Opportunities of Traditional Knowledge in Natural Resource Management: experiences from the Chittagong Hill Tracts, Bangladesh

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Chittagong Hill Tracts (CHT) is situated in the Southeast of Bangladesh covering about 10 per cent of the total land. It is the native home of 13 tribal communities and these communities have their own traditional knowledge for natural resource management. This paper provides 8 traditional knowledge namely, folk classification of landform, land use zoning, community reserve for common resource management, fuel wood selection for domestic use, water harvesting ditches, tree management in the jhum field by the Murang community, coppice management of *Gmelina arborea* Roxb. (*gamar*) and *Tectona grandis* L. (*teak*) by the Bwam community, timber harvesting time, keeping bark in teak logs to protect it from insect and borer attack, and maintenance of vegetation at the catchments areas. The economy, livelihood and culture of the tribal people are closely interlinked with the natural resources. An integrated approach is needed by different institutions for conserving the natural resources in the Chittagong Hill tracts.

**Keywords:** Traditional Knowledge, Natural Resource and Management

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The Chittagong Hill Tracts (CHT) comprises of Bandarban, Rangamati and Khagrachari hill districts and is situated in the Southeast of Bangladesh. It lies between 21°25' and 23°45' North latitude and between 91°45' and 92°50' East longitude. The total area of CHT is 13,295 sq. km covering about 10 % of the total land area of Bangladesh and geographically part of the Hindu-Kush-Himalayan region. About 80% of the total land is hilly or mountainous and are arranged in North-South direction linked with the Hindu-Kush-Himalayan regions. Thirteen tribal communities of Bangladesh are living in this area for centuries. They have their own traditional knowledge for natural resource management and to cope with their own agro-ecological and socioeconomic environments. This knowledge is generated or developed and transmitted by the communities over time. It is mentioned that traditional knowledge is generated and transferred by a systematic process of observations, experimenting with solutions, and readapting previously identified solutions to modified environment, socioeconomic and technological situations. Traditional knowledge is vital because of its ecological rationality its inspiration being the sustainable use of ecosystem. Traditional knowledge is location and sometimes community specific and it obviously has to be starting point if peoples’ involvement to be ensured and development has to be sustainable.

Soil, water and vegetation are considered as the three basic natural resources. Human beings are managing the natural resources to meet their requirement from the pre-Vedic era. The natural resources management systems are localized systems that form a basis in rural people’s decision making and traditional natural resource management system is found to be functioning and proved to be economically, socially and ecologically sound. The local people of the CHT have a long heritage of practicing natural resource management. The history of traditional knowledge of natural resource management in CHT is very primitive but the report on it is very recent. It is reported that production of hydro-electricity, increase of population, and commercial and industrial plantations are the main cause of deforestation and deterioration of soil condition of CHT. This paper discusses traditional knowledge for the management of natural resource.

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practiced by the different tribal communities in the different hilly regions of Chittagong Hill Tracts.

Methodology

Participatory rural appraisal (PRA) method is considered as an important tool for documenting plant based traditional knowledge. PRA was applied to document plant based traditional knowledge existing among the different tribal groups of Bandarban. An open ended questionnaire was followed to get the real information. In some cases, group meetings were conducted to collect the information on traditional knowledge that provides effective information for new topics like cultural knowledge. The prior consent of the knowledge providers were taken for documentation.

Following section presents some example of traditional knowledge practices by hill communities of the Chittagong Hill Tracts for natural resources management.

Folk classification of landform

The tribal people of Bandarban have their own classification system for landform and site selection. Different tribes call hills in different words. Hill is called as Moane by the Chakma, Muya by the Tanchangya, Tang by the Marma, Hung by the Murang and Talong by the Bwam. Folk classification for landform used by the Chakma, the Tanchangya, the Marma, Murang and the Bwam is given in Table 1. The farmers of Amazon also use this type land use classification on the basis of soil type, fertility and natural vegetation.

Land use zoning

Generally hill people of Bandarban hill district consider landscape of the hills in land use planning. This is local, specific and ecologically sound. They follow some sorts of zoning for land use planning. The land use planning is broadly classified into three categories as given in Table 2. In addition to these, they also use the streams and water courses (jhuris and charas) for multiple purposes (Fig. 1).

It is also reported that the classification of ecological zones on the basis of land use capability appears to be widespread among the traditional agriculturalist of Amazon. Land use classification is made on the basis of the characteristics of soil texture, colour, hydrological pattern and the plant community they support.

Community reserve for common resource management

Conservation and management of natural resources as a common resource is a tradition of many tribal communities in the CHT. It is generally called Para reserve or Mouza reserve (Fig. 2). This is a common property of the villagers. Generally, they do not extract any timber from this natural forest. Sometimes, they extract timber for some community purposes like construction of school, church. However, some member of the community can extract limited amount of timber only for home consumption with prior permission of the village community. Other than this primary forest, there is some bamboo patch under community management. Like timber, community members can extract bamboo only for domestic use. None of them are allowed to extract timber or bamboo for selling purpose. During the field trips in the CHT some remnant of the community reserves were observed in different places (Table 3).

There was a Government order to maintain 40 h of Mouza (community head) or Karbaries (Village head) under each Mouza in the CHT to meet people’s requirement other than timbers. It is also reported local people protect biological communities in the vicinity of their homes and elders based managed them for religious and traditional beliefs. This type of habitat conservation exists in different parts of the world for conserving different species and maintained under collective ownership by indigenous people group.

Fuel wood selection for domestic use

Bandarban Hill District has diverse fuel wood species. The tribal people collect the fuel wood in January to February from the surrounding forest for the whole year and preserve under machang type house. Generally they prefer white coloured straight-grained wood as fuel wood. Common fuel wood species are; kom (Nauclea sessilifolia Roxb.), dharmara (Stereospermum personatum (Hassk. Chatterjee), rong kat (Mitragyna parviflora (Roxb.) Korth.), bura (Macaranga denticulata (Bl.) Muell. Arg.), barmala (Callicarpa tomentosa (L.) Murr.), goda (Vitex sp.), and itchri (Anogeissus acuminata (Roxb.)Wall.ex Bedd.), etc (Fig. 3). These are considered as good fuel wood as they burn well and slowly. Gamar (Gmelina arborea Roxb.) is a dominant plantation species in the CHT and easily available in the forest areas. But, the tribal people do
not prefer gamar as fuel wood as it makes sound, smoke and splits during burning. Generally whitish and straight grained wood produces less smoke during burning. It is reported that wood having fast drying, easy splitting and cutting, efficient burning, burns easily, produce less smoke, good storage characteristics and high heat intensity is suitable for fuel wood. Wood having higher concentration of resin in wood produces toxic fumes on burning.

Water harvesting ditches: Establishment and lasting of tribal people in an area depend on the availability of water in that area. The tribal farmers of the hilly areas have traditional knowledge of harvesting seepage water at the base of the hills. The seepage water of hills moves downwards through small water channels (jhiri). The tribal peoples who are at the upper altitude dug out small rectangular shaped ditches at the base of the hills. The water comes through the streams are reserved in the ditches and the excess water are out let through a small hole (Fig. 4). The tribal people used this water for domestic, drinking and other purposes. For steady supply of seepage water in the streams the tribal people keep the vegetation at the top of the hill. The vegetation of this area is kept intact and nobody is allowed to harvest any timbers and fuel wood from the area.

Tree management in the jhum field by the Murang community
During jhum preparation farmers clear all vegetation from the field. But, keep some important trees like Albizia spp., Derris robusta and other members of Leguminosae and Ficus spp. Kept trees are cut at about 1m height above the ground. Browsing animals can not reach coppiced shoot at this height. Thus protect from animals. Tree cutting at 1m height or above is not always scientifically sound. The newly produced shoots become susceptible to wind.
break. Many Murang jhumias of Empu para do not remove the large trees from their jhum field (Fig. 5). They lop the branches of trees for easy light penetration in the ground. It seems to be more scientific than the previous one. The coppices of alder (Alnus nepalensis) are carefully pollarded against the main trunk in fallow management in traditional jhum practices by the Angami Nagas.

Coppice management of gamar and teak by the Bwam community

Gamar (Gmelina arborea) and teak (Tectona grandis) are two important fast growing forest timber species. Gamar is planted both in public and private forestland, and harvested at 10-12 yrs cycle. Teak is harvested in 20 yrs rotation. The Bwam community of Sharon Para has their own technology for harvesting the Gamar tree. It is cut at above 15 cm above the ground label using handsaw in the month of February (before spring). The stumps of the felled (harvested) trees are kept in the field undisturbed. Profuse coppices sprout from the stump within 15-30 days. These attain about 1m height within 2-3 months (Fig. 6). The coppice-shoots are allowed grow till mid-July without any management. After mid-July, framers manage the gamar coppices, keeping 2-3 healthy coppice shoots for the first time. Finally the best coppice shoot is kept to get a healthy tree. This clearly indicates farmers’ perception of periodicity about coppice shoot thinning. Farmers reported that coppice crop of gamar had better growth performance than the seedlings crop and thus the coppice shoots produce merchantable boles within 6-7 yrs. In Rwangchari, the Tanchangya tribe practices the coppice management of teak, which is almost similar to gamar. This type of management could be incorporated in raising sustainable tree farming system.

Timber harvesting time

Generally, the foresters and timber traders harvest timbers from the forest mostly throughout the year. The Traditional people apply their own tree harvesting technology and time, when they harvest for their own use. The tribal people mostly harvest trees before the spring, during dry months of January-February. During dry months, due to low moisture content in the soil, growth of the tree is comparatively slower than the monsoon. So, there is less starch content in the trunk, which makes the wood less susceptible to insect attack. The Murang farmers first girdle in the trunk by removing bark and sapwood of the tree at about 60 cm above the ground. After one or two months of girdling the tree is harvested (Fig. 7). This method reduces the starch content of the sapwood portion due to disconnection of water transportation system. Thus, wood becomes resistant to insect attack due to reduce content of starch materials in sapwood portion. This method is more scientific and effective to hilly areas. This also helps to prevent the insect attack with any extract cost.

Keeping bark in teak logs to protect it from insect and borer attack

Teak is an important timber species having good value in Bangladesh and widely planted by the local people and forest department. The upland people use it as house posts, rafters, doors and windows. The sapwood of teak is susceptible to insect and borer attack. Generally people debark most of the trees before using as house posts. But it was observed that some members of the Marma community of Rwangchari do not de-bark the lower portion of teak posts, which is used for house construction. The users reported that teak bark protects the susceptible sapwood from insect and borer attack. It may be due to large number chemicals such as resin, tannin and secondary metabolites in the bark, which may acts as preservatives. It is reported that bark contain a large variety of complex aromatic extractives which acts against fungi and microbiological attack.

Maintenance of vegetation at the catchments areas

The hills receive rainwater in the rainy season and release it in the form of seepage water through out the year. This water goes downwards through the streams. During dry season the tribal people of Chittagong Hill Tracts make earthen cross dam for reserving water out along the streams, which is locally called Goda (Fig. 8). The tribal people use this water for irrigation and domestic purpose. The tribal people maintain vegetation cover at the upper catchments without any disturbance of the vegetation. The vegetation at the catchments area ensures continuous flow of water.

Refinement of Traditional Knowledge with modern Knowledge

All traditional knowledge based local practices are not always sustainable form the scientific point of view. But this practice is easily adaptive and
diffusible among the different community members, as the local people have developed it. There is a need to subject traditional knowledge to rigorous scientific testing to render their value to the world. The knowledge is dynamic, evolving to suit changing circumstances and remaining relevant to the groups’ socio-cultural make up. Thus refinement of traditional knowledge with modern scientific knowledge is necessary to solve the problems towards sustainable management and development.

**Conclusion**

The economy, livelihood and culture of the tribal people of the CHT are closely interlinked and natural resource based. Traditional knowledge is well proven, practiced and accepted to the local people. So the local people would more easily adopt technology based on traditional knowledge. Most of the traditional conservation systems have been broken down as cash economics have developed among the tribal people. People are now frequently selling...
natural resources in town markets for money. So, awareness should be developed among the young generation about the importance of natural resources conservation. Therefore, the different institutions may develop an integrated approach for conserving the natural resources in the Chittagong Hill Tracts.

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