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Traditional knowledge base in the management of village bamboos: A case study in Barak Valley, Assam, Northeast India

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Bamboos are the important component in the traditional land use systems of Barak Valley. The traditional practice of village bamboo management in the homegarden system was studied in the Cachar district of Barak Valley, Assam. Utilization of village bamboos for fulfilling basic rural necessitate supports the maintenance of village bamboo diversity. Traditional management of village bamboos has recognized the formation of certain societal groups that forms a complex interlinkage and generates rural employment. Traditional practice of moulding of soil around the clump, addition of leaf litter and farm yard manure to the bamboo clump is of practical importance and have scientific basis. Clear felling strategy of bamboo clump management for commercial utilization has severe effects on the clump growth parameters that can endanger the village bamboo productivity. Strategies to overcome the weaknesses of traditional management system are also discussed.

Keywords: Village bamboos, Bamboo management, Bamboo clump, Traditional Knowledge, Assam
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Village bamboos form an important component in the home garden systems that have been traditionally used in India for variety of purposes. In India, clumps of bamboo are raised in cultivated lands of most Northeastern states, Goa, Kerala, coastal Maharashtra and Karnataka[1]. The association of men with bamboo in India is as old as human civilization[2]. Village bamboos are grown in the backyard and in the periphery of the holdings and are mostly clump forming. Home gardens in villages of India, Bangladesh, Malaysia and Indonesia often possess bamboo clump[3-5]. India is the second largest producer of bamboo in the world next to China and also has the rich diversity of bamboos with almost 130 species spread over 18 genera[6]. Of the 78 species of bamboos distributed in the North East India, 42 species are found in Assam[7,8]. Various traditional utilization patterns of bamboo are reported in Apatani plateau, Peninsular Malaysia and Manipur[9-11]. Traditional systems of resource use and management are often being recognized as sophisticated and appropriate as they are socially well-based[12]. However, cultivation and proper management and use of rural bamboo are being neglected[4,13]. Therefore, systematic collection and incorporation of farmer's knowledge should be given priority while developing any programme for the promotion of cultivation, use and sustainable management of the resources[14]. However, before incorporation of traditional knowledge and practices for the development of programmes for the promotion of any crop, systematic assessment of such knowledge for their validity and relevance is also required[12]. The study is an attempt to assess the traditional knowledge base system of bamboo management and its importance in sustainable development of village bamboo sector. The knowledge of such study is important in developing better utilization and management practices for higher yield.

Barak Valley region, which forms the southern part of Assam, covers an area of 6,922 sq km. (Fig. 1). The region shares its border with North Cachar Hills district and the state of Meghalaya in the North, the state of Manipur in the East; the state of Mizoram in the South and the state of Tripura and the Sylhet district of Bangladesh in the West. The Barak Valley region has an undulating topography characterized by hills, hillocks (locally known *Tilla*), wide plains and low-lying waterlogged areas (locally called *beels*). The study was conducted in Irongmara and Dargakona village, in Cachar district of Barak Valley and is situated between latitude 24°41′ and longitude

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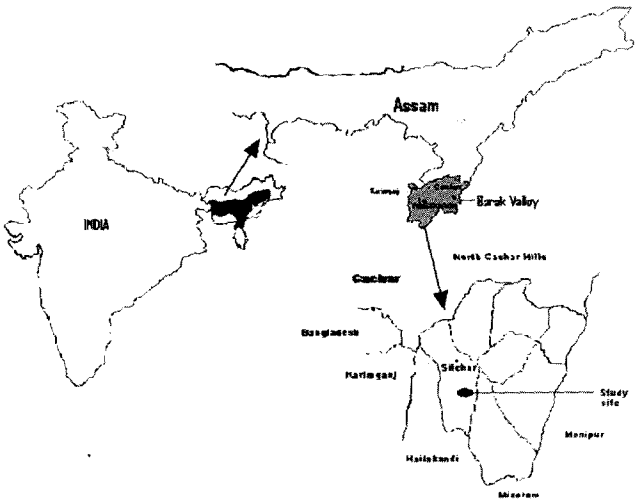

Fig. 1—Lociation map of the study area

92°45′. The two villages have population of 6,847 with 3,523 males and 3,324 females[15]. Socio-economically, the villagers are small holders with paddy land as the major land use system and day labourer as the primary occupation. Average number of people per family is 6.86 (Range 2-20) with average number male 3.81 (Range 1-14) and female 3.06 (range 1-10). Community like *Mala, Maal* and *Pashi* dominates the study villages. The climate of the study site is sub-tropical warm and humid with average rainfall 2,660 mm, most of which is received during the Southwest monsoon season (May to September). The mean maximum temperature ranges from 25.1°C (January) to 32.6°C (August). The mean minimum temperature ranges from 11°C (January) to 25°C (August).

Methodology

Hundred homegardens were selected for the study. Traditional knowledge base systems for the management of village bamboos were studied by surveying all the selected homegardens. Information regarding harvesting of bamboo culms, season of harvesting, pattern of transportation was gathered through field visits and interaction with bamboo growers through detailed and structured questionnaire. Culm growth parameters of *B.cacharensis, B.vulgaris* and *B.balcooa* under traditional management system were studied from November 2003 to November 2004, as growth of bamboo stabilizes by the month of November. For each traditional harvesting system (selective felling, clear-felling in rainy season), 10 clumps with age group varying between 10-20 yrs for each of the three species were selected and labeled with paints. Since only the full grown clumps i.e. of 10-20 yrs age group are clear-felled, for comparative study clumps with similar age group were selected under selective felling system as well.

Results

Traditionally, bamboo resources of homegarden and bamboo grove of Barak Valley have assumed great economic importance both commercially and locally. In the present investigation traditional knowledge base systems have been categorized in to its strengths and weaknesses depending on the aspect of utilization and management system adopted by the villagers. Traditional utilization pattern of village bamboo resources are described (Fig. 2). In the process of utilization of bamboos, villagers are maintaining a number of bamboo species in their homegarden and bamboo grove to fulfill their basic necessitates (Table 1). Commercial utilization of village bamboos forms an interlinkage between the bamboo grower, bamboo contractor and labourers, the different societal groups within the community (Fig. 3). Bamboo contractor purchase bamboos from bamboo grower and sell it either in scaffolding unit or in the paper industry. Bamboo contractor involves labourers for harvesting bamboo culms. These societal groups (bamboo grower, contractor and labourer) are dependent on each other for the utilization of village bamboos and in doing so they generates their income. Moulding of soil to the bamboo clump prior to rainy season is practiced every year which according to the bamboo growers keeps the newly emerged shoot healthier and even reduces their mortality rate (Fig. 5). Leaf litters and farmyard manure are added around the clump every year for fulfilling the nutrient requirement of the growing culms in the clump (Fig. 6). Harvesting of culms from a newly developed clump begins only after it exceeds five years of age, thus keeping the younger clumps undisturbed.

Table 1–Village bamboos in homegarden and bamboo grove

Plant name	Local name
Bambusa assamica Barooah *et* Borthakur	*Mirtinga*
B. balcooa Roxb.	*Sil borua*
B. cacharensis R. Majumder	*Betua*
B. nutans Wall.	*Bakal*
B. vulgaris Schrader	*Jai borua*
Gigantochloa albociliata (Munro) Kurz	*Kalasundi*
Schizostachyum dullooa (Gamble) Majumder	*Dolu*

Under traditional management system, vegetative propagation is practiced through offset method in which offset from 1-2 yr old culms are cut at about 1.5-2.0 m height that is excavated along with a portion of rhizome with its root system and planted in rainy season. The disadvantages of offset plantation are associated with its limited number, extraction and transportation difficulty. Under offset plantation, synchronous flowering occurs in the propagated clump with that of parent clumps. Traditional clear felling strategy of bamboo clump management (Fig. 7) is mainly practiced during the rainy season in comparison to selective felling system, which is mainly practiced during winter season (Fig. 8). Bamboo growers prefer clear felling system during rainy season as the harvested culms are constructed into rafts and ferried through water that reduces transportation cost (Figs. 9-11). Under clear-felling system, 85–100% of the total culms per clump are harvested. The effects of clear felling systems on the clump growth parameters are described (Table 2, Fig. 4). Production of new culms per clump is higher in all the three species under selective felling than clear-felling rainy season. Under selective felling *B. balcooa* (23.1) produced highest number of new culms than *B. cacharensis* (17.8) and *B. vulgaris* (17.17), while under clear felling rainy season *B. cacharensis* (6.9) produced highest number of new culms than *B. vulgaris* (5.0) and *B. balcooa* (5.78). Under selective felling culm height and culm DBH of newly emerged culms of both 2003 and 2004 is about 30-45% higher than clear felling rainy season for all the three species. Culm height and culm DBH for the new culms of 2003 and 2004 for all the three species under selective felling remained almost same, whereas under clear felling system culm height and culm DBH for the new culms of all the three species exhibited marginal increase during 2004 than that of 2003.

Table 2-New culm production under traditionally managed clump

Bamboo species	New culm production per clump	
	Selective felling	Clear felling
B.cacharensis	17.8* (12-23)	6.9 (3-8)
B.vulgaris	17.17 (11-20)	6.0 (4-7)
B.balcooa	23.1 (16-37)	5.78 (4-10)

* Average number of culms; Range (in parentheses)

Discussion

Utilization of village bamboos in the rural lives of Barak Valley is diverse ranging from household to commercial to product making sector. Utilization and management of village bamboos has enabled bamboo growers to maintain the village bamboo diversity. Among the seven village bamboo species encountered in the study, *B. assamica* and *B. cacharensis* are endemic to Assam[8,16]. *B. cacharensis* is also a priority village bamboo of Barak Valley and is widely distributed and frequently cultivated in the homegardens[17]. Three other bamboo species *B. balcooa*, *B. nutans* and *B. vulgaris* are among the14 Indian priority bamboo species and 38 priority bamboo species for international action[6,18,19]. Therefore, traditional knowledge base systems of village bamboo growers are responsible in managing such endemic, nationwide and internationally prioritized bamboo species. Bamboo is an excellent resource for pulp and paper making, used in India, Japan and other Asian countries for a long time[20]. It is estimated that harvesting of bamboos in India itself requires about 71.25 million man-days every year 21. Village commercial utilization of bamboo resources provides an important source of raw material for paper industry and in the process, it economically directly benefits bamboo grower and indirectly to bamboo contractor and labourers. Commercial bamboo utilization develops an interlinkage cycle between bamboo grower (in the farm), bamboo contractor and labourers (non-farm) sector, where all of them are economically benefited. The traditional practice of soil moulding and addition of leaf litter to the bamboo clump every year made bamboo growers dependent on the natural sources for bamboo clump nourishment and thus reducing the chemical input to the environment.

The traditional practice of vegetative propagation through offset plantation is labour intensive and is not feasible for raising large scale plantation. Moreover, extraction of more number of offset from a clump can damage the rhizome system of the mother culms and hence reduced productivity of bamboo stands. Traditional bamboo growers prefer to harvest *B. vulgaris* and *B. balcooa* under clear-felling system for paper industry due to their higher green weights while *B.cacharensis* under selective felling system due to its multipurpose uses in construction of new houses and repairing of old houses. Clear felling strategy of clump management has severe effect on the clump growth parameters like new culm production, culm height and culm DBH. New culm production is almost three fold higher under selective felling system than clear felling system. Selective harvest gives a somewhat greater yield than clear-cutting[22]. Culm

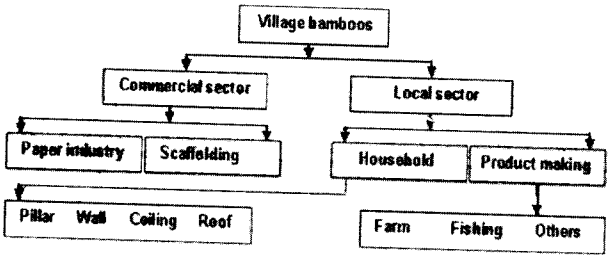

Fig.2 Traditional utilization pattern of village bamboos

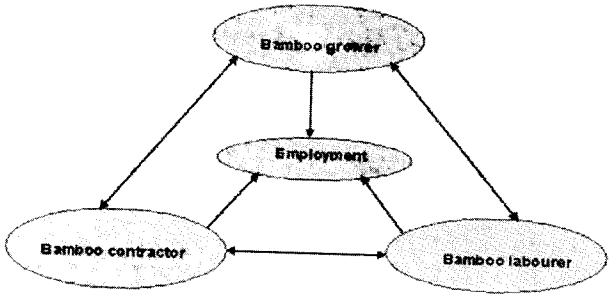

Fig. 3 Interdependency cycle

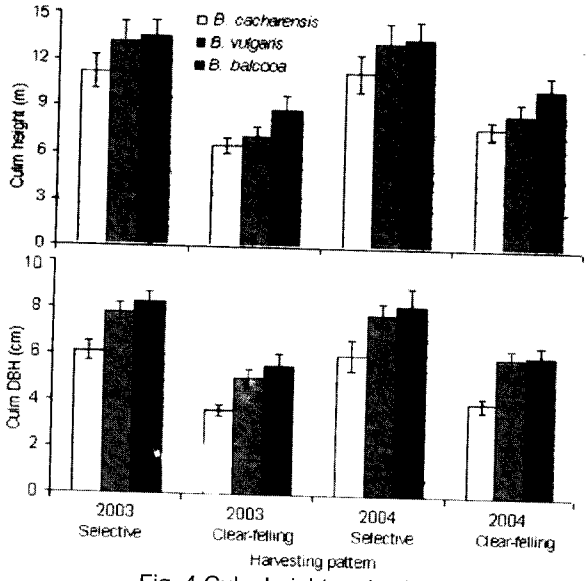

Fig. 4 Culm height and culm DBH

Fig.5 Moulding of soil around the clump

Fig.6 Moulding of soil around the clump the clump

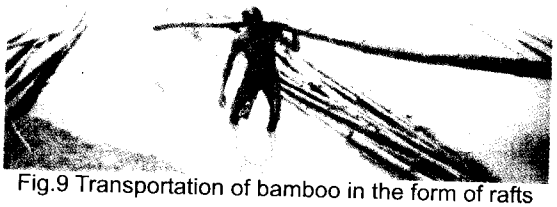

Fig.9 Transportation of bamboo in the form of rafts

Fig.10 Weighing of bamboo culm pieces

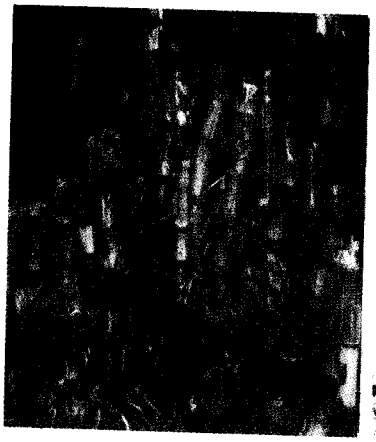

Fig.7 Clear felling strategy of clump management

Fig.8 A selectively felled clump

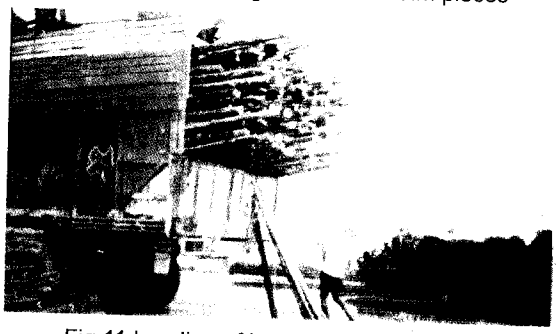

Fig.11 Loading of bamboo pieces in truck

production of 3.2 – 8.8 in the 5th year of clump age in case of four *Bambusa* species in Bangladesh has been reported[23]. Differences in the new culm production under selective harvest between the study and the reported from Bangladesh may be due to differences in the age of the bamboo clump studied. Under selective felling, retention of sufficient number of culms maintained the vigour of rhizome ensuring maximum production and sustained growth. After a clump is fully felled, the new culms arising are smaller in length, thinner in diameter and less vigorous for the first few years[24]. In the study, similar observations were made where the new culms of both 2003 and 2004 are smaller in length and thinner in diameter in comparison to new culms of selective felling clumps. Culm height and culm DBH of new culms under clear felling systems were 30-50% lower than the new culms of selective felling clumps. Under clear-felling, retention of less number of culms per clump can not maintain the vigour of underground rhizome that substantially reduce yield.

Some of the indigenous knowledge base system of bamboo clump management has negative feature that can endanger the village bamboo productivity. Therefore, some strategies have been formulated to overcome the weaknesses of traditional knowledge. The strategies include information exchange between researchers and bamboo growers; integration of traditional and modern knowledge for better management of village bamboos; need of having policy guidelines for harvesting village bamboos; and organizational and institutional support to convert farmer's skills and knowledge in to commercial production

Conclusion

The rural lives in Barak Valley are intricately related with the village bamboos. Different aspect of traditional utilization of bamboo provides direct and indirect economic benefit through employment generation that is accessible to low income and socially disadvantaged groups. The existing management system, especially traditional clear felling system of clump management is unscientific. For enhancing the higher productivity of the village bamboo stand, scientific management of the clump through selectively felling of the mature culms each year are desirable. Thus, more emphasis is needed to utilize this keystone rural resource socially, ecologically and economically for sustainable development of the region.

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