

## Role of traditional home garden systems in Northeast India

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In Northeast India, traditional home gardens have been maintained as a part of rural survival over generations, with a complex vegetational structure harbouring diverse types of local plant species with multiple functions. Nonetheless, significant difference in species selection for traditional home gardens may primarily be due to altitudinal/climatic regime and also traditional beliefs and day-to-day requirements of the farming people. In the study, the role of three different farming communities (*Nyishis*, *Apatanis* and *Kalitas*) in the preservation and management of their traditional values, faith and indigenous knowledge system were studied.

**Keywords:** Ethnic community, Indigenous beliefs, Traditional home gardens, *Nyishis*, *Apatanis*, *Kalitas*

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Home gardens can be defined as land use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably, livestock within the compounds of individual houses, the whole tree-crop-animal unit being intensively managed by family labour<sup>1</sup>. Such systems are essentially man-made and reflect the wisdom of the traditional culture and ecological knowledge that have evolved over the years. Such valuable traditional ecological knowledge systems are based on strong socio-cultural and traditional beliefs, confounded by the economic status of the people. In this context, if designed and managed appropriately, the traditional home gardens based largely on indigenous knowledge systems harbouring a wide diversity of local crops of their social and traditional significance can be the most promising and ecologically feasible option for the farming communities. The indigenous knowledge used by these communities after repeated trial and error is now being regarded as an invaluable resource of agri-diversity<sup>2</sup>. It is believed that traditional home garden practices depend on the type of human community, tradition, needs, beliefs, etc. The traditional home gardens practiced by two different ethnic communities in Northeastern India have been compared to provide a base for further scientific studies.

### Methodology

To correlate the different home gardens with the human societal structure and function, three villages practicing traditional home gardens, Nirjuli and Doimukh (Papum Pare district; 126 amsl), Ziro (Lower Subansiri district; 1700 amsl) of Arunachal Pradesh and Harmutty (North Lakhimpur district; 120 amsl; 14 km from the sites in Arunachal Pradesh) of Assam were selected for a detailed study. The area receives most rainfall (ca. 80%) during summer months (May-July) with relatively a little or none during winter (November-January). Total annual rainfall is typically 1100-1600 mm and average daytime temperatures vary from a minimum of 12°C to a maximum of 37°C in all the study area experiencing a humid tropical climate, except in Ziro (higher altitudes), where mean temperature varies from -5-15°C (temperate climate). Geologically, the parent rock exposed around Doimukh and Nirjuli area consists of newer alluvium (newer terrace deposits) represented by valley field deposits, mainly the sediments. The rocks of Ziro valley belong to Hapoli formation and are considered to represent the lacustrine deposits in the inland basins. The peat has given <sup>14</sup>C dating of 40,000 years. In Harmutty, the alluvium belongs to Pleistocene and recent times<sup>3</sup>.

A detailed survey of 50 farming household from each study sites were conducted and the relevant information about the existing home-gardens and

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other related aspects were collected through personal interview method by using a standardized questionnaire. Table 1 shows the detailed structural characteristics of the selected villages. The average area of the home garden plots varied between 200-400 m<sup>2</sup> in Nirjuli and Doimukh; 320-490 m<sup>2</sup> in Harmutty and over 400 m<sup>2</sup> in Ziro. The *Nyishis* and the *Apatanis*, (two major tribes) both belonging to the *Tani* group of Arunachal Pradesh with a Tibeto-Mongoloid stock inhabits Papum Pare and Lower Subansiri districts, respectively, while the *Kalitas* inhabiting in the small pockets of Harmutty have Caucasoid feature and are of Aryan origin. Such ethnic differences have distinct characters in terms of management of traditional agricultural systems, including the home gardens. In Nirjuli, Doimukh and Ziro, about 70-80% of the population live in rural villages, where agriculture is practised along traditional lines and only about 15-20% are employed (in sectors like agriculture, industry, handlooms, etc.), while in Harmutty, the local farmers besides maintaining their age-old wet-rice cultivation and traditional home gardens also prefer business as their source of income. Uses of plant species were explained by the villagers and the information thus gathered was again confirmed by field observations. Nomenclature of the plant species was followed with standard flora<sup>4</sup>.

Table 1—Socio-economic status of different ethnic communities

Village name	Harmutty	Nirjuli & Doimukh	Ziro
Inhabitants	Assamese	Nyishis	Apatanis
Language	Assamese	Nyishi dialect	Nyishi dialect
Land use pattern	Home gardens-cum-agroforestry and wet cultivation	Jhum and traditional home gardens	Paddy-cum-fish culture and bamboo-cum-pine home gardens
Income sources	Agriculture, business	Agriculture, service, business	Agriculture, service
Educational status	Children are sent to schools	75% literate	Mostly literate
Women's participation	No participation	Partial participation	Full participation in cultivation
Food (animal-based)	Chicken, goat, fish, etc.	Mainly <i>Bos frontalis</i>	Cows and others
Food (plant-based)	Rice, vegetables, etc.	Bamboo shoot, rice,	Same as <i>Nyishis</i> Rice beer and others
Communication Road		Road	Road
Households	75	107	122

## Results and discussion

The traditional home gardens in the study shows vegetal stratification with random mixture of trees, shrubs and herbs<sup>5</sup>. The ensuing overall species diversity may be contributed largely on their traditional ecological knowledge, which is a part of the cultural patterns of the local community. Not surprisingly, it was however observed that the selection of principal crop species varies between the ethnic communities. The species grown in the sites ranged from building material (*Livistona jenkinsiana*, *Mesua ferrea*, *Pinus wallichiana*), edible products (*Areca catechu*, *Musa* sp, *Artocarpus heterophyllus*, etc.), medicinal (*Curcuma longa*, *Clerodendron viscosum*, *Spilanthes* sp, etc.) and horticultural (*Ananas comosus*, *Citrus* sp, etc.) to craft materials (*Mesua ferrea*, *Anthocephalus cadamba*, etc). Nonetheless, contribution of dicotyledonous weeds, grasses, pteridophytes and bryophytes to the floristic diversity of the gardens can not be completely ruled out.

Traditional home gardens of *Nyishis* are rich in biological diversity harbouring many local crop species including the medicinal plants. Associated local knowledge, cultural and rituals of local people sustain such diversity. Home gardens are practiced primarily on low fertility soils that involve intercropping of cereals like, *Oryza sativa*, *Setaria italica*, *Zea mays*, etc. *Manihot esculenta*, *Colocasia* sp, *Solanum tuberosum*, *Dioscorea* sp, etc. are most common and subsidiary tuberous food crops while *Capsicum* sp, *Solanum melongena*, etc. were common vegetable crops. Besides, *Livistona jenkinsiana* and *Bambusa* sp were also encountered that provides a building material. So, this system is highly diverse and complex, involving simultaneous growing of as many as 15-20 crops in the same field, because mixed cropping is a general rule. Farmers were only able to describe plant species which they have cultivated in their home gardens and of which they have direct management knowledge<sup>6</sup>. This indicates that farmers' ecological knowledge is largely practical in nature, and is influenced by the interactive effects of ecological and socio-economic constraints.

The *Apatanis* practiced paddy-cum-fish culture and bamboo-cum-pine home gardens that are confined to a narrow territory of 1,058 km<sup>2</sup>. The people are mostly agriculturists and superstitious, and practice settled agriculture. Perhaps, they are the only tribe in the state practicing a unique paddy-cum-fish culture,

where water and agricultural resource management system is seen<sup>7</sup>. In this type of cultivation, farmers introduce fishlets of common carps (*Cyprinus carpio*) in the month of April-May and harvest during July-August, i.e. during the cropping phase of the paddy. This system (locally called *Aji* system) is very lively based on a complex network of irrigation channel and firm water management practices involving the people's participation. The water essential for the rice field are tapped from the close streams rising from adjacent catchments areas and steered into the fields by means of small channels. Paddy is the major crop cultivated by the *Apatanis*. The efficacy of the fish production in this system however seems to be enormously high. It can be mentioned that this excellent efficiency is despite greater mortality of fingerlings<sup>7</sup>.

The level of awareness about most of the functional aspects of home gardens among farmers is very high (Fig. 1). *Pinus roxburghii* and single-culmed bamboo (*Phyllostachys bambusoides*) are the principal perennial home garden plants species mostly preferred by the *Apatanis*. These two plant species play a paramount role in providing building materials for the rural poor, where they are extensively use for construction, fencing, roofing, etc. as this bamboo can be harvested over a cycle of 2-3 yrs when the culms attains 8-10 cm in diameter. Other fruit trees generally preferred by these communities are grapes, pears, peach, etc. Overall, shortage of land has led to the growth of a creditably efficient and well-managed land use system and water resource management worthy of replication in other areas.

Traditional home gardens-cum-agroforestry systems of the *Kalitas* have been maintained through generations. In general, these systems have so far been based on tree crops and livestock population.

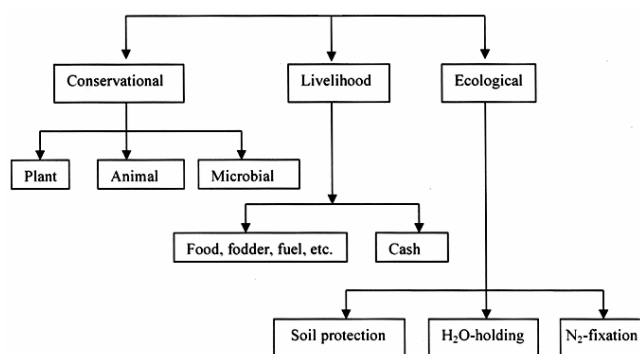


Fig. 1—Functional role of traditional home gardens

Plantation forestry is an important component of the production system of this community and plant species are grown as major cash crops for a range of commercial products that includes nut bearing palms (*Areca catechu* and *Cocos nucifera*) and fruit trees (*Musa* sp, *Ananas comosus*, *Citrus* sp, etc.). Arecanut constituted the most important component of their home gardens. The management of *A. catechu* is often considered to be an indicator of social status among the *Kalitas*. On the other hand, they also manage *Oscimum sanctum* because of its religious and medicinal values. The economic gain of the system is derived from cash-sale of the agricultural products. The system also provides more or less a full-time employment to most local participants who have no other source of income. *Kalitas* also maintain fish ponds in their home yards. Trees are planted surrounding the pond, and crops inter-planted forming an eco-friendly biological production system. Like the *Apatanis*, the *Kalitas* also prefer common carps (*Cyprinus carpio*). So, these traditional home gardens based on the cultivation of a variety of crops and trees have allowed the traditional farmers to maximize harvest security, promote diet diversity under low levels of technology and with limited environmental impact.

Presence of more plant families in the study sites may be due to the fact that the systems were in toto human manipulated planting several seasonal traditional crops at a time with other perennials. Nonetheless, it is imperative that the distribution and abundance of plants are basically governed by two major factors, the appropriateness of habitat, which is a product of different factors, and the level and pattern of biotic pressure<sup>8</sup>. In the study, the second factor was predominantly working, as the sites have been subjected to the cultural discrepancy of the human society residing in the study area. For example, when farmers of *Nyishis* (Nirjuli and Doimukh) favour to plant more woody perennials and bamboos that is useful for their housing purposes, while arecanut and other fruit-yielding species constituted the most important component of larger home gardens in Harmutty. In addition to providing food, arecanut palms are multipurpose and play an important role during festivals and in rituals. Above all, the selection and inclusion of crop components are based mainly on household preferences, requirements, and dietary habits.

Many traditional crop species were reported to have medicinal properties, which are retained in the

traditional knowledge of the local people (Table 2) and also bear ecological significance. In total, 17 medicinal plant species were reported to be used by the local people to cure different ailments. Nevertheless, the proportions of medicinal plants used by various communities are different<sup>9</sup>. For instance the *Apatanis* use the *Clerodendron* sp for high blood pressure whilst the *Kalitas* prefer to grow *Musa* sp as an all-time medicinal plant around their households that cure dysentery. The local inhabitants mostly rely on traditional remedies, which use medicinal plants both cultivated as well as gathered by them. The local healers use a variety of medicinal plants, the side effects of which are either negligible or not known<sup>10</sup>. However, rapid acculturation is taking place in the state, leading to the erosion of traditional values and indigenous knowledge of healthcare system. Hence, recording of indigenous knowledge becomes increasingly important.

### Conclusion

The study thus clearly reveals that species grown in the traditional home garden systems are mystified by the livelihood requirement and traditional knowledge. Nonetheless, significant difference in species selection for home gardens may be due to altitudinal/climatic regime. Today, it is widely accepted that indigenous knowledge is a powerful resource in its own right and complementing to knowledge available from western scientific sources<sup>11</sup>. Thus, by combining the ecological wisdom of the villagers with scientific knowledge, higher productivity of home gardens may be achieved without causing substantial environmental degradation<sup>12</sup>. Further, they also contribute to *ex situ* conservation of local plant diversity and can also serve as gene pools of the eroding indigenous plant species<sup>5</sup>. Induction of more indigenous plant species such as, leguminous plants, bamboos, palms and medicinal plants also prove vital for the sustainability of the system in Northeast India. Hence, there is an urgent need to strengthen and document such

traditional systems of natural resource management for economic viability, ecological sustainability and social acceptability.

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