

# Forest genetic resources and management in Pakistan – status, needs, challenges and action required

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## **Introduction**

The importance of forest resources is significant in countries like Pakistan, which has arid and hot climate over more than 70% of its land area and where percentage of forest area is very low, only 5.4%. Although limited in area, the forests of Pakistan reflect great physiographic, climatic and edaphic contrasts in the country. Starting from the Alpine scrub in the Northern Himalayas, one comes across a variety of types ending up with the mangroves in the shallow waters of the Arabian Sea in the south. Based on altitude and rainfall pattern, these forests can be broadly classified into the following four categories:

### **High altitude coniferous forests**

The high altitude coniferous forests lie between 1200 to 3200 m above sea level, with a small percentage (<25%) of broad-leaved species. Important coniferous genera include *Abies*, *Pinus*, *Cedrus* and *Picea*. The few major broad-leaved genera include *Quercus*, *Acer*, *Populus*, *Betula* and *Fraxinus*. The total area of such forests is 1 928 000 ha which constitutes about 45.2% of the total forest area. These forests provide timber, fuelwood, fodder, resin and medicinal products, along with non-tangible services.

### **Low altitude (<1200 m) broad-leaved species forests**

These forests cover an area of 520 000 ha of irrigated and foothill plantations in Punjab and Sindh, consisting of *Populus* sp. (poplar), *Dalbergia sissoo* (shisham), *Bombax ceiba* (semal), bakain, *Morus* sp. (mulberry) and *Eucalyptus*. The aridity is mostly compensated by irrigation.

### **Agroforestry plantations**

Farmers have been planting trees on their lands for centuries. Recently, these activities have been accelerated by various development projects in the past and are still continued under forestry sector projects in each province. The most common species planted are eucalypts, bakain, semal, poplars, acacias, prosopis, shisham and mulberry. The local requirements of farmers for fodder, fuelwood and poles are readily met from trees planted singly or in rows or in block plantations. A modified form of agroforestry system called “Hurry” is also practised in Sindh where 2–4 acres of land are set aside to raise plantations of *Acacia nilotica* only. These plantations cover an area of about 200 000 ha. Farmers have also started to establish their own nurseries about two decades ago to increase tree cover especially on marginal lands.

### **Coastal and riverine forests**

Located in the extreme southern part of Pakistan as well as along the banks of rivers viz. Indus, Chenab and Ravi, these tracts are rich in species like poplar and acacias. The coastal areas consist of valuable species of *Ceriops tagal*, *Avicennia officinalis* and *Rhizophora mucronata*, which had been badly affected by river pollution in the recent past. A survey has indicated that nearly 21% of the coastal forests have been degraded and has adversely affected regeneration and growth of these species. The scarcity of water as well as the diversion of river flow due to construction of dams have degenerated *Populus euphratica* forests along riverbanks. There is a need to conserve this valuable genetic resource immediately. Such forests are spread over 345 000 ha. Shelterwood system is generally used to manage natural stands of coniferous and broadleaved species while irrigated plantations are managed through clear-cut felling by the provincial forest departments. Permission has to be obtained from the Forest Officer to fell a tree on a farmland by any farmer. Trees planted by the sides of roads and canals are also looked after and managed by the Forest Department. Currently national afforestation programmes are in operation to encourage tree cover on private lands through community participation. The scrub forests with sparse vegetation cover of about 1 271 000 ha mainly constitute scattered arid zone species like *Zizyphus*, *Acacia*, *Prosopis* and *Olea*. These plantations have undoubtedly reduced demand pressure of timber (as poles) and fuelwood from state forests.

### **Organizations relevant to FGR**

The Pakistan Forest Institute (PFI), Peshawar, and the Punjab Forestry Research Institute (PFRI), Faisalabad, are the only organizations working on forestry research at national level. The former is federally administered while the latter is a provincial organization. Under this set-up, there are little or no coordinated efforts between the two organizations for conservation and management of FGR. Located in two distinct ecological zones, the PFI has been handling genetic improvement work in the natural coniferous forests while the PFRI had undertaken studies in irrigated as well as farmland plantations. The activities of both institutes have been mainly confined to collecting and supplying quality seeds from plus trees and stands with little efforts towards conservation and management of rare and endangered species. A gene bank with a storage capacity of 20 000 kg seed has been established at the PFI during the early 1990s wherein *ex situ* conservation of target species has been undertaken. However, this facility could not be utilized to its full capacity due to lack of interest and knowledge of stakeholders in the conservation of FGR. Until and unless these activities are included in the national forest policy, conservation of FGR cannot be increased to the desired level. Establishment of seed stands as *in situ* conservation stands over an area of 8 ha is one step towards this direction. These stands are also ideal sites for conserving several other endangered associated species.

### ***National Task Force***

Forestry is a provincial subject in Pakistan. At the level of the federal government, it is represented by the Inspector General of Forests who enjoys the status of Additional Secretary and acts as an advisor to the government in FGR conservation and policy matters and also liaison with international forestry organizations and other related agencies. He is also the Head of the National Forestry Research Review Committee comprising 10 members including Chief Conservator of Forests; Conservator of Forests; Director General, Pakistan Forest Institute and Director, Punjab Forestry Research Institute. The meeting of this committee is held annually at Pakistan Forest Institute, Peshawar, to discuss various forestry related problems including FGR conservation.

### ***National Policies relevant to FGR conservation and management***

The National Forest Policy announced in 2001, covers the renewable national resources (RNR) of Pakistan, that is forests, watersheds, rangelands, wildlife biodiversity and their habitats. The policy seeks to launch the active participation of all the concerned agencies and stakeholders to realize the sustainable development of the resources. It is an umbrella policy providing guidelines to the federal government, provincial governments and territories for the management of the RNR. In consonance with it, the provincial and district governments devise their own policies in accordance with their local circumstances and requirements.

The implementation of this policy is being carried out at two levels:

- At the *federal level* the Inspector General of Forests is responsible for initiating actions, monitoring the progress of implementation and submitting a report on its state at the end of each calendar year to the Federal Forestry Board (FFB). He is also responsible for actions in areas under jurisdiction of the Federal Government.
- At *provincial level* this responsibility rests with the respective provincial forest and wildlife departments including the relevant departments of Azad Jammu Kashmir and Northern Areas.

### ***Updates and happenings***

- **New Projects**

The Forestry Sector Research and Development Project (FSR&DP), initiated in July, 2003, for a period of five years with a total cost of Rs.193.5 million, is an integrated project covering different disciplines of forestry including tree improvement and silviculture. The tree improvement component of this project includes programmes on the following tree species: conifers including *Pinus gerardiana*, walnut, almond, neem, shisham, and paulownia.

- **Other major happenings**

Shisham die-back has become a very serious problem in Pakistan. It is widespread in plantations throughout the country. It is a complex disease

caused by factors which are poorly understood. It is a hot topic of discussion among forestry professionals. The research activities carried out in this respect under the FSR&DP include:

- Study causes of die-back and its control measures
- Selection and multiplication of die-back resistant trees
- Determine alternative and substitute tree species for raising in irrigated plantations

### **Species conservation strategy**

The Pakistan National Conservation Strategy (1992) identifies sectors, such as agriculture, energy, forests, water, biodiversity, soil, population and human settlements, in which interventions are possible for sustainable development. The main objectives of the PNCS are to conserve natural resources, foster sustainable development and improve efficiency in the use and management of resources. The strategy consists of three parts. The first part gives an analysis of state of physical and natural resources of Pakistan and the extent of the environmental problems faced in the country as a result of resource use impacts and linkages. This part also examines existing institutions and present policies and programmes related to environment.

Part 2 of the PNCS discusses the scope for improvement in various sectors of the national economy. Detailed recommendations are made for formulation of policies and measures for development of primary sectors of agriculture, forestry, rangelands and livestock management, water supplies, marine and coastal resources, wildlife and mining. Secondary and tertiary sectors of economy such as energy supplies, industrialization, urbanization, pollution, and recreation and tourism are also dealt in this part. A number of programmes are proposed which include population planning, participation of women in development activities, educational reforms, research and technology development etc. In the third part of the report, fourteen development areas are identified for implementation. Amongst these, the areas which are of interest to the forestry sector are protecting watersheds, supporting forestry and plantations, restoring rangelands and improving livestock and conserving biodiversity.

### **Choice of species for conservation**

Considering the efforts made in the past to restore important biomass and the multiple uses of several species, a number of exotic and indigenous species could be used so that the endangered native species are conserved. Proper and timely conservation measures are required for this purpose. Most of the exotics have been successfully introduced recently and large-scale establishment of conservation cum demonstration plots is therefore recommended to rehabilitate the fragile ecosystem in the country. This is not an exhaustive list and could be updated at a national workshop on the conservation and management of FGR through participation and involvement of several stakeholders. So far no *in situ* conservation stands of any endangered indigenous species have been

established and the number of individual tree species could still diminish unless protective measures are taken.

Natural forests in Pakistan represent a mixture of native coniferous and broad-leaved species and therefore, an ecological balance must be maintained through an appropriate mix of *ex situ* and *in situ* conservation stands. Several timber species, such as *Ulmus*, *Prunus*, *Acer*, *Quercus*, *Fraxinus*, *Taxus* and *Picea*, are endangered or vulnerable. Most of the fodder species, like *Ficus*, *Prunus*, and *Grewia* in the sub-tropical zone; and *Acer*, *Elaeagnus* and *Quercus* in the temperate forests; are disappearing at a very fast rate. These are considered low priority species by field foresters and are not included in any artificial regeneration programmes. Similarly, the inhabitants in hilly areas use the valuable wood of *Cedrus deodara* as firewood because of ignorance and easy accessibility. The pressure on these forests could be reduced if some alternatives for cooking and heating were provided to the local people. Forest and soil degradation could be reduced if the original native flora is restored. Some surveys and regeneration studies on non-timber species have been undertaken by the PFI in the past on limited scale but these could not be developed and included in large-scale afforestation programmes at provincial level. These native woody herbaceous and non-herbaceous genetic resources not only fulfill the basic needs of the local communities but also stabilize the eroded areas in the Himalayas, as they are the important components of the whole ecosystem.

Since species like *Quercus*, *Juglans*, *Aesculus*, are recalcitrant, *ex situ* conservation as seeds is not possible. However, the establishment of *in situ* conservation areas and use of biotechnological techniques in certain species may help promote and improve the status of FGR in the country. Conservation and management of coastal forest tree species is a challenging job because of difficulties in storage of seeds. Availability of firewood is another problem in the area as no other energy source is available.

In addition to the problems mentioned above, several biotic and abiotic factors (overgrazing, clearing of land for agriculture), pollution and construction of dams are some of the major direct causes for the genetic erosion of valuable FGR in Pakistan.

In the past the PFI has successfully introduced some exotics to improve the biodiversity in different ecosystems in the country. In some cases they outperformed the native species in terms of survival and growth. If introduced species are found better and are posing no threat to the natives, they may be continued to be tested and included in tree improvement programmes and rehabilitation of degraded lands which in turn can help to reduce the pressure on natural forests. Being less aggressive, none of the above species have posed any threat so far, but rather resulted in enhancing net productivity, as these were found better than native ones.

### **Suggestions**

As some economically important coniferous and broad leaved species are spread over several countries, it is suggested that international collaboration on species that cover large distribution areas, should be strengthened. This should include exchange of visits, research results and planting material. A typical example is Shisham, which is distributed over vast areas in South Asia and suffers from die-back. Strengthened regional collaboration could contribute to solving this kind of problems that are encountered by more than one country.

### **References**

- Anonymous. 2001. National Forestry Policy. PFJ 51(2).
- Anwar A. Khan. 1990. Artificial regeneration of some important indigenous medicinal plants in the hill forests of NWFP. Annual Progress Report of PL-480 Projects, PFI, Peshawar (unpublished).
- Chaudhry, M. A. and E. Ahmad. 2003. *Dalbergia sissoo* dieback probable suspects. PJF 53(2).
- Marcar, N. E., R.W. Hussain, Arunin and T. Beetson. 1991. Trials with Australian and other *Acacia* species on salt affected land in Pakistan, Thailand and Australia. Proc. Tropical Acacia Trials, Bangkok.
- Rehman, S., A. Hussain and R. A. Khattak. 2003. Reducing poverty vis-à-vis combating salinity through reforestation in South Asia. A case study. PJF 53(1).
- Roshetko, J. M. 1995. Recommendations to improve seed collection and handling process of forest seed center at Garhi Dopatta. North Resource Management Project Publication. 128 pp.
- Shams R. Khan. 1993. Quality tree seed production in Pakistan. Pp. 25-28 in Proceedings of National Workshop on Seed Technology. PFI, Peshawar.
- Shams R. Khan. 2001. Genetic variation in blue pine and applications for tree improvement in Pakistan, Europe and North America. In Five-needle pine species; genetic improvement, disease resistance and conservation (R. Sniezko, S. Samman, S.E. Schlarbaum and H. Kriebel, eds.). Proc. RM RM-P-000. Ogden, UT, USDAFS, Rocky Mountain Research Station.
- Siddiqui, K. M. 1992. The Pakistan National Conservation Strategy and the Forestry Sector. PJF 42(2).
- Wani, B. A., H. Shah and S. Khan. 2003. Forestry Statistics of Pakistan 1998-2000. Forest Economics Branch, Pakistan Forest Institute, Peshawar. (Unpublished).