RESEARCH PAPER

State of Urban Nurseries in Bangladesh: A Case Study from the North-Eastern Region

**Romel Ahmed · Md. Sorif Hasan ·
Md. Abdul Halim · Mahbubul Alam**

Abstract The state of urban seedling nurseries in the north-eastern region of Bangladesh is examined with a focus on production and profitability of the enterprises. Twenty-eight sample nurseries out of the 97 nursery enterprises in Sylhet town were selected at random, and operators personally interviewed. It was found that the entrepreneurs are not highly educated though they believed that a basic level of education is required to understand the management of young nursery stock. Labourers of various employment categories work in the enterprises and their wage is determined by their skill, gender and efficiency. Capital and operating costs vary among the enterprises according to land value, production capacity, infrastructure type and workforce size. Production capacity ranges from 10,000 to 5 M seedlings/ year with an average 836,000, though actual average production is only 341,000 seedlings/year. The production cost per seedling ranges from Tk. 4 to 50 while sale value ranges from Tk. 10 to 60. The most frequently sold species are *Acacia mangium, Swietenia macrophylla, Tectona grandis, Mangifera indica, Litchi chinensis* and *Cocos nucifera*. Nursery techniques and cultural practices adopted by nursery operators depend on the type of species and its silvicultural requirement. Despite some problems, including lack of suitable land for nursery establishment and inadequate level of technical knowledge for high quality seedling management, it seems that production of tree seedlings is a promising profitable small-scale business in the study area.

Keywords Seedling production · Sylhet town ·
Permanent and temporary workers · Homestead forest · Impediments

R. Ahmed · Md. Sorif Hasan · Md. Abdul Halim
Department of Forestry, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

M. Alam (✉)
Forest Management Laboratory, Faculty of Agriculture, Kochi University,
Otsu 200 Monobe, Nankoku-shi, Kochi 783-8502, Japan
e-mail: malam.ku@gmail.com

Introduction

Bangladesh has a very low stock of forest resources, and per capita forest land is only 0.02 ha (BBS 1999). Forest land accounts for about 17% of the total land area (GOB 2007), but actual tree cover is less than 8%. The existing natural forest is under tremendous pressure of human interference in terms of encroachment and illegal collection of forest products. As a result, forest land is disappearing at an average rate of 8,000 ha/year (Banglapedia 2007). On the other hand, the homestead forest[1] area is rich in plant resources with a mean annual increment of 5 m^3/ha/year (GOB 1992). Homestead owners usually obtain seedlings of their desired species from their own land, from neighbours or from nurseries situated in the village or *upazilla sadar* (sub-district headquarters). People living in urban and periurban areas collect seedlings from urban nurseries. Hence nurseries play an important role in greening the barren land of Bangladesh.

A nursery is a place where young trees or other plants are raised for experimental purposes, for transplanting, or for sale (Webster 1960). Seedling production is one of the labour-intensive forest industries in Bangladesh. Nurseries have been established throughout the country by both government and private initiatives. The Forest Department (FD) has nurseries at each of its management units (*beat* and *range* are two such management units) to establish plantations in the barren government-owned forest land. Moreover, the FD has established nurseries at upazilla level under the Thana Afforestation and Nursery Development Project (TANDP), with financial assistance from the Asian Development Bank (Loan 956-BAN[SF]) to run and promote social forestry activities (ADB 2001). Individual entrepreneurs and NGOs working with social forestry have also established nurseries throughout the country. The number of private nurseries in Bangladesh has increased from a few hundred to about 4,000 during the last 5 years. Nursery activities by both groups and individuals have been found to be highly successful in accelerating tree planting activities in Bangladesh (Safa 2006).

It has been declared in the latest forest policy of Bangladesh that

> attempts will be made to bring about 20% of the country's land (as against 6–8% at present) under the afforestation programs of the government and private sector by year 2015 by accelerating the pace of the program through the coordinated efforts of the government and NGOs and active participation of the people in order to achieve self-reliance in forest products and maintenance of ecological balance (GOB 1994, p. 56).

Through the policy statement the government acknowledges the importance of non-government efforts for greening of the country. Achieving the 20% target would require production of a large quantity of seedlings. There is no alternative to establishing and running private nurseries alongside government efforts to meet this

---

[1] The *homestead forest* is common in Bangladesh, containing a mixture of natural and planted species in a complex structure and being a source of economic-benefit of the rural poor (e.g. see. Rahman et al. 2005a).

demand. Hence, it is important to understand the production situation of the current seedling nursery sector in Bangladesh.

Study Area and Research Method

The study of seedling nursery operations was conducted in Sylhet town in the north-eastern region of Bangladesh (Fig. 1). One of the richest semi-evergreen hill forests of Bangladesh is located in this region. The total area of government forest in Sylhet is 1,922 ha (Rahman et al. 2005). This forest is dominated by tree species including *Artocarpus chaplasha, Tetramefes nudiflora, Pterygota alata, Dipterocarpus* spp., *Swintonia floribunda, Anthocephalus chinensis, Trewia nudiflora* and *Lagerstro-emia speciosa* (ADB 2000). The plantation establishment in this forest is supported by government nurseries. Rahman et al. (2005b) studied the quantitative stand structure of woody components of homestead forests of this region, finding that homestead forests are dominated by *Mangifera indica* (Abundance $(A)^2$ 2.53 and Relative frequency $(RF)^3$ 16.4%), *Artocarpus heterophyllus* (A 1.56, RF 14.0%), *Cocos nucifera* (A 2.70, RF 6.4%) and *Swietenia macrophylla* (A 2.75, RF 2.6%). The people living in and around the study area purchase seedlings for their homesteads plantings from both private and government nurseries.
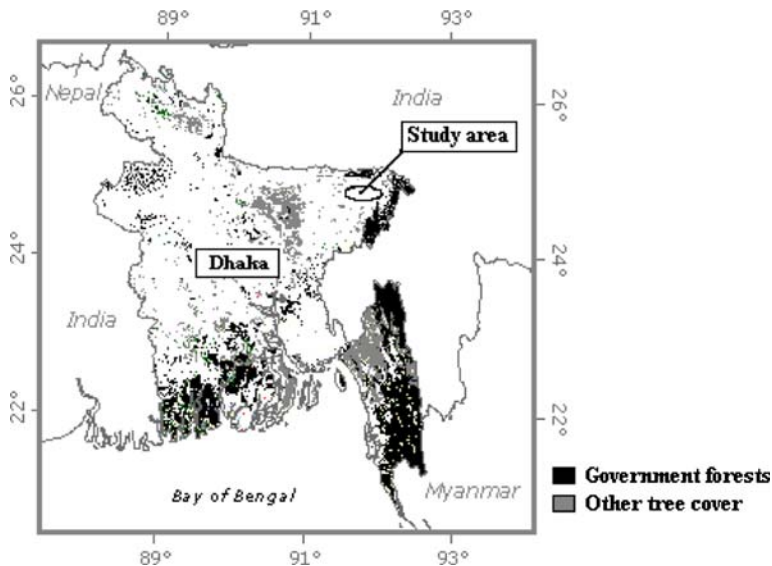
Fig. 1 Map of Bangladesh showing study area and forest cover. *Source*: Modified from FAO (2000)

---

[2] The estimated number of individuals of a species per unit area is referred to as abundance of the species (*A*).

[3] Relative frequency (*RF*) is defined as the dispersion of a species in relation to that of all the species.

A list of private nurseries in Sylhet metropolitan area was obtained from the Sylhet Divisional Forest Office, and a random sample of 28 nurseries was selected. A semi-structured questionnaire was prepared, having a combination of closed and open-ended questions, covering the socio-economic profiles of entrepreneurs and workers, salary and wage structure of workers, capital structure of nurseries, and maintenance activities. Open-ended questions were used to seek entrepreneurs' perception of existing problems facing nursery operators and recommendations for overcoming those. Face-to-face interview were conducted by the authors during April–May 2006. Subsequent visits were made where entrepreneurs were not available on the first visit, all sample members being eventually interviewed. MS Excel and MS Paint were used to analyze data and create figures and tables.

Results and Discussions

Age and Level of Education of Entrepreneurs

Of the 28 entrepreneurs interviewed, 18 were aged between 30 and 60 years, including eight in the 30–39 years age class. Only four of the entrepreneurs held a bachelor degree and eight held a secondary certificate, indicating that higher educated people do not enter the nursery business or higher education is not required for this business. However, the entrepreneurs agreed that education is essential for understanding silviculture and management of young seedlings. No nursery owner was found to have prior experience of nursery establishment. Table 1 shows the frequency distribution of age class and level of education of entrepreneurs of the sample nurseries.

Characteristics of Nursery Workers

The numbers of permanent and temporary workers of the sample nurseries were 148 and 128 respectively, a total of 276, including 232 males. On average, nurseries had 10 paid employees, including 8 males. Usually each nursery has some permanent workers but also hired temporary workers when required. Nursery workers typically had a low education levels; most were illiterate and none were reported to have

Table 1 Age and education level distribution of nursery entrepreneurs in the study area

Age class (years)	Entrepreneurs (frequency and percentage)	Level of education	Entrepreneurs (frequency and percentage)
<30	6 (21.4)[a]	Primary	2 (7.1)
30–39	8 (28.6)	Junior school	10 (35.7)
40–50	4 (14.3)	Secondary	8 (28.6)
50–60	6 (21.4)	Higher secondary	4 (14.3)
60+	4 (14.3)	Bachelor	4 (14.3)

[a] Figures in the parenthesis indicate percentages

Table 2 Labour wage structure for various employee categories in the study area

Types of labour		Labour wage, male		Labour wage, female	
		Monthly (Tk)[a]	Daily (Tk)	Monthly (Tk)	Daily (Tk)
Permanent	Skilled	4,500	150	2,500	83
	Unskilled	3,500	117	2,000	67
Temporary	Skilled	–	120	–	80
	Unskilled	–	100	–	60

[a] $1 US = Tk.70 (2006 rate)

completed secondary education. Permanent workers are usually paid monthly but temporary workers are paid on a daily basis, with permanent workers paid at a higher rate than temporary workers and females paid less than male workers. Average wages of the various employee types are reported in Table 2.

Capital Structure of Nurseries and the Costs of Seedling Production

The fixed capital value of nurseries includes land value, value of earth filling on the nursery site, drainage excavation expenses, fencing expenses, pump purchasing cost, and sale centre building expenses. The fixed capital of studied nurseries ranged from Tk. 23,500 to Tk. 18.11 M with an average Tk .2.74 M. The value of working capital—including seedling stock in polybags, seedling stock in pots, cuttings, soil stock and bare earthen pots—ranged from Tk. 107,000 to Tk. 5.24 M with an average Tk. 1.43 M. The average initial investment for establishing a nursery of typical size (about 1.6 ha) was Tk. 84,500, and corresponded to a nursery size sufficient to generate an averages daily sales value of about Tk. 9,570.

The costs of seedling production include overhead, direct and marketing costs. Overhead costs—including holding tax, depreciation, interest, rent, utilities, insurance, repairs and maintenance, and managerial and administrative salaries—are incurred regardless of what tree seedlings are grown or how many units are produced. Since these costs remain constant, costs per unit decrease as more seedlings are produced. Variable costs—which include both material costs and production labour—are directly related to the number of units produced and are relatively easy to allocate based on information from invoices. Material costs include rooted cuttings, pots, growing medium, fertilizer and chemicals. Material costs were found to differ considerably between nurseries, depending on the type, quality and quantity of materials used.

Seedling Production Activities of Nurseries

Annual seedling production capacity of nurseries ranged from 10,000 to 5 M, with an average of 836,000, although actual seedling production averaged only 341,000. The large gap between capacity and actual production might be due to low education level, lack of operating capital, low technological uptake and lack of nursery experience resulting in poor production management.

The nurseries provided seedlings of timber and fruit species, indoor and hedge plants, medicinal plants and ornamental species. Almost 90% of seedlings were of timber species. Most frequently sold species included *Acacia mangium, Swietenia macrophylla, Tectona grandis, Mangifera indica, Litchi chinensis* and *Cocos nucifera*. The nursery entrepreneurs grow seedlings by themselves, collect seed and other propagation materials from other regions of the country (including Mymensing, Barisal, Jessore, Rangpur and Dhaka), and sometimes import these from India and Thailand.

The calculated production cost per seedling ranged from Tk. 4 to Tk. 50, being greatest for nurseries sourcing propagation materials from abroad or other parts of the country. The selling price of seedlings was found to vary with species, production cost, demand and transportation cost from source of germplasm. The price ranged from Tk. 10 to Tk. 60, and the average profit per seedling was Tk. 3 to 10. The important seedling species, types of use and sale prices are listed in Table 3.

Table 3 Selected seedling species and their selling price

Species	Types of use	Average Sale value (Tk.)	Abundance	Relative frequency (%)
Acacia mangium	Timber, fuel	17	–	–
Aegle marmelos	Fruit	17	1.00	0.4
Albizia procera	Timber	15	2.50	3.4
Andrographis paniculata	Medicinal	10	–	–
Anthocephalus chinensis	Fuel	10	1.64	2.3
Artocarpus heterophyllus	Fruit, timber	15	1.56	14.0
Azadirachta indica	Medicinal	15	–	–
Bombax ceiba	Fuel	12	1.15	2.8
Bottle palm	Indoor	100	–	–
Canna indica	Medicinal	10	–	–
Cassia siamea	Timber	10	–	–
Cestrum nocturnum	Ornamental	10	–	–
Citrus grandis	Fruit	17	–	–
Cocos nucifera	Fruit	50	2.70	6.4
Codieum varigatum	Hedge, ornamental	200	–	–
Cycus palm	Indoor	170	–	–
Delonix regia	Timber	30	1.50	1.3
Dipterocarpus turbinatus	Timber	15	–	–
Duranta repens	Hedge	10	–	–
Emblica officinalis	Medicinal	15	–	–
Euphorbia antiquorum	Hedge	15	–	–
Eucalyptus camaldulensis	Timber, fuel	15	–	–
Fern	Indoor	150	–	–
Ficus benghalensis	Timber, fuel	50	–	–
Gardenia jasminoides	Ornamental	12	–	–

Table 3 continued

Species	Types of use	Average Sale value (Tk.)	Abundance	Relative frequency (%)
Gmelina arborea	Timber	15	–	–
Hill cactus	Cactus	400	–	–
Hydrocotyl asiatica	Medicinal	5	–	–
Jasminum sambac	Ornamental	10	–	–
Litchi chinensis	Fruit	80	–	–
Mangifera indica	Fruit	20	2.53	16.4
Mentha vinidis	Medicinal	10	–	–
Murraya paniculata	Hedge, ornamental	30	–	–
Nyctanthes arbortristis	Ornamental	10	–	–
Psidium guajava	Fruit	150	1.20	2.1
Rag palm	Indoor	300	–	
Samanea saman	Timber	25	1.71	8.9
Snake cactus	Cactus	150	–	–
Swietenia macrophylla	Timber	15	2.75	2.6
Syzygium cumini	Timber	20	1.19	5.5
Syzygium grandii	Fruit	12	–	–
Tamarix spp.	Ornamental	100	–	–
Tectona grandis	Timber	15	1.00	0.9
Terminalia arjuna	Medicinal	15	–	–
Terminalia chebula	Medicinal	15	–	–
Zizyphus mauritiana	Fruit	10	1.23	2.8

Abundance (*A*) and relative frequency (*RF*) of different species (as defined by Rahman et al. 2005b) influence seedling species demand and production of nurseries. Higher abundance of a species implies higher preference by landholders. The abundance and relative frequency values are also indicated in Table 3.

Nursery technique and cultural practices adopted by nursery operators depend on the type of species and its silvicultural requirement. For example, seed treatment before sowing is adopted for *Acacia mangium, Acacia auriculiformis, Albizia procera* and *Anthocephalus chinensis.* Similarly, mulching is done for *Mangifera indica* and *Litchi chinensis.* Practices common for all species include weeding and watering. Nursery techniques of different species are summarised in Table 4.

Problems of Nursery Establishment and Operation

In terms of problems, it was reported that there is insufficient suitable land for establishment of new nurseries and expansion of existing nurseries in Sylhet town. Seedlings from private nurseries are often of low quality, in terms of genetic and physical characteristics. Technical know-how about silvicultural requirements and pest control measures are lacking among the entrepreneurs, which is an impediment to production of high quality seedlings. Proper irrigation and drainage facilities are

Table 4 Nursery technique of selected species in the study area

Species name	Nursery technique						
	Seed treatment	Sowing	Root pruning	Shoot pruning	Weeding	Watering	Mulching
Mangifera indica	–	–	–	–	√	√	√
Sweitenia mehogoni	–	√	–	–	√	√	–
Acacia mangium	√	–	–	–	√	√	–
Artocarpus heterophyllus	–	–	–	–	√	√	–
Acacia auriculiformis	√	–	–	–	√	√	–
Litchi chinensis	–	√	–	–	√	√	√
Citrus grandis	–	–	√	–	√	√	–
Bougainvilleas spp.	–	–	–	√	√	√	–
Albizia procera	√	–	–	–	√	√	–
Delonix regia	–	√	–	–	√	√	–
Psidium guayava	–	–	–	–	√	√	√
Codieum variegatum	–	–	–	√	√	√	–
Terminalia catappa	–	–	–	√	√	√	–
Carica papaya	√	–	–	–	√	√	–
Zizyphus mauritiana	–	–	–	√	√	√	–
Cassia siamea	√	–	–	–	√	√	–
Michelia champaca	–	√	–	–	√	√	–
Tectona grandis	–	–	–	√	√	√	–
Anthocephala chinensis	√	–	–	–	√	√	–

pre-requisites for nursery operation but these are not always installed. The government of Bangladesh has banned the use of polythene bags because these create drainage problems along with other environmental hazards. However, nurseries are not able to raise seedlings in paper and sack buckets instead of polythene because these materials are not long lasting. Finally there is no credit facility for nursery operators from the government agency (the Forest Department), so many prospective nursery entrepreneurs cannot establish and expand nurseries.

Conclusion

Besides government efforts, private nursery enterprises produce a huge number of seedlings in Bangladesh. The national plan to bring 20% of the country's land under afforestation programs will not succeed unless private entrepreneurs come forward. Hence, it is urgent to ensure, as recommended by entrepreneurs, that private sector nursery establishment is supported with adequate funding and state-of-the-art technology, and that appropriate policy measures are formulated and promulgated, including provision of institutional support through local Forest Department offices, for expansion of the private seedling nursery sector in Bangladesh. Moreover,

nursery entrepreneurs could be seen as the 'tree extension agents' of the future with proper training on tree growth and management. They can contribute in producing seedlings of required quantity and quality and distribute these among the people. They can also create community awareness of the necessity of tree planting and greening the country.

References

ADB (2000) FRA 2000 forest resources of Bangladesh country report. Asian Development Bank, Rome

ADB (Asian Development Bank) (2001) Project performance audit report on the Upazila Afforestation and Nursery Development Project (Loan 956-BAN[SF]) in Bangladesh. Dhaka

Banglapedia (2007) National Encyclopedia of Bangladesh. Asiatic Society of Bangladesh. http://www.banglapedia.org/bangla/index.htm. Accessed 12 June 2007

BBS (Bangladesh Bureau of Statistics) (1999) Statistical year book of Bangladesh. Ministry of Planning. People's Republic of Bangladesh, Dhaka

FAO (Food and Agricultural Organization) (2000) Global forest resources assessment 2000 main report. FAO, Rome

GOB (Government of Bangladesh) (1992) Forestry Master Plan (Forest Policy). Ministry of Environment and Forests, People's Republic of Bangladesh, Dhaka

GOB (Government of Bangladesh) (1994) Bangladesh National Forest Policy 1994. Asian Development Bank/UNDP/FAO-BGD, Government of the Peoples Republic of Bangladesh, Dhaka

GOB (Government of Bangladesh) (2007) Bangladesh Forest Department Official Website: http://www.bforest.gov.bd/agro.php. Accessed 12 Jan 2007

Rahman MM, Furukawa Y, Kawata I, Rahman MM, Alam M (2005a) Homestead forest resources and their role in household economy: a case study in the villages of Gazipur sadar upazila of central Bangladesh. Small-scale For Econ Manage Policy 4(3):359–376

Rahman MM, Tsukamoto J, Furukawa Y, Shibayama Z, Kawata I (2005b) Quantitative stand structure of woody components of homestead forests and its implications on silvicultural management: a case study in Sylhet Sadar, Bangladesh. J For Res 10:285–294. doi:10.1007/s10310-004-0137-4

Safa MS (2006) The role of NGOs in improving social forestry practice: do they promote livelihood, sustainability and optimal land use in Bangladesh? Small-scale For Econ Manage Policy 5(2):207–229

Webster (1960) New world dictionary of the American language, College Edition. World Publishing Company, New York