Education in botanic gardens in Bangladesh: Prospects and problems

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Introduction

Bangladesh has been striving hard to achieve economic progress since independence in 1971, but its high population pressure and poor resource-base have made it impossible to achieve such progress. Now it ranks as the world's eighth and Asia's fifth most populous country with a land area of 147 570 sq km resulting in a population density of about 948 per km^2 which is the highest in the world. According to recent report, the human population of Bangladesh stands at about 140 million and is expected to reach approximately 225 million by 2050. Almost all the people, particularly the rural people are directly dependent on the continued productivity of natural resources, like water, soils, forests and fisheries. But the overuse by the extremely high population pressures has degraded the natural resources in to severe soil erosion, soil nutrient depletion and widespread deforestation. The degradation of natural resources, particularly the plant resources has been a great concern for socio-economic and sustainable development of the country (UNCED 1991).

Diversity of plants in Bangladesh

Bangladesh is unique in having a wide variety of plant species with enormous genetic diversity. About 5700 species of higher plants have been recorded so far (Hossain 1995), and of these some 260 species are used as crops (Mondal 1990). The rest of the species are virtually left on growing in natural forests, village thickets and jungles which have been important sources of fruit and nuts, fuel and fodder, medicinal plants, bamboo, rattans, palms, ornamentals and aromatics. Some 60 species of both minor and underutilized fruit and nut species are common in natural vegetations which are locally being consumed as food (Das 1987). More than 600 wild medicinal plant species are potentially being used for human ailments and veterinary medicines. There are 18 species of bamboo, 20 species of palm and 8 species of rattans are occurring both wild in the forest and cultivated in rural households (Alam 1990). Numerous other wild resource species, eg. orchids, bromeliads, anthuriums, heliconias, cacti are also abundant in the forests and village jungles.

Depletion of plant genetic resources

Flora of Bangladesh is still poorly studied and so there remains a serious lack of information on the rare and endangered species. However, it has been reported that some 45 forestry species are currently threatened with extinction (Khan 1995), and many other important forest species are now are at risk of being lost in all or part of their distribution ranges because of reduction in their population number and loss of habitats. A large number of medicinal plants and other wild resource species are reported to be disappearing rapidly in Bangladesh due to destruction of natural habitats (FAO 1994). Walter (1998) reported that 24 vascular plant species have been threatened in Bangladesh of which 1 species is extinct/endangered, 21 species vulnerable, 1 rare

and 1 indeterminate. The Bangladesh National Herbarium also listed 106 plant spp. as endangered (Khan 2001). Another 23 vascular tree spp. have been reported as rare and threatened (Das 2001). The threat of extinction is mainly brought about by the degradation and encroachment of habitats due to rapid industrialization and urbanization, illegal grabbing of forest land and unsustainable harvesting of wild species

Conservation status of plants

In situ conservation

At present there are 15 protected areas for *in situ* conservation under the management of Forest Department. The protected areas are spread almost all over the country covering an area of 240 606.0 ha. According to IUCN categories of protected areas, there are 7 national parks, 7 wildlife sanctuary and 1 game reserve.

Ex situ conservation

There are, at present 3 Botanical Gardens, 3 Eco-parks and 1 Safari park under the management of Forest Department for *ex situ* conservation. Bangladesh Forest Research Institute has also established 2 preservation plots for conservation of 17 endangered tree species, 2 clone banks and arboretum for bamboo, cane and medicinal plants in different places of Chittagong district. Plant Genetic Resources Division of Bangladesh Agricultural Research Institute (BARI) and the Bangladesh Agricultural Development Cooperation (BADC) have established field stands for conservation of minor fruit spp. in various sub-station farms. Bangladesh Tea Research Institute (BTRI) has been given the responsibility for conservation of tea and coffee genetic resources, and Sugarcane Research Institute (SRI) for conservation of sugar crops. Beside these, there are a number of botanical gardens associated with the universities and research institutes and small city parks under the control and management of City Corporation and Municipal Committee.

Considering the threats on plant species, particularly with changing concept after the proclamation adopted in the Convention on Biological Diversity (CBD) in 1992, conservation has been the most important agenda of most *in situ* and *ex situ* centres in Bangladesh. But unfortunately the protection and conservation activities has been ineffective and arrested in most protected areas (*in situ*) due to indiscriminate cutting of trees and encroachments. At present the rate of deforestation is very high and, I think, this will continue unabated. As the natural habitat is disappearing rapidly, *ex situ* conservation of rare and endangered species in botanic gardens is gaining greater relevance as they contribute as the safest refuge to the preservation of gene pools of indigenous flora. So, *ex situ* conservation has become an important tool for promotion and maintaining of species and genetic diversity of plants, and thus, it has become a last resort for many species that would otherwise extinct out as their habitat is destroyed. Apart from conservation, botanic gardens can also play a vital role in educating the visitors and the general public on sustainable development and conservation through undertaking education programmes. Education programmes can be effective tools for disseminating information, knowledge and awareness raising about the plants and their importance for conservation. But the botanic gardens have been underutilized as they have been suffering from many weaknesses and limitations related to conservation and education. Among others, these are - (a) poor resource base, (b) lack of coordination and networking, (c) lack of trained manpower, (d) poor data management and information systems, etc. The botanic gardens are involved in conservation activities without having a common strategic conservation action plan and guidelines, and having no linkage and coordination among them. As a result, botanic garden activities have been ineffective, and there

are unnecessary and unplanned redundancies. Also the documentation and data management systems have been very poor, and there remains a serious lack of information on what the rare and endangered species, and commonly or abundantly available species they hold. Education programme has also been very poor and almost nonexistent in most botanic gardens due to lack of knowledge and logistics.

Bangladesh, along with most other countries of the world has signed and ratified the 1992 Convention on Biological Diversity (CBD) accepting its provision and agreeing to work towards conservation and education on biodiversity for sustainable development. So, some steps need to be taken immediately for contributing and achieving the objectives of the *International Agenda for Botanic Gardens in Conservation* and as a contribution towards the *Global Strategy for Plant Conservation* (GSPC). The steps are:

(1) Documentation and inventorying of plant holdings of botanic gardens

An inventory of the live collections of plant genetic resources (PGR) is important to know what is conserved where. But the plant holdings of the botanic gardens and the *ex situ* centres are not well inventoried and documented, and so there is a serious lack of information on the *ex situ* genetic resources they contain. In the absence of such documentation, the value of PGR conservation is expected to be reduced to users of genetic resources, as these are not known to them. So, inventorying of plant collections is most important that will help demonstrate the amount of genetic diversity contain in the *ex situ* populations. This will also help to look for the gaps to plan future collecting activities.

(2) Computerized data management and information system:

Modern techniques of data management system enable a much better control of the information relating to PGR activities. Botanic gardens in many countries are increasingly placing their collection records onto database to make use of the computerized information about sources of germplasm. But in Bangladesh, computerized database for germplasm collection has not yet been developed. Information on PGR, like passport data, evaluation data, characterization data etc are now maintained manually in register, which is at all not user oriented. So, computerized data management system is expected to help exchange/dissemination of information in a better way with users of germplasm, in country and abroad.

(3) Networking of botanic gardens

Networking of botanic gardens and *in situ* conservation centres will play an extremely valuable role in developing and strengthening conservation activities. It can be most effective tool in building new capacity for conservation, policy development, documentation and exchange of information and resources.

(4) Education and awareness on plant diversity and conservation

Education and awareness raising programmes can play important role in improving the capacity of people to address environment and conservation issues. So, the botanic gardens need to reorient and organize education programmes that can address topics including development issues, invasive threats, the relationship between people and plant conservation, sustainable living and the value of biodiversity etc. A variety of techniques may be adopted to convey the messages from guided tours, cultural activities, exhibiting and displaying plant collections, etc. Education programmes may include:

a) **Student education programme:** This education program is aimed to provide support to class room teaching of the students and teachers from the school, colleges and universities using the botanic gardens for the physical study of the diversity of plant species and related information from the well identified and well organized germplasm collection.
b) **Public education programme:** This program aims to develop awareness among the general visitors on the importance of plants and the need for conservation through exhibiting and displaying plant species as live class rooms.
c) **Training for the botanic garden staff:** Short training courses may be organized on different aspects of botanic gardens for the educators, managers/supervisors of the botanic gardens of the country to strengthen knowledge and skills on conservation and education programmes.
d) **Outreach education programme:** Outreach education programmes may be developed for the students and teachers of schools to help them develop plans for using the botanic gardens as their outdoor class rooms for raising awareness on plants, environment and conservation.

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Biography

Prof Rahman obtained his M S.degree from the Bangladesh Agricultural University, Mymensingh, Bangladesh. He attended a year-long training course on Micropropagation and Plant Tissue Culture in Wye College, London. He wants to enhance botanic gardens movement for plant conservation and education.