tree. Seedlings are susceptible to frost damage. In Pakistan it has no known pests or diseases.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: It is relatively fast growing. Yields of 10 m^3/ha/yr, depending on the site, have been recorded for rotations of 30 years. Growth in irrigated plantations has been excellent.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of moist sites and soils. It is well suited to alkali soils. It coppices readily. It is a good nitrogen fixer. It could be a good tree for irrigated plantations. With care this would be a useful farm forestry tree. Young plants need protection from grazing and frost. It also has potential as a tree for saline, sodic sites.

WOOD PROPERTIES:

GRAIN: Figured, coarse.

COLOR: Sapwood is whitish, heartwood is brown with streaks of darker and lighter color.

DENSITY: Dense, with a specific gravity of 0.69 and a calorific value of 4800 kcal/kg.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel, nitrogen fixing, poles and construction, agricultural implements, shade, furniture, tannin, and apiculture.

Alnus nitida (Spach.) Endl.
(Betulaceae)

COMMON NAMES: Sharol, Alder.

DESCRIPTION: A large, deciduous tree 24 to 30 m tall, with stem diameters of 0.6 to 100 cm. Leaves are simple, 5 to 20 cm long and 2.5 to 12.5 cm wide. The bark is dark brown, rough and with deep furrows.

It is monoecious. The male flowers(cones or catkins) are 12.5 to 25 cm long. The female cones are 5mm long. It flowers in August to October. The fruit is a cone or a nut. At maturity it is between 2.5 and 6 mm in length. The fruit matures between October and December.

DISTRIBUTION: This tree is native to Pakistan and India. In Pakistan it is found in the mountains of Chitral, Dir, Hazara, and Azad Kashmir. It has been planted along roadsides, stream banks and water courses.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that requires full sunlight to develop to a mature tree. It grows well in moist situations on sandy soils. It requires a precipitation zone of 750 to 1250 mm/yr. It prefers a sub-humid, cool, sub-tropical winter/monsoon climate with a temperature range of -20 to 40°C. and an elevation range of 1600 to 2900 m. It is frost hardy and has no known insects or pest problems.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. It is easily coppiced.

PRODUCTIVITY: Fast growing tree that can reach heights of 24 to 30 m and diameters of 50 to 60 cm.

MANAGEMENT IMPLICATIONS: Because of its frost hardiness, fast growth, and nitrogen fixing properties, it is ideally suited to be a farm forestry tree in the high valley and mountains of Pakistan especially close to perennial streams.

WOOD PROPERTIES:

GRAIN: Straight, fine textured, even grained.

COLOR: Pinkish white to reddish white.

DENSITY: Specific gravity of 0.43.

STRENGTH: Soft, light.

USES: Fodder, fuel, light construction, nitrogen fixing, and erosion control.

Alstonia scholaris R. Br.
(Apocynaceae)

COMMON NAMES: Chattian, Dita Bark Tree.

DESCRIPTION: A large evergreen tree. The branches are arranged in whorls along a buttressed trunk. Leaves are simple and arranged in whorls of 4 to 7. Each egg shaped leaf is between 10 to 17 cm long and 4 to 7 cm wide. The leaves are leathery, shiny on top and a dull green underneath. The bark is gray and has vertical lines and is fairly smooth. The bark when wounded exudes a milky fluid.

The flowers are green to white, borne in bunches and are small. It flowers in December to March. The fruit is a long tube usually occurring in pairs. The fruit matures between May and August.

DISTRIBUTION: In Pakistan it is planted extensively in the Punjab as an avenue tree and in gardens. It is common in Lahore and Kharian Cantonment.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that does not do well in shade. It requires a precipitation zone of 600 to 1000 mm/yr. It prefers a semi-arid, hot sub-tropical climate with a temperature range of 4 to 42°C. at elevations below 1000 m. It has no known insects or disease problems.

REPRODUCTION: It is reproduced from seed. Seeds are 6 mm long and have a fringe of hairs at each end.

PRODUCTIVITY: Growth is slow, with an annual diameter growth of 15 cm.

MANAGEMENT IMPLICATIONS: The tree is planted as an ornamental, but the bark is used for medicinal purposes. It is an excellent evergreen shade tree.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Grayish white, creamy.

DENSITY: Heavy.

STRENGTH: Hard, brittle.

USES: Ornamental and medicinal.

Avicennia marina (Forssk.) Vierh.
(Avicenniaceae)

COMMON NAMES: Tivar, Timar.

DESCRIPTION: A small, shrub like, evergreen tree 1 to 3 m tall, with stem diameters of 25 to 30 cm. Leaves are simple, 3 to 8 cm long and 1.5 to 3.5 cm wide. It has pneumatophores (appendages that look like knees supporting the bole).

The flowers are in tightly packed heads, are dungy yellow with an orange throat and are quite fragrant. It flowers in February to June. The fruit is 12 to 18 mm long and 10 to 12 mm wide, usually with only one seed. The fruit matures between May and July.

DISTRIBUTION: A native tree in the tidal swamps and creeks from the Red Sea to the Arabian Sea coast of Pakistan and India. In Pakistan it is found along the coast and tidal creeks from Karachi in the Sindh to Makran coast in Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that requires full sunlight to develop to a mature tree. It grows well on swampy saline, coastal mud flats. It requires a precipitation zone up to 125 mm/yr. It prefers a humid to arid, hot sub-tropical, winter/monsoon to tropical maritime climate with a temperature range of 5 to 40°C. It has no known insects or pest problems.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. Seed has low viability.

PRODUCTIVITY: Growth is slow, it take 5 years to grow 1m in height. It may reach heights of 7 to 8 m and diameters of 30 cm on good sites.

MANAGEMENT IMPLICATIONS: This tree has been over harvested because of its desirable fuel characteristics. It is a valuable member of the coastal forest and should be protected. Artificial regeneration may be needed to preserve the tree in Pakistan.

WOOD PROPERTIES:

GRAIN: Alternate layers of pore bearing tissue and loose large cell tissue without pores.

COLOR: Brown, gray.

DENSITY: Heavy.

STRENGTH: Very brittle.

USES: Fodder, fuel and tannin.

Azadirachta indica (L) A. Juss.
(Meliaceae)

COMMON NAMES: Neem, Margosa Tree.

DESCRIPTION: A medium to large, usually evergreen tree, 12 to 25 m tall with a diameter of 0.57 to 0.86 m. The crown is broad, dense, spreading and rounded. The leaves are compound, with the leaflets 2.5 to 7 cm long, and lance shaped with long points and 4 to 7 pairs of leaflets on each leaf. Edges of the leaflets are toothed. The bark is dark gray, lightly furrowed and broken in irregularly shaped scales.

The flowers are small, white and with the fragrance of honey, occur in dense bunches and appear between March and April. The fruit is a fleshy drupe containing one seed enclosed in a hard shell. Each fleshy drupe is greenish, oblong 1.5 to 2 cm long. The drupe is yellow when fully ripe. The fruiting period is June to August.

DISTRIBUTION: A native tree to India, Pakistan, Nepal, Afghanistan, Burma, China and Sri Lanka. In Pakistan it is found in the Sindh, southern Punjab, and lower Balochistan, has been identified as far west as Sarai Alamgir, but has not been recorded west of the Jhelum river.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately tolerant tree that withstands some shade at an early age. It grows on soils which vary from rich loams to nutrient deficient sites which are not saline or waterlogged and where the water table is above 18 m. It requires a precipitation zone of 300 to 1150 mm/yr and prefers an arid, hot tropical and sub-tropical climate with a temperature range of 1 to 45°C. It is not frost hardy and grass competition will prevent its establishment. It coppices easily and has few insect and disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed has low viability and does not store well. It must be collected when it is mature and planted as soon after collection as possible. The tree has achieved world fame due to its medicinal value and should be propagated on a large scale in Southern Punjab and Sindh.

PRODUCTIVITY: Growth rates are high. On rotations of 8 years yield of 5 to 18 m^3/ha have been recorded. Coppice stands seem to grow faster than seedling stands.

MANAGEMENT IMPLICATIONS: A drought hardy tree that grows fast even on poor sites. It has potential as a farm forestry tree especially in those areas where frost is not a problem.

WOOD PROPERTIES:

GRAIN: Uneven, interlocking, dull to somewhat lustrous.

COLOR: Sapwood is grayish white, heartwood is red fading to reddish brown with age, darkening on exposure.

DENSITY: Specific gravity of 0.68 and a calorific value of 4990 kcal/kg.

STRENGTH: Heavy, hard, resilient.

USES: Furniture, fodder, wood carving, medicinal (leaves as a febrifuge extracts as a cure of typhoid), timber, agriculture implements and tannin. Oil (from the seed) is marketed as a pesticide, vermifuge, and a contraceptive.

Bauhinia purpurea Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Kachnar, Purple Bauhinia.

DESCRIPTION: A small evergreen tree. The leaves are single(not compound). Each leaf is divided into two pointed lobes by a cleft that goes half way down the leaf. The leaves are heart shaped and vary in size from 7 to 15 mm in diameter. The bark is dark gray or brown and the young branches are covered with short, stiff hairs.

The flowers are pink, lilac to purple in color, fragrant and bloom between September and November depending on geographic location. The pods are flat, thick, slightly curved and pointed. They vary in length from 15 to 30 cm. Pods mature between January and March.

DISTRIBUTION: Native to Pakistan, this tree is found in the sub-Himalayan tracts. It has a wide distribution through the hills and plains of the sub-continent.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree of the tropics and sub-tropics within a precipitation range of 1000 to 2160 mm. It grows within a temperature range of -1 to 40°C. It is drought resistant, and will tolerate light frost. It does best on well drained, sandy loam or loamy soils. There are minor problems with defoliating insects.

REPRODUCTION: It can be regenerated by seed or vegetative methods. Seed can be successfully stored for a year if seed is protected from seed borers.

PRODUCTIVITY: Although a small tree it is relatively fast growing.

MANAGEMENT IMPLICATIONS: It has potential as a farm forestry tree. This is especially true in the foothills regions of Pakistan.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Light brown.

DENSITY: The wood is soft and light with a specific gravity of 0.57.

STRENGTH: Moderately strong.

USES: Erosion control, fodder, food (pickle and chutney), tannin, honey, and medicinal (antidote for snake bite).

Bauhinia variegata Linn.

(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Bahari Kachnar, Kaliar.

DESCRIPTION: A small deciduous tree. The leaves are single (not compound). Each leaf is divided into two pointed lobes by a cleft that goes one third of the way down the leaf. The leaves are heart shaped and vary in size from 7 to 15 mm in diameter. The bark is gray with vertical cracks and the young branches are slightly hairy.

The flowers are large, pink to white, fragrant and bloom between March and April. The flowers are formed on the upper leafless branches quite. The pods are flat, thick, curved and pointed. They vary in length from 15 to 30 cm. Pods mature during the rainy season.

DISTRIBUTION: Native to Pakistan this tree is found in the sub-Himalayan tracts. It has a wide distribution through the hills and plains of the sub-continent and is widely planted as an ornamental.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree of the moist sub-tropical temperate regions. It has a precipitation range of 1000 to 2500 mm and a temperature range of -1 to 40°C. It will tolerate light frost. It does best on well drained, sandy loam or loamy soils. There are problems with defoliating insects.

REPRODUCTION: It can be regenerated by seed or by vegetative methods. Seed can be successfully stored for a year if it is protected from seed borers.

PRODUCTIVITY: Although a small tree it is relatively fast growing. Height growth of up to a meter a year and diameters of 15 cm in 8 years have been observed.

MANAGEMENT IMPLICATIONS: It has potential as a farm forestry tree. This is especially true in the foothills regions of Pakistan.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Grayish brown.

DENSITY: The wood is moderately hard.

STRENGTH: Strong and resilient.

USES: Implements, tool handles, fodder, food (pickle and chutney), tannin, honey, medicinal (antidote for snake bite), and ornamental plantings.

Betula utilis D. Don
(Cupuliferae)

COMMON NAMES: Bhoj Patra, Birch

DESCRIPTION: A small deciduous tree or shrub. The leaves are silky, soon becoming glabrous, 5 to 10 cm long, ovate and acute serrate. The bark is conspicuously white, peeling off in large papery layers.

The male flowers are catkins and the female flowers are spikes. It flowers in May. The fruit is a winged nut.

DISTRIBUTION: Native to the Himalayas up to 4000 m above sea level. Usually gregarious. Occasionally a single tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: Grows on high mountain slopes and internal valleys in the Himalayas. Can grow on rocky steeps.

REPRODUCTION: It reproduces by seed and by suckers.

PRODUCTIVITY: Growth is slow.

MANAGEMENT IMPLICATIONS: Exists as individual trees rather than stands so browsing by livestock tends to be a problem. Bark is peeled off and used for writing paper.

WOOD PROPERTIES:

GRAIN: Even grained.

COLOR: Pink on white.

DENSITY: Heavy.

STRENGTH: Strong but low as compared to yellow birch.

USES: Fuel, fodder and furniture.

Bischofia javanica Blume
(Euphorbiacea)

COMMON NAMES: Irum, Bishop Wood.

DESCRIPTION: A large, evergreen or deciduous tree 15 to 17 m tall and with a diameter of 0.6 to 0.8 m. The crown is large, oval and dense. The leaves are compound occurring in threes with the leaflets 7.5 to 5.7 cm long and 3 to 6 cm wide. The bark is thick and dark gray.

It is dioecious. The male flowers are in long bunches and crowded. The female bunches are open. The flowers occur in March. The fruit is a small capsule 5 cm in diameter which contains 3 to 5 seeds. The capsules mature in May.

DISTRIBUTION: This tree is native to India and east to South China. In Pakistan it is planted in the plains and in gardens. Some impressive avenues exist in Islamabad.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is an intolerant tree that does not grow well in shade. It grows on a variety of soils, but prefers deep alluvium. It thrives on very moist sites. It requires a precipitation zone of 700 to 1500 mm/yr or more. It prefers a sub-humid hot tropical monsoon climate with a temperature range of -5 to 40°C at elevations up to of 1200 m. The tree grows in shady ravines, swamps, river banks, and valleys in the hills. It has some frost resistance. There are no known insects or disease problems of significance.

REPRODUCTION: It is reproduced mainly from seed. Hundreds of seedlings can be seen around a tree.

PRODUCTIVITY: A fast growing tree with a diameter growth of 1.3 cm/yr.

MANAGEMENT IMPLICATIONS: This tree is grown along canals and irrigations channels. Good as an avenue tree due to heavy shade.

WOOD PROPERTIES:

GRAIN: Straight, interlocking.

COLOR: Sapwood is light green to reddish brown, heartwood is red to dark reddish brown or chocolate brown.

DENSITY: Specific gravity of 0.74 and a calorific value of 5300 kcal/kg.

STRENGTH: Hard, strong.

USES: Fuel, furniture, sleepers, construction, pilings and ornamental.

Bombax cieba Linn.
(Bombaceae)

COMMON NAMES: Simal, Silk Cotton Tree.

DESCRIPTION: A large deciduous tree, 36 m or more tall, with a diameter of 0.75 to 1.25 m. Leaves are compound with the 5 to 7 leaflets arranged like the fingers of a hand. The leaflets are large, 15 to 20 cm long, leathery, lance shaped and pointed. The compound leaf has a long stalk. The bark is smooth, gray to light brown and thick. Young bark may have very heavy thorns. The older trees develop considerable butt swell.

The red, showy flowers are fleshy and occur March. The fruit or pods are 12 to 17 cm long and contain the seed which is surrounded by a thick mass of silky hairs. The pods mature in April and May.

DISTRIBUTION: The tree is native to Pakistan, India and Nepal. In Pakistan it in the sub-Himalayan tract from Hazara eastward. It is planted on the plains, in gardens and along roadsides.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that does not do well in shade. It grows on a variety of soils and sites; however it grows best on deep alluvial soils that are well drained. It requires a precipitation zone of 750 to 1700 mm/yr or more. It prefers an sub-humid warm sub-tropical to tropical monsoon climate with a temperature range of -5 to 40°C at elevations up to 1000 m. Seedlings are susceptible to frost damage, but are drought hardy. When grown under unhygienic conditions or when water supply is deficient, it is severely attacked by a stem borer lowering the qualityof timber. The thorns of the younger plants protect it from grazing animals. Older trees are somewhat fire resistant, but fire does retard growth.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: A very fast growing tree. Diameter growth of 35 cm/yr is not uncommon.

MANAGEMENT IMPLICATIONS: This very drought resistant tree is in demand as a commercial timber tree. It can be planted on arid and semi-arid sites with irrigation. It is also an attractive ornamental. Farmers like it and in the past have used it extensively. An excellent farm forestry tree. Young trees will coppice.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Whitish.

DENSITY: Very light, with a calorific value of 4900 kcal/kg.

STRENGTH: Weak.

USES: Fuel, ornamental, furniture and carving, canoes, medicinal (bark and roots), cotton from seed for pillows and quilts, match sticks and packing cases.

Broussonetia papyrifera (L) L. Hertit. Ex Vent.
(Moraceae)

COMMON NAMES: Kaghzi Toot, Paper Mulberry.

DESCRIPTION: A medium, deciduous tree, 3 to 12 m tall. The crown is spreading and rounded. The leaves are simple, but varied in shape, 5 to 20 cm long. The bark is light gray with shallow ridges or fissures.

It is dioecious. The reddish yellow male flowers are in small catkins. The reddish to orange red female flowers are in solitary, rounded heads 2 to 3 cm in diameter, and occur between March and August. The fruit is a berry containing 5 to 15 small seeds which ripen between May and September.

DISTRIBUTION: A native tree of Japan, South East Asia and China. In Pakistan it is successfully planted and established in the plains and hills. It has been planted successfully in many other parts of the world. It has become a weed in Islamabad and measures are being taken to eradicate it.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that does very well in shade. It grows on a variety of well drained, rich soils, but will not grow well on poor sites. It requires a precipitation zone of 700 to 2000 mm/yr or more. It prefers a sub-humid warm, sub-tropical monsoon climate with a temperature range of 0 to 40°C on elevations up to 900 m. It coppices easily and aggressively occupies shady sites. It is relatively insect and disease free.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seeds are small. Birds eat the berries and hasten the tree's rapid spread.

PRODUCTIVITY: It grows very fast, 1 m a year in height growth is not uncommon. Diameter of 15 cm has been recorded in a 5 year period.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth and its suitability on dry hillsides. It may have potential as a farm forestry tree. However because of its aggressive nature, care is needed when recommending planting as there is a possibility of it escaping and becoming a weed. It is also being labelled as an allergen causing cold, sneezing and cough.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Sapwood is grayish white, heartwood is light brown.

DENSITY: Calorific value of 5100 kcal/kg.

STRENGTH: Light and brittle.

USES: Fodder, bark (for pulp, tapa cloth), erosion control, furniture, boxes and packing crates, sports equipment, and veneer and plywood.

Butea frondosa Koeing EX Roxb.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Dhak, Flame of the Forest.

DESCRIPTION: A small or medium sized deciduous tree with a crooked trunk and large irregular branches. The leaves are compound with three leaflets. The leaflets are hard, rigid and leathery smooth on top with silky hairs on the underside. The bark is moderately thick, very fibrous and gray to light brown in color.

The flowers occur when the tree is leafless, March to April, and are in hanging bunches that are between 10 to 18 cm long. Each flower is small, 3 to 5 cm long, bright red tinged with orange. The pods mature in May and are long, thin and flat 10 to 20 cm long. Each pod contains only one seed.

DISTRIBUTION: Native to tropical areas of the sub continent. Commonly found in areas below 1200 meters. The tree is not found in arid regions, but is found on the plains and in the foothills of Jhelum valley and Sialkot Districts.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: The tree grows best on black loamy soils, but is well adapted to saline-alkali and waterlogged sites. It is frost hardy and has a temperature range of -4 to 49°C. It prefers moist sites with precipitation greater than 600 mm/yr. It is very intolerant. The wood is susceptible to boring insects.

REPRODUCTION: It will reproduce from seed or by vegetative means. Direct seeding has been reported to be more successful than planting.

PRODUCTIVITY: A moderately fast growing tree. Growth of 5 m in height and 20cm in diameter have been recorded for an 8 year period.

MANAGEMENT IMPLICATIONS: A nitrogen fixing tree that has potential as a plant for saline-sodic, waterlogged sites. Not a preferred fodder tree, but should be considered as a farm forestry tree since the leaves are eaten by buffalo.

WOOD PROPERTIES:

GRAIN: Soft and porous.

COLOR: Dirty white.

DENSITY: Specific gravity of 0.54 with a calorific value of 4900 kcal/kg.

STRENGTH: Soft and not durable.

USES: Erosion control, gum from the bark, fodder, fuel, host for the Lac insect, medicinal (oil from seed as anthelmintic), fiber and an ornamental.

Buxus wallichiana Baill.
(Buxaceae)

COMMON NAMES: Shamshad, Boxwood.

DESCRIPTION: An evergreen shrub or small tree, up to 10 m tall. Leaves are simple, 2 to 5 cm long.

It is monoecious. Flowering shoots are 6 to 8 cm long, appearing between March and May. The fruits are 7 to 10 cm long and mature between June and August.

DISTRIBUTION: The tree is native to Pakistan and India. In Pakistan it in the sub-Himalayan tract from Azad Kashmir westward to Rawalpindi, Islamabad, Murree, Hazara, Chitral, Swat, and the Gadoon area.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that does well in shade. It grows on a variety of soils, but prefers rich sandy loams. It requires a precipitation zone of 600 to 1200 mm/yr or more. It prefers a cool subtropical to a humid-sub-humid monsoon climate with a temperature range of 6 to 15.6°C in an elevation range of 1200 to 2000 m. It is frost hardy. It has no known insect or disease problems of significant importance.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. Natural regeneration occurs in moist, shady microsites. Viable of seed is usually very low.

PRODUCTIVITY: Diameter growth increments of 0.30 over a 70 year period have been recorded.

MANAGEMENT IMPLICATIONS: Because of the demand for packing cases it has been harvested to the point where it could be considered "endangered". Programs to protect and re-establish this tree need to be initiated.

WOOD PROPERTIES:

GRAIN: Smooth, even textured.

COLOR: Light yellow to yellowish-brown.

DENSITY: Heavy.

STRENGTH: Hard, strong, very durable.

USES: Fuel, fine wood articles like combs, carving, and packing cases.

Callistemon viminalis Cheel.
(Myrtaceae)

COMMON NAMES: Botal Bursh, Bottle Brush.

DESCRIPTION: A small evergreen tree, with drooping branches. Leaves, about 7 cm long, are alternate, lanceolate, narrowed at both ends, sharply pointed and gland dotted. The leaves are spirally group toward the ends of the branchlets which hang vertically.

The red flowers are in terminal spikes 7 to 15 cm long. Flowering begins about May and persists for an extended period. The fruit, a small woody capsule, contains many seeds. The capsules open and ripen between July and September. The empty capsules may persist on the ends of branches for a year.

DISTRIBUTION: The tree is native to Australia. It has been successfully planted on avenues and in gardens in Pakistan. A highly prized ornamental as it would grow where others do not.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that will not grow well in shade. It is cultivated on a large variety of sites and can withstand periods of drought. It prefers a semi-humid warm hot, sub-tropical winter/monsoon climate. It can survive some frost but grows best below an elevation of 2200 m.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Its very small, red seeds are numerous.

PRODUCTIVITY: Diameter growth rate is slow, 0.4 cm/yr.

MANAGEMENT IMPLICATIONS: The tree has value as an ornamental. It produces an abundance of pollen and nectar which gives impetus for its use in honey production.

WOOD PROPERTIES:

GRAIN: Spiral, very close grained, pores small, evenly distributed.

COLOR: Gray or red.

DENSITY: Heavy.

STRENGTH: Weak.

USES: Ornamental and honey production.

Cassia fistula Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Amaltas, Indian Laburnum.

DESCRIPTION: A medium sized deciduous to semi-evergreen tree, with an open crown. The tree may never appear to be entirely leafless. At maturity, height of the tree will range from 5 to 9 m and have a diameter of 0.5 to 1.5 m. Leaves are compound and are divided into between 4 and 6 pairs of larger (12 by 6cm.) oval shaped leaflets. The leaflets are leathery, long pointed and stalked. The bark is greenish-gray on young trees, changing to a reddish brown with age. On old trees the bark peels off in hard scales.

The flowers which are bright yellow and appear around April and May. They form in large, hanging, pointed bunches and are arranged along a central axis. The fruit is a long pod (2 to 3 cm in diameter and 30 or more cm long). Usually smooth, hard and dark brown when ripe; they mature between September and February. The pods break open easily to expose the seed.

DISTRIBUTION: The tree is native to Pakistan, commonly found east of the Indus in the plains and continuing north into the Himalayas to a elevation of approximately 1200 meters. It is cultivated throughout the plains region.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately shade tolerant tree that will grow on many soils types including low nutrient and shallow soils. It is found in a sub-humid cool to sub-tropical humid warm tropical climate receiving between 500 to 3000 mm of annual precipitation. Its temperature range is from -5 to 45°C, even though both seedlings and trees are susceptible to some frost damage.

REPRODUCTION: It is easily reproduced from seed and by vegetative means. The seed can be stored for 2 years and retain its viability.

PRODUCTIVITY: Approximate yields of 10 to 12 m^3/ha/yr have been recorded. Average diameter is growth is 0.5 cm/yr.

MANAGEMENT IMPLEMENTATIONS: The tree is not grazed by animals and it has no disease or insect problems of significance. It has potential in areas where watershed protection is needed and grazing has been a problem.

WOOD PROPERTIES:

GRAIN: Straight grain with medium texture.

COLOR: Yellowish red to reddish brown.

DENSITY: 0.8 gm/cm^3 air dry with a calorific value of 5164 kcal/kg.

STRENGTH: Very strong, hard and resilient.

USES: Fuel, ornamental, fine furniture, agricultural implements, tool handles, support posts, cart wheels and axles, tannin, and medicinal (seed pod pulp as a purgative).

Casuarina equisetifolia Linn.
(Casuarinaceae)

COMMON NAMES: Casuarina, Beefwood.

DESCRIPTION: A large, evergreen tree, 15 to 25 m tall with a diameter of up to 1 m. The open, feathery crown is composed of leafless branchlets which act as leaves (look like pine needles). The bark is rough, brown and peels off in long strips.

It is monoecious. The male is a small bunch or group flowers at the end of the branchlets and the female is in roundish bunches of flowers also at the ends of the branchlets appearing in March. The fruit is a brownish woody cone 1.5 to 2 cm long, containing small winged seeds. The cones mature in June and July.

DISTRIBUTION: The tree is native to North and Northeastern Australia. It has been successfully planted in Africa, the Subcontinent, the Pacific region and North America. In Pakistan it has been planted on the plains, in gardens and as a roadside tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that does not do well in shade. It grows on a variety of soils, if they are well drained. It requires a precipitation zone of 700 to 2000 mm/yr or more. It prefers a warm to hot tropical/ sub-tropical to a coastal maritime climate with a temperature range of 5 to 35°C at elevations of up to 1200 m. It is frost hardy and can withstand draught periods of 6 to 8 months. Seedlings are attacked by termites and other insect pests.

REPRODUCTION: It can be reproduced from seed. Seed can be stored at room temperature for 1 to 2 years without loss of viability.

PRODUCTIVITY: A fast growing tree with recorded yields between 6 to 18 m^3/ha/yr on a 30 year rotation.

MANAGEMENT IMPLICATIONS: This is a non-leguminous tree that fixes nitrogen and can grow on waterlogged and saline sites. It can also tolerate salt spray. It is valuable for fuel and other wood products and is also useful for erosion control. An excellent farm forestry tree for areas where there are sodic, saline and waterlogged conditions.

WOOD PROPERTIES:

GRAIN: Straight to somewhat wavy grained.

COLOR: Light to dark reddish brown.

DENSITY: Specific gravity of 0.9 to 1.2 with a calorific value of 4950 kcal/kg.

STRENGTH: Hard, heavy, resilient.

USES: Fuel, mine props, implements, erosion control, windbreaks, and wheels, spokes and axles.

Cedrela serrata Royle.
(Meliaceae)

COMMON NAMES: Dravi, Hill Toon.

DESCRIPTION: A medium sized, deciduous tree, 20 m tall and with a diameter of 0.50 to 0.60 m. The leaves are compound, feathery usually 35 to 80 cm long. The bark is thick and rough.

The flowers are in drooping bunches, up to 0.5 m long. They are pinkish and develop between May and June. The fruit is a capsule 2.5 to 3 cm long. The seed is 1.5 cm long, winged at the upper end, and matures between June and July.

DISTRIBUTION: The tree is native to India, Pakistan, Nepal and Burma. It has been successfully cultivated in the foothill areas of Swat, Murree, Hazara, and Azad Kashmir.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An aggressive pioneer that will quickly occupy exposed land slides, areas among loose boulders and sides of ravines. Prefers moist soils that are well drained. It grows on a variety of soils, as long as the water table is close to the soil surface. It requires a precipitation zone of 500 to 1250 mm/yr or more, within an elevation range of 1000 to 2500 m. It prefers a humid cool temperate to sub-tropical monsoon climate with a temperature range of -10 to 30°C. It is frost hardy and will coppice easily. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means.

PRODUCTIVITY: Growth rates are high. Average diameter growth of 2.5 cm/yr has been recorded.

MANAGEMENT IMPLICATIONS: It has potential as a farm forestry tree especially in foothill areas. It is considered a valuable timber tree.

WOOD PROPERTIES:

GRAIN: Straight, coarse with an uneven texture.

COLOR: Heartwood is red to reddish brown.

DENSITY: Specific gravity of 0.49.

STRENGTH: Heavy, hard, resilient.

USES: Furniture, heavy construction, fodder, and sleepers.

Cedrela toona Roxb. ex Wild.
(Meliaceae)

COMMON NAMES: Tun.

DESCRIPTION: A medium sized, deciduous tree, 18 to 21 m tall and with a diameter of 0.57 to 0.95 m. The crown is broad and rounded. The leaves are compound 30 to 55 cm long.

The flowers are small, white and with the fragrance of honey, and occur in dense, hanging bunches between March and May. The fruit is a capsule 2 cm long. Each seed is winged at the top and bottom. The fruiting period is April to July.

DISTRIBUTION: This tree is native to the lower Himalayas including, Pakistan and Nepal. In Pakistan it is found in the plains east of the Indus River. Has extensively been planted in Islamabad as avenue tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately tolerant tree that can stand some shade at an early age; however it becomes more intolerant to shade with age. It grows on a variety of well drained soils, in valleys and ravines. It requires a precipitation zone of 1125 to 4000 mm/yr or more. It prefers a sub-humid sub-tropical climate with a temperature range of -5 to 40°C. It is not frost hardy as a seedling but older trees are quite frost hardy and it coppices easily. The shoot borer Hypsipyla can be a serious problem.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed has a low percent of viability and does not store well.

PRODUCTIVITY: Growth rates are high. Trees 14 m tall with diameters of 20 cm are grown in 16 years.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth. It is also useful for roadside plantings and as a farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight, somewhat uneven textured.

COLOR: Sapwood is pinkish to grayish white. Heartwood is light red aging to reddish brown.

DENSITY: Specific gravity of 0.57 and a calorific value of 5100 kcal/kg.

STRENGTH: Light, moderately hard, resilient.

USES: Furniture, fodder, ornamental, timber, medicinal (bark for dysentery), shade, and construction.

Cedrus deodara (Roxb. Ex Lamb.) G. Don.
(Pinaceae)

COMMON NAMES: Diar, Deodar, Himalayan Cedar.

DESCRIPTION: A large, evergreen, tree 45 to 60 m tall with a diameter of 0.8 to 1.1 m. The crown extends to the ground with the branches forming a conical shape. The leaves are three, sided needles 2.5 to 4 cm long. The needles occur in groups or dense tufts, sometimes as rosettes. The bark is grayish or reddish-brown forming into irregular shaped scales with age.

It is monoecious. The male flowers or cones are solitary on the ends of branches. The female flowers are erect along the tops of the branches, 10 to 15 cm long, and oval to pyramidal in shape. They are blue-green when young. The cones bloom between June and September. The fruit is the female cone. As the cone ripens it turns a brown color. The seed in the cone takes a full year to mature after pollination and a full 2 years for the reproductive cycle to be completed. There are two winged seed beneath each cone scale. Seed is shed in November.

DISTRIBUTION: This tree is native to the Himalayas of the subcontinent including Pakistan, Afghanistan and India. In Pakistan it is found at high elevations in Azad Kashmir, Murree Hills, Hazara, Swat, Dir, Tirah and Chitral.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that will grow fairly well in shade, requiring full sun light with age. It grows on a variety of deep, rich soils, formed from various parent materials. It will grow on thin rocky poor soils, but growth is stunted. It grows on steep, cool, northern exposures and in valleys. It is adapted to a precipitation zone of 1000 to 2000 mm/yr. It prefers a sub-humid, winter moisture regime, cold temperate climate with a temperature range of -20 to 30°C within an elevation range of 1200 to 3000 m. It is susceptible to a number of wood rotting fungi and insect defoliators.

REPRODUCTION: It is reproduced from seed. Seed viability is low.

PRODUCTIVITY: It grows slow. MAI of 6 to 9 m^3/ha/yr has been recorded.

MANAGEMENT IMPLICATIONS: It is a valuable member of the coniferous forest. The wood is in high demand resulting in overcutting. Harvesting should be curtailed until regeneration methods have been perfected.

WOOD PROPERTIES:

GRAIN: Straight, even, fine textured.

COLOR: Wood is white.

DENSITY: Specific gravity of 0.57 with a calorific value of 5200 kcal/kg.

STRENGTH: Light, soft.

USES: Construction, fuel, railway sleepers, watershed protection, packing cases and medicinal (aromatic wood juice ia a carminative, diuretic).

Celtis eriocarpa Decne.
(Ulmaceae)

COMMON NAMES: Batkhar, Nettle Tree.

DESCRIPTION: A moderately fast growing, medium to large sized, deciduous tree. It reaches heights of 9 to 18 m with diameters of 6 to 9 cm. Mature trees have large crowns and a buttressed base. The leaves are simple and alternate. They are 7 to 12 cm long, are tough, leathery, oval shaped and pointed. The bark is blue-gray smooth, with horizonal ridges and round swellings.

The small, pale yellow or greenish flowers may be perfect (both sexes) or imperfect (one sex) on the same tree. They occur on the new shoots before the new leaves appear. The fleshy fruits are round 1 cm in diameter. The fruit is green turning to yellow then to blue-black when dry. It flowers between February and May and its fruit matures between April and September.

DISTRIBUTION: The tree is native to Pakistan, India and Nepal. In Pakistan it is common on both sides of the Indus. Natural and cultivated stands and individuals are not uncommon throughout central Pakistan. Very common in Islamabad as avenue tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that will stand some shade. It grows on a variety of sites and soils including both dry rocky site to swamps. It is adapted to a precipitation zone of 750 to 1225 mm/yr. It has a temperature range of -20 to 40°C and is frost hardy. It prefers a sub-humid, cool to semi-arid, warm sub-tropical winter/monsoon climate, usually at elevations of 400 to 1800 m. It appears to be disease and insect free.

REPRODUCTION: It is reproduced from cuttings, coppice, and seed. Seeds have high viability.

PRODUCTIVITY: Diameter growth of 0.6 cm/yr has been observed.

MANAGEMENT IMPLICATIONS: This is a very valuable tree for both food and fodder. The fodder is highly palatable and is used for forage in the sub-mountainous regions. The wood has many uses including fuel. It has potential both as a farm forestry tree and as an ornamental.

WOOD PROPERTIES:

GRAIN: Straight and uneven textured.

COLOR: Yellowish white to pale yellow with dark irregular streaks.

DENSITY: Specific gravity of 0.60.

STRENGTH: Hard, strong, and elastic.

USES: Tool handles, agriculture implements, fodder, and food (fruit).

Ceratonia siliqua Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Sada Sabz, Carob Tree.

DESCRIPTION: A small evergreen tree. The leaves are compound with leaflets paired in groups of 3 to 5. The leaflets are arranged opposite each other on the main axis of the leaf. Leaflets are 3 to 5 cm long.

The flowers occur in small bunches 5 to 7 cm long. Each flower is very small and greenish in color, appearing between October and November. The pods are large 7 to 30 cm long and 1 to 2 cm wide. The pods are thick and turgid. Seeds are embedded in the pulp within the pods. Pods mature in December.

DISTRIBUTION: This tree is native to Southern Europe and North Africa. It has been successfully established in the subcontinent. In Pakistan it has been planted in the Punjab and is found as far north as Abbottabad and Peshawar in NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It has a wide range of adaptability and will do well on a variety of soils within a dry, sub-tropical, temperate climate. It is damaged by hard frost so it does best in a temperature range between 0 and 40°C. The tree does not do well where precipitation is below 300 mm. This tree is highly intolerant.

REPRODUCTION: It can be reproduced both from seed or by vegetative means. The seed will remain viable for at least 5 years if stored in cool, dry conditions.

PRODUCTIVITY: A rather slow growing but excellent fodder tree.

MANAGEMENT IMPLICATIONS: Because of its fodder production the tree has potential on poor sites. It must be protected from uncontrolled grazing and can be considered a good farm forestry tree, but its slow growth may restrict expansion in its use.

WOOD PROPERTIES:

GRAIN: Pores are moderately sized in radial patches. Rays are unequal and irregularly distributed.

COLOR: The sapwood is white and the heartwood is red.

DENSITY: Hard, heavy with a calorific value of 4900 kcal/kg.

STRENGTH: Fairly strong.

USES: Fodder (both leaves and pods), fuel, gum, and medicinal.

Ceriops tagal (Perr.) C.B. Rob.
(Rhizophoraceae)

COMMON NAMES: Kirrari, Tagal Mangrove.

DESCRIPTION: A small to medium, evergreen tree 5 to 15 m tall with a diameter of 20 to 40 cm. The crown is spreading and may be brush like. Roots may be stilted with knees 20 to 30 cm high. The leaves are simple, elliptical to rounded 5 to 10 cm long and 2 to 6 cm wide. The leaf tips are slightly rounded and notched, short pointed at the base with wavy (entire) margins. The thick, leathery leaves are shiny green and hairless on the tops and yellowish green underneath. The bark is light to dark gray to reddish brown, smooth or with irregular fissures. The inner bark is orange or reddish.

There are 4 to 5 small flowers to a cluster. They are yellow green with white petals. The flowers bloom between July and September. The fruit is a berry, egg shaped 1.5 to 2.5 cm long and leathery. The seed matures between August and October.

DISTRIBUTION: This tree is distributed throughout a very wide range from East and South Africa through South Asia to the islands of the South Pacific. In Pakistan it is found on mud flats and along salt water creeks at the mouth of the Indus and on the Lasbela coast of Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that will not grow well in shade. It grows on well drained soils and brackish mud flats within reach of an occasional tide. It can do well on fairly saline soils, is adapted to a precipitation zone of 125 to 1700 mm/yr or more, and a temperature range of 1 to 40°C. It prefers a humid to arid, hot sub-tropical to tropical maritime climate for best growth rates. It will coppice. It has no known disease or pest problems of importance.

REPRODUCTION: It is reproduced from seed. In nature the seed germinates on the tree then falls to the ground (viviparous seed).

PRODUCTIVITY: It is slow growing.

MANAGEMENT IMPLICATIONS: This tree can be managed with a coppice system on short rotations. Because of over harvesting it appears to be threatened with extinction and should be protected.

WOOD PROPERTIES:

GRAIN: Very fine, straight.

COLOR: Wood is orange red changing to reddish brown.

DENSITY: Specific gravity of 0.89.

STRENGTH: Hard, heavy, strong.

USES: Fuel (including charcoal), tannin, post and poles, and fodder.

Conocarpus lancifolius Engler
(Combretaceae)

COMMON NAMES: Ghalab, Ethiopian Teak.

DESCRIPTION: An evergreen tree which grows up to 20 m in height and 60 to 250 cm in diameter under favorable climatic conditions. Leaves are dark green, simple lanceolate. Flowers in April. Fruit formation occurs in hot weather.

DISTRIBUTION: Natural stands of this tree occur in Somalia and southwest parts of the Arabian Peninsula. It is cultivated in Dijibouti, Yemen, Sudan and Kenya. It was introduced in Pakistan from Sudan and has been primarily planted in the province of Sindh. More recently it has been introduced in the Punjab.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This tree grows naturally along water courses and can be planted up to 1000 m above sea level. It can survive in precipitation of 50 to 400 mm when growing along seasonal water courses. It can stand droughty conditions and temperatures ranging between 5 and 50°C. It grows well on deep soils and tolerates salinity. Insect and disease problems have not been recorded in Pakistan.

REPRODUCTION: It can be reproduced both from seed or by vegetative means. It seeds profusely.

PRODUCTIVITY: Height growth of 1 m/yr has been recorded in good soils with sustained irrigation. Yields of up to 21 m^3/ha/yr are possible.

MANAGEMENT IMPLICATIONS: This tree is easy to plant, manage and raise in plantations. Because of its fodder, fuel and timber uses it has potential as a farm forestry tree.

WOOD PROPERTIES:

GRAIN: Even.

COLOR: Gray-white.

DENSITY: Medium to heavy with a specific gravity of 0.81.

STRENGTH: Strong.

USES: Fodder, fuel, timber (carpentry, boats), and windbreaks.

Cordia myxa C. B. Clarke
(Boraginaceae)

COMMON NAMES: Lasura, Sebasten Plum.

DESCRIPTION: A medium sized deciduous tree, 5 to 15 m tall. Leaves are simple, variable in shape, with the base rounded or heart shaped. The leaves are 7 to 13 cm long and 6 to 11 cm wide. The bark is brown and has deep fissures with numerous shallow fissures around the stem.

The white yellowish brown flowers hang in bunches. Each flower is between 0.5 to 1 cm across. The fruit, a drupe, is oblong 1 to 3 cm long. The drupe is yellowish brown pink to black when ripe. The drupe is sweet and edible, and matures in July and August.

DISTRIBUTION: This tree is native to Pakistan and India. In Pakistan it in the sub-Himalayan tract from Rawalpindi eastward. It is also found in the Salt Range.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that does not do well in shade. It grows on a variety of soils where moisture is available, in microsites like nullas, gullies, pockets on hills where moisture will accumulate, near waterways, and in depressions. It requires a precipitation zone of 300 to 600 mm/yr or more. It prefers a dry sub-tropical to a dry temperate climate with a temperature range of 2 to 42°C at elevations up to 1500 m. It is frost and drought hardy. It has no known insects or disease problems of significant importance.

REPRODUCTION: It can be reproduced from seed. Seed will remain viable for one year.

PRODUCTIVITY: It is a very fast growing tree.

MANAGEMENT IMPLICATIONS: This frost and drought resistant tree has value as a commercial timber tree. It can be planted on arid and semi-arid degraded sites. Farmers like it because of the fruit. It is an excellent farm forestry tree on harsh, degraded sites.

WOOD PROPERTIES:

GRAIN: Variable, texture is fine to medium.

COLOR: Grayish brown, reddish brown on exposure, lustre variable.

DENSITY: A calorific value of 4900 kcal/kg.

STRENGTH: Hard, moderately strong.

USES: Fuel, fruit, implements, erosion control, and medicinal (fruit for cough, diseases of the chest).

Crataeva religiosa Linn.
(Bixaceae)

COMMON NAMES: Barna, Religious tree.

DESCRIPTION: A medium sized deciduous tree. Leaves may be trifoliate, ovate, obovate or lanceolate. They are acuminate and the base is attenuated to lateral oblique, entire, glabrous, and pale underneath. The bark is gray and nearly smooth.

Flowers are 7 to 10 cm across, white, pale-yellow or reddish-yellow in many flowered, lax corymbs. The 4 petals are long-clawed and ovate, and occur between May and June. The berries are 2.5 to 3 cm in diameter and globose with many seeds embedded in the yellow pulp. The fruits mature between August and September.

DISTRIBUTION: This tree is native to the sub-Himalayan tract from the Ravi River eastward. It appears to be wild on the plains but is probably self-sown from cultivated trees. It is often planted in grave-yards for shade.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows well in arid areas on sandy loam, saline or even calcareous soils. It requires a precipitation zone of 500 to 800 mm/yr. It prefers a semi-arid, hot sub-tropical climate with a temperature range of 5 to 40°C. It has no known insects or disease problems of significant importance.

REPRODUCTION: It can be reproduced from seed or suckers.

PRODUCTIVITY: It is a fast growing tree going upto 30 cm/yr in height.

MANAGEMENT IMPLICATIONS: This tree regenerates profusely from root suckers and is planted for its handsome aromatic flowers.

WOOD PROPERTIES:

GRAIN: Smoothed grained.

COLOR: Yellowish.

DENSITY: Medium.

STRENGTH: Weak.

USES: Afforestation, ornamental, and apiculture.

Cupressus arizonica
(Cupressaceae)

COMMON NAMES: Gulabi Saru, Arizona Cypress.

DESCRIPTION: A 15 to 25 m tall tree, conic in shape. Branches are not compressed. Leaves are acute, blue-gray to grayish-green, about 2 mm long. The margins are finely toothed. The bark is rough reddish brown, graying and not infoliative.

Mature cones are 12 to 25 mm across with 6 to 8 scales. They stay on the tree for many years.

DISTRIBUTION: This tree is native to Arizona and New Mexico in the United States of America and to Mexico. It has been planted in Pakistan as an ornamental around homes and in Balochistan in juniper forests as a replacement species.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tree that is well adapted to semi-arid conditions. In extremely arid regions it needs irrigation for establishment but subsequently survives in precipitation zones of 300 to 350 mm/yr. It can stand frost and snow.

REPRODUCTION: It is reproduced from seed.

PRODUCTIVITY: It is a comparatively fast growing cypress tree. It can grow 1 m/yr in height under favorable conditions.

MANAGEMENT IMPLICATIONS: This tree might be grown in large plantations in arid regions of Pakistan, especially in Balochistan.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Soft, grayish yellow.

DENSITY: Soft.

STRENGTH: Average strength.

USES: Afforestation and ornamental.

Dalbergia sissoo Roxb.
(Leguminosae, sub family Papilionoideae)

COMMON NAMES: Shisham, Tahli, Rose wood.

DESCRIPTION: A medium size to large, deciduous tree, 30 m in height. The branches are spreading and diameters of 3 m have been recorded. The trunk is usually crooked. The leaves are compound with 3 to 5 leaflets on an 8 cm stalk. The leaflets are between 2.5 to 6 cm in diameter, broadly oval, tough and pointed. The bark is gray, and furrowed longitudinally. On older trees the bark may peel off in strips. Young branches may be covered with a gray down.

The flowers occur in groups and are small. The flowers are dull white to yellowish white to pinkish, appearing between March and May. The pods are small, 5 to 8 cm long and papery. The pods ripen from June to February. There are usually 1 to 4 seeds per pod.

DISTRIBUTION: The tree is native to the subcontinent along a sub-Himalayan tract. It is common along rivers banks and streams. It is successfully planted in many areas of Pakistan, India and other parts of the world.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is one of the most important trees in Asia. It occurs in a dry sub-tropical, dry temperate climate and does best on well drained sandy to sandy loam soils but will tolerate saline soils. It has an elevation range of 900 to 1500 m if precipitation is between 300 to 2000 mm. It is frost hardy and has a temperature range of 0 to 50°C. A very intolerant tree, susceptible to root diseases in irrigated plantations and attacks by a number of leaf fungi. Young trees are heavily grazed and browsed.

REPRODUCTION: It can be reproduced both from seed or by vegetative means. It is difficult to separate the seed from the pods. Seed (in broken pods) can be stored for 6 months without loss of viability.

PRODUCTIVITY: In irrigated plantations growth of 11m in height and 20 cm in diameter have been recorded during a 15 year period. MAI of 7.7 m^3/ha/yr is achieved over a 20 year rotation.

MANAGEMENT IMPLICATIONS: Under irrigation it is grown extensively throughout the Punjab, NWFP and parts of Sindh. It grows slower than Eucalyptus and poplar, but is a good farm forestry tree because its a good fodder tree, it fixes nitrogen, and is a good long term investment for farmers. It is also a good shade tree.

WOOD PROPERTIES:

GRAIN: Interlocked grain with a medium to coarse texture.

COLOR: Sapwood white to pale brown. Heartwood is golden brown to dark brown.

DENSITY: Wood is heavy with a specific gravity of 0.85 and a calorific value of 5000 kcal/kg.

STRENGTH: Hard and strong, resilient.

USES: Fodder, furniture, fuel and charcoal, medicinal (roots and bark), railway carriages, sporting goods, farm implements, and shade.

Delonix regia Raf.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAME: Gul Mohar, Gold Mohur.

DESCRIPTION: A small to medium sized tree that attains heights of 12 to 15 m with diameters of 30 to 35 cm. Although it sheds its leaves in winter, or the dry season, it is never totally leafless. The tree has a wide crown of 15 m or more. The grow is erect at first and then turns outward causing an umbrella shaped crown. The alternatively arranged leaves are large, double compound (bipinnate), and long, up to 20 to 60 cm. The bark is gray, smooth, splitting or exfoliating. The bole is short and sometimes buttressed.

Flowers are 10 cm across, bright scarlet in lax terminal and axillary racemes. They are extremely showy. Flowering occurs after the cold season between May and June. The fruit is a large woody pod 50 cm long and 5 cm wide containing flattened beans. Pods and seed are persistent.

DISTRIBUTION: The tree is native to Malagasy and has been planted in much of Asia and Africa. It is a common ornamental in Karachi, Hyderabad and Lahore.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: The tree grows on almost any well drained soil. It is an intolerant, but is sensitive to frost especially when young.

REPRODUCTION: It is reproduced from seed. The seeds are large, yellowish and mottled.

PRODUCTIVITY: This is a fast growing tree.

MANAGEMENT IMPLICATIONS: A fast growing ornamental in areas that are free of hard frosts.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Whitish gray.

DENSITY: Medium.

STRENGTH: Durable.

USES: Ornamental and shade.

Derris indica Bennet.
(Leguminosae, sub family Papilionoideae)

COMMON NAMES: Pongam, Ponga Oil Tree.

DESCRIPTION: A medium size, deciduous tree, 20 to 25 m in height. The branches are spreading and drooping. The leaves are compound with leaflets in groups of 5 to 9. The leaflets are lime green turning dark green with age. The bark is soft, grayish brown.

The flowers occur in hanging bunches and are 1.3 cm long. The flowers are white tinged with violet, appearing between April and May. The pods are small, 3 to 5 cm long and woody. The pods ripen from March to May of the following year. There is usually one seed per pod.

DISTRIBUTION: The tree is native to the subcontinent along tidal rivers banks and tidal forests. It is successfully planted in arid regions of Pakistan and India.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This tolerant tree grows on a variety of sites including saline, sodic and waterlogged soils. It can tolerate salt conditions (pH 9.8) and can grow with its roots in salt water. It is adapted to a sub-humid tropical climate at elevations up to 1200 m in areas that receive between 500 and 2500 mm of precipitation. It is considered drought hardy and has a temperature range of 0 to 50°C. It can stand light frost.

REPRODUCTION: It can be reproduced both from seed or by vegetative means. The seed will remain viable for one year if its carefully stored.

PRODUCTIVITY: This is a fast growing tree that attains its mature height in 4 to 5 years.

MANAGEMENT IMPLICATIONS: Because of its fast growth and ability to grow on saline, and doughty site this tree is valuable for both reclaiming saline problem areas and in controlling erosion. It has been successfully used in dune stabilization. It is an excellent farm forestry tree especially in the Sindh.

WOOD PROPERTIES:

GRAIN: Coarse textured, beautiful, but difficult to work.

COLOR: Yellowish white.

DENSITY: Wood is heavy with a specific gravity of 0.75 and a calorific value of 4600 kcal/kg.

STRENGTH: Hard and strong.

USES: Fodder, wheels and axles, oil (from seeds), furniture, fuel, medicinal (oil used for skin diseases), insect repellant (dried leaves in grain storage sheds) and ornamental.

Ehretia serrata Roxb.
(Boraginaceae)

COMMON NAMES: Puran, Punna.

DESCRIPTION: A medium sized deciduous tree, 10 m to 12 m tall and with a diameter of 0.4 to 0.5 m. Leaves are simple, oblong in shape, and the edges sharply toothed. The leaves are pointed, 8 to 15 cm long and 4 to 7 cm wide. The top of the leaves are shiny. The bark is dark gray and with vertical fissures.

The small, white flowers are fragrant, occur in large cone shaped bunches, and mature between March and May. The fruit, a drupe, is small and rounded, and matures between September and November.

DISTRIBUTION: The tree is native to Pakistan and India. In Pakistan it grows in the sub-Himalayan tract from Azad Kashmir westward to Rawalpindi, Islamabad, Murree, Hazara, Swat. It has been successfully planted in areas around Lahore.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of shallow soils, even on boulder formation. It requires a precipitation zone of 750 to 1250 mm/yr or more. It prefers a cool sub-tropical to a humid sub-humid monsoon climate with a temperature range of -10 to 40°C at elevations up to 1500 m. It coppices well, is frost hardy and has no insect or disease problems of significance.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: A moderately fast growing tree. Diameter growth increments of 0.73 to 0.83 cm/yr have been recorded.

MANAGEMENT IMPLICATIONS: A very frost hardy tree that has limited value for commercial timber. It can be planted on semi-arid, harsh degraded sites. The leaves can be used as fodder. It is an excellent farm forestry tree for erosion control.

WOOD PROPERTIES:

GRAIN: Coarse.

COLOR: Light brown.

DENSITY: Specific gravity of 0.59.

STRENGTH: Hard, strong.

USES: Fuel, fruit, implements, erosion control, furniture, and gun stocks.

Elaeagnus hortensis M. Bieb.
(Elaeagnaceae)

COMMON NAME: Sanjata, Russian olive.

DESCRIPTION: A small deciduous tree. Leaves are elliptic, oblong, greenish on the upper surface, silvery beneath with scattered scales. Flowers are small, scented and dull yellowish-white. Flowers between April and May and are borne in the axils of leaves. Fruit is a drupe with a stony seed 2 cm long red and sweet when ripe.

DISTRIBUTION: Distributed throughout temperate and sub tropical climates. Grows along water courses in the Northern Areas (Gilgit, Skardu, Chitral) and in moist places in Kaghan and Balochistan.

SILVICAL CHARACTERS:

HABITAT AND ECOLOGY: An intolerant tree that grows well in moist places, slopes and valleys and along natural streams. It will grow in almost any soil but thrives in calcareous soils. Rainfall zone is 200 to 500 mm and temperature range of minus zero to 30°C. It has no known insects problems.

REPRODUCTION: It can be reproduced both from seed and by cuttings. Seed is also disseminated by birds.

PRODUCTIVITY: A rather slow growing tree.

MANAGEMENT: This tree is planted for fodder and fruit and is lopped for fuel.

WOOD PROPERTIES:

GRAIN: Porous.

COLOR: Sapwood narrow, heartwood dark brown.

DENSITY: Soft.

STRENGTH: Mild.

USES: Fruit jam and jellies, fodder, fuel, wildlife habitat, windbreaks, and nurse crop for timber trees.

Erythrina suberosa Roxb.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Gul-i-Nishter, Coral Tree.

DESCRIPTION: A medium size tree, 12 to 15 m in height. The leaves are compound with leaflets in threes. The leaflets are 10 to 20 cm long and broad. Leaves may be armed a few scattered prickles. The bark is corky and deeply cracked. The branches and bark are armed with yellowish, white thorns.

The flowers which appear in February are deep red. The pods are large 12 to 16 cm long and mature in June and July.

DISTRIBUTION: The tree is native to the subcontinent. In Pakistan it is distributed in the Punjab west of the Ravi River.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This intolerant tree grows on sandy loams soils in a moist sub-tropical climate where precipitation exceed 800 mm/yr at an elevation up to 800 m. It has a temperature range of 2 to 40°C.

REPRODUCTION: It can be reproduced both from seed or by vegetative means.

PRODUCTIVITY: A fast growing tree that attains diameters of one m in 40 years.

MANAGEMENT IMPLICATIONS: Because of its fast growth and nitrogen fixing properties it would be considered a good farm forestry tree. It is highly regarded as a landscape improvement tree. It has no known insect or disease problems.

WOOD PROPERTIES:

GRAIN: Smooth, straight.

COLOR: Light.

DENSITY: Wood is light and has a calorific value of 4800 kcal/kg.

STRENGTH: Soft and not durable, but fibrous and tough.

USES: Fuel, nitrogen fixing, ornamental and medicinal (bark as a febrifuge).

Eucalyptus camaldulensis Dehn.
(Myrtaceae)

COMMON NAMES: Sufeda, Lachi, Red River Gum.

DESCRIPTION: A large, evergreen tree, up to 40 m tall with a diameter of 1 to 2 m. The crown is spreading and irregular. The leaves are simple, narrow and lance shaped, 6 to 30 cm long and 0.8 to 2 cm wide. The leaves have a unique eucalyptus smell when crushed. The bark is smooth and stem may be crooked. The bark is whitish, pale gray with mottle reddish patches. Pieces of the bark will shed in long strips or irregular flakes.

The flowers, which occur in groups of fives and tens, bloom usually between May and June. The fruit is a capsule containing many small seeds, and is shaped like a half globe 0.7 cm in diameter. The capsules mature between September and October.

DISTRIBUTION: The tree is native to Australia. It is widely planted in arid areas throughout the world. In Pakistan it is successfully planted throughout the plains and in the hills.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of soils. It does well on saline, sodic and waterlogged sites. It is adapted to a precipitation zone of 200 to 1250 mm/yr or more. It prefers a semi-arid, warm hot, sub-tropical winter/monsoon rain climate with a temperature range of -5 to 40°C at elevations up to 1400 m. It coppices well and can be grown in mixed stands. It is frost hardy and can tolerate hot droughty conditions if irrigated or if there is a shallow water table. Young tree may be attack by termites, but with age it is pest free.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed sealed in air tight containers will remain viable for long periods in cold storage.

PRODUCTIVITY: It grows very fast. Height growth rates of 0.3 m/month for young stands have been reported. MAI of 10 to 25 m^3/ha/yr is not uncommon.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth and wood value. Farmers like it because of its fast growth. There is some evidence that this tree may compete with crops for moisture. It is an excellent farm forestry tree ideally suited for planting on saline, sodic and waterlogged farm sites.

WOOD PROPERTIES:

GRAIN: Twisted and interlocked, medium coarse, uneven texture.

COLOR: Sapwood is light gray, heartwood is reddish brown.

DENSITY: Specific gravity of 0.71 and a calorific value of 4900 kcal/kg.

STRENGTH: Hard, elastic and resilient.

USES: Carriages, fuel, charcoal, furniture, oil (leaves), shelterbelt, apiculture, pulp, and fiber board.

Eucalyptus citriodora Hook.
(Myrtaceae)

COMMON NAMES: Sufeda, Lemon Scented Gum.

DESCRIPTION: A large, evergreen tree, up to 40 m tall with diameters of 1 to 2 m. The crown is thin and irregular. The leaves are simple, narrow and lance shaped, 10 to 20 cm long and 1 to 2.5 cm wide. The leaves have a unique lemon smell when crushed. The bark is smooth and the stem is straight. The bark is whitish, to silver gray or bluish with a dimpled appearance.

The flowers, which occur in groups of threes and fives, usually bloom between February and March. The fruit is a capsule containing many small seeds, and is shaped like a half globe. The capsules mature between September and October.

DISTRIBUTION: The tree is native to Australia. It is widely planted in arid areas throughout the world. In Pakistan it is successfully planted throughout the plains and in the hills.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of soils, including poor gravely soils as long as they are well drained. It is adapted to a precipitation zone of 600 to 900 mm/yr or more, but can tolerate a dry season of 5 to 6 months. It prefers a semi-arid, warm hot, sub-tropical winter/monsoon, climate with a temperature range of 5 to 40°C at elevations up to 2000 m. It can withstand a light frost, it coppices easily, and can be grown in mixed stands. Young tree may be attacked by termites, but with age they become pest free.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed sealed in air tight containers will remain viable for several years in cold storage.

PRODUCTIVITY: It grows very fast. Height growth rates of 0.3 m/month for young stands have been reported. MAI of 10 to 15 m^3/ha/yr on an 8 year rotation has also been recorded.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth and wood value. Farmers like it because of its fast growth. This is a excellent farm forestry tree.

WOOD PROPERTIES:

GRAIN: Twisted and interlocked, medium coarse, uneven texture.

COLOR: Sapwood is light gray, heartwood is light brown.

DENSITY: Specific gravity of 0.78 and a calorific value of 4800 kcal/kg.

STRENGTH: Hard, elastic and resilient.

USES: Fuel, charcoal, furniture, perfume (leaves), shelterbelt, apiculture, pulp, fiber board, and tool handles.

Eucalyptus microtheca F. Muell.
(Myrtaceae)

COMMON NAMES: Sufeda, Flooded Box.

DESCRIPTION: A small to medium sized, evergreen tree, 10 to 20 m tall with diameters up to 1 m. The crown is bushy and spreading. The leaves are simple, narrow and lance shaped, 7 to 12 cm long and 1 to 2.5 cm wide.

The flowers, which occur in groups of threes and fives, usually bloom between June and July. The fruit is a capsule containing many small seeds, and is shaped like a half globe. The capsules mature in September.

DISTRIBUTION: The tree is native to Australia. It is widely planted in arid areas throughout the world. In Pakistan it is successfully planted throughout the plains and in the hills.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of soils, including poor gravely soils as long as they are well drained. It can stand inundation at least part of the year and will do well on flood plains and around swamps and lagoons. It is adapted to a precipitation zone of 200 to 1000 mm/yr or more, but can tolerate a dry season of up to 7 months. It prefers a semi-arid, warm hot, sub-tropical winter/monsoon, climate with a temperature range of 0 to 40°C at elevations up to 700 m. It can stand a light frost, it coppices easily, and young tree are less likely to be attack by termites than other Eucalyptus species.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed sealed in air tight containers will remain viable for several years in cold storage.

PRODUCTIVITY: It grows slow. With irrigation height growth can be increased to approximately 3 m/yr. MAI of 5 to 10 m^3/ha/yr on a 8 year rotation under irrigation has been recorded.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its ability to tolerate drought conditions. Farmers like it because of its shelterbelt potential. It is a excellent farm forestry tree.

WOOD PROPERTIES:

GRAIN: Twisted and interlocked, medium coarse, uneven texture.

COLOR: Wood is black to dark brown.

DENSITY: Specific gravity of 0.89.

STRENGTH: Hard, elastic and resilient.

USES: Fuel, charcoal, poles and fence post, shelterbelt, apiculture, shade, and tool handles.

Eucalyptus tereticornis Sm.
(Myrtaceae)

COMMON NAMES: Sufeda, Lachi, Mysore hybrid.

DESCRIPTION: A large, evergreen tree, up to 40 m tall with diameters of 1 to 2 m. It has a straight stem and the crown is spreading and open. The leaves are simple, narrow and lance shaped, 15 to 20 cm long. The leaves have a unique eucalyptus smell when crushed. The bark is smooth, whitish and more or less deciduous.

The small, white flowers, which occur in clusters, usually blooms between January and April. The fruit is a capsule containing many small seeds, and is shaped like a half globe. The capsules mature between August and September.

DISTRIBUTION: The tree is native to Australia. It is widely planted in arid areas throughout the world. In Pakistan it is successfully planted throughout the plains and in the hills.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of soils. It does well on saline, sodic and waterlogged sites. It is adapted to a precipitation zone of 800 to 1500 mm/yr or more. It prefers a semi-humid warm hot, sub-tropical winter/monsoon, climate with a temperature range of 0 to 40°C at elevations up to 1500 m. It coppices easily and can be grown in mixed stands. It is frost hardy and can tolerate hot draughty conditions if irrigated or if there is a shallow water table. Young tree may be attack by termites, but with age become pest free.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed sealed in air tight containers will remain viable for long periods in cold storage.

PRODUCTIVITY: It grows very fast. Height growth rates of 0.3 m/month for young stands have been reported. MAI of 12 to 25 m^3/ha/yr has been reported over a 15 year rotation.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth and wood value. Farmers like it because of its fast growth. This is a excellent farm forestry tree ideally suited for planting on saline, sodic and waterlogged sites. It could be planted on wastelands and for erosion control.

WOOD PROPERTIES:

GRAIN: Twisted and interlocked, medium coarse, uneven texture.

COLOR: Wood is red to reddish brown.

DENSITY: Specific gravity of 0.70 and a calorific value of 4900 kcal/kg.

STRENGTH: Hard, elastic and resilient.

USES: Carriages, fuel, charcoal, furniture, shelterbelt, apiculture, pulp, fiber board, and erosion control.

Ficus religiosa Linn.
(Moraceae)

COMMON NAME: Pipal.

DESCRIPTION: A large deciduous tree that is leafless or nearly so for a short period during hot seasons. The leaves are simple, large 10 to 15 cm by 6 to 12 cm and are broadly ovate, abruptly lanceolate, and shiny on the top side. The bark is gray and smooth with small irregular scales when old.

It flowers in April and May. The fruit (fig) grows in the axil of the lower leaves and are 1.2 cm in diameter. Seeds are very small. Fruit matures from October to November.

DISTRIBUTION: The tree is common in the sub-Himalayas but probably is not native. It is cultivated throughout the plains.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that is cultivated on a large variety of sites, but does best on sandy clay soils. It is adapted to an elevation zone of 0 to 1200 m with a precipitation range of 800 to 1000 mm/yr. It grows well within a temperature range of 0 to 40°C in a semi-arid, warm, sub-tropical climate.

REPRODUCTION: It is reproduced both from seed and by vegetative means. It will coppice. Seeds are very small and are sometimes spread in bird droppings.

PRODUCTIVITY: The growth rate of this tree is fast. Height growth of 1 m/yr has been reported.

MANAGEMENT IMPLICATIONS: The tree has value as an avenue tree and is planted along water courses. It is a good fodder tree. Because of its fodder and fig potential it could have importance as a farm forestry tree.

WOOD PROPERTIES:

GRAIN: Spiral.

COLOR: Whitish gray.

DENSITY: Medium.

STRENGTH: Soft.

USES: Ornamental, fodder, food (figs), small timber, and medicinal.

Fraxinus hookeri Wenzing.
(Oleaceae)

COMMON NAMES: Sum, Ash.

DESCRIPTION: A large, deciduous tree 18 to 30 m tall with diameters of 0.6 to 1.0 m. The crown is oval shaped and dense. The leaves are compound, with the leaflets in threes. Leaves are 3 to 25 cm long. The bark is smooth and stem straight. The bark is light to dark gray. Roughness of the bark increases with age.

The small, white flowers, are arranged in bunches and usually bloom between April and May. The fruit is a winged seed, 3 to 3.5 cm long and 6 to 8 cm wide. The seed matures between May and October.

DISTRIBUTION: The tree is native to the subcontinent including Pakistan. In Pakistan it is found from Swat to Azad Kashmir and Hazara.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on a variety of rich, deep soils. It is adapted to a precipitation zone of 600 to 1200 m/yr. It prefers a humid cool temperate, sub-tropical winter/monsoon, climate with a temperature range of 12 to 35°C at elevations between 1200 and 2700 m. It coppices easily, and is frost and drought sensitive. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seeds are small and winged and under natural conditions can be transported great distances.

PRODUCTIVITY: It grows fast. MAI diameter growth of 0.2 cm/yr has been observed.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its wood value for sporting goods items. This wood has proprieties similar to European ash and should be recommended for planting. This is a excellent farm forestry tree ideally suited for planting on high hilly farm sites.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Wood is whitish.

DENSITY: Specific gravity of 0.79.

STRENGTH: Hard, heavy and resilient.

USES: Construction, fuel, tool handles, oars, and sporting goods.

Fraxinus xanthoxyloides (G. Don) D.C.
(Oleaceae)

COMMON NAMES: Shang, Ziarat Ash.

DESCRIPTION: A shrub or small deciduous tree 3 to 7.5 m tall with diameters of 0.3 to 0.6 m. The leaves are compound, with the leaflets in threes. Leaves are 8 to 12 cm long.

The flowers are arranged in dense bunches. They may be unisexual or bisexual and bloom between March and April. The fruit is a winged seed, that mature between May and August.

DISTRIBUTION: The tree is native to the subcontinent including Pakistan, Afghanistan, and India. In Pakistan it is found in Gilgit agency, Chitral, Dir, Swat, Hazara, Kurram, and Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on a variety of calcareous, loamy, rich, deep soils. It is adapted to a precipitation zone of 250 to 1000 m/yr. It prefers an arid to semi-arid, cool to cold temperate, Mediterranean climate with a temperature range of -20 to 35°C at elevations between 1000 and 2500 m. It coppices easily, and is frost and drought resistant. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seeds are small and winged and under natural conditions can be transported great distances.

PRODUCTIVITY: It grows very slow. MAI of 0.25 cm/yr is common. One year old coppice shoots are 0.25 to 0.9 m tall.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects in denuded watersheds. The wood is of limited value, but can be used for fuel and fodder.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Wood is white.

DENSITY: Specific gravity of 0.72.

STRENGTH: Hard, heavy and resilient.

USES: Construction, fuel, tool handles, fodder, and watershed protection.

Gleditsia triacanthos Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Dozakh, Honey Locust.

DESCRIPTION: A large deciduous tree with a spreading crown. Heights of 25 m are not uncommon; diameter will range from 0.6 to 1 m. Leaves are compound between 12.5 and 17.5 cm long. Twigs and branches are armed with thorns.

The flowers are greenish and occur as hanging bunches with the individual flowers arranged along the central axis. Flowering usually occurs in May and June. The fruit is a large pod, 50 cm in length and 3.7 cm in width. The pod is pulpy and encases the seed. Seed ripens in September and October.

DISTRIBUTION: The tree is native to the United States of America, but has been successfully planted in Africa, Australia, New Zealand, South America, Pakistan and other countries of the world. In Pakistan, it is found as a roadside tree and in gardens, and in the plains of Punjab and NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant, deep rooted tree that is adapted to semi-arid, warm to hot sub-tropical climates that are characterized by winter monsoons. Under cultivation the tree can survive on varied sites including both alkaline and acid soils. It grows best on deep alluvial soils of limestone origin and in precipitation regimes of 500 to 1500 mm/yr. It is frost hardy, and occurs in a temperature range of -2 to 35°C.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Under cold storage seed will remain viable for 2 years. Hot water or acid treatment is need to overcome seed coat dormancy.

PRODUCTIVITY: MAI in the central plains of the United States is recorded as 4.6 m^3/yr over a period of 18 to 35 years. Height growth is approximately 0.5 m/yr.

MANAGEMENT IMPLEMENTATIONS: This tree is drought resistant with no observed disease or insect problems. It is ideally suited for planting on eroded sites if its protected from grazing. Since it is a good fodder tree it could be adapted to farm forestry programs.

WOOD PROPERTIES:

GRAIN: Course.

COLOR: Dark.

DENSITY: Hard, tough, and difficult to work.

STRENGTH: Strong.

USES: Posts and supports, furniture, shade, apiculture, and fodder (pods are 29% sugar).

Gmelina arborea Roxb.
(Verbenaceae)

COMMON NAMES: Gumhar, Yemane.

DESCRIPTION: A medium to large sized, deciduous tree. It reaches heights of 20 to 30 m with average diameters of 60 cm. Large trees may have clear boles of 6 to 9 m. Open grown trees have wide crowns, heavy branches and tapered boles. Its large leaves are simple, alternate, 7 to 15 cm long with long stalks. The leaves are heart shaped (cordate). The bark is corky, smooth, gray to cream colored. On older trees the bark will peel off in large pieces giving the bole a patchy appearance.

The reddish brown or yellow flowers are borne when the trees are leafless. They are tubular in shape, 2.5 cm across and occur in bunches at the ends of the branches. The fruits is a succulent drupe 3 cm long. It flowers in February to April, and its fruit matures between May and June. Each drupe contains a hard stone (seed).

DISTRIBUTION: The tree is native to the moist forests of India, southeast Asia and as far east as southern China. In Pakistan there may be natural stands in Mirpur and Azad Kashmir. It has been successfully cultivated in the plains and in irrigated plantations. It appears to be well established in parts of the Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety on deep, well drained soils, including acid or calcareous loams. Thin soils will retard growth rate, and it will not grow on waterlogged sites. It is adapted to a precipitation zone of 1000 to 2500 mm/yr, although it can stand periods of extended drought. It has a temperature range of 5 to 40°C but is very susceptible to frost damage. It prefers a humid to sub-humid, hot tropical climate, usually at elevations up to 1000 m. It is susceptible to root and stem rots as well as shoot destroying insects.

REPRODUCTION: It can be reproduced both from seed and vegetatively. Seeds lose their viability after a year of storage.

PRODUCTIVITY: A relative fast growing tree with reported volume yields of 25 to 35 m^3/ha/yr on rotations of 5 to 8 years.

MANAGEMENT IMPLICATIONS: A tree potentially used in irrigated plantation in Sindh and Punjab and as an ornamental. With good management its an excellent wood producer. The fruit is edible and the flowers are used by honey bees. A good farm forestry tree in many areas of Pakistan.

WOOD PROPERTIES:

GRAIN: Straight, interlocked, medium coarse textured.

COLOR: Light yellow to brown.

DENSITY: Specific gravity of 0.48 and a calorific value of 4763 Kcal/kg.

STRENGTH: Hard, strong, and elastic.

USES: Construction, particle board, match sticks, pulp, pit props, fodder, furniture, cordage, plywood, apiculture, fruit, and medicinal.

Grevillea robusta A. Cunn.
(Proteaceae)

COMMON NAMES: Reshmi Oak, Silver Oak.

DESCRIPTION: A medium to large, deciduous tree 12 to 20 m tall or more, with diameters of 30 to 90 cm. The crown is conical and long. The fern like, leaves are compound, 15 to 30 cm long, with 11 to 21 pairs of leaflets 4 to 9 cm long. The leaves are green and hairless on the tops with silky, whitish or ash-colored hairs underneath. The bole is straight and the bark is light to dark gray with many deep furrows.

The flowers are in clusters 7 to 18 cm long, very showy yellow to orange in color. The flowers bloom between February and April. The fruit is pod like, boat shaped slightly flattened, 2 cm long, containing 1 to 2 winged seeds. The seed matures April through June.

DISTRIBUTION: The tree is native to Australia and is successfully cultivated in many parts of the world. In Pakistan it has been planted along roads, and in gardens both in the hills and plains.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of sites including acidic soils. It will not do well on wet or waterlogged sites. It is adapted to a precipitation zone of 600 to 1500 mm/yr in a temperature range of -10 to 40°C. It can withstand drought periods of 2 to 6 months and is moderately frost hardy. It prefers a warm temperate to sub-tropical temperate climate within an elevation range of 0 to 2300 m. No disease or pest problems have been observed in Pakistan.

REPRODUCTION: It is reproduced from seed. Seed is viable for a short period, unless the are dried and stored under refrigeration. Under refrigeration seed will last 2 years or more.

PRODUCTIVITY: A fast growing tree attaining heights of 20 m. MAI of 15.5 m^3/ha/yr has been reported in plantations on a 14 year rotation.

MANAGEMENT IMPLICATIONS: This tree has potential in farm forestry programs as well as in irrigated plantations. The wood is valuable and the growth rate is very fast. Caution is warranted as this tree is aggressive and has become a problem in some areas.

WOOD PROPERTIES:

GRAIN: Fine.

COLOR: Sapwood is grayish white and heartwood bright reddish brown.

DENSITY: Specific gravity of 0.57.

STRENGTH: Moderately hard, heavy, strong.

USES: Fuel, various wood products including furniture, apiculture, and ornamental.

Grewia optiva Drum. ex Burret.
(Tiliaceae)

COMMON NAMES: Dhamman, Pharawa.

DESCRIPTION: A moderately fast growing, small to medium sized, deciduous tree. It reaches heights of 10 to 12 m with diameters of 3 to 4 cm. The leaves are simple 3.5 to 10 cm by 2 to 6.5 cm. They are slightly pointed and the edges are toothed. Each leaf has 3 distinct veins. The bark is white-gray and smooth when young becoming furrowed with age.

The flowers which grow out the branches opposite the leaves are fragrant, white, yellow to red in color. The fruit is a lobed drupe, each lobe 4 to 6 mm in diameter. The fruit is dark green turning to black when ripe. Flowers occur from April to September, while fruit matures between July and December.

DISTRIBUTION: The tree is native to Pakistan, India and Nepal. In Pakistan it is common on both sides of the Indus. Natural stands are found in the hills of Balochistan, NWFP, Punjab, and Azad Kashmir. It has also been successfully cultivated in the plains.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A strongly intolerant tree that grows well on well drained sandy to sandy loam soils and can tolerate draughty sites. It is adapted to a precipitation zone of 750 to 1200 mm/yr with prolonged periods of draught. It has a temperature range of -10 to 40°C and is frost hardy. It prefers a sub-humid, cool to semi-arid, warm sub-tropical winter/monsoon climate, usually at elevations from 500 to 2500 m. It appears to be disease and insect free.

REPRODUCTION: It is reproduced from cuttings and root suckers, and rarely from seed. Seeds have a very low viability.

PRODUCTIVITY: Diameter growth of 0.7 cm/yr has been observed.

MANAGEMENT IMPLICATIONS: This is a very valuable tree as it produces both food and fodder and will grow on poor, and draughty sites. It is sometimes considered an "evergreen" because as the old leaves drop new leaves develop. It is a critical source of fodder in the colder periods of the year. The fodder is highly palatable and is used for forage in the sub-mountainous regions. Because of an undesirable odor the wood is not used as fuel. The inner bark is also used to make rope. A good farm forestry tree.

WOOD PROPERTIES:

GRAIN: Spiral.

COLOR: Whitish gray.

DENSITY: Calorific value of 4835 kcal/kg.

STRENGTH: Moderately hard, and strong.

USES: Tool handles, agriculture implements, fodder, food (fruit), and cordage.

Heterophragma adenophyllum Seem.
(Bignoniaceae)

COMMON NAMES: Sanp Phali, Mostan Phul.

DESCRIPTION: A moderate sized deciduous tree. Leaves are compound, large 0.3 to 0.6 m long. Usually there are 5 to 7 leaflets per leaf.

The flowers are large, brownish yellow, 6.35 to 7.62 cm across. It flowers in November. The fruit is a large capsule 0.3 to 0.9 m long cylindrical ribbed, and twisted maturing between January and February.

DISTRIBUTION: The tree is native to the eastern Himalayas through Burma to the northern parts of Malaya. It is planted as an ornamental in Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that requires full sunlight to develop to a mature tree. It grows well in moist situations on deep soils that are well drained. It requires a precipitation zone of at least 800 mm/yr. It prefers a sub-humid, tropical climate with a temperature range of 0 to 40°C. It has no known insect or pest problems.

REPRODUCTION: It can be reproduced from seed. The seed is viable only when fresh.

PRODUCTIVITY: It grows approximately 1m in height every 2 years.

MANAGEMENT IMPLICATIONS: Because of its large flowers it has some value as a landscape ornamental.

WOOD PROPERTIES:

GRAIN: Straight, fine textured, even grained.

COLOR: Sapwood is light yellow and the heartwood is orange yellow with occasional dark streaks.

DENSITY: Calorific value of 4800 kcal/kg.

STRENGTH: Hard,strong resilient.

USES: Furniture, fuel, and ornamental.

Jacaranda ovalifolia D. Don.
(Bignoniaceae)

COMMON NAMES: Jacaranda, Nila Gul Mohar.

DESCRIPTION: A small sized deciduous tree (may appear to be evergreen at lower elevations). Heights of 12 m are not uncommon. Leaves are compound, 25 cm long. Usually there are 15 to 20 paired leaflets per leaf. The bark is creamy brown, furrowed vertically and cracked horizontally into narrow scales.

The bell like flowers are blue violet and have a fragrance of honey. The flowers occur in dense clusters in March, but may flower more than once a year. The fruit is a large capsule, or pod 7.6 to 5 cm long, oval which contains numerous seed. Pods may hang on the tree for 2 years. The fruit may mature twice a year.

DISTRIBUTION: The tree is native to Central and South America and has been cultivated in tropical Africa, Asia and the Mediterranean. It is planted as an ornamental in Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that require full sunlight to develop to a mature tree. It grows well in moist situations on deep soils that are well drained. It requires a precipitation zone of at least 800 mm/yr. It prefers a sub-humid, tropical climate with a temperature range of 5 to 40°C but is frost hardy. It is susceptible to mealy bug infestations.

REPRODUCTION: It can be reproduced from seed. The seed is viable only for one year.

PRODUCTIVITY: It grows approximately 1m in height every year.

MANAGEMENT IMPLICATIONS: Because of its large flowers it has some value as a landscape ornamental.

WOOD PROPERTIES:

GRAIN: Twisted.

COLOR: Creamish.

DENSITY: Calorific value of 4700 kcal/kg.

STRENGTH: Resilient.

USES: Fuel, and ornamental.

Juglans regia Linn.
(Juglandaceae)

COMMON NAMES: Akhrot, Walnut.

DESCRIPTION: A large, deciduous tree, 15 to 30 m tall with diameters of 1 to 1.5 m. The crown is broad, spreading and rounded. The leaves are compound, with leaflets 7 to 20 cm long and 5 to 10 cm wide, oval to oblong, pointed and the edges not usually toothed. The bark is gray becoming darker with age. The younger bark has long vertical striations that deepen with age. Older bark will also be cracked transversely.

It is monoecious. Male flowers are in bunches 5 to 12 cm long growing on last year's shoots. Female flowers occur as singles or in two or threes between February and April. The fruit is a fleshy drupe, greenish yellow spotted, oblong in shape 5 cm long. Inside the drupe is the nut in a hard, wrinkled shell. The fruiting period is June to October.

DISTRIBUTION: The tree is native to India, Pakistan, Nepal, Afghanistan, upper Burma, China and Japan. It is cultivated in many parts of the world because of its nuts. In Pakistan it is found in Northern Areas, Dir, Swat, Hazara, Murree Hills, and Azad Kashmir. It is also planted in gardens and along streets in cities.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately tolerant tree that grows on deep, rich, moist soils, but prefers moist, shady sites. Its precipitation zone is 750 to 1500 mm/yr or more in a humid, cool, temperate climate with a temperature range of -10 to 35°C at elevations between 1000 and 3300 m. It coppices at an early age. The tree is attacked by various fruit and wood borers and is susceptible to leafy mistletoe.

REPRODUCTION: It is generally reproduced from seed, but can also be reproduced by vegetative means. Seed can be successfully cold stored for two years in air tight containers.

PRODUCTIVITY: Diameters of 1 m in 60 years have been recorded.

MANAGEMENT IMPLICATIONS: An important and valuable component of the coniferous forest but planting programs may be needed to preserve it and insure its position as a member of the coniferous forest. Because of its fruit and high value wood it could be part of a farm forestry program. Its slow growth rate precludes rapid acceptance by farmers.

WOOD PROPERTIES:

GRAIN: Straight and very fine even-textured.

COLOR: Sapwood is grayish white, heartwood is grayish brown with darker streaks. Color is quite variable.

DENSITY: Specific gravity of 0.61.

STRENGTH: Heavy, hard, resilient.

USES: Fruit, gun stocks, furniture, fodder, wood carving, burls, and medicinal (bark as an anthelmintic, leaves as an astringent, fruit to cure rheumatism).

Juniperus excelsa M. Bieb.
(Cupressaceae)

COMMON NAMES: Obusht, Himalayan Pencil Cedar.

DESCRIPTION: A medium-sized, evergreen tree, 9 to 15 m tall with diameters of 0.6 to 0.8 m. It has a conical crown. The leaves are scale like. There are two leaf shapes, one sharp and needle like and the other flat and feather like.

It is monoecious. The male flowers or cones are located at the tips of the branches while the female cones are on shorter branchlets. The flowers appear between May and June. The fruit is a woody cone 0.7 cm in diameter. Each cone contains 2 to 5 seeds. The cones mature between September and October.

DISTRIBUTION: The tree is native to the Subcontinent and southeastern Europe. In Pakistan it is found in the dry inner valleys of Balochistan, Kurram, Chitral, Northern Areas, and Kaghan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of fertile to rocky soils. It is found growing in pure groups. It requires a precipitation zone of 200 to 2500 mm/yr or more, with much of the precipitation falling as snow. It prefers an arid cold, temperate climate with a temperature range of -30 to 30°C at elevations from 2000 to 4000 m. It is both drought and frost hardy. It has a very well developed, spreading root system. It is susceptible to bark beetles, especially in a stressed condition and is attacked by dwarf mistletoe, Arceuthobium oxycedri.

REPRODUCTION: It is reproduced mainly from seed. Under natural conditions layering has been reported. Seed viability is approximately 5 percent. It has to be sown immediately after collection to get good germination. In the nursery beds, the seed keeps on germinating for 2 years, the first germination starting within 2 months after sowing. Seedlings are pricked in poly bags when 4-5 months old in the beds. Field planting is successfull when plants are 2 years old in the nursery.

PRODUCTIVITY: A very slow growing tree, it will reach maturity in 240 to 700 years. Attains 2.5 cm diameter and one m height in 50 years.

MANAGEMENT IMPLICATIONS: This is a very important tree for watershed protection throughout most of its range. In many areas it has been harvested for fuel without any thought of regeneration. A major effort is needed to reforest these valuable watershed with this tree and its associates.

WOOD PROPERTIES:

GRAIN: Twisted.

COLOR: Grayish white.

DENSITY: Specific gravity of 0.46.

STRENGTH: Light, soft.

USES: Fuel, pencils, gin (berries), medicinal (oil from fruit is carminative, stimulants, diuretic).

Leucaena leucocephala (Lam.) de Wit.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Subabul, Ipil Ipil.

DESCRIPTION: A fast growing, evergreen shrub or small tree 5 to 20 m tall. Diameters to 20 cm are common, depending on whether tree or shrub like form. Foliage is feathery-like and the leaves are compound. Leaves are 7 to 15 cm long, while the leaflets are small, 3 cm long.

The flowers are small, white, look like "powderpuffs", and occur between June and November. The pods are in bunches, flat and long. They are brown when ripe and mature between September and December.

DISTRIBUTION: The tree is native to Mexico. It has been successfully planted throughout tropical parts of the world. In Pakistan it is cultivated in the plains and foothill areas.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This aggressive, tolerant tree grows on a variety of sites. It is quite adaptable, growing on steep hill sides with shallow soils and marginal mountainous gravelly and sandy soils. It will also grow on saline and acid soils (pH. 6.5 and above). It requires a summer precipitation zone of 500 to 1000 mm/yr. It prefers a moist tropical climate with a temperature range of 2 to 45°C at elevations up to 500 m. Grazing can be a problem. Seedlings tolerant light frost. No known pests or diseases have been reported in Pakistan. However a defoliator, Psylid spp., is creating serious problems with Leucaena in other parts of the world.

REPRODUCTION: It can be reproduced both from seed and by vegetative means. Seed can be stored without special considerations for several years and maintains its viability. Pre-treatment of seed with a water soak will speed up germination.

PRODUCTIVITY: It is fast growing and highly productive. Yields of 30 m^3/ha/yr have been recorded for rotations of 10 years. Growth in irrigated plantations has been excellent.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of sites and soils. Both acid and alkali soils are suitable for this tree. It coppices readily, is an good nitrogen fixer, and is a good tree for irrigated plantations. It is a useful tree in farm forestry programs. Young plants need protection from grazing and frost. Because of its tolerance and seed habit it can quickly become a weed problem.

WOOD PROPERTIES:

GRAIN: Straight grained with medium fine texture.

COLOR: Sapwood is whitish, heartwood is yellow-brown.

DENSITY: Dense with a specific gravity 0.56 and a calorific value of 4600 kcal/kg.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel, nitrogen fixing, poles and construction, agricultural implements, apiculture, furniture, and soil stabilization.

Mangifera indica Linn.
(Anacardiaceae)

COMMON NAMES: Aam, Mango.

DESCRIPTION: A large evergreen tree 12-21 m tall. The crown is broad, closed, oval shaped with stem diameters of 25 to 48 cm. Leaves are simple, alternate, oblong to lance shaped, large 18 cm long and 4 to 8 cm wide. The leaves are dark green, leathery, shiny and tend to cluster at the ends of branches. The bark is thick, rough and dark gray.

The flowers are small, greenish-yellow and are arranged in dense bunches, about 16 cm long, appearing between February and April. The fruit is a fleshy drupe with one seed. The drupes will vary in size from 5 to 12 cm or more in length and mature between May and July.

DISTRIBUTION: The tree is native to Pakistan, India, Nepal, and Bhutan. It is cultivated in many tropical parts of the world. In Pakistan it is found in the river valleys of the Chenab and Ravi near Sialkot and throughout the irrigated portions of the Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately shade tolerant tree that grows on a variety of well drained sites. It is quite adaptable, but does best on deep loamy soils. It requires a precipitation zone of 750 to 1500 mm/yr. It prefers a humid hot, sub-tropical to tropical, monsoon climate with a temperature range of -3.5 to 40°C at elevations up to 600 m. It is frost sensitive when young. Felled logs are susceptible to wood borers.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: Growth is slow. Average height growth for 7 years is 4 m.

MANAGEMENT IMPLICATIONS: It is highly valued for fruit production. The wood is also in demand. It is used in various farm forestry cropping systems as a duel purpose tree.

WOOD PROPERTIES:

GRAIN: Interlocked, sometimes straight. Texture is moderately fine to coarse.

COLOR: Sapwood and heartwood are not distinct, gray to grayish-brown, reddish brown on exposure, lustrous.

DENSITY: Dense, with a specific gravity of 0.55 and a calorific value of 4600 kcal/kg.

STRENGTH: Strong and durable.

USES: Fruit, lumber and construction, chipboard, ornamental, medicinal (ripe fruit is a laxative, seeds are astringent and vermifuge), and food (pickles).

Melia azedarach Linn.
(Meliaceae)

COMMON NAMES: Bakain, Persian Lilac.

DESCRIPTION: A medium to small sized, deciduous tree, 6 to 12 m tall and with diameters of 0.57 to 0.70 m. The crown is spreading and rounded. The leaves are compound up to 60 cm long. The bark is dark gray with longitudinal ridges.

The flowers are small, lilac colored and fragrant. The flowers occur in dense, hanging bunches appearing between March and May. The fruit is a drupe containing 4 to 5 seeds. The fruiting period is June to January.

DISTRIBUTION: The tree is native to the lower Himalayas including, Pakistan and Nepal. In Pakistan it is extensively planted in the plains of the Punjab and NWFP. It has been successfully planted in many other parts of the world.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of well drained soils in valleys and ravines. It requires a precipitation zone of 600 to 1000 mm/yr or more. It prefers a tropical to sub-tropical temperate climate with a temperature range of -5 to 40°C within an elevation range of 900 to 1700 m. It is not frost hardy as a seedling but older trees are drought resistant and frost hardy. It coppices easily and is relatively insect and disease free.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Approximately 70 % of the seed will be viable. The seed can be stored for approximately a year without loss of viability.

PRODUCTIVITY: Growth rates are high. Yields of 17.5 m^3/ha/yr have been recorded.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth. It is also used for roadside plantings and in irrigated plantations. It is a good farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight, uneven textured.

COLOR: Sapwood is yellowish white, heartwood is reddish brown.

DENSITY: Specific gravity of 0.56 and a calorific value of 5100 kcal/kg.

STRENGTH: Light, moderately hard, resilient.

USES: Furniture, fodder, ornamental, timber, construction, agricultural implements, boxes and packing crates, sports equipment, veneer and plywood, and medicinal (flowers and leaves as poultice for headaches, juice of leaves as an anthelmintic and diuretic).

Millingtonia hortensis Linn.
(Bignoniaceae)

COMMON NAMES: Nim Chameli, Indian Cork Tree.

DESCRIPTION: A tall erect evergreen tree attaining a height of 25 to 30 m. Leaves are large, opposite, 2 to 3 pinnate up to 1 m long. Leaflets are 2.5 to 5 cm long and acunate. Bark is patchy and fissured.

Flowers are white, fragrant and appear between February and March in many flowered pannicles.

DISTRIBUTION: The tree is believed to be native to Burma and Malaysia. It is common in gardens and around resthouses in Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It grows on a variety of soils including soils formed of weathered sandstone. In good soil its growth is phenomenal. It has a straight, cylindrical stem.

REPRODUCTION: It is reproduced primarily from root suckers.

PRODUCTIVITY: Growth rates are high. It can grow in height up to 2 m in one season.

MANAGEMENT IMPLICATIONS: In Pakistan this tree has only been cultivated as an ornamental. It has no observed insect or pest problems.

WOOD PROPERTIES:

GRAIN: Even.

COLOR: Light.

DENSITY: Medium.

STRENGTH: Brittle.

USES: Ornamental, fuel.

Moringa pterygosperma Gaertn.de.Fruct
(Moringeceae)

COMMON NAME: Sohanjna, Horseradish Tree.

DESCRIPTION: A large deciduous tree. The tripinnate, compound leaves are large 30 to 70 cm long. Leaflets are opposite. The bark is corky.

The flowers are 2.4 cm across, white, strongly honey scented in large panicles. Flowers develop between February and April. The fruit is a large capsules 25 to 50 cm long. The three angled, winged, seed matures in August and is 2.4 cm long.

DISTRIBUTION: The tree is native to Pakistan in the Sub-Himalayan tract. Cultivated in the plains from Rawalpindi eastward.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that is cultivated on a large variety of sites, but does best on well drained soils. It can withstand periods of drought, grows on eroded sites, and coppices.

REPRODUCTION: It is reproduced both from seed and by vegetative means.

PRODUCTIVITY: The growth rate is moderate.

MANAGEMENT IMPLICATIONS: The tree has value as an avenue tree or planted along water courses. It is a good fodder tree especially for camels.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Light.

DENSITY: Medium.

STRENGTH: Soft, spongy, weak.

USES: Ornamental, fodder, food (leaves, flowers and fruits), seed oil (lubrication and perfume), and gum (bark).

Morus alba Linn.
(Moraceae)

COMMON NAMES: Tut, Mulberry.

DESCRIPTION: A medium sized, deciduous tree, 9 to 15 m tall and diameters of 0.6 to 0.8 m. The crown is spreading and rounded. The leaves are simple, but varied in shape, 5 to 15 cm long and 4 to 12 cm wide. The bark is dark grayish brown with vertical ridges or fissures.

It is monecious. The male flowers are in 1 to 2 cm long catkin like bunches. The female flowers are in solitary, rounded heads 0.5 to 1 cm in diameter. The flowers are greenish appearing between February and April. The fruit is a berry containing 5 to 15 small seeds, 0.7 to 1 cm long. The berries are white to pinkish to purple to red to black. The fruiting period is between March and June.

DISTRIBUTION: The tree is native to Pakistan, China, Central Asia and Afghanistan. It has been planted in many other parts of the world.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows on a variety of well drained, rich soils. It requires a precipitation zone of 750 to 1250 mm/yr or more, and prefers a semi-arid, cool to cold subalpine temperate, sub-tropical winter/monsoon, climate with a temperature range of -10 to 40°C at elevations up to 3300 m. It will coppice easily, can be grown in mixed stands, is frost hardy, and can tolerate hot draughty conditions if irrigated. It has numerous insects and pest enemies including porcupines, defoliators, powdery-mildew, root rots, and die back.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Insecticide treated seed can be stored.

PRODUCTIVITY: It grows very fast and MAI of 5 to 8.5 m^3/ha/yr is not uncommon. Diameters of 60cm are recorded for 15 year old trees.

MANAGEMENT IMPLICATIONS: This is a good tree for reforestation projects because of its fast growth and wood value. Also it is important as silkworm feed. Silkworm growers have a tendency to reduce the quality of the wood, by over lopping the branches and foliage, subsequently reducing tree growth. This is a good farm forestry tree. The sport goods industry's needs for its wood presents an opportunity for farmers to have a direct link with industrial markets.

WOOD PROPERTIES:

GRAIN: Straight, medium coarse uneven texture.

COLOR: Sapwood is yellowish to yellowish white, heartwood is bright yellowish brown changing to dull brown with age.

DENSITY: Specific gravity of 0.69 and a calorific value of 5100 kcal/kg.

STRENGTH: Hard, elastic and resilient.

USES: Silk worm food, fodder, fruit, carriages, sports equipment, veneer and plywood, furniture, medicinal (Bark is a vermifuge and purgative, fruit is a laxative), and shelterbelts.

Olea ferruginea Royle
(Oleaceae)

COMMON NAMES: Kahu, Indian Olive.

DESCRIPTION: A small, evergreen tree 9 to 12 m tall with diameters of 0.3 to 0.6 m. The leaves are simple, 3 to 10 cm long.

The whitish, flowers are arranged in bunches. They bloom between March and September. The fruit is a drupe 8 mm long, that mature between May and December.

DISTRIBUTION: The tree is native to the subcontinent including Pakistan, Afghanistan, and India. In Pakistan it is found on the lower hills of Azad Kashmir, Punjab, NWFP, Balochistan and in the hills on the west side of the Indus in the Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on a variety of calcareous, loamy, to gravel sandy soils. It is adapted to a precipitation zone of 250 to 1000 mm/yr. It prefers an arid to semi-arid, cool-cold temperate, sub-humid semi-arid, cool warm sub-tropical climate with a temperature range of -10 to 40°C at elevations from 500 to 2[illegible]0 m. It coppices easily, and is frost and drought resistant. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seeds should be planted immediately after collection, as stored seed loses its viability rapidly. One year old poly bag plants are suitable for field planting.

PRODUCTIVITY: It grows very slow. MAI of 0.25 cm is common. One year old coppice shoots are 0.25 to 0.90 m tall. Trees with heights of 3.5 m and diameters of 3 cm in a six year period have been reported.

MANAGEMENT IMPLICATIONS: This is a good tree for reforest[illegible]ion projects in arid areas. It also has potential as an oil and fruit tree. Attempts to graft better varieties could increase both oil and fruit production. The wood is of value, and can be used for fuel, while the foliage makes good fodder.

WOOD PROPERTIES:

GRAIN: Close, even.

COLOR: Sapwood is white, heartwood varies from light brown to nearly black.

DENSITY: Specific gravity of 1.125.

STRENGTH: Hard, heavy and resilient.

USES: Construction, fuel, tool handles, fodder, watershed protection, and fruit and oil.

Parkinsonia aculeata Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Parkinsonia, Jerusalem Thorn.

DESCRIPTION: A small evergreen tree or shrub. It is often crooked with a broad crown. At maturity it reaches heights of 5 to 9 m and diameters of approximately 0.3 m. Twigs and branches are armed with thorns. The leaves are compound with the tiny leaflets borne on long flat leaves, 15 to 35 cm long that look like blades of grass. The bark is smooth and has a greenish color.

The yellow flowers occur in May in hanging bunches with the individual flowers arranged along a central axis. The fruit is a pod 7 to 10 cm long, maturing in June and July.

DISTRIBUTION: The tree is native to vast areas of America extending from Texas, New Mexico and Arizona south to Argentina. In Pakistan it is a very common sight on G.T. Road as an avenue plant.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that can adapt to varied soil conditions including salinity. It is successfully planted in areas below 1300m where precipitation is between 200 and 1000 mm/yr. It is drought resistant and can exist in a temperature range between -3 to 36°C. It grows poorly on waterlogged sites.

REPRODUCTION: It is easily reproduced from seed or by vegetative means. The seed can be stored up to a year without loss of viability. Pre-treatment of seed is needed to overcome seed coat dormancy. A water soak for 3 to 4 days is usually adequate.

PRODUCTIVITY: A relatively fast growing tree.

MANAGEMENT IMPLICATIONS: A drought resistant tree that may be damaged by termites. It is ideal for erosion control in arid areas if protected from grazing. It can be used for hedges, windbreaks and ornamentals in farm forestry programs.

WOOD PROPERTIES:

GRAIN: Coarse.

COLOR: Grayish.

DENSITY: Heavy with a specify gravity of 0.6.

STRENGTH: Hard, heavy and very brittle.

USES: Fuel, ornamental, charcoal, fodder, living hedges, wind and shelter breaks, and erosion control.

Peltophorum pterocarpum
(Leguminosae)

COMMON NAME: Zard fawwar, Golden Shower.

DESCRIPTION: A small sized tree, 7 to 10 m high with diameters up to 30 cm. The leaves are compound each with 10 to 20 cm long leaflets forming a dense green crown.

The yellow flowers are borne in long bunches (spikes) at the top of the tree crown. The dense green foliage accents the flower's color. Flowers develop in May through August, while fruit and seed are produced in the autumn.

DISTRIBUTION: The tree is native to the Philippines but has been successfully grown in many parts of the tropics and sub-tropics. In Pakistan it has been planted as an avenue tree in Karachi and Lahore.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: The tree grows on well drained sites in a warm climate. It is sensitive to frost especially when young.

REPRODUCTION: It is reproduced from seed.

PRODUCTIVITY: It is a fast growing tree.

MANAGEMENT IMPLICATIONS: It is a showy flowering and shade tree well suited as a garden or avenue tree. It needs protection from frost during its early years.

WOOD PROPERTIES:

GRAIN: Closed.

COLOR: Gray.

DENSITY: Medium.

STRENGTH: Durable, hard.

USES: Ornamental, and shade.

Phoenix dactylifera Linn.
(Palmae)

COMMON NAME: Khajur, Date Palm.

DESCRIPTION: A tall evergreen tree attaining a height of 30 to 35 m. The stem is covered with the stumps of old leaves from the bottom to the top except for the space occupied by existing whorls of large frond like gray leaves. Leaflets make an acute angle with the rachis and are up to 2.5 m long. Base of stem is surrounded by suckers.

Male flowers are white, in short compact pinnacles 15 to 22 cm long. It flowers between March and April. The fruit is full of nourishment, sweet and tasty, up to 5 cm long.

DISTRIBUTION: The tree has reportedly been introduced to the Subcontinent by muslims from Middle East countries. It has become naturalized in several southern districts of Punjab and NWFP, and in parts of Sindh and Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: The tree grows well in an arid climate in saline soils but requires plenty of moisture. It can withstand temperatures up to 45°C. It has no known insect or fungi problems but the fruit must be covered with nets to save it from birds and squirrels.

REPRODUCTION: It is reproduced from seed or suckers which are plentiful around the base of the main stem.

PRODUCTIVITY: Its growth is slow especially when young. It takes about 10 years to attain a height of 2 m.

MANAGEMENT IMPLICATIONS: The tree grows naturally in its habitat and spreads by suckers and seed distributed by birds. Several edible varieties have been developed which are managed as garden trees or in agroforestry systems.

WOOD PROPERTIES:

GRAIN: Interlocked.

COLOR: Grayish white.

DENSITY: High.

STRENGTH: Hard but non-durable.

USES: Rafters, support posts, and fruit.

Phyllanthus emblica Linn.
(Euphorbiacea)

COMMON NAMES: Amla, Indian Gooseberry.

DESCRIPTION: A medium-sized, deciduous tree, 25 to 33 m tall with diameters of 0.3 to 0.6 m. The crown is large, oval and dense. The leaves are compound, and look like feathers. The leaflets are small, 0.5 to 1.6 cm long and 0.1 to 0.3 cm wide. The bark is smooth, greenish gray and peels off in sheets.

The flowers are small almost inconspicuous, greenish yellow in color, appearing between March and May. The fruit is small, round, fleshy, 2.5 cm in diameter, containing 6 seeds. The fruiting period is June to February.

DISTRIBUTION: The tree is native from the Indus in Pakistan east to South China. In Pakistan it is planted in the plains and in gardens on both sides of the Indus.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils, but prefers deep, moist alluvium. It can successfully be grown on alkaline or poor soils. It requires a precipitation zone of 750 to 1200 mm/yr or more. It prefers a sub-humid cool-warm sub-tropical monsoon climate with a temperature range of -5 to 40°C at elevations up to 1800 m. It is susceptible to both frost and drought conditions, especially when young and will coppice readily. It has no known insect or disease problems of significance.

REPRODUCTION: It is reproduced both from seed and by vegetative means.

PRODUCTIVITY: A moderately fast growing tree. It has been reported that in 5 years, a plantation will have an average diameter of 2.7 cm. At 40 years the same plantations has an average diameter of 20.5 cm.

MANAGEMENT IMPLICATIONS: This tree has potential for use in farm forestry programs, especially in the Bruner, Hazara, Rawalpindi, and Jhelum area. The fruit is valuable.

WOOD PROPERTIES:

GRAIN: Straight, closed grain.

COLOR: Red.

DENSITY: Specific gravity of 0.7 to 0.8 and a calorific value of 5200 kcal/kg.

STRENGTH: Hard, strong, splits on drying, durable under water.

USES: Fuel, furniture, construction, charcoal, fruit (200 kg from a 15 year old tree), medicinal (fruit is a laxative, diuretic, astringent), and pickles.

Picea smithiana (Wall) Boiss
(Pinaceae)

COMMON NAMES: Kachal, Himalayan Spruce.

DESCRIPTION: A large, evergreen, tree 30 to 45 m tall with diameters of 0.8 to 1.1 m. In the open the branches extend to the ground forming a conical crown. In dense stands it self-prunes leaving a clear bole. Branches are whorled with a drooping appearance. The leaves are needle-like 2.5 to 4 cm long, arranged around the branch. The bark is grayish-brown forming into plate like scales with age.

It is monoecious. The male flowers or cones are solitary on the ends of branches. The female flowers are erect at the ends of the branches, pendulous when mature, 10 to 15 cm long and 2.5 to 5 cm wide. The cones bloom between April and May. The fruit is the female cone. As the cone ripens it turns to a brown color. The seed in the cone takes a full year to mature after pollination and a full 2 years for the reproductive cycle to be completed. There are two winged seed beneath each cone scale. Seed is shed in October.

DISTRIBUTION: The tree is native to the Himalayas in Pakistan, India, Afghanistan, and Nepal. It is found at high elevations in Azad Kashmir, Murree Hills, Hazara, Swat, Dir, Kurram Agency and Chitral.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows in some shade. It grows on a variety of soils from sandy loams to loams, which have formed from various parent materials, mica schists, shales, gneiss and limestone on steep, cool, northern exposures and in valleys. It is adapted to a precipitation zone of 1000 to 2500 mm/yr. It prefers a humid semi-arid, cold temperate climate with a temperature range of -20 to 35°C at elevations between 2100 to 3600 m. It is susceptible to a number of wood rotting fungi and needle rust and is sometimes gnawed by squirrels and porcupines.

REPRODUCTION: It is reproduced from seed. Seed viability is variable from 22 to 65 percent. Seed will remain viable for an extended period in cold storage. Good seed years are infrequent.

PRODUCTIVITY: It yields 4 to 6 m^3/ha/yr.

MANAGEMENT IMPLICATIONS: Its a valuable member of the coniferous forest. The wood is in demand resulting in overcutting. Natural regeneration is difficult to obtain and planting is necessary to insure that it remains a member of future forests.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and even textured.

COLOR: Wood is white or light brown.

DENSITY: Specific gravity of 0.46 and a calorific value of 4900 kcal/kg.

STRENGTH: Light, moderately hard.

USES: Construction, fuel, railway sleepers, packing cases, pulp, and mulch.

Pinus brutia Ten.
(Pinaceae)

COMMON NAMES: Cyprus pine.

DESCRIPTION: A medium to large tree 12 to 24 m tall with diameters of 0.4 m. The crown is thin, irregular and spreading. The needle are in twos, 11 to 15 cm long, and 0.5 to 1.5 mm wide. The needles are green with whitish lines. The stem is straight and the bark is brownish-gray and furrowed.

It is monoecious. The male flowers or cones are many, crowded in headlike clusters, elliptical 6 to 7 mm long and reddish yellow in color. The female flowers are erect, 2 to 4 sometimes 6 in rings at the ends of the branches. The cones are very short-stalked to stalkless and up to 10 cm long. The cones bloom between February and March. The fruit is the female cone. As the cone ripens it turns to a shiny reddish-brown color, remaining attached and closed. The seed in the cone takes a full year to mature after pollination or a full 2 years for the reproductive cycle to be completed. There are two winged seed beneath each cone scale. Seed is shed in September.

DISTRIBUTION: The tree is native to the eastern Mediterranean region in Turkey from the Black Sea, south to Lebanon and west to Greece. Found on Cyprus, Crete and in Northern Iraq. In Pakistan it has been successfully planted in Balochistan and NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils from high lime content to acid podzols. It grows best on well drained soils with a precipitation zone of 1000 to 2500 mm/yr. On coastal lowland site it can survive on 250 mm/yr. It prefers a semi-arid, mild temperate climate with a temperature range of 0 to 45°C at elevations up to 2600 m. It is frost and fire resistant. It has no insect or disease problems. It grows well on hot, dry, doughty hill sides. It can stand 5 to 6 month of prolonged drought.

REPRODUCTION: It is reproduced from seed. Seeds are small and can be stored for 1 to 2 years at room temperatures.

PRODUCTIVITY: It yields 2 to 6 m^3/ha/yr. Height growth will average 0.2 to 0.3 m/yr up to 50 years.

MANAGEMENT IMPLICATIONS: This is a valuable tree for reforestation and afforestation of denuded hill sides. It would be ideal for reclaiming denuded areas in Balochistan, Upper Kaghan, Gilgit and Skardu.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and even textured.

COLOR: Wood is light brownish-white with a resinous odor.

DENSITY: Specific gravity of 0.54.

STRENGTH: Moderately hard, heavy.

USES: Construction, fuel, railway sleepers, packing cases, pulp, transmission poles, resin, and windbreak.

Pinus gerardiana Wall. Ex Lamb.
(Pinaceae)

COMMON NAMES: Chalghoza pine.

DESCRIPTION: A medium sized tree 12 to 18 m tall with diameters of 0.4 m. The crown is short and rounded. The branches are flat or curved. The needle are in threes, 3.6 to 12 cm long and are dark green.

It is monoecious. The male flowers or cones are many, crowded in headlike clusters. The female flowers are erect. The cones bloom between June and July. The fruit is the female cone. As it ripens it turns a shiny reddish-brown color, remains attached and closed. The seed in the cone takes a full year to mature after pollination and a full 2 years for the reproductive cycle to be completed. There are two winged seed beneath each cone scale. Seed is shed in September through October.

DISTRIBUTION: The tree is native to the Western Himalayas, the Hindukush mountains of Pakistan and Afghanistan extending south to the Sulaiman range in Balochistan. It is found in the inner dry valleys of Chitral, Kurram, Upper Swat, Astore, Shingar and in the Northern Areas.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils and textures. It prefers well drained soils and will not grow on heavy or wet sites. It is drought hardy and is well adapted to a precipitation zone of 370 to 750 mm/yr. It prefers a semi-arid, cool temperate climate with a temperature range of -20 to 35°C at elevations between 2000 to 3000 m. It is frost hardy and grows in pure stand, in small groups, or as scattered individual trees. The tree is attacked by cone borers and bark beatles. Grazing and collection of the edible seed has limited natural regeneration.

REPRODUCTION: It is reproduced from seed. Seeds are low in viability.

PRODUCTIVITY: It is a slow growing tree that is adapted to harsh sites. A tree 21.3 m tall and 1.45 m in diameter has been recorded.

MANAGEMENT IMPLICATIONS: This is a valuable tree for reforestation and afforestation of denuded hill sides. Because of its ability to grow in semi-arid cold temperate climates this tree would be ideal for reclaiming denuded areas of Balochistan, Upper Kaghan, Gilgit and Skardu in Pakistan. Because of the value of the edible seed, natural regeneration is almost impossible. The future of this valuable tree will depend on the development of protected seed sources.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and un-even textured.

COLOR: Sapwood is white to yellowish white and heartwood is light reddish brown to dark brown, resinous.

DENSITY: Specific gravity of 0.58.

STRENGTH: Moderately hard, heavy.

USES: Construction, fuel, food (pine nuts), and medicinal (pine nuts).

Pinus halepensis Miller
(Pinaceae)

COMMON NAMES: Aleppo pine, Quetta pine.

DESCRIPTION: A medium sized tree 12 to 27 m tall with an average diameter of 0.4 m. The crown is rounded, diffuse with spreading branches. The needle are in twos, 6.25 to 15 cm long.

It is monoecious. The male flowers or cones are many, crowded in headlike clusters. The female flowers are erect and clustered at the ends of branches. The cones bloom between April and June. The fruit is the female cone. As it ripens it turns a shiny reddish-brown color. The seed in the cone takes a full year to mature after pollination or 2 years for the reproductive cycle to be completed. There are two, winged seed beneath each cone scale. Seed is shed September through October.

DISTRIBUTION: The tree is native to the Mediterranean basin. However it is not found in either Libya or Egypt. In Pakistan it has been successfully planted in NWFP and Balochistan, especially in Quetta with handwatering.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils, including shallow, eroded and soils low in nutrients. Although it grows best on well drained soils it will not grow on saline or wet sites. This is one of the few pines that does grow on heavy clay soil. It is drought hardy and is well adapted to a precipitation zone of 250 to 800 mm/yr and can survive 7 to 8 months of drought. It prefers a semi-arid, cool temperate mediterranean climate with a temperature range of -20 to 40°C at elevations up to 2000 m. It can withstand short periods of hard frosts. The tree is free of disease and insect problems.

REPRODUCTION: It is reproduced from seed. Seeds crops are frequent and seed can be stored in sealed containers in a refrigerated environment for a number of years.

PRODUCTIVITY: This is considered a fast growing tree. Yields of 3 to 12 m^3/ha/yr have been recorded on different quality sites. Height growth of 0.3 to 0.5 m/yr has been recorded over a fifty year period.

MANAGEMENT IMPLICATIONS: This is a valuable tree for reforestation and afforestation of denuded areas of Pakistan that have a Mediterranean type climate.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and un-even textured.

COLOR: Wood is light brownish white with an resinous odor.

DENSITY: Specific gravity of 0.71.

STRENGTH: Moderately hard, heavy.

USES: Construction, fuel, resin, erosion control, and packing crates.

Pinus roxburghii Sargent
(Pinaceae)

COMMON NAMES: Chir pine, Nakhtar.

DESCRIPTION: A large tree 21 to 33 m tall with an average diameter of 0.6 m. The crown is rounded. The needles are in threes, 20 to 30 cm long. The bole is straight, erect.

It is monoecious. The male flowers or cones are many, crowded in headlike clusters, 1.3 to 1.8 cm long. The female flowers are erect solitary with 2 to 5 clustered at the end of branches. The cones bloom between January and April. The fruit is the female cone. As it ripens it turns a shiny reddish-brown color. The seed in the cone takes a full year to mature after pollination and 2 years for the reproductive cycle to be completed. There are two, winged seeds beneath each cone scale. Seed is shed September through October.

DISTRIBUTION: The tree is native to Pakistan, Bhutan, Nepal, India, and Afghanistan. In Pakistan it is found in the Himalayas specifically in Azad Kashmir, Murree, Hazara, Swat, Dir, Bajaur, Khyber, Malakand, and Orakzai Agencies. It is easily cultivated in the northern areas of the Punjab and the NWFP. Large plantations have been raised in Mansehra, Abbottabad and Balakote areas of NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils, including shallow soils and soils originating from limestones, granites, and sandstone. It is drought hardy and is well adapted to a precipitation zone of 450 to 1625 mm/yr and can survive 2 to 4 months of drought. It prefers a humid sub-humid, cool-moderately cool, sub-tropical monsoon climate with a temperature range of -5 to 40°C at elevations between 500 to 2500 m. It is frost hardy and fire resistant. The tree is free of disease and insect problems. Natural regeneration occurs readily on bare mineral soil.

REPRODUCTION: It is reproduced from seed. Seed crops are erratic but seed can be stored in sealed containers in a refrigerated environment for a number of years.

PRODUCTIVITY: This is considered a fast growing tree. Yields of 7 to 14 m^3/ha/yr are recorded on sites of different quality.

MANAGEMENT IMPLICATIONS: This is a valuable tree for reforestation and afforestation of denuded areas in the foothills of Pakistan. Native stands have been heavily overcut and will need to be replanted.

WOOD PROPERTIES:

GRAIN: Straight or spiral, medium fine and un-even textured.

COLOR: Sapwood white, heartwood light red turning to reddish or yellowish brown with age.

DENSITY: Specific gravity of 0.61 and a calorific value of 5015 kcal/kg.

STRENGTH: Moderately hard, heavy.

USES: Construction, fuel, resin, erosion control, sleepers, food (edible seed), various wood products (furniture, match sticks, etc.), tar (roots), and tannin.

Pinus wallichiana A.B. Jackson
(Pinaceae)

COMMON NAMES: Kail, Biar, Blue pine.

DESCRIPTION: A large tree 30 to 45 m tall with a diameter of 1 to 1.5 m. The crown is conical. The needles are in fives, 10 to 20 cm long and bluish to gray green in color. The bole is straight, erect.

It is monoecious. The male flowers or cones are many, crowded in headlike clusters, 1 cm long. The female flowers are solitary or 2 to 3 clustered at the ends of branches and bloom between April and June. The fruit, female cone, is 15 to 30 cm long when mature. Seed in the cone takes a year to mature after pollination or 2 years to complete the reproductive cycle. There are two, winged seeds beneath each cone scale. Seed is shed September through October.

DISTRIBUTION: The tree is native to Pakistan, Bhutan, Nepal, India, and Afghanistan. In Pakistan it has been divided into two varieties:
Var. wallichiana isolated in the moist temperate zone of Murree-Galiat and Azad Kashmir. Artificial plantations are being raised in Kaghan and swat.
Var. karakorama isolated in the dry temperate zone of the Northern Areas, Takhte-Sulaiman, Swat, Dir, Chitral, Tirah, and Kurram. Plantations are being raised in Kaghan and Swat.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows on a variety of soils, but does best on fertile, well drained sandy clay to sandy clay loams. It is adapted to a precipitation zone of 300 to 1500 mm/yr in a temperature range of -20 to 35°C. It prefers a humid cool temperate/arid cold temperate climate at elevations between 1200 and 3700 m. It occurs in pure stand or as part of the mixed coniferous forest. Fire, porcupines and bears cause considerable damage to it. It is susceptible to red ring rot (Phellinus pini), dwarf mistletoe (Arceuthobium minutissimum), and snow damage.

REPRODUCTION: It is reproduced from seed. Seed crops are frequent and seed can be stored in sealed containers in a refrigerated environment for at least 2 years.

PRODUCTIVITY: It is considered a fast growing tree. Yields of 5 to 8 m^3/ha/yr are recorded on different quality sites.

MANAGEMENT IMPLICATIONS: This is one of the most valuable trees of Pakistan. Native stands have been heavily overcut and need to be replanted. Care must be taken to match the seed and seedlings to the appropriate ecological zone.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and uneven textured, easily worked.

COLOR: Sapwood is white and heartwood is pink.

DENSITY: Specific gravity of 0.48 and a calorific value of 4995 kcal/kg.

STRENGTH: Moderately hard, moderately heavy.

USES: Construction, fuel, sleepers, and various wood products (furniture, match sticks, window frames, etc.).

Pistacia integerrima Bunge
(Anacardiaceae)

COMMON NAMES: Kangar.

DESCRIPTION: A medium sized deciduous tree 10 to 15 m tall. The crown is spreading with stem diameters of 38 to 48 cm. Leaves are compound, large 16 to 25 cm long.

It is dioecious. The female flowers are in long, 15 to 25 cm, bunches. The tree flowers between March and May.

DISTRIBUTION: The tree is native to Pakistan, India, Afghanistan and is cultivated in many parts of the world. In Pakistan it is found in the foothills of Azad Kashmir, the Northern Areas, Murree hills, Rawalpindi, Hazara, Peshawar, Swat, Chitral, the Salt range and Balochistan. Quite common as avenue tree in Islamabad.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately tolerant tree that grows well on shallow, calcarious, stony, and sandy soils. It is drought hardy and will grow on steep hill sides with hot aspects. It requires a precipitation zone of 400 to 1250 mm/yr. It prefers a humid sub-humid, cool sub-tropical monsoon to semi-arid winter/monsoon climate with a temperature range of -5 to 40°C at elevations between 400 and 1250 m. It has no observed insect or disease problems.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: Its growth is slow with a diameter growth of 0.5 to 0.75 cm/yr. It reaches maturity between 50 and 60 years of age.

MANAGEMENT IMPLICATIONS: This tree has been over harvested because of its desirable fuel characteristics. It is a valuable member of the mixed coniferous forest and should be protected. It has potential for large scale, mixed plantings with Chir pine to protect watersheds.

WOOD PROPERTIES:

GRAIN: Twisted with medium fine, somewhat uneven grain.

COLOR: Sapwood is light brown and heartwood is dark, reddish brown with black streaks.

DENSITY: Dense with a specific gravity of 0.68 and a calorific value of 5100 kcal/kg.

STRENGTH: Hard, heavy, and strong.

USES: Nuts, ornamental, fodder, furniture and wood carving, and medicinal (galls are considered an expectorant).

Pistacia khinjuk
(Anacardiaceae)

COMMON NAME: Khanjak, Guli-pista.

DESCRIPTION: A tree 6 to 12 m in height. Young foliage has a beautiful dark tinge. Flowers between April and May. Gall formation is quite common.

DISTRIBUTION: A tree of very wide distribution, extending from Pakistan through Mediterranean to Spain. Natural in Balochistan.

SILVICAL CHARACTERS:

HABITAT AND ECOLOGY: Grows in dry and harsh climate in the open. Can stand tempratures of less than 0°C and grows with as little as 250 mm rainfall annually. It has no known insects problems.

REPRODUCTION: It is easily reproduced from seed.

PRODUCTIVITY: Growth is slow. Seedlings grow in height at the rate of 8 cm/yr.

MANAGEMENT: Grows naturally as scattered trees and has never been managed as stands of trees. Seedlings raised in nurseries were planted in Ziarat with 50% success in the field due to biotic and climatic factors.

WOOD PROPERTIES:

GRAIN: Close.

COLOR: Dark brown.

DENSITY: Quite high.

STRENGTH: Very hard, durable.

USES: Fruit, fodder, fuel, medicinal(oil, resin), dye and tannins(leaves).

Pithecolobium dulce (Roxb.) Benth.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Jangal Jalebi, Manila Tamarind.

DESCRIPTION: An almost evergreen, thorny, medium sized tree, 20 m tall. The crown is broad and spreading to 30 m in diameter. The stem is short and is up to 31 cm in diameter. Foliage is feathery-like and the leaves are compound, 1 to 2.5 cm long. The bark is smooth gray with small, yellowish white spots.

The flowers are small, greenish white and are arranged in long bunches. It flowers between October and April. The pods are flat, 10 to 12.5 mm long and mature between April and June.

DISTRIBUTION: The tree is native to Mexico, southern California, and south into Central and South America. It has been successfully planted throughout sub-tropical parts of the world. In Pakistan it is cultivated in the Punjab and Sindh.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An aggressive tolerant trees that is quite adaptable and will grow on most soils from clays to sands including areas of brackish water tables and saline soils. It requires a summer precipitation zone of 400 to 600 mm/yr and is considered drought hardy. It prefers a warm sub-tropical to tropical climate with a temperature range of 7 to 45°C at elevations up to 1500 m. Grazing can be a problem but, once established, it is very difficult to eradicate. Insect and disease problems include leaf spot and defoliators plus it is a favored host of the thornbug.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seed remains viable for long periods of time. Pretreatment of seed with a water soak will speed up germination.

PRODUCTIVITY: It is a fast growing tree. On favorable sites it has reached heights of 10 m in 5 to 6 years.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of sites and soils. It coppices readily. It is a good nitrogen fixer. It is a useful farm forestry tree. Young plants need protection from grazing and frost. It can be planted on saline, sodic sites. Because of its seed habit it can quickly become a weed problem and is difficult to eradicate.

WOOD PROPERTIES:

GRAIN: Straight grained.

COLOR: Sapwood is whitish and heartwood is reddish brown.

DENSITY: Dense with a specific gravity of 0.65 and a calorific value of 5600 kcal/kg.

STRENGTH: Very strong, resilient.

USES: Fodder, fuel nitrogen fixing, poles and construction, agricultural implements, apiculture, furniture and soil stabilization.

Platanus orientalis Linn.
(Platanaceae)

COMMON NAMES: Chinar, Plane Tree.

DESCRIPTION: A large, deciduous tree 20 to 25 m tall with diameters of 1 to 3 m. The crown is oblong. The leaves are simple 12 to 20 cm long, with 5 to 7 deep lobes.

It is monoecious. The male flowers are densely crowded round heads. The female flowers are similar to the male flowers and bloom between March and May. The fruit is a rounded head, 2.5 to 7.5 cm in diameter, containing numerous small 1-seeded nuts (achenes). The seed matures June through August.

DISTRIBUTION: The tree is native to southwestern Asia. In Pakistan it has been successfully planted in the Northern Areas, NWFP, Balochistan, Peshawar, Islamabad and Lahore.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on sandy, acidic soils, on wet sites and along stream banks. It is adapted to a precipitation zone of 1000 to 2000 mm/yr in a temperature range of 20 to 40°C. It prefers an arid, cool temperate climate at elevations up to 3000m. The tree is susceptible to many insects, which can be controlled with insecticides.

REPRODUCTION: It is reproduced from seed and by vegetative means. Seed is very small and difficult to collect.

PRODUCTIVITY: Diameter growth of 2 cm a year is not unusual.

MANAGEMENT IMPLICATIONS: This tree could be planted with conifers on denuded sites. Its fast growth rate makes it quite useful for stabilizing erodible slopes.

WOOD PROPERTIES:

GRAIN: Straight, medium fine and un-even textured.

COLOR: Wood is light to grayish brown.

DENSITY: Specific gravity of 0.59.

STRENGTH: Moderately hard, heavy, strong.

USES: Construction, fuel, various wood products including furniture, and erosion control.

Populus caspica Bornm.
(Salicaceae)

COMMON NAMES: Chitta Sufeda, white poplar.

DESCRIPTION: A medium to large, deciduous tree 12 to 20 m or more tall, with diameters of 30 to 50 cm. The trunk is erect and the crown spreading. The leaves are simple, 3 to 5 lobed, 5 to 10 cm long and broad. The bark is smooth, light gray to greenish white in color.

It is dioecious. The male catkins are 5 to 10 cm long and the female catkins are 5 cm long. Flowering and seed production occurs between March and May.

DISTRIBUTION: The tree is native to Europe, North Africa, the Middle East and Asia. In Pakistan it grows in the Himalayas, Karakorum and Hindu-kush. It has been successfully planted in the Peshawar valley and the hills of the Punjab.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows best on deep moist soils, but can grow on a variety of sites. It is adapted to a precipitation zone of 750 to 1250 mm/yr or more, in a temperature range of -3 to 35°C. It prefers a humid, cool cold temperate, sub-tropical temperate semi-arid, cool temperate, Mediterranean climate. It can be coppiced. The foliage, when attack by rust and powdery mildew, can be considerably damage.

REPRODUCTION: It is reproduced from seed and by vegetative means. The seed is small, light and wind disseminated.

PRODUCTIVITY: Growth is relatively fast. Diameter growth of 1.5 to 2.0 cm a year is not uncommon.

MANAGEMENT IMPLICATIONS: This tree has the potential to control erosion on steep hillsides. It should be used in the hill regions on problem watersheds, because of its growth rate and ease of reproduction. Growth on the plains has not been good.

WOOD PROPERTIES:

GRAIN: Very fine, straight, even textured.

COLOR: Wood is white.

DENSITY: Specific gravity of 0.49 and a calorific value of 5900 kcal/kg.

STRENGTH: Moderately light, soft.

USES: Fuel, packing cases and crates, matches, erosion control and reforestation, plywood, and fodder.

Populus ciliata Wall. Ex. Royle
(Salicaceae)

COMMON NAMES: Palach, Himalayan poplar.

DESCRIPTION: A large, deciduous tree 18 to 21 m tall, with diameters of 60 to 80 cm. The trunk is erect and the crown spreading. The leaves are simple, 7.5 to 17.5 cm long.

It is dioecious. The male catkins are 7.5 to 10 cm long and the female catkins are 15 to 30 cm long. Flowering and seed production occurs between March and June.

DISTRIBUTION: The tree is native to the Subcontinent, North and Central Asia, and North America. In Pakistan it grows in Azad Kashmir, Northern Areas, Gilgit, Murree Hills, Hazara, Swat, Dir, Chitral and Tirah.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows best on deep moist soils, but can grow on a variety of sites and soils including rocky exposed, land slide areas. It also grows best on alluvium, stream beds and/or sandy loams. It is adapted to a precipitation zone of 750 to 1250 mm/yr or more, in a temperature range of -20 to 35°C. It prefers a humid, semi-arid cool, cold temperate, climate. It has no observed insect or disease problems in Pakistan. It does not coppice except when young.

REPRODUCTION: It is reproduced from seed and by vegetative means. The seed is small with long silky hairs, light and wind disseminated. Viability is low.

PRODUCTIVITY: It is relatively fast growing. Yields of 6 to 13 m^3/ha/yr have been recorded.

MANAGEMENT IMPLICATIONS: This tree has the potential to control erosion on steep hillsides. It should be used in problem watersheds, because of its growth rate and ease of reproduction. It is a component of the coniferous forest and can be easily regenerated by cuttings. It is also useful for controlling stream bank erosion and land slide areas.

WOOD PROPERTIES:

GRAIN: Very fine, straight, even textured.

COLOR: Sapwood is white, heartwood pale to brownish gray.

DENSITY: Specific gravity of 0.46 and a calorific value of 5900 kcal/kg.

STRENGTH: Moderately light, soft.

USES: Fuel, packing cases and crates, matches, erosion control and reforestation, plywood, pulp, and fodder.

Populus deltoides Bartr.
(Salicaceae)

COMMON NAMES: Sufed Poplar, Northern Cottonwood.

DESCRIPTION: A large, deciduous tree 25 to 30 m tall, with diameters of 40 cm or more. The trunk is erect and the crown broad and spreading. The leaves are simple, 7.5 to 12.5 cm long. The bark on older trees is gray to gray black and rough. On younger trees the bark is smooth and shiny.

It is dioecious. The male catkins are 7.5 to 10 cm long and the female catkins are 15 to 20 cm long. Flowering and seed production occurs between June and August.

DISTRIBUTION: The tree is native to North America. In Pakistan it has been successfully planted in the plains as well as in the hills. Several clones of this species have been tested in different parts of Pakistan and the best ones suited to local conditions have been identified.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on sandy loams and alluvial soils. It requires considerable amounts of water to maintain growth and is adapted to a precipitation zone of 750 to 1250 mm/yr or more, in a temperature range of -20 to 35°C. It prefers a semi-humid to semi-arid, cool, sub-tropical temperate climate. It does coppice. It is susceptible to many insect and disease problems especially when stressed.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seed is small with silky hairs (cotton), light and wind disseminated. Seed viability is low.

PRODUCTIVITY: It is fast growing. Yields of 20 to 40 m^3/ha/yr have been recorded. Clones such as AY-48, S7C2, S7C3, S7C4, S7C20, I-63/51, I-72/51, I-24/64, I-72/58, I-69/55, I-262 and ST-92 have given excellent performance.

MANAGEMENT IMPLICATIONS: This is a good farm forestry tree. It has been extensively planted and intercropped on farms in Pakistan. Under some conditions it will compete with crops for water. It is also a good shelter belt tree because of it rapid growth.

WOOD PROPERTIES:

GRAIN: Very fine, straight, even textured.

COLOR: Sapwood is white, and heartwood pale to brownish gray.

DENSITY: Specific gravity of 0.46 and a calorific value of 5900 kcal/kg.

STRENGTH: Moderately light, soft.

USES: Fuel, packing cases and crates, matches, erosion control and reforestation, plywood, pulp, fodder, and roadside tree.

Populus euphratica Olivier
(Salicaceae)

COMMON NAMES: Bahan, Euphrates Poplar.

DESCRIPTION: A small to medium, deciduous tree 7.5 to 15 m tall, with diameters of 30 to 70 cm. The trunk is twisted or crooked and forked while the crown is broad and somewhat spreading. The leaves are simple, lobed 5 to 15 cm long.

It is dioecious. The male catkins are 2.5 to 15 cm long and the female catkins are 5 to 7 cm long. Flowering and seed production occurs between January and June.

DISTRIBUTION: The tree is native to the Middle East, southern Russia, the Subcontinent and east to China. In Pakistan it is found in hot arid areas along rivers courses or where there is sub-surface water.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on a variety of sites including waterlogged and saline soils. This is the only poplar that will grow on saline soils. It is adapted to a precipitation zone of 750 to 1250 mm/yr or more, in a temperature range of -10 to 45°C. It prefers a arid, semi-arid, sub-tropical climate. It is considered a riverain species and in these areas its growth does not depend upon rainfall. It is frost hardy, can withstand drought and periodical inundation. It has a elevational range from below sea level to the tree line at 4000 m. It does coppice. It has no significant disease or insect problems in Pakistan.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seed is small light and wind disseminated. Seed viability is high.

PRODUCTIVITY: It is relatively fast growing. Yields of 8 to 15 m^3/ha/yr have been recorded. Diameter growth of 3 to 17 cm/yr can be expected.

MANAGEMENT IMPLICATIONS: This is a good farm forestry tree. In natural areas within Pakistan it has been utilized to the point of extinction, and should receive at least limited protection. It should be given greater emphasis in farm forestry programs especially in the reverain tracts.

WOOD PROPERTIES:

GRAIN: Interlocked and irregular, fine, and even textured.

COLOR: Sapwood is white, and heartwood is reddish brown.

DENSITY: Specific gravity of 0.46 and a calorific value of 5000 kcal/kg.

STRENGTH: Moderately light, soft.

USES: Timber, packing cases and crates, matches, erosion control and reforestation, plywood, pulp, fodder, roadside tree, used to clean teeth, and medicinal (bark is a vermifuge).

Populus euramericana C V-I-214 (Dade) Guinier
(Salicaceae)

COMMON NAMES: Doghla Poplar, Hybrid Poplar.

DESCRIPTION: A tall tree often attaining a height of 30 m with a diameter of 50 cm. The leaves are broadly triangular with long petioles.

It is a female poplar, a hybrid cultivar derived from Populus deltoides and Populus nigra at the Institute of Casale Monferrato, Italy. It has no burrs. Buds are pointed and flowering occurs before leafing.

DISTRIBUTION: The tree was widely grown all over Europe after the Second World War and now throughout the world. It was introduced into Pakistan in the mid fifties.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on deep soils which have large quantities of water. However, it performs poorly under waterlogged and saline conditions. It can withstand freezing temperatures but is damaged when temperatures exceed 40 to 45°C. It should therefore not be planted in southern parts of the Punjab and Balochistan as well as in Sindh.

REPRODUCTION: It is reproduced by vegetative means (stem cuttings).

PRODUCTIVITY: It is very fast growing hybrid. MAI of 40 m^3/ha/yr has been recorded. Height of 17 m with diameter of 15 cm in 5 years are common.

MANAGEMENT IMPLICATIONS: This is a good farm forestry tree. It requires deep soil working and continuous weed control. If stressed, it is susceptible to insect and disease problems including defoliators and borers.

WOOD PROPERTIES:

GRAIN: Fine or medium, even textured.

COLOR: White, greenish brown when dry.

DENSITY: Specific gravity between 0.28 and 0.52.

STRENGTH: Fairly strong.

USES: Timber, fuel, packing cases and crates, housing, furniture, matches, plywood, pulp, chip board, shuttering poles, and fodder.

Populus nigra Linn.
(Salicaceae)

COMMON NAMES: Siah poplar, Lombardy poplar.

DESCRIPTION: A large, deciduous tree 15 to 27 m tall with diameters of 60 to 90 cm. The trunk is straight with fastigiate branching and the crown is cylindrical. The leaves are simple, lobed 5 to 10 cm long.

It is dioecious. The male catkins are 2.5 to 7.5 cm long and the female catkins are 5 to 15 cm long. Flowering and seed production occurs between January and June.

DISTRIBUTION: The tree is native to western and central Europe, the Middle East, and the Subcontinent. In Pakistan it is planted in all provinces, the Northern Areas, and Azad Kashmir. It has been successfully planted in the plains. The best specimen are available in the Northern Areas.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of well drained sites along water courses. It is adapted to a precipitation zone of 650 to 900 mm/yr or more, in a temperature range of -20 to 45°C. It prefers a arid, cool-cold, sub-tropical climate. It is frost hardy. It has a elevation range from 900 to 3750 m. It does coppice. There are no significant disease or insect problems when planted on a favorable site; however if the tree is stressed it can be attacked by a number of defoliators. Gall formation by insects has been observed.

REPRODUCTION: It is reproduced both from seed and by vegetative means. However, most individuals are the result of root suckers or cuttings. Seed has not been readily used to propagate this tree in Pakistan.

PRODUCTIVITY: It is relatively fast growing. Yields of 10 to 15 m^3/ha/yr have been recorded.

MANAGEMENT IMPLICATIONS: This is a good farm forestry tree because of its fast growth and large size. The wood is valued and can provide fuel as well as timber in areas where forests have been destroyed by over harvest.

WOOD PROPERTIES:

GRAIN: Straight, fine, and even textured.

COLOR: Sapwood is white and heartwood is pale to olive brown.

DENSITY: Specific gravity of 0.46 and a calorific value of 5000 kcal/kg.

STRENGTH: Moderately light, soft.

USES: Fuel, packing cases and crates, matches, erosion control and reforestation, plywood, pulp, fodder, roadside tree, and general construction.

Prosopis cineraria (Linn.) Druce.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Jand, Kandi.

DESCRIPTION: An almost evergreen, thorny, large shrub, small sized tree 12 m tall. The crown is open and spreading. The stem is short with diameters up to 31 cm. Foliage is feathery-like and the leaves are compound, 1 to 2.5 cm long. Leaf fall occurs for short periods before flowering. The bark is rough, gray, and exfoliating in thin flakes.

The flowers are small, creamy white to pale yellow and are arranged in small bunches, 1 to 2.5 cm long, flowering between December and May. The pods are flat, 12 to 25 mm long and contain on the average 10 to 15 seeds, maturing between April and August.

DISTRIBUTION: The tree is native to Pakistan, India, Afghanistan, and other parts of the Middle East. In Pakistan it is found in the dry plains and hills of the Sindh, Punjab, Balochistan, and NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An aggressive tolerant tree that grows on a variety of dry sites including most soils from clays to sands. It also does well on highly alkaline sites (ph 9.8). It requires a summer precipitation zone of 75 to 650 mm/yr and is considered very drought hardy. It prefers a hot arid, semi-arid to sub-tropical climate with a temperature range of -6 to 45°C at elevations up to 450 m. Seedlings can be damaged by frost, and grazing can be a problem but once it is established it is very difficult to eradicate. A number of insects attack it but they are of little significance.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seed can be stored for long periods. Pretreatment of seed by nicking the seed coat, or a water or acid soak will speed germination.

PRODUCTIVITY: It is fast growing with reported yields of 3 to 5 m^3/ha/yr. On favorable sites it will reach heights of 7 m in 11 years.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of sites and soils, coppices readily, and is a good nitrogen fixer. Since framers like it because its root system does not compete with crops and it fixes nitrogen, it is a good farm forestry tree. Young plants need protection from grazing and frost.

WOOD PROPERTIES:

GRAIN: Interlocked, close grained.

COLOR: Sapwood is whitish, and heartwood is purple-brown.

DENSITY: Dense, with a specific gravity of 0.61 and a calorific value of 5000 kcal/kg.

STRENGTH: Very strong, resilient, not durable.

USES: Fodder, fuel, nitrogen fixing, poles and construction, agriculture implements, apiculture, furniture, and soil stabilization.

Prosopis juliflora (Swartz) D.C.
(Leguminosae, sub family Mimosoideae)

COMMON NAMES: Mesquite.

DESCRIPTION: An almost evergreen, thorny, shrub or small sized tree 10 m tall. The crown is open and stem diameters of 20 cm have been reported. Foliage is feather-like and the leaves are compound up to 1.8 cm long. Leaf fall occurs for a short period before flowering.

The flowers are small, greenish-yellow, arranged in small, dense bunches, and appear between March and June. The pods are fleshy, flat, 16 to 23 cm long and contain on the average 10 to 18 seeds. The straw colored pods mature between May and July.

DISTRIBUTION: The tree is native to the West Indies, the southwestern United States, Central and South America. In Pakistan it is found in the dry plains and hills of the Sindh, Punjab, Balochistan and NWFP.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An aggressive intolerant tree that grows on a variety of dry sites including most soils from clays to sands. It also does well on highly alkaline sites (ph 9.8). It requires a precipitation zone of 150 to 750 mm/yr and is considered very drought hardy because of its large tap root and extensive root system. It prefers a hot arid, semi-arid to sub-tropical climate with a temperature range of -2 to 45°C at elevations up to 1200 m. It is fairly frost hardy, and grazing is not a problem since cattle avoid it. Once established it is very difficult to eradicate. A number of insects attack it but they are of little significance.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seed can be stored for long periods. Pretreatment of seed by nicking the seed coat, or a water or acid soak will speed germination.

PRODUCTIVITY: Yield of 3 to 5 m^3/ha/yr has been recorded. On favorable sites it produces 50 to 60 tons/ha biomass on a 10 year rotation.

MANAGEMENT IMPLICATIONS: This tree is adapted to a variety of sites and soils, coppices readily, and is a good nitrogen fixer. It can be used on saline, sodic sites. Because of its seed habit it can become a weed problem thus care should be taken so it does not escape cultivation. It is considered a noxious weed in parts of Pakistan.

WOOD PROPERTIES:

GRAIN: Spiral.

COLOR: Heartwood is rich brown, sometimes red.

DENSITY: Dense with a specific gravity of 0.70, and a calorific value of 4500 kcal/kg.

STRENGTH: Very strong, resilient, not durable.

USES: Fodder, fuel, nitrogen fixing, poles and construction, agricultural implements, apiculture, furniture, and soil stabilization.

Prunus cornuta (Wall. Ex. Royle) Steud.
(Rosaceae)

COMMON NAMES: Kala Kat, Bird Cherry.

DESCRIPTION: A medium sized deciduous tree 15 to 18 m tall with diameters of 50 to 60 cm. The leaves are simple, 10 to 15 cm long. The bark is smooth brown to purple in color.

The white flowers grow in 10 to 15 cm long brunches or groups and bloom between April and June. The fruit is small 0.6 to 1 cm in diameter and matures from June to October.

DISTRIBUTION: The tree is native to South Eastern Europe, the Middle East and Asia. In Pakistan it occurs in Azad Kashmir, Hazara, Murree Hills, Kurram, Chitral and Swat.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on sandy loam soil that is well drained, but prefers a moist site. It is adapted to a precipitation zone of 750 to 1500 mm/yr or more, in a temperature range of-10 to 25°C. It prefers a humid, cool cold temperate, sub-tropical monsoon climate. It is easily coppice. It has no observed insect or disease problems of significance. Once planted it spreads rapidly by means of root sprouts. Birds will eat the fruit and spread the seed.

REPRODUCTION: It is reproduced both from seed and by vegetative means.

PRODUCTIVITY: Yields of 3 to 6 m^3/ha/yr has been recorded. Heights of 20 m with diameters of 75 cm have also been observed.

MANAGEMENT IMPLICATIONS: This tree has the potential to control erosion on steep hillsides. It should be used in problem watersheds, because of its growth rate and ease of reproduction. It has been destroyed in some areas of its natural range through heavy lopping. Special care is needed to ensure that it is retained in its natural range.

WOOD PROPERTIES:

GRAIN: Very fine, straight, even textured.

COLOR: Sapwood is white, and heartwood is reddish brown.

DENSITY: Specific gravity of 0.66.

STRENGTH: Moderately hard, heavy, strong.

USES: Fuel, agriculture implements, furniture, erosion control, textile bobbins, wheels and carts, and fodder.

Pyrus pashia Ham. Ex D. Don.
(Rosaceae)

COMMON NAMES: Batangi, Wild pear.

DESCRIPTION: A small to medium size deciduous tree 6 to 10 m tall with diameters of 50 cm. The crown is small and oval shaped. The leaves are simple, 5 to 10 cm long.

The white flowers grow in brunches or groups and bloom between March and May. The fruit is 1 to 3 cm in diameter and matures from May to December.

DISTRIBUTION: The tree is native to the Himalayas of Pakistan, India, Bhutan and Nepal. In Pakistan it occurs in Azad Kashmir, Hazara, Murree Hills, Chitral and Swat.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that grows on sandy loam soil that is well drained. It is adapted to a precipitation zone of 750 to 1500 mm/yr or more, in a temperature range of -10 to 35°C. It prefers a humid to sub-humid cool sub-tropical monsoon climate. The fruit and leaves are susceptible to a "scab" infection. Once planted it will spread rapidly by means of root sprouts.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed stored under refrigerated conditions will remain viable for 2 to 3 years.

PRODUCTIVITY: Diameter growth of 30 cm in 8 years has been recorded.

MANAGEMENT IMPLICATIONS: This tree has the potential to control erosion on steep hill sides in addition to providing a fruit crop.

WOOD PROPERTIES:

GRAIN: Very fine, straight, even textured.

COLOR: Wood is light, reddish brown.

DENSITY: Specific gravity of 0.70.

STRENGTH: Hard, heavy, strong.

USES: Fuel, agriculture implements, root stock for grafting, erosion control, food (fruit), and fodder.

Quercus baloot Griff.
(Fagaceae)

COMMON NAMES: Bunj, Holy Oak.

DESCRIPTION: A small-medium evergreen tree 2 to 12 m tall with a diameter of 0.5 to 0.6 m. The leaves are simple, and can have smooth margins or be toothed lobed. The bark is rough, and light-gray to dark-gray to black.

It is monoecious. The male flowers or catkins are hanging bunches 3 to 5 cm long. The female flowers are erect bunches 2 to 4 cm long. The flowers occur between April and May. The fruit is an acorn or nut, 1.2 to 1.3 cm in diameter. The fruiting period is 12 to 18 month after pollination.

DISTRIBUTION: The tree is native to India, Pakistan, and Afghanistan through the Mediterranean north into Europe. In Pakistan it is found in the Himalayas and the Hindukush mountains. Specifically it is found in Dir, Chitral, Swat, Hazara, Tirah and Kurram.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows on a variety of soils, including dry, stony and arid sites. It requires a precipitation zone of 200 to 1000 mm/yr or more. It prefers a sub-humid, semi-arid temperate Mediterranean climate with a temperature range of -20 to 35°C at elevations between 1500 and 3000 m. It will coppice readily and is attacked by powdery mildew and leafy mistletoe.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The fruit, a nut, is solitary and does not store well.

PRODUCTIVITY: Slow growing, it has been reported to have a MAI of 0.25 cm in diameter. Coppice shoots have been recorded to grow to 25 cm in height in one season.

MANAGEMENT IMPLICATIONS: This tree is well suited for planting in watershed areas to help control erosion and has potential as a farm forestry tree. Currently it is being exploited, and is in danger of extinction. It should be included in artificial reforestation programs.

WOOD PROPERTIES:

GRAIN: Straight to very fine even-textured.

COLOR: Heartwood is red to reddish brown.

DENSITY: Specific gravity of 0.94 and a calorific value of 5100 kcal/kg.

STRENGTH: Heavy, hard, resilient.

USES: Fuel, handles, agriculture implements, fodder, charcoal and tannin.

Quercus dilatata Royle
(Fagaceae)

COMMON NAMES: Barungi.

DESCRIPTION: A large evergreen tree, 24 to 30 m tall and with a diameter of 0.7 to 1.5 m. The crown is very dense. The leaves are simple, with smooth margins, 4 to 12 cm long.

It is monoecious. The male flowers or catkins are hanging bunches 3 to 5 cm long. The female flowers are short, erect bunches. The flowers occur between April and May. The fruit is an acorn or nut, 2.5 cm in diameter. The fruiting period is May to October, a year after pollination.

DISTRIBUTION: The tree is native to India, Pakistan, Afghanistan and Nepal. In Pakistan it is found in the Himalayas mountains. Specifically it is in Dir, Chitral, Swat, Hazara, Tirah, Kurram agency, Murree Hills, and Azad Kashmir.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that can stand shade better than most oaks. It grows on deep, rich moist, well drained soils and prefers moist shady sites. It is prone to wind throw. It requires a precipitation zone of 500 to 1200 mm/yr or more, prefers a humid to sub-humid, cool-cold, temperate climate with a temperature range of -20 to 35°C at elevations between 1600 and 2900 m. It will coppice readily. The coppice shoots are heavily browsed and the tree is attacked by leafy mistletoe.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The fruit, a nut, is solitary and has a very low viability.

PRODUCTIVITY: Slow growing, it has been reported to have a MAI of 0.4 cm in diameter. Coppice shoots have been recorded to obtain heights of 0.75 m in 5 years and 3 m in 15 years.

MANAGEMENT IMPLICATIONS: This tree is an important component of the coniferous forest. In order to maintain diversity attempts must be made to ensure that it is regenerated with the coniferous species.

WOOD PROPERTIES:

GRAIN: Straight to very fine even-textured.

COLOR: Sapwood is gray, and heartwood is reddish gray with darker streaks.

DENSITY: Specific gravity of 0.95 and a calorific value of 4900 kcal/kg.

STRENGTH: Heavy, hard, resilient.

USES: Fuel, handles, agriculture implements, fodder, charcoal, tannin and sled runners.

Quercus glauca Thurb.
(Fagaceae)

COMMON NAMES: Banni, Barin Oak.

DESCRIPTION: A small or medium sized evergreen tree, 20 m tall with a diameter of 75 cm. The leaves are 10 cm by 3 cm, oblong acuminate. The bark is smooth and gray in color.

Male flowers are catkins and the female flowers on short axillary pedunder. The flowers occur between March and April. The fruit is an acorn or nut, 2 cm long.

DISTRIBUTION: The tree is native to India, Pakistan, Afghanistan and Nepal.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This tree prefers moist ravines in a moist temperate climate with freezing temperatures in winter, 900 mm/yr rainfall annually and an elevation range between 800 and 2000 m. It is not gregarious and has no known insect or disease problems.

REPRODUCTION: It is reproduced from seed.

PRODUCTIVITY: Slow growing.

MANAGEMENT IMPLICATIONS: This tree is managed only for fuel wood but the branches are lopped for fuel and fodder. It is gradually disappearing from its natural habitat due to heavy biotic pressure.

WOOD PROPERTIES:

GRAIN: Close grained.

COLOR: Dark.

DENSITY: Hard.

STRENGTH: Very strong and durable.

USES: Fuel, fodder and timber.

Quercus incana Roxb.
(Fagaceae)

COMMON NAMES: Rein, White Oak.

DESCRIPTION: A medium to large evergreen tree, 18 to 24 m tall and with a diameter of 0.8 to 1.0 m. The crown is rounded. The leaves are simple, oblong to ovate, 6 to 15 cm long. The bark is gray to grayish brown, silvery when young and peels off in rounded flakes.

It is monoecious. The male flowers or catkins are hanging bunches 6 to 14 cm long. The female flowers are solitary, 1 to 2 cm long. The flowers occur between April and May. The fruit is an acorn or nut, 2.5 cm in diameter. The fruiting period is November to January.

DISTRIBUTION: The tree is native to India, Pakistan, Nepal and upper Burma. In Pakistan it is found in the Himalayas mountains. Specifically it is found in Swat, Hazara, Murree Hills, and Azad Kashmir.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: It is a moderately intolerant tree that grows on deep, rich moist, well drained soils and prefers moist shady sites. It requires a precipitation zone of 1000 to 2300 mm/yr or more. It prefers a humid to sub-humid, cool-cold, temperate climate with a temperature range of -10 to 35°C at an elevation range of 1600 to 2400 m. It coppices readily and the coppice shoot may be heavily browsed. The tree is attacked by leafy mistletoe.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The fruit, a nut, is solitary, viability is low and storage is difficult.

PRODUCTIVITY: Slow growing, it has been reported to attain 10 cm in diameter in 30 years. A plantation has been recorded as producing upto 21 m^3/ha in 70 years.

MANAGEMENT IMPLICATIONS: This tree is an important component of the Chir Pine forest. In order to maintain diversity, attempts must be made to insure that it is regenerated with the coniferous species. Because of heavy exploitation, planting programs may be needed to preserve this tree.

WOOD PROPERTIES:

GRAIN: Straight to very fine, even-textured, lustre low.

COLOR: Heartwood is reddish brown.

DENSITY: Specific gravity of 0.97 and a calorific value of 4600 kcal/kg.

STRENGTH: Heavy, hard, resilient.

USES: Fuel, handles, agriculture implements, fodder, charcoal and tannin.

Quercus semicarpifolia
(Fagaceae)

COMMON NAMES: Banjar, Brown Oak.

DESCRIPTION: A large evergreen tree, 25 to 30 m tall and with a diameter of 1 m. The leaves are 5 to 12 cm by 2.5 to 7 cm, elliptic oblong, glabrous and dark green above, rusty or brown tomentous beneath. The bark is dark gray.

The male flowers or catkins are 5 to 15 cm long. The female flowers are short spikes. The flowers occur between May and June. The fruit is an acorn or nut, 2.5 cm in diameter and ripens between July and August.

DISTRIBUTION: The tree is native to India, Pakistan, Afghanistan and Nepal.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: This tree prefers a moist temperate climate with an annual rainfall of 1000 mm and freezing temperatures at an elevation range between 2500 and 3800 m. It is gregarious and can extend up to the tree line where it is often seen with conifers and other broad leaved associates. It has no known insect or disease problems.

REPRODUCTION: It is reproduced from seed.

PRODUCTIVITY: Slow growing.

MANAGEMENT IMPLICATIONS: The tree grows in pure stands or in association with conifers. It is gradually disappearing from its natural habitat due to heavy lopping for fodder and fuelwood.

WOOD PROPERTIES:

GRAIN: Closed grained.

COLOR: Light, pinkish brown.

DENSITY: Hard.

STRENGTH: Strong.

USES: Fodder, fuelwood and charcoal.

Rhizophora mucronata Lam.
(Rhizophoraceae)

COMMON NAMES: Kamo, Kunro, Bhora, Timmar, Asiatic Mangrove.

DESCRIPTION: A small to large evergreen tree 25 m tall with a diameter of 70 cm. The crown is spreading and supported by stilted roots. The leaves are simple, elliptical to oblong 8 to 15 cm long and 5 to 10 cm wide. The leaf tips are sharply pointed while the bases are short pointed, with wavy (entire) margins. The thick, leathery leaves are dark green and hairless on top and black dotted green underneath. The bark is brown or blackish, smooth or with horizontal fissures.

There are 3 to 8 small flowers 15 mm long, to a cluster. They are bell shaped, yellow and fragrant. The flowers bloom between July and October. The fruit is berry, egg shaped 5 to 7 cm long and leathery. The seed matures from August through September.

DISTRIBUTION: The tree has a very wide range from East and South Africa through South Asia to the islands of the South Pacific. In Pakistan it is found on mud flats and along salt water creeks on the Lasbela and Makran coasts.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on silty, mud soils within the tidal zone. It does well on saline and brackish silts. It is adapted to a precipitation zone of 125 to 1700 mm/yr or more, in a temperature range of 1 to 40°C. It prefers a humid to arid, hot sub-tropical to tropical maritime climate. It has no known disease or pest problems of any importance.

REPRODUCTION: It is reproduced from viviparous seed. In nature the seed germinates on the tree and then falls to the ground.

PRODUCTIVITY: A slow growing tree. Heights of 8 to 10 m and diameters of 1 to 10 cm over a 15 year period have been reported.

MANAGEMENT IMPLICATIONS: Because of over harvesting the tree appears to be threatened with extinction in some areas and should be protected.

WOOD PROPERTIES:

GRAIN: Very fine, straight.

COLOR: Wood is orange red changing to reddish brown.

DENSITY: Specific gravity of 0.81.

STRENGTH: Hard, heavy, strong.

USES: Fuel including charcoal, tannin, post and poles, medicinal (bark), and fodder.

Robinia pseudoacacia Linn.
(Leguminosae, sub family Papilionoideae)

COMMON NAMES: Black Locust, Robinia.

DESCRIPTION: A medium sized to large, deciduous tree 30 m in height with an open crown and a straight bole. There are a variety of growth forms some of which may be thorny. The leaves are compound 18 to 15 cm long. The bark is thick, rough, brown and has longitudinal fissures.

The flowers are small and occur in long hanging bunches. They are yellowish to white and fragrant, appearing between March and June. The pods are small, 2.5 to 3 cm long and 0.5 cm wide. The pods are hard and usually break open while on the tree scattering the seed. The pods mature between August and October.

DISTRIBUTION: The tree is native to the southeast and central United States. Because of its adaptability it is grown throughout temperate zones in the world. In Pakistan it has been successfully established in the plains and in the hills of the Punjab and NWFP. Plantations are being raised in Gilgit and some other parts of Northern areas.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils but prefers well drained sites and will not grow on waterlogged sites. The tree is frost tolerant and will grow in areas with temperatures down to -20°C. It grows from sea level to 2500 m within a precipitation range of 700 to 1000 mm/yr. It is surprisingly drought hardy and can withstand dry periods of 2 to 6 months. The tree is relatively free of disease and insect problems. In the United States it can be heavily damaged by borers such as Megacyllene robiniae and Cyllene robiniae.

REPRODUCTION: It is easily reproduced both from seed and by vegetative means. Good seed crops are produced annually and seed stores well for several years. Pretreatment of seed will improve germination.

PRODUCTIVITY: It has a rapid growth rate for 30 years then slows and by age 50 growth almost ceases. Growth of 4 to 8 m^3/ha/yr in 44 year old stand has been reported.

MANAGEMENT IMPLICATIONS: A useful and fast growing tree in the Chir Pine zone of Pakistan. The wide spreading root system makes it an ideal tree for erosion control and soil stabilization. It fixes nitrogen and its foliage and seed are useful as fodder. An excellent farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight.

COLOR: Sapwood is white, and heartwood is yellowish or reddish brown.

DENSITY: Specific gravity between 0.75 and 0.80, and a calorific value of 4800 kcal/kg.

STRENGTH: Hard, heavy, and resilient.

USES: Fodder, fuel and charcoal, shade, erosion control, fence posts, apiculture and ornamental.

Salix acmophylla Boiss.
(Salicaceae)

COMMON NAMES: Bisee, Willow.

DESCRIPTION: A small, deciduous tree up to 9 m tall with a diameter of 50 to 70 cm. The trunk is straight and the crown is rounded, with pendulous branches. The leaves are simple, 5 to 12.5 cm long and 0.5 to 2 cm wide.

It is dioecious. The male catkins are 2.5 to 5 cm long and the female catkins are 2.5 to 5 cm long. The catkins appear after the leaves have flushed. Flowering and seed production occurs between February and April.

DISTRIBUTION: The tree is native to parts of the Middle East, and the Sub-Continent. In Pakistan it is found in the Karakorum, and in the Himalaya and Sub-himalayan tract. It is specific to Azad Kashmir, Salt Range, Murree Hills, Hazara, Swat, Chitral, Northern Areas, Kurram and the mountains of Balochistan. It has been successfully planted in the plains, usually along water courses.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of well drained sites along water courses. It is adapted to a precipitation zone of 750 to 1250 mm/yr or more, in a temperature range of -20 to 35°C. It prefers a arid, cool-cold, sub-tropical climate and is frost hardy within an elevation range of 300 to 1600 m. It does not coppice. It has no significant disease or insect problems.

REPRODUCTION: It is reproduced from seed and by vegetative means. However most tree result from root suckers or cutting. Seed viability is low.

PRODUCTIVITY: It is relatively fast growing. Diameter growth of 0.7 to 2.5 cm/yr has been reported.

MANAGEMENT IMPLICATIONS: Its fast growth and large size make this a very desirable tree for use in farm forestry programs especially on wet sites. It is also a good tree to use on fragile hills to control erosion.

WOOD PROPERTIES:

GRAIN: Straight, fine, and even textured.

COLOR: Whitish gray.

DENSITY: Specific gravity of 0.46.

STRENGTH: Moderately light, soft.

USES: Fuel, dye, erosion control and reforestation, pulp, and fodder.

Salix babilonica Oinn.
(Salicaceae)

COMMON NAMES: Majnu, Weeping Willow.

DESCRIPTION: A small to medium sized, deciduous tree. The trunk is straight, with spreading, pendulous branches and the crown is rounded. The leaves are simple, long and narrow, 8 to 18 cm long and 1 cm wide. The leaf margins are finely tooth with pointed tips. The bark is fissured, rough and ridged.

It is dioecious. The male and female catkins are yellowish, 2 to 3 cm long. The catkins appear after the leaves have flushed. Flowering and seed production occurs between February and March.

DISTRIBUTION: The tree is native to central China. It is now grown extensively in many parts of the world as an ornamental. In Pakistan it is found in the Himalayas Valleys along water courses. It is specific to Azad Kashmir, Kaghan, and Swat. It has been successfully planted in the plains, usually along water courses.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows on a variety of rich, sandy loam soils that are well drained. It is adapted to a precipitation zone of 750 to 2250 mm/yr or more, in a temperature range of -2 to 40°C. It prefers a sub-humid, semi-arid, sub-tropical, monsoon climate and is frost hardy. It does coppice. Rust and powdery mildew are not uncommon on the foliage and can become epidemic. Ganoderma wood rot is also a common problem.

REPRODUCTION: It is reproduced from seed and by vegetative means. However most trees result from root suckers or cuttings.

PRODUCTIVITY: It is relatively fast growing. Diameter growth of 1 to 2 cm/yr has been reported. Height growth will average 1 to 2 m/yr.

MANAGEMENT IMPLICATIONS: Its fast growth and size make this a very desirable tree for use in a farm forestry programs especially on wet sites. It is also a good tree to use on moist denuded hills and gullied areas to check erosion.

WOOD PROPERTIES:

GRAIN: Straight, fine, and even textured.

COLOR: Light brown to purplish brown.

DENSITY: Specific gravity of 0.49.

STRENGTH: Moderately light, soft.

USES: Fuel, match sticks, paper pulp, basket making, fodder and tannin. Landscaping.

Salix tetrasperma Roxb.
(Salicaceae)

COMMON NAMES: Bed-i-Laila, Indian Willow.

DESCRIPTION: A small to medium sized, deciduous tree, 6 to 12 m tall with diameters of 0.4 to 1.0 m. The trunk is erect, with a large crown. The leaves are simple, 5 to 20 cm long.

It is dioecious. The male and female catkins are borne on leafy shoots. The male catkins are 2.5 to 12.5 long, while the female catkins are 2.5 to 12.5m long. Flowering and seed production occurs between February and May.

DISTRIBUTION: The tree is native to the sub-continent including Pakistan. It occurs in swampy areas, on river islands, and on the banks of water courses. In Pakistan it is found in the Murree hills, Kahuta, Hazara, Swat, Azad Kashmir, Quetta, Kurram, and Gilgit. It has been successfully planted in the plains of Afghanistan and in the Peshawar valley.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of rich, sandy loam soils that are well drained. It is adapted to a precipitation zone of 750 to 1250 mm/yr or more, within a elevation range of 300 to 1600 m and within a temperature range of -10 to 40°C. It prefers a sub-humid, semi-arid, sub-tropical, monsoon to temperate climate and is frost hardy. It does coppice. Rust and powdery mildew may cause damage to the foliage.

REPRODUCTION: It is reproduced both from seed and by vegetative means. Seed are small and wind disseminated. However most trees result from root suckers or cuttings.

PRODUCTIVITY: It is relatively fast growing. Diameter growth of 0.7 to 2 cm/yr has been reported.

MANAGEMENT IMPLICATIONS: Because of its fast growth it should be considered an ideal tree for use in a farm forestry program especially on wet sites. Useful in soil conservation programs.

WOOD PROPERTIES:

GRAIN: Straight, fine, and even textured.

COLOR: Light reddish brown to purplish brown.

DENSITY: Specific gravity of 0.49.

STRENGTH: Moderately light, soft.

USES: Fuel, match sticks, paper pulp, basket making, fodder, tannin, crates, cricket bats, and planking.

Salvadora oleoides Dene.
(Salvadoraceae)

COMMON NAMES: Van Pilu.

DESCRIPTION: A large evergreen shrub or tree, sometimes growing into a rather large tree. The leaves are 3.8 to 7.8 cm long. Bark is gray and slightly rough.

The flowers are 2.35 cm across. The fruit is a drupe 5 cm in diameter, sub-sessile, globose and yellow in color when ripe. Flowers occur in March and April. The seed matures in summer.

DISTRIBUTION: The tree is native to Pakistan and occurs throughout the plains of the Punjab. It is restricted to hot, dry areas of the Punjab waste lands.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows as scattered individuals or groups in the desert. Occurs with Prosopis cineraria and Capparis aphylla on a variety of well drained sandy soils. It is adapted to a precipitation zone of 100 to 250 mm/yr, in a temperature range of 10 to 50°C. It prefers an arid, dry, sub-tropical, tropical thorn type climate and is very susceptible to frost. In its natural range it is disease and insect free.

REPRODUCTION: It is reproduced from seed. Poly bag raised 1-year old seedlings can be successfully planted out.

PRODUCTIVITY: It grows about 6 cm/year in height.

MANAGEMENT IMPLICATIONS: The tree is currently being heavily lopped for fodder and fuel. Efforts should be made to initiate a planting program as well as a protection program for existing individuals and groups of individuals. It is a good fodder tree for harsh sites, but it needs to be managed. The tree would become extinct if new plantations are not raised in its natural ecological zone i.e. deserts of Thal, Cholistan and Tharparkar.

WOOD PROPERTIES:

GRAIN: Straight, fine, and even textured.

COLOR: Heart wood small, irregular, purple.

DENSITY: Calorific value of 5100 Kcal/kg.

STRENGTH: Light, hard.

USES: Fuel, fruit medicinal (leaves for coughs, root bark as vesicant, fruit extract for spleen), wheels, building materials, fodder, boat building knees, tools. Oil from seed.

Sapindus mukorossi Gaertn.
(Sapindaceae)

COMMON NAMES: Ritha, Soap Nut.

DESCRIPTION: A deciduous tree that sometimes grows to a rather large size with heights from 15 to 20 m and diameters of 60 to 80 cm. The leaves are compound, alternatively arranged with each leaf 15 to 45 cm long with 5 to 10 pairs of leaflets. There is no terminal leaflet on the leaf. The leaflets tend to become smaller towards the top of the leaf. They are leathery, lance shaped, pointed and have short stalks. The bark of young trees is light colored with many small bumps. Older trees have a gray-brown bark with irregular scales that peel off.

The greenish yellow flowers are fringed with hairs and borne in terminal panicles. The fruit is a drupe, 1.5 to 2.5 cm in diameter. Flowers occurs in May and June while fruit matures between June and January.

DISTRIBUTION: The tree is native to China and is cultivated in Japan, Bangladesh, India, and Pakistan. In Pakistan it is found in gardens. It has been successful planted in Azad Kashmir and Hazara and does well in the foothill regions.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that requires deep, moist soils. It is adapted to a precipitation zone of 1000 to 1750 mm/yr or more in a temperature range of -0 to 40°C. It prefers a sub-humid, cool, sub-tropical monsoon climate on elevations up to 600m. It appears to be disease and insect free.

REPRODUCTION: It is reproduced from seed or branch cuttings. The seed can be stored for up to a year and still maintain 90% viability.

PRODUCTIVITY: Trees with height of 9 m and diameter of 10 cm have been recorded in 5 years.

MANAGEMENT IMPLICATIONS: A valuable tree because of its soap nuts and its foliage which is used as fodder. It has potential as a farm forestry tree in the foothill regions.

WOOD PROPERTIES:

GRAIN: Straight, fine.

COLOR: Greenish, light yellow.

DENSITY: Compact, heavy.

STRENGTH: Moderately hard.

USES: Fodder and nuts for soap.

Sapium sebiferum (L.) Roxb.
(Euphorbiaceae)

COMMON NAMES: Tarcharbi, Chinese Tallow Tree.

DESCRIPTION: A small-sized deciduous tree 6 to 12 m tall with a diameter of 0.2 to 0.3 m. The crown may range from low spreading and multi-forked to slender columnar with small pendant branches. The leaves are simple, heart-shaped and 2 to 7.5 cm across. The bark is rough and light-gray.

It can be monecious but in some cases the flowers have both male and female parts. The yellow flowers occur in small, drooping bunches 5 to 20 cm long. The flowers occur between May and October. The fruit is a capsule and the fruiting period is between November and January.

DISTRIBUTION: The tree is native to China and Japan. In Pakistan it is planted in the plains and in gardens. Grows naturally along stream beds in Abbottabad. Used extensively in Islamabad for landscaping.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of soils, including wet and saline sites. It can be successfully grown on alkaline or poor soils. It requires a precipitation zone of 500 to 1200 mm/yr or more. It prefers a sub-humid to semi-arid, cool-warm sub-tropical monsoon climate with a temperature range of -10 to 40°C, up to an elevation of 1200 m. It is frost hardy and coppices readily. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means.

PRODUCTIVITY: A moderately fast growing tree, it has been reported to have a diameter growth MAI of 0.85 cm. In a plantation it is reported to have produced 22 m^3/ha/yr over a 4 year period.

MANAGEMENT IMPLICATIONS: This is a potentially useful tree in farm forestry programs. It can also be planted in watershed areas to help control erosion.

WOOD PROPERTIES:

GRAIN: Straight to rather deeply interlocked to wavy; lustre low, texture medium.

COLOR: Light yellow brown.

DENSITY: Specific gravity of 0.5 and a calorific value of 4100 kcal/kg.

STRENGTH: Weak, soft.

USES: Fuel, candles and soap (from wax on seed coat) ornamental, erosion control, apiculture, and crates and boxes.

Schinus molle Linn.
(Anacardiaceae)

COMMON NAMES: Kali mirch, The Pepper Tree.

DESCRIPTION: A large shrub or small evergreen tree. The leaves are compound 12 to 20 cm long with 15 to 27 leaflets or more on each leaf. The leaflets are small and lance shaped.

The flowers are very small and appear between February and March. The fruit is a drupe, 0.8 mm in diameter. It ripens from August to September.

DISTRIBUTION: The tree is native to Mexico, Chile and Brazil. In Pakistan it is commonly planted as an avenue tree in Lahore, Rawalpindi, Islamabad and Peshawar.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: Under cultivation it can be grown on very dry sites with a rainfall of as low as 250 mm/yr. Wind stress will result in a bushy growth form.

REPRODUCTION: Grown easily from seed. It can be coppiced.

PRODUCTIVITY: Fairly rapid growing.

MANAGEMENT IMPLICATIONS: A good avenue shade tree but trees may be damaged during the collection of the fruit. Although the fruit looks like a spice it has no food or spice value.

WOOD PROPERTIES:

GRAIN: Twisted, medium fine, somewhat uneven.

COLOR: Light.

DENSITY: Heavy.

STRENGTH: Strong and Hard.

USES: Ornamental, medicinal, fuel.

Sesbania sesban (Linn.) Merrill
(Leguminosae, sub family Papilionoideae)

COMMON NAMES: Jantar, Sesbania.

DESCRIPTION: A small tree, almost evergreen, attaining a height of up to 6 m and a diameter of 15 cm. Leaves are green and pinnate.

The flowers are pale yellow, slender and occur in the spring as well as in the autumn. Seed is produced in slightly twisted pods up to 25 cm long which contain many seeds.

DISTRIBUTION: The tree is native to Egypt and has now found its way into Africa and Asia. It is widely planted in all parts of Pakistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: Grows in a wide variety of climatic and edaphic conditions primarily with irrigation. It can be grown on saline sites. Young plants may be attacked by insect defoliators and stem borers.

REPRODUCTION: Grown very easily from seed which is sown directly.

PRODUCTIVITY: Can attain a height of 5 m in a year. Yield recorded in India was more than 5 tons/ha on a one year rotation.

MANAGEMENT IMPLICATIONS: It is fast growing but short lived tree that can be grown in plantations. It responds to pruning but gradually dies back under excessive pollarding. It is often used as green manure and its annual variety is extensively used for biological amelioration of saline soils. A highly desirable farm forestry tree because of its fast growth rate, its nitrogen fixing properties and the market opportunities for its products.

WOOD PROPERTIES:

GRAIN: Open textured.

COLOR: Light.

DENSITY: Low.

STRENGTH: Weak.

USES: Fuel, fodder, windbreak, support stakes for vegetables, soil improvement and fertilizer.

Syzygium cumini (Linn.) Skeels
(Myrtaceae)

COMMON NAMES: Jamun, Jaman, Black Plum.

DESCRIPTION: A large evergreen tree up to 40 m tall with a diameter of 1 to 2 m. The crown is spreading and dense. The leaves are simple, variable in size and shape, oval to oval-lance like 7 to 15 cm long, dark green, tough and leathery. The bark is smooth and the stem may be crooked. The bark is light to dark gray, with slight depressions.

The small white flowers have tassels and a sweet scent. They are arranged in bunches of threes and bloom usually between February and March. The fruit is a smooth, round fleshy berry that is purple black when ripe. The berry contains a single seed. The berries are edible and mature between June and August.

DISTRIBUTION: The tree is native to the subcontinent including Pakistan. It has been successfully planted in many areas of the world. In Pakistan it is found in the plains and lower hills of the Punjab, NWFP, and Azad Kashmir.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A very intolerant tree that grows on a variety of soils, from sands to loams as long as they are well drained. It is adapted to a precipitation zone of up to 1250 mm/yr. It prefers a semi-humid warm hot, sub-tropical winter/monsoon climate with a temperature range of -5 to 40°C at elevations up to 1500 m. It will coppice easily. The tree is frost hardy and can tolerate hot draughty conditions if irrigated. It has no known insect or disease problems.

REPRODUCTION: It is reproduced both from seed and by vegetative means. The seeds are small and should be planted immediate after collecting and de-pulping. They lose viability rapidly and do not store.

PRODUCTIVITY: It grows very fast. Height growth rates of 0.75 m/yr for young stands have been reported. MAI of 10 to 12 m^3/ha/yr is not uncommon over rotations of 20 years.

MANAGEMENT IMPLICATIONS: It is a good tree for reforestation projects because of its fast growth and wood value. It will do well on water-logged sites, and provides a number of useful products including fruit and fire wood. It is a excellent farm forestry tree ideally suited for planting on waterlogged farm sites.

WOOD PROPERTIES:

GRAIN: Interlocked, texture moderately fine.

COLOR: Wood is reddish gray to brownish gray.

DENSITY: Specific gravity of 0.70 and a calorific value of 4800 kcal/kg.

STRENGTH: Hard, heavy and resilient.

USES: Construction, fuel, fruit, medicinal (fruit is a carminative, seed for treatment of diabetes), tannin, shelterbelts, apiculture, paper pulp, shade, fodder and roadside planting.

Tamarindus indica Linn.
(Leguminosae, sub family Caesalpinoideae)

COMMON NAMES: Imli, Tamarind.

DESCRIPTION: A moderate to large-sized evergreen tree. At maturity heights to 25 m and diameter of 3 m have been recorded. On large trees the trunk is buttressed. The crown is wide, rounded and dense. The leaves are compound, 15 cm long and divided into 9 to 12 pairs of leaflets. The leaflets are gray-green, smooth, linear to oblong approximately 1.5 cm long and have short stalks. The bark is gray, cracked and scaly. The trunk is often forked into numerous large stems.

The flowers are small, yellowish with pink strips. They occur in loose bunches around a central axis between March and May. The fruit is a pod 7.5 to 20 cm long, 2.5 cm wide, 1 cm thick and slightly curved. The color of the pod is a grayish brown. It matures from June to July.

DISTRIBUTION: The tree is native to tropical Africa and has been planted extensively in tropical areas of Asia. It was introduced to Pakistan and India by Arab traders. It is well established in the Sindh and in the Punjab as far north as Jhelum.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that is adapted to a wide range of precipitation and soil conditions. It grows best on deep alluvium soils but does well as dry sandy soils. It is found in hot humid and dry tropical to sub-tropical climates with temperature as high as 40°C and a precipitation zone of 250 to 1250 mm/yr. It does not grow above 600 m elevation and is susceptible to frost damage. It has no known insect or disease problems.

REPRODUCTION: It is easily propagated by seed and by vegetative methods. It begins to produce fruit about age 10 to 12.

PRODUCTIVITY: It is long lived but slow growing. Height growth of young trees is approximately 0.5 to 0.8 m/yr.

MANAGEMENT IMPLICATIONS: A long lived, drought resistant tree that should be an excellent farm forestry tree in the Sindh, Balochistan and southern parts of the Punjab.

WOOD PROPERTIES:

GRAIN: Closed grained with radiating ramifications.

COLOR: Sapwood is yellowish-white with reddish streaks. Heartwood is dark purplish-brown.

DENSITY: Very hard, with a specific gravity of 0.91 to 1.28. It has a calorific value between 4909 and 4969 kcals/kg.

STRENGTH: Strong and resilient.

USES: Implement handles, fuel, charcoal, furniture, wheels and axles, fodder, food (curries and pickles) medicinal (pulp is a mild laxative), apiculture and ornamental.

Tamarix aphylla (L.) Karst.
(Tamaricaceae)

COMMON NAMES: Frash, Ghaz, Khaggal, Tamarisk.

DESCRIPTION: An erect medium to large sized evergreen tree. It reaches heights of 10 to 18 m with diameters of 1 m, and has a non-spreading crown. The leaves are minute and scale like.

The white, minute flowers are borne in spikes and arranged in panicles. Flowers occurs between April and September, while seed matures between December and January.

DISTRIBUTION: The tree is native to the Middle East including Pakistan, central Asia, North Africa and Arabia. In Pakistan it is common to the plains of the Punjab, Sindh, Balochistan and NWFP. Extensively planted in the sand dune area of Thal desert.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A strongly intolerant tree that grows well on well drained sandy soils and can tolerate highly saline/sodic sites. It is adapted to a precipitation zone of 100 to 500 mm/yr with prolonged periods of draught. It has a temperature range of -1 to 50°C and is frost hardy. It prefers a arid to hot sub-tropical winter monsoon climate and usually occurs at elevations below 600 m. It is disease and insect free with the exception of some minor gall forming insects.

REPRODUCTION: It is reproduced from cuttings and root suckers, rarely from seed. Seed is small and produced in large numbers. Natural regeneration is common and very dense.

PRODUCTIVITY: Diameters upto 30 cm have been attained in 12 years. Wood production of 5 to 10 m^3/ha/yr has been reported.

MANAGEMENT IMPLICATIONS: This is a very valuable tree in arid areas. It can withstand extreme temperatures and saline/soil and water conditions. It is also useful for the stabilization of sand dunes and in shelter belts. A simple coppice system can be used to produce considerable amounts of firewood under a rotation of 20 years.

WOOD PROPERTIES:

GRAIN: Straight to twisted fibrous, coarse and uneven textured.

COLOR: White, with a yellowish tinge.

DENSITY: Specific gravity of 0.68 and a calorific value of 4835 kcal/kg.

STRENGTH: Moderately hard, heavy and nondurable.

USES: Carpentry, agriculture implements, fuelwood, shelter belts, charcoal, tannin, erosion control, and sand dune stabilization.

Tecomella undulata Seem.
(Bignoniaceae)

COMMON NAMES: Lahura, Forest fire.

DESCRIPTION: A small-sized deciduous tree. Heights of 12 m and diameters of 0.5 to 0.8 m are not uncommon. Leaves are opposite, simple and 3 to 9.5 cm long.

The flowers are pale yellow to orange and appear in dense clusters from February to May. The fruit is a capsule or pod 17 to 34 cm long. The pods mature between April and July.

DISTRIBUTION: The tree is native to Pakistan, India and Afghanistan. In Pakistan it occurs in Punjab, Sindh, Balochistan and NWFP. Planted along raods and canals.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A moderately intolerant tree that grows on a variety of soils and sites. Its requires a precipitation zone of 200 to 1200 mm/yr. It prefers an arid, semi-arid, hot sub-tropical winter monsoon climate with a temperature range of 0 to 45°C on elevations up to 1200 m. It is frost and drought hardy. It has no known insect or disease problems.

REPRODUCTION: It can be reproduced from seed. The seeds are winged, 2 cm long and broad.

PRODUCTIVITY: It is a very slow growing tree. Diameters of 5 to 8 cm in five years are not uncommon.

MANAGEMENT IMPLICATIONS: This very drought resistant tree has potential as a commercial cover crop on arid and semi-arid tracts of land that are now without vegetation. It is an attractive ornamental.

WOOD PROPERTIES:

GRAIN: Straight, medium coarse and somewhat even-textured.

COLOR: Grayish to yellowish brown.

DENSITY: Specific gravity of 0.57 to 0.83.

STRENGTH: Strong, resilient.

USES: Fuel, ornamental, furniture and carving, medicinal (flowers as a vermifuge) and agricultural implements.

Terminalia arjuna (Rox. Ex D.C.) Wight & Arn.
(Combretaceae)

COMMON NAMES: Arjun.

DESCRIPTION: A large evergreen tree 21 to 30 m tall with a diameter of 1 to 2.5 m. It has an open, spreading crown with drooping branches. The leaves are simple with smooth margins, and are oblong or elliptic 10 to 15 cm long. The truck is buttressed with pronounced ridges. The bark is thick, pinkish green to gray and peels off in large thin sheets.

The flowers are yellowish white and occur in bunches 3 to 6 cm long between April and May. The fruit is a wood capsule 2.5 to 5 cm long. The cones mature in May and June.

DISTRIBUTION: The tree is native to the subcontinent. In Pakistan it has been planted throughout the plains, in gardens and as a roadside tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A shade tolerant tree that grows on a variety of moist sites if they are well drained. It will grow on saline, sodic and waterlogged sites. It requires a precipitation zone of 750 to 3800 mm/yr. It prefers a humid, hot tropical, sub-tropical monsoon climate with a temperature range of 0 to 45°C on elevations up to 600 m. The tree is not frost hardy. It has no known insect or disease problems.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: It is a fast growing tree that can produce yields between 10 and 12 m^3/ha/yr. Heights of 5 to 8m have been recorded in a 5 year period.

MANAGEMENT IMPLICATIONS: This fast growing tree can grow on waterlogged and saline sites. It is valuable for fuel and other wood products. It is also useful for erosion control. The leaves are used for winter fodder and can also be used to feed tasar silkworms. An excellent farm forestry tree for areas where there are sodic, saline and waterlogged conditions.

WOOD PROPERTIES:

GRAIN: Wavy, coarse and even-textured.

COLOR: Sapwood is reddish white and heartwood is brown with streaks.

DENSITY: Specific gravity of 0.9 and a calorific value of 5000 kcal/kg.

STRENGTH: Hard, heavy, resilient.

USES: Fuel, implements, erosion control, wheels, spokes and axles, fodder, medicinal (bark is a astringent and cardiac stimulant), timber and ornamental.

Terminalia belerica (Gaertn.) Roxb.
(Combretaceae)

COMMON NAMES: Bahera, Beleric Myrabolam.

DESCRIPTION: A large deciduous tree 24 to 30 m tall with a diameter of 0.6 to 2.5 m. It has a massive spreading crown. The leaves are simple but clustered near the ends of the branches. The leaves are oblong or elliptic 8 to 20 cm long and leathery. The trunk is buttressed with pronounced ridges. The bark is thick, bluish or ash gray with vertical furrows.

The flowers are greenish yellow with an offensive odor and occur in bunches 7 to 15 cm long. It is monoecious with the flower bunches divided into separate male and female flowers. The female flowers are in the lower parts of the bunch with the males in the upper portion. The flowers appear between April and June. The fruit is a fleshy nut 3 cm long. The nuts mature in December.

DISTRIBUTION: The tree is native to the subcontinent. In Pakistan it is in the sub-himalayan tract east of Rawalpindi, to Sialkot and Azad Kashmir. It has been planted throughout the plains, in gardens and as a roadside tree.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that grows on a variety of moist soils if they are well drained. It requires a precipitation zone of 750 to 1750 mm/yr. It prefers a humid, hot tropical, sub-tropical monsoon climate with a temperature range of -5 to 40°C on elevations up to 900 m. The tree is not frost hardy. There are a number of fungi that attack it but they do not cause significant damage.

REPRODUCTION: It can be reproduced both from seed and by vegetative means.

PRODUCTIVITY: It is a fast growing tree. Diameter growth MAI of 0.24 to 0.69 cm have been recorded.

MANAGEMENT IMPLICATIONS: This is a fast growing tree, valuable for fuel and other wood products. The nut is a favorite food for many animals. It will coppice. It is an excellent farm forestry tree.

WOOD PROPERTIES:

GRAIN: Straight, coarse and even-textured.

COLOR: Yellowish gray.

DENSITY: Specific gravity of 0.69.

STRENGTH: Hard, heavy, resilient.

USES: Fuel, implements, boats, tannin, fodder (nuts) medicinal (fruit is a laxative) timber, nut intoxicate and ornamental.

Ulmus wallichiana Planch.
(Ulmaceae)

COMMON NAMES: Kain, Himalayan Elm.

DESCRIPTION: A large sized deciduous tree.It reaches heights of 24 to 27 m with diameters of 1.2 to 1.5 m. Large trees will have an ascending crown. The leaves are simple, alternate, 7 to 15 cm long. The bark is rough, gray to dark gray and deeply furrowed.

The flowers are in congested bunches on the leafless branches. The fruits are 12 to 15 mm long. It flowers in March to April while fruit matures between April and June.

DISTRIBUTION: The tree is native to Pakistan, India and Nepal. In Pakistan it is found in Swat, Hazara, Murree, Azad Kashmir and Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: A tolerant tree that becomes more intolerant with age. It grows on deep, well drained soils and prefers moist ravines and broad leaved forests. It is adapted to a precipitation zone of 750 to 1250 mm/yr. It has a temperature range of -10 to 35°C. It prefers a sub-humid, cool to semi-arid, warm subtropical, temperate climate usually at elevations of 1000 to 3000 m. Although it is sometimes attacked by wood borers they cause little economic damage.

REPRODUCTION: It is reproduced from seed. Seeds are small and lose their viability shortly after ripening.

PRODUCTIVITY: Diameter growth of 0.85 cm/year has been observed.

MANAGEMENT IMPLICATIONS: The tree has value as it produces wood, fodder and cordage. It can be successfully cultivated around villages and has potential as a ornamental. It has potential as a farm forestry tree in agroforestry systems in high elevation areas.

WOOD PROPERTIES:

GRAIN: Straight, coarse and uneven-textured.

COLOR: Grayish brown.

DENSITY: Specific gravity of 0.67.

STRENGTH: Hard, strong, and heavy.

USES: Tool handles, agriculture implements, fodder, furniture and cordage.

Zizyphus mauritiana Lam.
(Rhamnaceae)

COMMON NAMES: Ber, Chinese date.

DESCRIPTION: A spiny deciduous or evergreen shrub or small tree 12 m tall with a diameter of 40 cm. The crown is spreading with drooping branches. The leaves are simple elliptical to rounded 2.5 to 6 cm long and 1.5 to 5 cm wide. The leaf tips are slightly rounded with finely wavy-tooth margins. The leaves are shiny green and hairless on the tops with dense whitish hairs underneath. Spines are curved, brownish, and 3 to 6 mm long. On harsh sites it is a dense shrub 3 to 4 m tall. The bole is straight and the bark is light to dark gray with many deep furrows.

The flowers are small 5 mm across in clusters and are quite fragrant, yellow, densely hairy and bloom between April and October. The fruit is shiny orange-red or reddish-brown and edible, 2 to 2.5 cm long. The seed matures from December through March.

DISTRIBUTION: The tree is native to South Asia including Pakistan. It has been successfully cultivated in many parts of the world. It can be seen throughout Pakistan but it grows best at lower elevations in the Punjab, NWFP, Sindh and Balochistan.

SILVICAL CHARACTERISTICS:

HABITAT AND ECOLOGY: An intolerant tree that has no particular soil requirements and grows on a variety of sites. It prefers a warm temperate to sub-tropical to tropical climate and is adapted to a precipitation zone of 600 to 1500 mm/yr within a temperature range of -5 to 50°C. It can withstand drought periods and is frost hardy. It prefers an elevation range up to 600 m. It is susceptible to fruit flies and defoliating insects. These pests can be controlled by timely spraying of insecticides.

REPRODUCTION: It is reproduced from seed and by vegetative means. Seed can be stored up to 3 years without refrigeration and maintain viability. Cracking the hard seed coat before planting will increase germination. Seed is kept in cowdung for 10 days to hasten germination.

PRODUCTIVITY: A fast growing tree where height growth of 7 m in a five year period has been reported.

MANAGEMENT IMPLICATIONS: In the past this tree has been planted on farms for its fruit, but also has potential for use in reforestation projects and erosion control on denuded watersheds. The fruit is valuable. It has excellent potential as a farm forestry tree.

WOOD PROPERTIES:

GRAIN: Very fine.

COLOR: Wood is reddish brown.

DENSITY: Specific gravity of 0.93 and a calorific value of 5900 kcal/kg.

STRENGTH: Hard, heavy, strong.

USES: Fuel, charcoal, agricultural implements and fruit.

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APPENDICES

APPENDIX - I

GLOSSARY OF TERMS

Buttressed - Swollen at the base.

Deciduous - Leaves fall annually.

Dioecious - Male and female flowers on different trees.

Intolerant - Tree requires exposure to direct sunlight to grow.

Monoecious - Male and female flowers are separate but on the same tree.

Phyllodes - Flat expanded petiole that replaces the blade of a foliage leaf.

Tolerant - Tree will grow in shade.

Viviparous Seed - Seed germinates on the tree.

APPENDIX - II

LIST OF TREES BY NATIVE AND EXOTIC SPECIES

Native Species

Abies pindrow
Acacia catechu
Acacia modesta
Acacia nilotica
Acacia senegal
Acer caesium
Acer oblongum
Aegle marmelos
Aesculus indica
Albizzia lebbek
Alnus nitida
Avicennia marina
Azadirachta indica
Bauhinia purpurea
Bauhinia variegata
Betula utilis
Bombax cieba
Butea frondosa
Buxus wallichiana
Cassia fistula
Cedrela serrata
Cedrela toona
Cedrus deodara
Celtis eriocarpa
Ceriops tagal
Cordia myxa
Crataeva religiosa
Dalbergia sissoo
Ehretia serrata
Erythrina suberosa
Fraxinus hookeri
Fraxinus xanthoxyloides
Grewia optiva
Juglans regia
Juniperus excelsa
Mangifera indica
Melia azedarach
Moringa pterygosperma
Morus alba
Olea ferruginea
Phyllanthus emblica
Picea smithiana
Pinus gerardiana
Pinus roxburghii
Pinus wallichiana
Pistacia integerrima
Pistacia khinjuk
Populus caspica
Populus ciliata
Populus euphratica
Populus nigra
Prosopis cineraria
Prunus cornuta

Exotic Species

Acacia albida
Acacia aneura
Acacia cyclops
Acacia farnesiana
Acacia saligna
Acacia seyal
Acacia tortilis
Ailanthus altissima
Ailanthus excelsa
Albizzia procera
Alstonia scholaris
Bishofia javanica
Broussonetia papyrifera
Callistemon viminalis
Casuarina equisetifolia
Ceratonia siliqua
Conocarpus lancifolius
Cupressus arizonica
Delonix regia
Derris indica
Elaeagnus hortensis
Eucalyptus camaldulensis
Eucalyptus citriodora
Eucalyptus microtheca
Eucalyptus tereticornis
Ficus religiosa
Gleditsia triacanthos
Gmelina arborea
Grevillea robusta
Heterophragma adenophyllum
Jacaranda ovalifolia
Leucaena leucocephala
Millingtonia hortensis
Parkinsonia aculeata
Peltophorum pterocarpum
Phoenix dactylifera
Pinus brutia
Pinus halepensis
Pitheclobium dulce
Platanus orientalis
Populus deltoides
Populus euramericana
Prosopis juliflora
Robinia pseudoacacia
Salix babilonica
Sapindus mukorossi
Sapium sebiferum
Schinus molle
Sesbania sesban
Tamarindus indica

Native Species

Pyrus pashia
Quercus baloot
Quercus dilatata
Quercus glauca
Quercus incana
Quercus semicarpifolia
Rhizophora mucronata
Salix acmophylla
Salix tetrasperma
Salvadora oleoides
Syzygium cumini
Tamarix aphylla
Tecomella undulata
Terminalia arjuna
Terminalia belerica
Ulmus wallichiana
Zizyphus mauritiana

APPENDIX - III

LIST OF TREES BY COMMON AND SCIENTIFIC NAMES

Common name	Scientific name
Aam	*Mangifera indica*
Akhrot	*Juglans regia*
Alder	*Alnus nitida*
Aleppo pine	*Pinus halepensis*
Amaltas	*Cassia fistula*
Amla	*Phyllanthus emblica*
Arizona cypress	*Cupressus arizonica*
Arjun	*Terminalia arjuna*
Ash	*Fraxinus hookeri*
Asiatic mangrove	*Rhizophora mucronata*
Asmani	*Ailanthus altissima*
Australian Kikar	*Acacia aneura*
Babul	*Acacia nilotica*
Bael	*Aegle marmelos*
Bahan	*Populus euphratica*
Bahari Kachnar	*Bauhinia variegata*
Bahera	*Terminalia belerica*
Bakain	*Melia azedarach*
Ban Khor	*Aesculus indica*
Banjar	*Quercus semicarpifolia*
Banni	*Quercus glauca*
Barin oak	*Quercus glauca*
Barna	*Crataeva religiosa*
Barungi	*Quercus dilatata*
Batangi	*Pyrus pashia*
Batkhar	*Celtis eriocarpa*
Bed-i-laila	*Salix tetrasperma*
Beefwood	*Casuarina equisetifolia*
Beleric myrabolam	*Terminalia belerica*
Ber	*Zizyphus mauritiana*
Bhoj Patra	*Betula utilis*
Bhora	*Rhizophora mucronata*
Biar	*Pinus wallichiana*
Birch	*Betula utilis*
Bird cherry	*Prunus cornuta*
Bisee	*Salix acmophylla*
Bishop wood	*Bishofia javanica*
Black siris	*Albizzia lebbek*
Black locust	*Robinia pseudoacacia*
Black plum	*Syzygium cumini*
Blue pine	*Pinus wallichiana*
Botal bursh	*Callistemon viminalis*
Bottle brush	*Callistemon viminalis*
Boxwood	*Buxus wallichiana*
Brown oak	*Quercus semicarpifolia*
Bunj	*Quercus baloot*
Carob tree	*Ceratonia siliqua*
Casuarina	*Casuarina equisetifolia*
Chalghoza pine	*Pinus gerardiana*
Chattian	*Alstonia scholaris*
Chinar	*Platanus orientalis*
Chinese date	*Zizyphus mauritiana*
Chinese Tallow tree	*Sapium sebiferum*
Chir pine	*Pinus roxburghii*

Common name	Scientific name
Chitta Sufeda	*Populus caspica*
Coral tree	*Erythrina suberosa*
Cutch tree	*Acacia catechu*
Cyprus pine	*Pinus brutia*
Date palm	*Phoenix dactylifera*
Deodar	*Cedrus deodara*
Dhak	*Butea frondosa*
Dhamman	*Grewia optiva*
Diar	*Cedrus deodara*
Dita Bark Tree	*Alstonia scholaris*
Doghla poplar	*Populus euramericana*
Dozakh	*Gleditsia triacanthos*
Dravi	*Cedrela serrata*
Ethiopian teak	*Conocarpus lancifolius*
Euphrates poplar	*Populus euphratica*
Flame of the forest	*Butea frondosa*
Flooded Box	*Eucalyptus microtheca*
Forest fire	*Tecomella undulata*
Frash	*Tamarix aphylla*
Ghalab	*Conocarpus lancifolius*
Ghaz	*Tamarix aphylla*
Gold mohur	*Delonix regia*
Golden wreath wattle	*Acacia saligna*
Golden Shower	*Peltophorum pterocarpum*
Gu-Kikar	*Acacia farnesiana*
Gul mohar	*Delonix regia*
Gul-i-Nishter	*Erythrina suberosa*
Gulabi Saru	*Cupressus arizonica*
Guli-pista	*Pistacia khinjuk*
Gum Arabic	*Acacia senegal*
Gumhar	*Gmelina arborea*
Hill Toon	*Cedrela serrata*
Himalayan cedar	*Cedrus deodara*
Himalayan poplar	*Populus ciliata*
Himalayan spruce	*Picea smithiana*
Himalayan Pencil Cedar	*Juniperus excelsa*
Himalayan Elm	*Ulmus wallichiana*
Holy oak	*Quercus baloot*
Honey locust	*Gleditsia triacanthos*
Horse chestnut	*Aesculus indica*
Horseradish Tree	*Moringa pterygosperma*
Hybrid poplar	*Populus euramericana*
Imli	*Tamarindus indica*
Indian olive	*Olea ferruginea*
Indian willow	*Salix tetrasperma*
Indian cork tree	*Millingtonia hortensis*
Indian Laburnum	*Cassia fistula*
Indian Gooseberry	*Phyllanthus emblica*
Ipil Ipil	*Leucaena leucocephala*
Irum	*Bishofia javanica*
Jacaranda	*Jacaranda ovalifolia*
Jaman	*Syzygium cumini*
Jamun	*Syzygium cumini*
Jand	*Prosopis cineraria*
Jangle Jalebi	*Pithecolobium dulce*
Jantar	*Sesbania sesban*
Jerusalem thorn	*Parkinsonia aculeata*
Kachal	*Picea smithiana*
Kachnar	*Bauhinia purpurea*
Kaghzi toot	*Broussonetia papyrifera*

Common name	Scientific name
Kahu	*Olea ferruginea*
Kail	*Pinus wallichiana*
Kain	*Ulmus wallichiana*
Kala sirin	*Albizzia lebbek*
Kala kat	*Prunus cornuta*
Kali mirch	*Schinus molle*
Kaliar	*Bauhinia variegata*
Kamo	*Rhizophora mucronata*
Kandi	*Prosopis cineraria*
Kangar	*Pistacia integerrima*
Katha	*Acacia catechu*
Khaggal	*Tamarix aphylla*
Khair	*Acacia catechu*
Khajur	*Phoenix dactylifera*
Khanjak	*Pistacia khinjuk*
Khumbat	*Acacia senegal*
Kikar	*Acacia nilotica*
Kirmola	*Acer oblongum*
Kirrari	*Ceriops tagal*
Kunro	*Rhizophora mucronata*
Lachi	*Eucalyptus camaldulensis*
Lachi	*Eucalyptus tereticornis*
Lahura	*Tecomella undulata*
Lasura	*Cordia myxa*
Lemon Scented Gum	*Eucalyptus citriodora*
Lombardy poplar	*Populus nigra*
Maharukh	*Ailanthus excelsa*
Majnu	*Salix babilonica*
Mango	*Mangifera indica*
Manila Tamarind	*Pithecolobium dulce*
Maple	*Acer caesium*
Margosa tree	*Azadirachta indica*
Mysore hybrid	*Eucalyptus tereticornis*
Mesquite	*Prosopis juliflora*
Mostan Phul	*Heterophragma adenophyllum*
Mulberry	*Morus alba*
Nakhtar	*Pinus roxburghii*
Neem	*Azadirachta indica*
Nettle tree	*Celtis eriocarpa*
Nila gul mohar	*Jacaranda ovalifolia*
Nim Chameli	*Millingtonia hortensis*
Northern Cottonwood	*Populus deltoides*
Obusht	*Juniperus excelsa*
Palach	*Populus ciliata*
Palosa	*Acacia modesta*
Paludar	*Abies pindrow*
Panhgor	*Acer oblongum*
Paper mulberry	*Broussonetia papyrifera*
Parkinsonia	*Parkinsonia aculeata*
Partal	*Abies pindrow*
Persian lilac	*Melia azedarach*
Pharawa	*Grewia optiva*
Phulai	*Acacia modesta*
Pipal	*Ficus religiosa*
Plane tree	*Platanus orientalis*
Ponga oil tree	*Derris indica*
Pongam	*Derris indica*
Punna	*Ehretia serrata*
Puran	*Ehretia serrata*
Purple bauhinia	*Bauhinia purpurea*

Common name	Scientific name
Quetta pine	*Pinus halepensis*
Red River Gum	*Eucalyptus camaldulensis*
Rein	*Quercus incana*
Religious tree	*Crataeva religiosa*
Reshmi oak	*Grevillea robusta*
Ritha	*Sapindus mukorossi*
Robinia	*Robinia pseudoacacia*
Rooikrans	*Acacia cyclops*
Rose wood	*Dalbergia sissoo*
Russian Olive	*Elaeagnus hortensis*
Sada sabz	*Ceratonia siliqua*
Samor	*Acacia tortilis*
Sanjata	*Elaeagnus hortensis*
Sanp phali	*Heterophragma adenophyllum*
Sebasten plum	*Cordia myxa*
Sesbania	*Sesbania sesban*
Shamshad	*Buxus wallichiana*
Shang	*Fraxinus xanthoxyloides*
Sharol	*Alnus nitida*
Shisham	*Dalbergia sissoo*
Shittim	*Acacia seyal*
Siah poplar	*Populus nigra*
Silk Cotton Tree	*Bombax cieba*
Silver fir	*Abies pindrow*
Silver oak	*Grevillea robusta*
Simal	*Bombax cieba*
Soap nut	*Sapindus mukorossi*
Sohanjna	*Moringa pterygosperma*
Subabul	*Leucaena leucocephala*
Sudani kikar	*Acacia albida*
Sufed sirin	*Albizzia procera*
Sufed poplar	*Populus deltoides*
Sufed kikar	*Acacia albida*
Sufeda	*Eucalyptus citriodora*
Sufeda	*Eucalyptus tereticornis*
Sufeda	*Eucalyptus camaldulensis*
Sufeda	*Eucalyptus microtheca*
Sum	*Fraxinus hookeri*
Sunehri Har	*Acacia saligna*
Tagal mangrove	*Ceriops tagal*
Tahli	*Dalbergia sissoo*
Talh	*Acacia seyal*
Tamarind	*Tamarindus indica*
Tamarisk	*Tamarix aphylla*
Tarcharbi	*Sapium sebiferum*
The pepper tree	*Schinus molle*
Timar	*Avicennia marina*
Timmar	*Rhizophora mucronata*
Tivar	*Avicennia marina*
Tree of Heaven	*Ailanthus altissima*
Trekhan	*Acer caesium*
Tun	*Cedrela toona*
Tut	*Morus alba*
Umbrella thorn	*Acacia tortilis*
Van Pilu	*Salvadora oleoides*
Vilayati Kikar	*Acacia farnesiana*
Walnut	*Juglans regia*
Weeping willow	*Salix babilonica*
White siris	*Albizzia procera*
White poplar	*Populus caspica*
White Oak	*Quercus Incana*
Wild pear	*Pyrus pashia*
Willow	*Salix acmophylla*
Yemane	*Gmelina arborea*
Zard fawwar	*Peltophorum pterocarpum*
Ziarat ash	*Fraxinus xanthoxyliodes*