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## PEOPLE AND ENVIRONMENT:

Conservation and Management of Natural Resources across the Himalaya

MICHAEL A. RECHLIN AND RITU VARUNI

## A PASSION FOR PINE: FOREST CONSERVATION PRACTICES OF THE APATANI PEOPLE OF ARUNACHAL PRADESH

The Apatani are a small tribal group in the northeastern India state of Arunachal Pradesh who have developed a culture around forest conservation that is unique among Himalayan peoples. Strict clan controls over tribal lands combine with private plantations to maintain a well protected forested landscape within their territory. Private, family owned and managed, plantations are primarily comprised of two locally non-indigenous species, blue pine (*Pinus wallichiana*) and a bamboo species known locally as *hje* (*Phyllostachys bambusoides*). These two species are highly prized and central to the tribal culture. Plantations were found to be sustainably managed to meet village needs. However, market forces and social change could be loosening the strong bonds between the Apatani and their forests. Possible reasons behind development of their strong conservation ethic and problems looming in the future are discussed.

The best way to grasp the landscape of Arunachal Pradesh is by helicopter. This far northeastern state of India, as seen from the air, is a patchwork of towering sub-tropical forests steadily being encroached by the indigenous swidden agriculture known as *shumel* cultivation. It is a view of towering trees and dense forests, extremely steep slopes, some of which are laid bare, an occasional cluster of homes, and a winding road. Situated at the eastern end of the Himalayan range, and inside India's restricted inner line, this is a rough and wild country. It was aptly described by Himalayan naturalist Bob Fleming (1995) as "an immensely rumpled, precipitous and varied terrain."

This imaginary flight crosses one more ridge and the view suddenly changes. We enter a wide valley, where the *shumel* cultivation is replaced by terraced agriculture. The surrounding forest is unbroken and the villages are nestled amongst well kept groves of pine and bamboo. This new view is the territory of the Apatani tribal group. It is a land described by the previous Chief Minister of Arunachal Pradesh, Mr. Gegong Apang, as an "island of green" in the Arunachal landscape. When traveling by road the contrast is just as stark. The road winds through the inhabited and steeply sloped *shumel* lands, with farmers burning and planting the cleared slopes in anticipation of the coming monsoon rains. Patches

of degraded forests are interspersed with these bare landslide-prone slopes. When the road drops into the Apatani country things change. The forest cover here is intact and unbroken.

Much has been written over the past thirty years about the state of the Himalayan environment. Early predictions were of impending ecological disaster. Viewing the steeply terraced fields and frequent landslides of Nepal, Eckholm (1975) wrote, "in probably no other mountain country are the forces of ecological degradation building so rapidly." Floods in Bangladesh were attributed to Himalayan deforestation and rapidly eroding hillsides (Begley et al. 1987). Ives and Messerli (1990) defined this scenario as the "theory of Himalayan degradation." They then went on to show how historical evidence and an understanding of mountain-forming processes did not support the theory. By the late 1980s evidence was mounting that the forest degradation trend was beginning to reverse. By examining the same forested area in 1980 and 1990, Fox (1993) was able to document an impressive re-growth in forest cover. Gilmour (1991) provided a model for understanding this reversing trend. In his article titled "A Re-Appraisal of the Deforestation Crisis," he examined evidence from two districts in Nepal, and found that as forest resources became scarce, and

the time needed to gather them lengthened, villagers' interest in conservation increased. This model predicted expanding deforestation to a critical point, after which tree cover on the landscape would begin to increase. Villagers, responding to the shortage of critical forest resources would start planting trees on terrace edges, in ravines around their homes, and on other barren non-agricultural sites (Figure 1). Finally, over

## THE PEOPLE AND THE PLACE

### Arunachal Pradesh: "Land of the Rising Sun"

Arunachal Pradesh is located in far northeastern India north of the state of Assam. Much of its southern border follows the Brahmaputra River, which flows south through the mountains from Tibet (Figure 2). During British colonial rule and through statehood in 1987, Arunachal Pradesh was known first as the Northeast Territories, later as the Union Territories of Arunachal (Duarah 1998). In 1962 India and China fought a border war over this sparsely populated and rugged piece of real estate. It remains today almost totally claimed by China as part of the Tibet Autonomous Region. Unlike residents of other areas of India, those of Arunachal have trouble getting a visa to visit China. The Chinese authorities claim that they don't need one; that they are, in fact, already citizens.

Arunachal is a tribal state. With a population of 864,000 (1991 census), it contains twenty-five major tribal groups with

RESOURCE	LOCAL INTEREST	RESPONSE
1. Ample forest in or adjacent to village.	➡ No interest in forest protection or tree planting.	➡ Indigenous management systems exist, confined to defining user rights only. Few trees on private land.
2. Forest becoming depleted or access restricted (up to 3 - hour walk).	➡ Emerging interest in forest development activities (or potential for extension).	➡ Indigenous management systems exist to define user-rights and in some cases have biological objectives. Few trees on private land, but interest beginning.
3. Severe shortage of forest products (accessible forest more than 4 - hour walk).	➡ Genuine interest in forest development activities. Little need for people to be convinced by extension.	➡ Indigenous management systems well developed and define both user-rights and biological objectives. Extensive private tree planting and protection likely.

Figure 1. Accessibility of forest resources and probable response of villagers

the last twenty years the success of the community forestry movement in fostering the re-growth of trees in the Himalayas has been documented in numerous reports and case studies (Kuchli 1997, Rechlin et al. 2002).

These well documented trends of deforestation and recovery occurred in regions and under circumstances similar to those of the Apatani. In all instances the people are subsistence farmers. Throughout the region trees are valuable. A good portion of a villager's annual income can easily be obtained by cutting and selling only a few mature trees. Throughout the region trees take a long time to grow. Planting a tree requires one to think of the future, something that can be hard to do when there is uncertainty about one's next meal.

This paper examines the communal forest conservation and private plantation practices of the Apatani people of Arunachal Pradesh. It then questions what makes the Apatani situation different. Why, under similar circumstances, did other Himalayan peoples exploit their forests while the Apatani protected theirs? Surrounded by abundant forest resources, what made them give up productive non-irrigated agricultural land to plant and grow trees that would not be mature for two generations? Finally, what makes them "passionate" about the planting and cultivating of their private plantations of pine and bamboo?

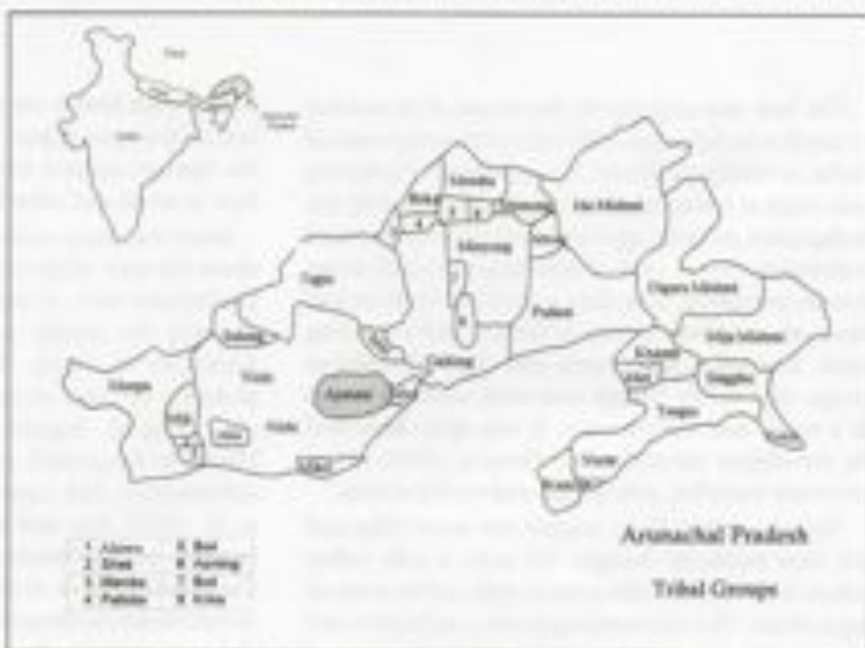


Figure 2. Map of India showing tribal regions of Arunachal Pradesh

105 ethnically distinct sub-groupings. There are 22 languages and 60 dialects spoken in the state (Duarah 1998).

From the time of the British Raj, Arunachal has been separated from the rest of the sub-continent by tight travel restrictions. Foreign nationals are required to have a special "inner line" permit to enter, and although a similar restriction applies to Indian citizens from other states, that restriction is loosely

applied. As in other tribal areas, the Indian Constitution (1949) provides for restricted land ownership by native ethnic groups. These limitations are in place to protect the culture and environment of the local people.

Arunachal has an area of 83,743 sq km. It is bounded by Tibet on the north, Myanmar (Burma) on the east, the Indian state of Assam on its south, and Bhutan on the west. It is at the eastern terminus of the Himalayan range. Here, the major ridges and spurs of the mountains begin running north-south. It is also where five major tributaries of the Brahmaputra River travel the valleys south from their point of origin in Tibet. Elevations range from approximately 304 meters at the edge of Assam to over 6,100 meters at the northern border. Arunachal is a very wet place. It receives an average annual rainfall of 350.5 cm per year (Duarah 1998). Most of this rain comes with the annual monsoons, which begin in May and run into September. About 60% of the land is covered with forests. In the lower one-third of the state much of the accessible and commercially valuable forests have been cut or have been degraded by logging and intensified swidden agriculture.

### The Apatani Plateau

The Apatani homeland is referred to in the literature as both a valley and a plateau. The main valley is broad and fertile, and has been likened to the much larger Kathmandu Valley of Nepal (Haimendorf 1962). Commonly called the Apatani Valley, it lies at an elevation of 1,754 meters and is surrounded by ridges that rise to over 2,377 meters. The Apatani tribal lands include two other valleys and their surrounding territory, all within the central part of lower Subansiri district. East of the Apatani Valley lies Hakhe Valley at 1,829 meters and farther to the east the Talle Valley at an elevation of

2,458 meters. Neither Hakhe nor Talle valleys are populated at this time, although both have evidence of past habitation. Talle is somewhat unique within the Himalayan region. The valley is covered with towering old growth Himalayan hemlock (*Tsuga dumosa*) and Himalayan fir (*Abies spectabilis*) with a dense understory of various thorny bamboo species (*Chimonobambusa* spp.). The Arunachal State government has designated Talle Valley as a wildlife sanctuary. To the local people, it is an extension of the clan-controlled forestlands that surround the main Apatani Valley.

Compared to other regions of Arunachal Pradesh, the Apatani Valley is well suited for terraced wetland rice cultivation. The valley is a 26 sq km broad flat expanse, drained by the Kale River and its tributaries. Over the years an extensive irrigation system has been built to move water from the Kale River to the fields. The land is rich, and the annual rice production is said to be enough to feed the local population.

### The Apatani People

The 1991 Indian census reported 22,526 people belonging to the Apatani tribe. Like all tribal groups in a modern state, Apatani people can now be found throughout Arunachal Pradesh. The Apatani homelands, however, are limited, and most all tribal members maintain family connections and have a home in the Apatani Valley. The Apatani, as well as other "Tani" tribal groups are thought to have migrated across the Himala after the decline of the late Neolithic civilizations in China and Mongolia (approximately 2,000 BCE). These groups all practice some form of the advanced wetland rice cultivation developed by those early civilizations (Kani 1993).

There are seven historic villages within the Apatani Valley. Each village is an independent political unit. Villages are compact with the individual houses grouped by clan. The Apatani social structure is organized around clan membership. Clans are patriarchal, and unique to a given village. Male members of each clan construct a raised wooden platform known as a *balang* which is used for clan meetings. Clan members share religious ceremonies and assist each other in the construction of houses and granaries. Historically, tribal laws were upheld and village administration accomplished through clan representatives known as *bulang*. The *bulang* would act as judges to decide individual cases or meet as a village or inter-village body to adjudicate public disputes (Kani 1993).

### APATANI LAND USE AND MANAGEMENT

Figure no. 3 is a sketch map of land use within the Apatani Valley. Roads and major settlements are shown as well as prominent land use patterns. This section describes the overall land use patterns in the Valley as well as two specific case studies of private plantations.

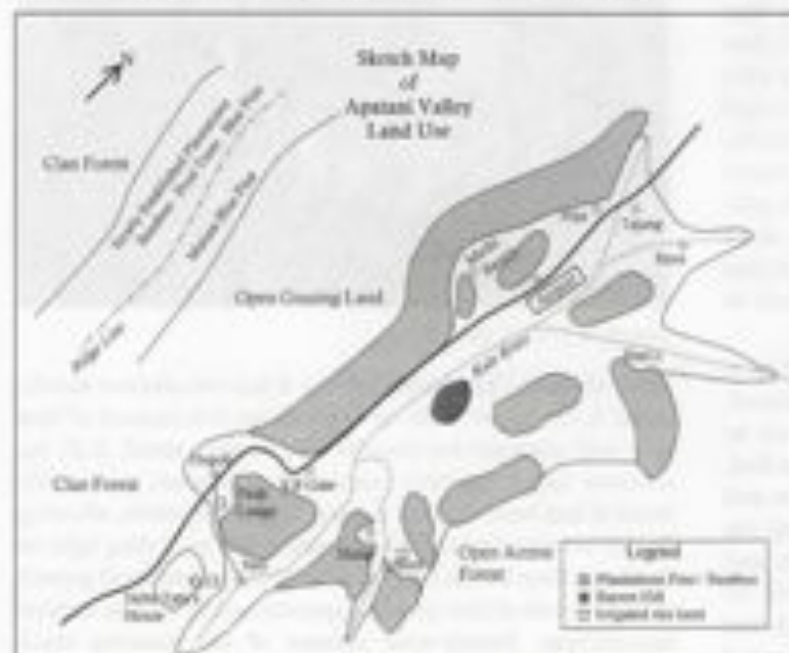


Figure 3. Apatani Valley Land Use

### Village and Agricultural lands

Apatani villages are compact. Houses are close together, with narrow walkways and roads. Villages are on the high ground in the valley, on land unsuitable for irrigation. The valley bottom and land surrounding the Kale River and its tributaries is used for rice production. In addition to rice, the Apatani grow vegetables in kitchen gardens and use some upland areas for maize and millet, which is grown primarily for brewing a local beer.

### Private plantations

Striking features of the Apatani landscape are the many plantations of blue pine (*Pinus wallichiana*) and bamboo, a species locally called *bje*, (*Phyllostachys bambusoides*). They are islands of green that are adjacent to the villages or creep up the surrounding hills. These islands are made up of many small, well-tended family tree gardens. An individual plot can range in size from 0.1 ha to 5.0 ha. It is common for a family to have a number of these plots, with a cumulative average holding of 1.0 ha (Varuni 1999). Plantations vary in composition from all pine to all bamboo, and almost always contain a variety of volunteer hardwoods. They also contain herbaceous and woody species used as food and for vegetable dyes.

These private plots, and the two species they cultivate, blue pine and *bje*, have special cultural significance to the Apatani people. Both species are non-indigenous to the valley, and Apatani tradition has it that they were brought with them during their historic migration to Arunachal. Sacred groves of old growth blue pine are found in most villages. Local belief is that these old trees were brought to the valley during their migration. Although attempts have been made by the Arunachal State Forestry Department to get them to diversify, the species cultivated remains almost solely blue pine and *bje*. When one local villager was asked why they only cultivate these two species, his answer was, "that is what we use." The logic of that answer is hard to beat. *Bje* is used in house construction, fencing, for food (bamboo shoots), firewood and for local crafts. Blue pine is also used in house construction, with the roofs traditionally made of thin pine shakes. The pine is also used for fence posts, firewood, and a variety of other construction needs. A single blue pine is also planted to mark resting places, called *Nyatu*, along trails in the forest.

The cultivation and protection of these private plots is taken very seriously (Figure 4). The plots are always fenced, many times with high solid bamboo fences that cannot be seen over or through. Plots have gates that are kept locked. Tending the plots is men's work. Traditionally, women and children worked the agricultural fields and maintained the home while Apatani men hunted on their clan lands and cared for the family plantations. Men were responsible for planting pine seedlings and propagating bamboo through root plantings. They maintained the plantations and harvested the needed forest products, which included wild vegetables

and medicinal herbs. Modernization has changed the role of men in society. Hunting is less important to survival, and the younger generations are spending less and less time in the forests. As is often the case with traditional societies, the older generations have a more intimate knowledge of their plantations, the uses of various trees and herbs, and of the hunting trails through clan forests.

### Heba Tatu's Plantation

The Tatu family manages a 1.0 ha plantation not far from their house in Siso. In the winter of 1999 the plantation was mapped and the resources surveyed. The plantation was established in



Figure 4. Private plot

1962, after the Chinese border war. It has two distinct stands. Stand A, the larger of the two at 0.83 ha, is a mixture of blue pine and scattered hardwoods. The smaller stand, 0.20 ha, contains larger diameter trees with a bamboo understory. Stand B had been thinned to meet household needs, allowing for the increased average tree diameter and providing light on the forest floor for the bamboo. The average combined growth of both stands of blue pine is approximately 6.4 cubic meters/hectare/year. Twenty-nine percent of the growing stock in stand A was hardwood. The hardwood includes various

species of oak, used for home construction and firewood, as well as an array of other species with food or medicinal uses. When visiting the plantation, Heba Eara knew little of the non-timber uses, whereas his father, who planted the trees in 1962, knew the local name and uses for the trees and for many herbaceous plants inside the plantation fence.

#### Takhe Gumbo's Plantation

Takhe Gumbo owns four plantations, the largest of which



Figure 5. Late-rotation plantation

is 0.19 ha. This plantation has a number of scattered large diameter blue pine, with an understory of hardwood and bamboo. The hardwoods are primarily species of oak, locally called kra, that were being harvested for house posts and fuelwood. At the time of the survey, some large diameter pines were also being harvested. With an average blue pine diameter of 44.3 cm, this plantation is obviously at the end of its rotation (Figure 5). The plot varied greatly in the density of its overstory trees and its understory bamboo. Clearer areas were almost totally in bamboo production, while a swale traversing the middle of the plot still held a high density of pine. The area of greatest bamboo density was being replanted with wildling pine seedlings, indicating a management strategy where bamboo is followed by pine, which led back to bamboo as the mature pine are harvested with the resultant decrease in overstory density. The bamboo is grown on a three-year rotation. The average annual household usage was estimated at 383 stems/year. With 969 stems in this plot, it is close to being able to provide this annual need. However, it takes an average of 2,000 stems to rebuild a traditional Apatani house, a process that is gone through approximately every eight years (Varusi 1999).

#### Clan lands

Forest and grazing lands surround the valley and are either under tight clan control or open to use by all members of the village. Open access areas are limited in size and set aside primarily for residents who are not clan members. Use of the forests on clan lands is strictly controlled. These areas are again fenced near the villages or roads. Their boundaries are posted with menacing signs - often bearing skull and crossbones - indicating the clan ownership and warning interlopers of the penalty, usually 5,000 rupees, to be paid for illegal entry. Clan lands extend to the furthest reaches of the Apatani territory. They are traditional hunting grounds of a time when men with bows and traps of poison arrows provided meat for the family. Unfortunately, the strict controls on entry and use of the trees on clan lands do not extend to the local fauna. As a vestige of their past, when hunting was a way of life, the Apatani will shoot anything in the forest that moves. As a result, their forests, as well as other forestlands in Arunachal are, to quote Fleming (1995), "empty jungles."

#### ANALYSIS AND CONCLUSIONS

The Apatani have developed forestry practices that are quite unique in the Himalayan region. They plant trees on private land, even though they live in the middle of a forest. They strictly control forest resource use on clan lands, to the point of an implied threat of death (skull and crossbones) heaped up by a hefty fine for mere trespass. The question is, why? Why them and no one else? In this section we look at those questions and pose some possible answers.

Part of the answer has to lie in their rich agricultural lands. The Apatani do not practice jhummed agriculture because they live in a rich valley that is much more suitable for their advanced wetland and terraced rice cultivation. The reason they live there is because that must have been the type of land they were looking for, having migrated from an area where those advanced agricultural skills had already developed.

But that reason alone is not good enough. Throughout the Himalayas, wetland rice cultivators have cut and burned their surrounding hillsides until there was little left to cook with before thinking of conservation (according to Gilmour's model). The Apatani arrived in their valley and cleared the agricultural lowlands but preserved and protected the hillsides. Certainly the forests were essential for the hunter-gatherer side of their life style, but why not just move on to hunt over the next ridge? The answer here could lie in their geopolitical position. The Apatani are a tribe with 22,526 members. They are surrounded by the Nishi tribe that number

over 180,000 members (Duarah 1998). Chowdhury (1996) describes the historic Nishis as "troublesome" and as having kept slaves and made raids into the Apatani villages. The Apatani, surrounded by this much larger group of enemies, were forced to live on resources within their geographical area. This would have forced the group early on to develop tight controls over resource use.

The Apatani are good tree farmers. Growth on their plantations, estimated at 6.4 cubic meters/hectare/year, compares favorably to that of well-managed eastern white pine (*Pinus strobus*) forests in the New England region of the United States. They seem to be sustainably supplying their bamboo needs from these private plots. The plots are well stocked, thinned regularly and replanted at the end of the rotation. But why do they grow only these two non-indigenous species, blue pine and bje? There are plenty of other species available to plant. Why not just use the trees they are protecting in the surrounding forests?

This is a harder question to answer. One possibility is that the plantations were traditionally men's work, and that the societal benefits of that tradition continue. Wherever those two species were brought in from, they serve their purposes well. Bje is a single stem species of bamboo that propagates easily. It is straight, smooth stemmed, strong, and is less susceptible to borer attack than other bamboo species. Blue pine is fast growing and easily splits out into slats flexible enough to bend and contour to a house roof. There is an ever-present threat of fire in the closely packed Apatani villages. With a ready source of pine and bamboo, an entire village could be rebuilt in little over a week.

The future of the Apatani private forestry plantations as well as the tightly controlled clan forests will increasingly depend on whether those uses and preferences continue. At present the systems seem healthy and sustainable; planting follows cutting while new plantations are opened up for the expanding population (Figure 5). However, that could all change as tin roofs replace pine slats and RC concrete homes replace traditional homes. There are already signs that market forces have started to drive timber harvest on clan lands. Change could come as village ties are weakened by the cosmopolitan world and as the knowledge of hunting trails and indigenous plant uses pass away with the older generation. For now though, the Apatani provide a unique glimpse into indigenous conservation practices, and an "island of green" on the Arunachal landscape.

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