INDIGENOUS KNOWLEDGE OF APATANI TRIBE OF CULTIVATION AND UTILIZATION OF RUNNER BAMBOO (*PHYLLOSTACHYS BAMBUSOIDES* GAMBLE) IN ARUNACHAL PRADESH

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Introduction

Bamboo is a tall arborescent graminoid belonging to Bambusoideae. In India, bamboos thrive best in well-drained parts of monsoon forests at the foothills of the Himalayas and the Peninsular Ghat region as a utility for humankind, as a commodity that begins with birth itself, from child rearing 'a cradle' (vern. 'Dala' in Kumauni dialect) to the funeral bed. Bamboo serves humanity for a range of socio-cultural and industrial commodities of non-food and food value except its applicability as milk (Mauria and Arora, 1988; Melkania, 2002). Economy-wise, it serves man as a natural plant, to the tribal population for socio-cultural uses to neo-humans for utensils, decoratives and furniture and fixtures. As a forest food, it provides shoots almost free from fat but rich in crude protein, carbohydrates and minerals. India is endowed with a large number of bamboo species. Tewari (1992) listed 23 genera and 126 species of bamboo from India, of which 18 genera and 90 species occur in the North-Eastern Region (NER). Hore (1998) described 125 species for India belonging to 23 genera; the NER accounts for 77 species and one variety belonging to 19 genera (Karthikeyan *et al.,* 1989). Different reports exist on the distribution of bamboo in the NER. Mauria and Arora (1988) reported 16 genera and 58 species in the entire NER. Biswas (1988) recorded 15 genera and 63 species in the same region; of these, 14 genera and 41 species were recorded from Arunachal Pradesh alone. Altitudinally, in Arunachal Pradesh, 35 species of bamboo are confined to 100-1,500 m amsl and seven species to 1,500-3,700 m amsl (Haridasan *et al.,* 1987). Melkania (2007) enumerated 63 species of 20 genera of bamboo in the natural forests and degraded and abandoned 'jhum' lands in the NER. These occur dominantly in tropical and sub-tropical moist deciduous forests and occasionally in semi-evergreen forests. Over 50 species of bamboo are used for different traditional dishes in large or small quantity in the NER.

Phyllostachys bambusoides Gamble (vern. 'Boji' in Apatani and 'Tabe' or 'Tabye' in Nishi tribe dialect) is so far reported to occur only in Ziro, locally called 'Apatani plateau' (altitude 1,524 m amsl) in Lower Subansiri District (26° 55' to 28° 21' N lat. and 92° 40' to 94° 21' E long.) in Arunachal

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Pradesh. The Apatani tribals manage its cultivation and utilization by the self-designed knowledge and technology based on their traditional experiences. Documentation of such knowledge is, therefore, vital for improving skills and capacity of development workers and extension services for sustainable development and natural resource management. This communication attempts on the traditional knowledge of Apatani tribe of cultivation and utilization of *P. bambusoides* – the endemic but wisely-cared bamboo.

Study Area

The study was conducted in the Apatani plateau that includes 21 small and large villages in 26 km^2 land in Lower Subansiri District. The plateau is inhabited traditionally by the Apatani tribe with population density 554 persons/km^2. Unlike other tribes who practice forest-based shifting (vern. 'jhum') farming, the Apatani practice wetland-based settled paddy-cum-fish cultivation – the agri-pisciculture (Melkania, 2001). These indigenous humans maintain all bio-productive systems essential for livelihood needs, viz., agriculture-cum-fishery, animal husbandry, forests and bamboo land (vern. 'bije') and grazing land/ grasslands, with considerable experience of land and water management. Historically, it is believed that Austric tribes first discovered this type of cultivation in India (Kani, 1996) and Mongoloid tribes did the same in China. The Apatani probably acquired such knowledge and ideas from Mongoloid tribes.

The Apatani plateau is a valley characterized by isolated hillocks and Blue pine (*Pinus excelsa* Wall.) spurs. The valley enjoys cool sub-tropical climate (chilled mornings during winters) with 2,350 mm annual rainfall and temperature 6.3° to 28.1°C during summer and 1.0° to 18.4°C during winters. Frost heaving is common in forested area during November to mid-February. Soil is humid black and reddish developed from genesis and schist overlaid on a wide area with old alluvial deposits. The surface soil (0-30 cm deep) is sandy loa, to clay loam with pH 5.10 to 5.64, organic carbon 1.50-2.75 per cent, available phosphorus 19 to 30 kg as P_2O_5 / ha and exchangeable potassium 300 to 362 kg as K_2O/ha.

Methods

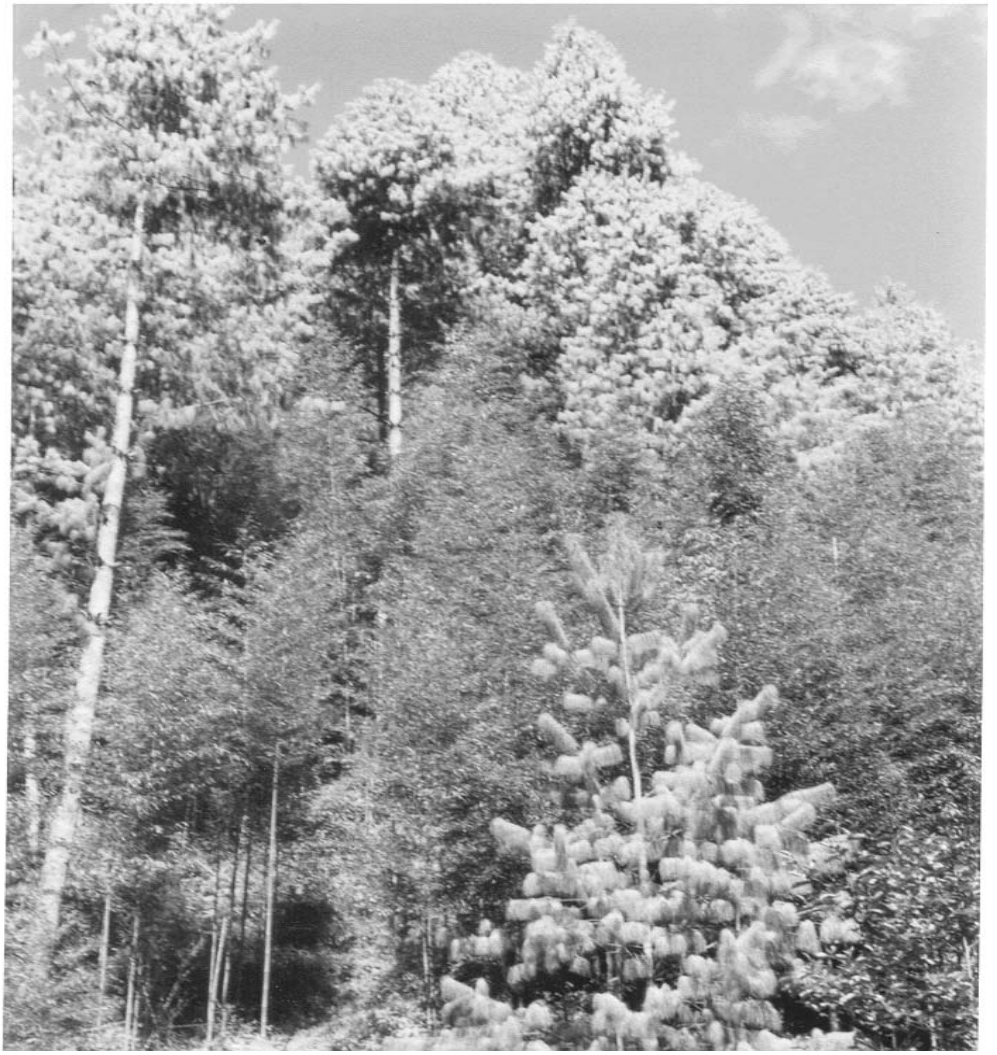
The indigenous knowledge and technology of the Apatani of cultivation and utilization of *P. bambusoides* was studied through field surveys comprising of door-to-door informal interactions with Apatani people selected randomly in the plateau. One hundred households, considering landholding and socio-economic status, were contacted for the study on socio-economic and cultural utilization of *P. bambusoides*. Additionally, local markets at Upper and Lower Ziro were visited to understand existing market potential of *P. bambusoides* produce. In natural landscape, bamboo stands were surveyed to study habit, cultivation and management. Data on selected physical features of growing shoots were recorded under field conditions. Selected nutrient parameters were studied following standardized laboratory analysis to understand its nutritive potential.

Observations

Habit : *P. bambusoides* is primarily a

cultivated reed-like bamboo with long creeping rhizomes. It is non-clump forming (heptomorph) and characterized by monopodial rhizomes and culms. It develops thick mat due to its runner habit on account of closely noded long stolons. It is cultivated as sole crop in 'bije' and barren lands at the periphery of crop fields surrounded exteriorly by natural *P. excelsa* woodlands. In natural stands, it is curiously species-specific and grows in association of *P. excelsa* under cool temperate environs (Fig. 1). Culms are slender and sturdy, erect, 90 cm to 6.0 m tall, 2.0 to 2.5 mm broad, hollow, green, glabrous, below the nodes at first characterized with powdery covering arising from underground rhizome. Two

Fig. 1



A view of *P. bambusoides* and *Pinus excelsa* stand in Apatani plateau, Arunachal Pradesh

morphotypes, one short and other medium tall, are evident. It shows fast establishment on planting. Each plant includes one to seven branches of spreading type, Leaves are four to 30 cm long, linear or lanceolate.

Silviculture : It is generally regenerated through rhizomes. The natural regeneration is very fast. No gregarious flowering has been reported in literature. The bamboo management plan includes production and protection as most common objectives. The former centers on economic yield and the latter is practiced for its regeneration and stand biodiversity and watershed conservation. The plan includes 'Working area' similar to 'Working Circle' of scientific forestry 'Working Plans'. The production working area is used for small timber and firewood. The Apatanis either individually or as community identify bamboo working area(s) and prohibit people strictly from entering or using a mountainous forest/land area designated for bamboo cultivation during specified period each year (generally August to October). The concept is bound by place and time and firmly fixed in local practice of conservation similar to 'Ridam' of Eastern Bhutan (Messerchmidt *et al.,* 2001). During these months, all forest activities like timber and fuelwood collection and grazing of Mithun (*Bos frontalis*) and cattle in the working area are completely banned. Anyone disregarding the rules is fined in cash or kind according to punishment decided collectively by the Apatani community. Such a participatory decision provides opportunity to new shoots of bamboo to grow and rest to bamboo stand and associated wildlife to mature relatively undisturbed during late warmer and wet months. The mature culms featuring vertical yellow strips on internodes at the basal parts in the third year of growth are harvested during mid-October to December or January, and extending less intensively upto April. The protection period covering August to October corresponds to the most important season for new bamboo growth. Fire hazards in the bamboo stands are controlled by developing 1.5 to 2.0 m wide fire lines.

The occurrence of rodents in bamboo land is not a menace rather rats are collected alive as a food resource through natural traps. A rat trap comprises of a box - like cage made up of two parallel stones, fixed vertically with some natural support posteriorly (soil column or wall). A flat stone is then supported on the top of the cage by two bamboo sticks adjusted to the bait (paddy grains) inside the cage through open passage in front and touches the bait. The two bamboo sticks supporting the stone give way to rat which is trapped inside the cage while eating paddy grains. The flat stone pressed alive rats are collected for food value.

Shoot Characteristics : Table 1 presents selected physical features and nutrient contents of 15 days old shoots. On an average, a shoot of 65 cm length contains 1,013 g fresh weight bearing 70.82 per cent edible portion. The edible dry matter ranges 8.1 to 9.2 per cent per shoot. The shoots are rich in carbohydrate, protein and minerals.

Utilization : The Apatanis utilize *P. bambusoides* poles variously for house construction, thatching and roofing, walking sticks, strengthening arable land bunds (vern. 'Alis'), basketry, mats, irrigation pipes, inter-terrace water channels (vern. 'Hubur'), agricultural

Table 1

Selected physical features and nutrient contents of 15 days old shoots of P. bambusoides

Physical feature		Nutrient content (% on dry matter basis)	
Length (cm)	60 - 70	Crude protein	24.2
Girth (cm) :		Crude fibre	16.5
Base	21 - 25	Carbohydrate	36.5
Middle	12 - 14	Fat	1.8
Top	07 - 10	Minerals	14.7
Fresh weight (g/shoot)	975 - 150	Energy (cal/g)	2.5
Edible portion (g/shoot)	690 - 755		
Edible portion (% of fresh wt.)	69.74 - 71.90		
Dry matter in edible portion (%)	8.1 - 9.2		

implements, rice cooking, hedges/fences, ladders, fishing rods, containers/devices for administering liquid medicines to domesticated animals, firewood and handicrafts. The distal part of poles is used for making 'Alter' (local god's temple) in front of the house. The foliages serve as preferred fodder for Mithun. Environmentally, the underground biomass (stolon, rhizome and roots) of *P. bambusoides* serves as potential soil binder, thus, prevents soil loss from bamboo stand. Singh (2000) reported that *P. bambusoides* plantation improves soil pH, organic carbon, calcium and magnesium over 15 years, however, available phosphorus and exchangeable potassium decreases with age. Thus, Apatani bamboo neutralizes soil acidity and improves fertility of soil.

Fresh bamboo shoots are a delicacy among food items. These are used as small pieces boiled or fried with fish or leafy vegetables. Also, the dried and grounded shoots are used as 'chuthey' or flavouring agent in curry. For off-season utilization as food, whole or small pieces of fresh shoots are kept in a basket lined with leaves inside. It is covered with leaves, made air tight and kept inside the forest or bamboo 'bije' for 1-3 months for fermentation. The fermented shoots or pieces are dried or preserved wet by storing in the internode of bamboo. The average consumption of shoots ranges between 6 kg to 15 kg/household. Category-wise, consumption of shoots was recorded 5 kg to 15 kg/household for vegetable, 13 kg to 15 kg/household as dry fermented and 8 kg to 10 kg/household as wet fermented material. The market availability of shoots was recorded 98 kg to 175 kg week during mid-July to September for fresh shoots, 20 kg to 31 kg/ week for wet fermented and flattened whole shoots and 1-1.2 kg/week for pieced dry product.

Conclusion

Evidently, the Apatani people have maintained productive and regenerating stands of *P. bambusoides* through

traditional knowledge and technology. Thus, all socio-economic and cultural necessities of livelihood based on Apatani bamboo are maintained locally by the Apatani people using organic mode of cultivation. Practically, no sign of genetic erosion and site quality deterioration were observed during the field study in the bamboo 'bije' and bamboo-Blue pine woodlands.

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SUMMARY

Bamboos are potential bioresources of tangible and intangible values for humankind. Tropical and sub-tropical Indian forests and agrarian ecosystems harbour great species diversity of bamboos. Majority of bamboo species find favourable niche in the North-Eastern Region of the country. Among these, *Phyllostachys bambusoides* Gamble is confined only to Apatani plateau in Lower Subansiri District of Arunachal Pradesh, thus called commonly 'Apatani' bamboo. It is strictly a cultivated bamboo either grown as sole crop on land adjacent to cultivation fields and/or in association of *Pinus excelsa*. The present contribution documents, based on field surveys, the indigenous knowledge of Apatanis of cultivation and utilization of *P. bambusoides*. The information will be useful for development workers and extension services involved in bamboo development and natural resource management.

Key words **: Runner bamboo, *Phyllostachys bambusoides*, Apatani tribe, Arunachal Pradesh, Indegenous knowledge, Utilisation.**

अरुणाचल प्रदेश में आरोही बांस (*फायलोस्टैकिस बैम्बूस्वायडिस* गैम्बल) की खेती करने और उसे उपयोग में लाने का आपातानी जनजाति का देशज ज्ञान

एन०पी० मेलकानिया

सारांश

बांस मानव जाति के लिए स्पर्श्य और अस्पर्श्य मूल्यों के संभावनाओं वाले जैवसंसाधन हैं। उष्ण और उपोष्ण भारतीय वनों और कृषि परिस्थिति–संहतियों में बांसों की बहुत जातिगत विविधता मिलती है। अधिकांश बांस जातियों को इस देश के उत्तरपूर्वी भाग में अनुकूल आश्रयस्थल मिला हुआ है। इनमें से *फायलोस्टैकिस बैम्बस्वायडिस* केवल अरुणाचल प्रदेश के निम्न सुबनश्री जिले के आपातानी पठार में ही सीमित हुआ मिलता है, और इसीलिए आमतौर से इसे आपातानी बांस भी कहा जाता है। यह पूरी तरह से कृषिकृत बांस है जिसे या तो खेतों से लगती जमीनों में एकल फसल की तरह और/अथवा पाइनस एक्सेल्सा के साहचर्य में उगाया जाता है। प्रस्तुत अध्ययन में क्षेत्र सर्वेक्षणों से मिली जानकारी के आधार पर *फा० बैम्बूस्वायडिस* की खेती, और उपयोजन विषयक आपातानियों के देशज ज्ञान को प्रलेखित किया गया है। यह जानकारी विकास कार्यकर्ताओं और बांसों के विकास और प्राकृतिक संसाधनों के प्रबन्ध में विस्तार सेवाओं के लिए उपयोगी रहेगी।

References

Biswas, S. (1988). Studies on bamboo distribution in North-Eastern Region of India. *Indian Forester,* **114** (9) : 514-531.

Haridasan, K., N.B. Singh and M.L. Deori (1987). Bamboo in Arunachal Pradesh – The present status. *J. Trop. For.,* **3** (4) : 299-312.

Hore, D.K. (1998). Genetic resources among bamboos of North-Eastern India. *J. Econ. Tax. Bot.,* **22** (1) : 173-181.

Kani, T. (1996). *Socio-religious Ceremonies of the Apatani of Arunachal Pradesh.* Frontier Publisher and Distributor, Itanagar, Arunachal Pradesh.

Karthikeyan, S., S.K. Jain, M.P. Nayar and M. Sanjappa (1989). *Florae Indicae Enumeratio Minocotyledonae. Flora of India, Series 4. Bambusoideae,* BSI, Calcutta, pp. 274-283.

Mauria, S. and R.K. Arora (1988). Genetic resources of bamboos – An Indian perspective. *Indian Forester,* **114** (9) : 539-548.

Melkania, N.P. (2001). Agri-pisciculture by women entrepreneurs in the North-Eastern India : A case study of *Apatani* tribe of Arunachal Pradesh. *Proc. Workshop on Integration of Fish Biodiversity Conservation and Development through People's Participation,* NBFGR, Lucknow. pp. 114-116.

Melkania, N.P. (2002). Bamboo resources in the North-Eastern India : Status, research and management issues. *Proc. Expert Consultation on Strategies for Utilization of Bamboo Resources subsequent to Gregarious flowering in the North-East* (Pattanaik, S., A.N. Singh, M. Kundu, S. Trivedi, Y.C. Tripathi and K.G. Prasad, eds.). Rain Forest Research Institute, Jorhat. pp. 114-126.

Melkania, N.P. (2007). Biodiversity in forest and rangeland ecosystems in Indian North-eastern Himalayan region. *Indian Forester,* **133** (12) : 1609-1635.

Messerchmidt, D., K.J. Temphel, J. Davidson and W.D. Incoll. (2001). *Bamboo in the High Forest of Eastern Bhutan : A Study of Species Vulnerability.* ICIMOD, Kathmandu, Nepal. pp. 15.

Singh, K.A. (2000). Potential of agroforestry intervensions in the humid hilly ecosystems of India : Productive conservation and management. *Natural Resources : Conservation and Management for Mountain Development* (Tiwari, S.C. and P.P. Dabral, eds.). International Book Distributors, Dehra Dun. pp. 59-89 .

Tewari, D.N. (1992). *A. Monograph on Bamboo.* International Book Distributors, Dehra Dun. 498 pp.