

Role of Riparian Vegetation in Pakistan¹

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Abstract.--Pakistan is poor in forest resources, and exploits all possible sources of wood to fulfill its needs for fuel, timber and other wood products. Riparian species are a major source of wood in many parts of the country, particularly in the province of Sind. The important riparian species in the country are Acacia arabica, Dalbergia sissoo, Tamarix spp., Salix sp., Morus alba, Populus euphratica and other Populus species.

INTRODUCTION

At the time of independence from British rule and the separation from India in 1947, Pakistan was apportioned only a small area of productive forest land. Whatever was available, was over-exploited to meet the immediate and heavy demands created by the influx of refugees and the growing needs of development. The forest lands which fell to Pakistan were mostly confined to the northern hilly portion of the country with some irrigated plantations and riverine forests in the south.

The total area of the country classified as forest land and administered by the Forest Department has now been increased to the extent of about 4.3 million hectares, almost 5 percent of the total land area of the country. The increase is partly due to avenue plantings along roads, canals, and railway lines and to the establishment of irrigated plantations in barrage zones. Major additions were made by the appropriation of unclassified and privately owned lands. However, less than one half of the national forest area is classified as productive.

The present forest lands are not sufficient to meet national and local demands for wood and other forest products. The deficiency must be fulfilled from private farm forests and by imports. The remainder of the national forest area is

classified as protective forest lands. Some of this area is in steep topography in the more humid, northern part of the country, but the greater portion is in the arid, semi arid provinces in the central and southern parts of the country. These dryland forests are primarily composed of Prosopis, Acacia, Ziziphus, and Capparis tree species and various shrubs. These trees and shrubs have no commercial value but are exploited for fuelwood and fodder by local people (Sheikh 1977).

Of the total national forest area, about 7 percent is in the inundation plain of the Indus river (Amjad 1982). Most of these riverine forests are located in Sind province in the south and are the major source of wood products for the province. In a country poor in forest resources all possible sources of wood are exploited. Riparian vegetation is an important source of wood not only in fulfilling national needs but also in fulfilling the needs of local populations. The purpose of this paper is to review the role played by riparian vegetation, primarily that along the Indus river, in meeting these needs.

THE INDUS

The Indus is the principal river in Pakistan. It originates in the Himalayan Ranges within India and enters Pakistan from the northeast. Passing through the Himalayans it receives the Kabul river at Attock, and after passing through the Salt Ranges to the south of the Himalayans it enters the arid Indus plain at Kalabagh. The major tributary rivers, Jehlum, Chenab, Ravi and Sutlej, also originate in the Himalayans and join at Punjnad near Multan. In addition to small tributaries, the Indus also receives the Kurrum and Gomal rivers from the west from Kalabagh. The

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The river flows 1250 km southward through the Indus plain and enters the Arabian sea near Karachi.

In the northern part of the Indus plain between Kalabagh and Punjab the river has incised a narrow flood plain 24 km wide and 450 km long. The western edge of the flood plain is adjacent to a high, alluvial plateau and the eastern edge is bounded by the sandy Thal desert. Within these confines, the river continuously changes its path and divides and subdivides into branches, which reunite to form a braided system. The new alluvial plains so developed are invaded by pioneer plant species followed by several stages of plant succession which reaches a typical climax riverine forest with the passage of time. Eventually these forest areas are eroded and engulfed by the river. Sediment is deposited on the opposite side forming huge side bars which result in the formation of new fluvial plains. The formation of fluvial plains by erosion and deposition is a regular feature of the Indus. Because the river is confined by the high lands on both sides of the flood-plain, the area is inundated annually during the monsoon season of July and August.

Below Punjab, the river enters the southern flood plain in Sind Province where the topography is flat. Due to the annual deposition of large sediment loads, the level of the riverbed and the areas immediately adjacent have been slowly raised above the surrounding plain. The results in the past were annual floods which caused heavy loss of life, property and agricultural crops.

About 100 years ago levies were constructed on both sides of the river roughly 24 km apart for a distance of 800 km to contain the river during the flood season. This has created a condition in the southern flood plain very similar to that of the northern portion and with similar plant communities.

This 24 km by 1250 km flood plain was the main source of food, fodder and wood for local populations for many years. The moisture retained by the clayey alluvial soil from the receding flood water was sufficient to mature winter crops of wheat, grain, lentils, peas and oil seeds. The same agricultural practices continue today. However, the greater portion of food production is from irrigated agriculture. Extensive irrigation works of reservoirs, diversions, and canals have now been constructed along the river. Rainfall varies from about 250 mm in the northern portion of the plain to 150 mm in the southern portion.

THE RIVERINE FORESTS OF THE INDUS

The principal species of the southern flood plain are Acacia arabica, Prosopis spicigera, Populus euphratica, Tamarix articulata, Tamarix dioica and Salvadora sp. In many areas these trees may form a fairly complete canopy 12-15 m high in which Acacia arabica usually predominates with varying amounts of Prosopis spicigera. Populus euphratica is usually present in the drier areas.

Plant succession in the flood plain begins with the pioneer species, elephant grass (Typha elephantina). This is an aquatic plant that invades newly deposited but permanently submerged alluvium. It commonly grows in the water near the banks of shallow streambeds. As sediment from successive floods is trapped by the grass, the alluvium is raised to a level where flooding only occurs during the monsoon season. At this stage, elephant grass is replaced by Saccharum spontaneum, a tall grass which reaches a height of 2 m. If deposition continues the site is invaded by dense thickets of Tamarix dioica. This shrub species has single stems, which are seldom greater than 3 cm in diameter, and grows to a uniform height of about 2 m. Successive sediment deposits may build the alluvium to a level where internal drainage will allow tree growth. The site may then be occupied by the climax species Acacia arabica, Eucalyptus euphratica and Tamarix articulata. Prosopis spicigera and the shrub like tree, Salvadora sp, may occupy the margins between the riverine forest and the subtropical thorn forest. If tree species do not invade the site, or are removed, the tall grass, Saccharum munja, will dominate the site.

The riparian vegetation of the northern flood plain has a composition similar to that of the southern plain but with the absence of Acacia arabica. This tree is not frost hardy and is supplanted by Dalbergia sissoo, an introduced species that withstands cold temperatures. This tree is valued for fuel and timber and is planted in irrigated plantations.

USES AND MANAGEMENT OF RIVERINE SPECIES

The riparian vegetation of the Indus and its tributaries helps in stabilizing river banks and providing habitat for wildlife. However, nearly every component of the community has value in fulfilling some human need, and ingenious uses of the materials provided by each of the riparian species have developed over the centuries.

Principal Species

Acacia arabica is the principal commercial tree and the dominant species in the southern riverine forest. The management system used with the species involves clear cutting on a 20 year cycle followed by broadcast seeding toward the end of the monsoon season when the river is receding. This is a fast growing multipurpose tree used for the production of timber, fuel and other wood products and is the main source of mine props for the country. The bark is used for tannin and the gum is collected for a variety of uses. It is a very good browse species and the foliage is also used during the dry season as fodder for camels and goats. The animals, particularly goats, prefer the pods and help both in the dissemination of seeds and in their germination. Large herds of goats are encouraged in the area partly for this purpose. The seeds have hard coats that otherwise must be treated with acid or boiling water if used in artificial regeneration.

Dalbergia sissoo is the principal commercial species in the northern riverine forests. The tree reseeds naturally but is also planted extensively. Seedlings are grown in the nursery for one year where they attain a height of about one meter. The stem is then pruned off about 2 cm above the root crown, and the root-shoot is used for outplanting. Plantings are made on the edges of excavated, boot shaped pits at spacings of 4.6 m. The pits are about 10 meters long, a foot or so wide and one foot deep. Their purpose is to retain water and to assist in natural regeneration by root suckers. The plant sites are irrigated by hand at the time of outplanting. Once the species has been established on an area, regeneration by root suckers and coppicing sustains the stand. Thinnings for fuelwood are made at intervals of 6 years up to 30 years and at 10 year intervals thereafter up to 60 years. The final cut is made at age 60 to produce fine cabinet wood and wood for ornamental objects.

Minor Species

Populus euphratica is a fast growing species which provides fuelwood and supplies the wood used in lac work, turneries and for handicraft cottage industries.

Tamarix articulata is also fast growing and occupies moist sites. It is a good browse species and supplies wood for fuel, agricultural implements and also for handicraft cottage industries.

Prosopis spicigera is slow growing and occupies dry sites in the transition zone between the riverine and thorn forests. It is a preferred source of fuelwood and timber and is a good source of fodder for camels, goats and sheep.

Tamarix dioica is a scrub species favored for basket making. It is also a good browse species and is used for fuel.

Grass Species

Saccharum munja is a good grass for cattle when in the early growing stage. When mature it produces stems 3-4 meters long which are used as thatching material for roofs of houses and sheds in the villages. The stems are also used for making baskets, woven stools and chairs, and were the main material used for making writing pens which are still used by primary school children in villages.

Saccharum spontaneum provides good forage both in the early growing stages and at maturity when the grass is about 2 meters tall, it is harvested and stored for livestock fodder for the winter. The grass is also used as short fiber material in the paper pulp industry. About 4,852,000 kg are harvested annually for this industry.

Typha elephantina is prized for its soft, fluffy leaves which are 2 to 3 cm broad and more than a meter long. Because of their softness, the leaves are used throughout Pakistan on sleeping cot beds. The fibers are also used for mats, baskets and strings for cots.

Riparian Vegetation of the Indus Tributary System

In addition to these typical Indus riverine forests, plants grow on the banks of tributary rivers and stream channels in the northern hill tract and western mountain ranges. The riparian vegetation of the tributaries plays an important role equal to that of the Indus in providing wood and other products for local populations. The main species are Dalbergia sissoo, Morus alba, willow, Populus ciliata, Populus euroamericana in addition to Tamarix and grasses.

The wood from mulberry and willow support the sporting goods industry, and Populus euroamericana is used in the match industry. The branches of both mulberry and willow are also used in basket making. The sericulture cottage industry depends upon the leaves of mulberry.

CONCLUSION

Riparian vegetation is the main source of wood and wood products in one of the four provinces of the country. It produces wood for furniture, timber, mining props, cottage industry, sporting goods and the match and pulp industry. In addition to wood and wood products riparian plant communities provide forage for livestock, fiber for ropes, cordages, strings, material for baskets and mats, tanning material and gum. In addition, riparian vegetation helps in stabilizing river banks and provides habitat for many wild birds and animals.

In a country poor in wood resources where the people collect leaves, straw and cow dung for fuel, riparian vegetation proves God's gift in fulfilling their needs for fuel, timber to construct their shelters, material for their beddings, fodder to feed their animals and a source of earnings.

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