

Species Diversity in Homestead Agroforestry System of Chittagong District : An Exploratory Study

M. Mohiuddin, R. M. Chowdhury¹ and M. Mohshin¹

Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong
¹Bangladesh Forest Department

Abstract

Species diversity and economic returns of five different components namely timber, fruit, fuelwood, vegetables and non-timber forest products (NTFPs) in homestead agroforestry system were studied at two smallest administrative units (Union) namely Betagi and West Demsha under Chittagong district. Most of the available species under each component at both locations were common. With little exception, the frequency distribution of each component species was similar in all household categories at each study location. Tree components for timber and fruit were more in West Demsha than in Betagi, whereas components for fuelwood, vegetables and NTFPs were more in Betagi. However, the economic returns from vegetable component were more than those from any other component in both the study locations. The results indicated that homestead agroforestry systems in the study locations were traditional, and generally immediate income generating component like vegetables had been selected by the small and medium households in the establishment of such system.

সারসংক্ষেপ

চট্টগ্রাম জেলার দু'টি ক্ষুদ্রতম প্রশাসনিক এলাকায় (ইউনিয়ন) গৃহস্থান-কৃষিবনায়ন পদ্ধতিতে পাঁচটি বিভিন্ন উপাদান যথা : কাঠ, ফল, জ্বালানী কাঠ, সবজি এবং অ-কাঠল বনজদ্ৰব্য উৎপাদনকারী প্রজাতির বৈচিত্র্য এবং অর্থনৈতিক প্রাপ্তির সমীক্ষা পরিচালিত হয়। উভয় এলাকায় প্রতিটি উপাদানের সর্বাধিক প্রাপ্ত প্রজাতিগুলো একই ধরনের। প্রত্যেক এলাকায় প্রতিটি উপাদানের প্রজাতিগুলোর সংগঠন বিস্তার সামান্য ব্যতিক্রম ছাড়া সব ধরনের পরিবারে সমান ছিল। কাঠ এবং ফলজ বৃক্ষ উপাদান বেতাগির চেয়ে পশ্চিম চেমশায় বেশী, তবে বেতাগিতে জ্বালানী কাঠ, সবজি এবং অ-কাঠল বনজদ্ৰব্য উৎপাদনকারী উপাদান বেশী। যাহোক, উভয় এলাকায় সবজি উপাদান হতে অর্থনৈতিক প্রাপ্তি অন্য যে কোন উপাদানের চেয়ে বেশী। প্রাপ্ত ফলাফল ইংগিত করে যে, সমীক্ষা পরিচালিত এলাকাতে গৃহস্থান-কৃষি বনায়ন পদ্ধতি ঐতিহ্যগত এবং সার্বজনীনভাবে নিম্ন ও মধ্যম শ্রেণীভুক্ত পরিবারগুলো এই পদ্ধতি স্থাপনে দ্রুত আর প্রদানে সক্ষম এমন উপাদান নির্বাচন করে থাকে।

Key words : Economic returns, homestead agroforestry, species diversity

Introduction

Agroforestry system is traditional in the homesteads of moist tropical world including rural areas of Bangladesh since the establishment of houses. This system could be considered as potential technology for rural poverty alleviation because of its diversified functions (Khandaker 1991). Plant components for the homestead agroforestry systems are generally selected on the basis of day to day requirement of households along with their choice (Abedin *et al.* 1988). Moreover, the households are mostly interested to grow definite annual income generating plants in their homesteads (Ahmed and Islam 1994). However, knowledge on the selection of appropriate species and their management with sufficient research are not adequately transferred to the farmers.

Since plant components in homestead agroforestry system are traditionally diversified as per importance, all the available components of economic value and their effects need to be evaluated to develop appropriate management technology for a model system in a selected area. However, only the role of tree components as fuelwood (Abedin and Quddus 1990, Miah *et al.* 1988), timber (Alam and Mohiuddin 1991) and MPTS (Ahmed and Islam 1994) have been studied independently in homestead plantations of different localities of Bangladesh. Therefore, the present study was conducted to evaluate floristic composition of plant components and their economic role in homestead agroforestry systems of two different selected areas of Chittagong district.

Materials and methods

Two smallest administrative units (Union) under two different Police Station (P.S.) of

Chittagong district were selected for the study. One was Betagi (an area adjacent to the government forest and a model horticultural farm with poor economic condition) from Rangunia P.S. of Northern Chittagong, and other one was West Demsha (an area away from the government forest and model horticultural farm with better economic condition) from Satkania P.S. of Southern Chittagong. On the basis of homestead area (ha) the households of each location were categorised into small (<0.50 ha), medium (0.50 - 1.00 ha) and large (>1.00 ha). Ten households of each category were selected randomly for the study in each location. The study was made during the month of January to April, 1994.

The numerical value of five different plant components namely, timber, fruit and fuelwood trees including agricultural annuals (vegetables) and non-timber forest products (NTFPs) species was recorded from each household category. The economic returns from each component (price of both self consumed and marketed products) of each household were also recorded interviewing the household owners. Percentage and then the mean percentage of the total for each component were calculated from the recorded data.

Results

Among the tree components, trees for fuelwood were dominant in Betagi and the fruit trees were in second position followed by timber trees irrespective of household categories. This is comparable to that of tree components in homesteads of West Demsha, where fruit trees were dominant and the timber trees were in second position followed by fuelwood trees (Table 2). With little exception, the frequency distribution of

each component species was similar in all household categories of each area. Comparing the study locations, trees for timber and fruits were relatively more at West Demsha than Betagi. On the other hand, the components for fuelwood, vegetables and NTFPs were more at Betagi than that of West Demsha (Table 2). Most of the available species of each component were common in homesteads at both study locations. However, some species of tree and NTFP components, forest based species in particular, were only available in homesteads of Betagi (Table 1).

Economic returns from vegetable components were higher than from any other components in all household categories of each study location (Table 3). In case of medium and large household categories, the economic returns from tree components were higher at West Demsha than those at Betagi. Whereas, in case of small household categories, the economic returns from fuelwood trees and NTFPs were less at West Demsha compared to those at Betagi although the contribution from fruit trees on economic return was reverse (Table 3).

Table 1. Available species of various plant components in homestead agroforestry system of West Demsha and Betagi.

Timber, fruit & fuelwood trees	Vegetable crops	Non-Timber Forest Products
Species present in both locations		
<i>Acacia mangium</i>	<i>Abelmoschus esculentus</i>	<i>Acalypha indica</i>
<i>A. auriculiformis</i>	<i>Amaranthus gangeticus</i>	<i>Adhatoda vasica</i>
<i>Albizia procera</i>	<i>A. lividus</i>	<i>Aegle marmelos</i>
<i>Areca catechu</i>	<i>Capsicum spp.</i>	<i>Azadirachta indica</i>
<i>Artocarpus heterophyllus</i>	<i>Curcuma domestica</i>	<i>Bambusa vulgaris</i>
<i>Averrhoa bilimbi</i>	<i>Cucurbita pepo</i>	<i>Boerhaavia repens</i>
<i>Carica papaya</i>	<i>Dolichos lablab</i>	<i>Calamus tenuis</i>
<i>Citrus aurantifolia</i>	<i>Lycopersicum esculentum</i>	<i>C. viminalis</i>
<i>Cocos nucifera</i>	<i>Solanum melongena</i>	<i>Calotropis gigantea</i>
<i>Erythrina orientalis</i>	<i>S. tuberosum</i>	<i>Cassia fistula</i>
<i>Garuga pinnata</i>		<i>Curcuma zedoaria</i>
<i>Gmelina arborea</i>		<i>Datura metel</i>
<i>Lagerstroemia speciosa</i>		<i>Eupatorium odoratum</i>

Table 1. Contd.

Timber, fruit & fuelwood trees	Vegetable crops	Non-Timber Forest Products
<i>Litchi chinensis</i>		<i>Helotropium indicum</i>
<i>Mangifera indica</i>		<i>Hydrocotyle asiatica</i>
<i>Musa paradisiaca</i>		<i>Mimosa pudica</i>
<i>Pongamia pinnata</i>		<i>Moringa oleifera</i>
<i>Psidium guajava</i>		<i>Ocimum sanctum</i>
<i>Samanea saman</i>		<i>Oldenlandia corymbosa</i>
<i>Spondias pinnata</i>		<i>Oxalis corniculata</i>
<i>Swietenia macrophylla</i>		<i>Schumannianthus dichotoma</i>
<i>Syzygium cumini</i>		<i>Solanum xanthocarpu</i>
<i>Tamarindus indica</i>		
<i>Tectona grandis</i>		
<i>Trewia nudiflora</i>		
<i>Ziziphus mauritiana</i>		
Species present in Betagi		
<i>Anthocephalus chinensis</i>	<i>Lageneria siceraria</i>	<i>Abroma augusta</i>
<i>Dalbergia sissoo</i>		<i>Anacardium occidentale</i>
<i>Elaeocarpus robustus</i>		<i>Bambusa tulda</i>
<i>Emblica officinalis</i>		<i>Coccinea indica</i>
<i>Eucalyptus camaldulensis</i>		<i>Daemonorops jenkinsianus</i>
<i>Hopea odorata</i>		<i>Dendrocalamus giganteus</i>
<i>Lannea coromandelica</i>		<i>Melocanna baccifera</i>
<i>Sterculia colorata</i>		<i>Mentha spicata</i>
		<i>Oxytenanthera nigrociliata</i>
		<i>Vitex negundo</i>
Species present in West Demsha		
<i>Annona squamosa</i>	<i>Trichosanthes anguina</i>	
<i>A. muricata</i>		
<i>Citrus grandis</i>		
<i>Dipterocarpus turbinatus</i>		

Table 2. Frequency distribution (mean % of total) of various plant components in homestead agroforestry of different household categories at West Demsha and Betagi.

Household categories	Name of plant components				
	Timber tree	Fruit tree	Fuelwood tree	Vegetable crops	Non-Timber Forest Products
West Demsha					
Large	31.20	33.35	16.97	09.86	08.64
Medium	28.29	31.41	15.47	17.43	07.43
Small	22.55	39.37	20.18	08.91	09.01
Betagi					
Large	14.95	17.91	25.19	21.63	20.34
Medium	15.46	21.41	24.73	23.10	15.19
Small	13.98	16.84	25.73	23.63	19.88

Table 3. Annual economic return (mean % of total) from various plant components in homestead agroforestry of different household categories at West Demsha and Betagi.

Household categories	Name of plant components				
	Timber tree	Fruit tree	Fuelwood tree	Vegetable crops	Non-Timber Forest Products
West Demsha					
Large	05.29	09.91	26.87	48.46	09.53
Medium	03.11	10.48	27.34	55.43	03.67
Small	01.89	14.25	09.88	67.21	06.79
Betagi					
Large	01.09	03.33	08.60	80.01	07.07
Medium	01.74	03.21	07.72	79.21	08.13
Small	02.26	04.19	13.56	69.08	11.02

Discussion

The selection of various components for homestead agroforestry production system traditionally depends on household requirement and their choice (Abedin *et al.* 1988). The presence of more timber and fruit trees in homesteads of West Demsha than in Betagi (Table 2) is an agreement with that since West Demsha is far away from government forest and a community based model horticultural farm. Also better socio-economic conditions of the households of West Demsha could play an important role in the selection of such component composition for their homestead agroforestry system (Abedin and Quddus 1990). Therefore, in homestead agroforestry composition of Betagi the components for fuelwood, vegetables and NTFPs were more than those in West Demsha (Table 2) as these components provide higher annual economic returns than timber and fruit tree components of that area (Table 3). This is an indication that household people of poor economic condition seems to be interested in the selection of annual income generating components for their homestead plantation as also stated by Ahmed and Islam (1994).

The observations of almost uniform frequency distribution of each component in all household categories in both the locations (Table 2) indicated the traditional practice of homestead agroforestry system. Availability of almost common species of each component in both the localities (Table 1) supports the idea of traditional homestead agroforestry systems. However, in comparison to that of West Demsha, a number of different timber species (8 species) and NTFPs (11 species) component have been grown in Betagi (Table 1). The location (adjacent to forest land) and household people's awareness to forest based species in association with poor socio-economic condition of Betagi could be related with this variation. Thus,

the species composition of various components in homestead agroforestry system of a particular area may be determined by the integrated influence of socio-economic and ecological conditions of that location.

Since agroforestry system could be considered as subsequent cash making technology (Khandaker 1991), households of rural area are interested to grow the components of immediate economic return in their homesteads. Higher economic returns from vegetable components than from any other components in both study locations (Table 3) could be suggested as an identical approach. However, the involvement of household people in the management of vegetable components with greater interest might influence in this respect. Similarly, more economic return from tree components has also been achieved by the large and medium households of West Demsha than Betagi since in West Demsha the management of tree components has been carried out by the farmers with greater attention.

During the observation of homestead agroforestry systems in both the study locations it revealed that households always try to incorporate as many component species as possible in their homesteads to establish a sustainable productive system. Moreover, species composition of various components and their arrangement were also in a traditional manner. Thus, the maintenance of sustainable production through the utilization of environmental resources is not well organised. As a result, appropriate components yet to be established in order to attain sustainable economic and environmental benefits from homestead agroforestry systems. However, farmers used to consider household requirements and immediate income generation in selecting components for homestead agroforestry system at both the study locations.

References

- Abedin, Z.; Aktar, S.; Haque, F. and Islam, S. 1988. Uses of multipurpose trees on the small farms of the low-rainfall Ganges flood plain soils of Bangladesh. *In*: Withinton, D. ; MacDicken, K. G. ; Sastry, C. B. and Adams, N. R. (eds.). *Multipurpose Tree Species for Small Farm Use*. Winrock International, USA and International Development Research Centre (IDRC), Canada. pp. 31-47.
- Adedin, Z. and Quddus, A. 1990. *Household Fuel Availability and Home Gardens in Some Selected Locations of Bangladesh*. FAO, RWEDP, Winrock International, USAID, Bangkok , Thailand. 74. pp.
- Ahmed, M. R. and Islam, A. 1994. People's choice and attitudes towards growing multipurpose tree species. *Chittagong University Studies, II Science* 18 (1) : 31-37.
- Alam, M. K. and Mohiuddin, M. 1991. Timber trees for homesteads in Bangladesh. Paper presented in a Training Course on Research Techniques in Agroforestry, Bangladesh Forest Research Institute, Chittagong. 12 pp.
- Khandaker, K. 1991. Homestead agroforestry in Bangladesh and its development. Paper presented in a Training Course on Research Techniques in Agroforestry, Bangladesh Forest Research Institute, Chittagong. 12 pp.
- Miah, G.; Abedin, Z.; Khair , A. B. M. A.; Sahidullah, M. and Baki, A. J. M. A. 1988. Homestead plantation and household fuel situation in Ganges flood plain of Bangladesh. Paper presented in National Workshop on Homestead Plantations and Agroforestry in Bangladesh, Joydebpur, Dhaka. 15 pp.