



Sustainability of Indigenous Farming Practices: A Case Study among Apatani, Nocte and Wancho tribes in Arunachal Pradesh, Northeast India

TONLONG WANGPAN¹, TAPI TAKA¹, SUMPAM TANGJANG^{1*} AND A. ARUNACHALAM²

¹Department of Botany, Rajiv Gandhi University,
Rono Hills, Doimukh-791112, Arunachal Pradesh, India

²Indian Council of Agricultural Research, Krishi Bhawan, New Delhi-110001

Received: 31 August 2014;

Revision: 18 September 2014

Accepted: 27 October 2014

ABSTRACT

Arunachal Pradesh with high ethnic and cultural diversity is the part of eastern Indian Himalaya. Apatani, Nocte and Wancho are among the major tribes of Arunachal Pradesh which are known for their remarkable indigenous knowledge on harvesting bio-resources, ecosystem conservation and management of natural resources which they have assimilated over centuries through experiments. For instance, the Apatanis are well known for their distinct traditional land use practices including innovative integrated farming techniques such as paddy-cum-fish and bamboo-cum-pine farming. On the other hand, the 'Nocte' and 'Wancho' have brilliantly converted their hostile undulating hilly terrains into beautiful landscape for farming. In all, land is divided mainly into cultivated land, settlement area and forest cover signifying the ecological equilibrium and their way of harnessing bio-resources and its conservation is generally not only confined to forestry but also to agriculture with high diversity of vegetables and crop plants. In this regard, potential role played by the indigenous knowledge system of these tribes and sociocultural values in up-liftment of the rural economy are highly commendable.

Key words: Apatani; Wancho; Nocte; Eastern Himalaya; *Jhum*; Paddy'-cum-fish; Bio-resources.

INTRODUCTION

With 26 major tribes and 110 sub-tribes, the State of Arunachal Pradesh is well-known for its rich ethnic diversity and traditional ecological knowledge. Covering an area of 83743 sq. km in the Indian eastern Himalaya range, the state lies in between 26 28 and 29 30 North latitude and 9730 and 97 30 East longitude. The Apatani tribe inhabiting Ziro valley, are known for their distinct traditional land use practices and rich indigenous knowledge on ecosystem

conservation and management of natural resources. Whereas, the Nocte and the Wancho tribes of Tirap and Longding districts are typically agrarian in nature and also have rich traditional ecological knowledge. As in many other regions of the tropics, slash-and-burn agriculture [*jhum* cultivation] still persists in Tirap and Longding districts due to its undulating hilly terrain and is considered to be a key element of farming, with the potential for sustainable development and enhanced livelihoods among the rural poor (Sharma and

Corresponding author: sumpam@gmail.com

Shukla, 1992). On the other hand, the Apatanis practice settled agriculture. The Apatani tribe is also known worldwide for their innovative integrated productive system of rice-cum-fish culture (Dolo, 2009), which is an additional source of income generation. The efficient management and sustainable use of agro-ecosystems by these tribes are unique and innovative in their own way. The article describes the traditional farming techniques, sustainability of agricultural system, management of agro-biodiversity and conservation strategies performed by Apatani, Nocte and Wancho tribes in response to their respective landscapes.

Study Area

Ziro, the home to the Apatani tribe is the district headquarters of Lower Subansiri district. It lies between 26°50'-98°21' N latitude and 92°40' and 94°21'E longitude; 1688 to 2438 AMSL (figure 1). The valley has an average cultivable area of about 32 km². The annual rainfall is about 2500 mm while the minimum and maximum temperature ranges between 6.3°C to 28.1°C respectively during summer (May to September) and 1.0°C to 18.4°C respectively during winter (November to February).

Recently, UNESCO has proposed Ziro valley as a World Heritage Site for its "extremely high productivity" and "unique" way of preserving the ecology. The Apatani have had a democratic system of running the society. The village council is known as the Bulyang. The institution still exists, but its functions have been diluted by other similar institutions like Gaon Buras and Panchayati Raj system. Majority of the Apatanis are loyal followers of the Danyi-Piilo faith, who worship the Sun (Ayo Danyi) and the Moon (.Atoh Piilo). Myoko, the festival of friendship and prosperity, is celebrated in a grand manner lasting for all of March month each year while Dree Festival, celebrated in July, is the main agricultural festival.

Within the periphery of Patkai range of Himalaya, the undivided Tirap District is

situated in between 26° 38'N and 27° 47' N latitudes and 96° 16' E and 95°40'E longitudes. The district is bounded by Changlang district of Arunachal Pradesh towards the East, Nagaland towards the West, Assam towards the North and Myanmar in the South. Recently, the Longding district has been created from Tirap district on 26 September 2011 to become the 1711' districts of Arunachal Pradesh. The Tirap district is inhabited by the Noctes and the Tutsas while the Longding district is inhabited by the Wanchos. All these indigenous tribes belong to the Indo- Mongoloid ethnic group, although their local dialects are believed to be Indo-Burman origin. Bearing rich social norms, customs, beliefs, faiths and practices, each of these tribes occupies a distinct geographical area. In the past, they were actively engaged in head-hunting practices; true follower of animism and the society was filled with myths, superstitions, tattoo customs and rituals. Nevertheless, due to modernization, these people have been positively influenced by Christian missionaries and modern education leading to permanent shunning away of head-hunting practice. The rituals became limited to major festivals and events only. The society is traditionally governed by the council of chieftains where the King is the head of the council.

Methodology

Extensive survey was conducted with the help of structured questionnaires by randomly selecting 7 villages in Apatani plateau, 6 and 9 in Tirap and Longding districts. The questions asked covered a wide array of subjects related to the land use pattern, agriculture, construction works, ritual needs, handicrafts and other conservation strategies in context of management of agro-biodiversity. Personal interviews were conducted and informal discussions were also held with older and experienced farmers to ascertain the past history of biodiversity management. Information was collected directly from the villagers including village elders of different villages regarding the

traditional land management system, agricultural practices, plantation, home-gardens, season for propagation, traditional harvesting seasons etc. (Tangjang *et al.*, 2011]. The meticulous preliminary data on the population, area, land use, flora, fauna, climate and ethnicity were collected from the district Statistical and Forest departments.

RESULTS AND DISCUSSION

Traditional farmland

Traditional land management is an important part of tribal culture in the state of Arunachal Pradesh that plays a crucial role by providing sustainability and better livelihood with respect to their lifestyle and landscape features. For instances, the Apatani tribe has a limited area of land leading to the development of an admirably efficient and very well managed land use system. In spite of the hostile undulating hilly topography the Nocte and Wancho tribes have also developed their own land management system. Thus, the agricultural systems performed by these tribes are inimitable in their own, where available resources are used prudently to achieve maximum outcome.

Altogether there are six different types of land traditionally managed by Apatanis such as *Balu* (traditional homestead garden), *Aji* (wet rice field), *Yorlu* (kitchen garden located away from the village), *Bije* (bamboo garden), *Saadi* (plot of woodland specially pine trees), *Morey* (natural forest). Daily demands of vegetables are usually fulfilled by *Balu* and *Yorlu*. *Aji* systems are purely dedicated for settled rice cultivation. *Bije* is specially meant for bamboo (*Phyllostachys bambusoides*) plantation while *Saadi* for plantation of pine trees. On the other hand, the *Morey* are source of wild fruits and other nontimber forest products (NTFPs). It is recorded that many important local vegetable crops are cultivated in homestead and kitchen gardens such as sweet potato (*Ipomoea batatas* (L.) Lam.), ginger (*Zingiber officinale* L.) and local vegetables such as pumpkin (*Cucurbita*

moschata Poir.), white gourd (*Benincasa hispida* Thunb.), coriander (*Coriandrum sativum* L.), soybean (*Glycine max* L.) Merr.), brinjal (*Solanum melongena* Linn.), *Solanum nigrum* L., chilli (*Capsicum* spp.), bitter gourd (*Momordica charantia* L.), tomato [*Lycopersicum esculentum* L.) and sesame (*Sesamum indicum* L.). Interestingly, the Apatani community have also develop an idea of incorporating bamboo and pine.

Bamboo varieties such as, *Phyllostachys bambusoides* Siebold & Zuccarini, *Chimonobambusa callosa* Munro) Nakai, *Dendrocalamus hamiltonii* Nees and Arm ex Munro., *Bambusa tulda* Roxb ., *Cephallostachyum capitatum* (Wall. & Griff.) Munro., *Chimonobambusa* sp., *Pleioblastus* sp., *Pleioblastus simonii* (Carr.) Nakai, *Arundinaria* sp. and *Chimonobambusa* sp. are integrated with pine trees (*Pinus wallichiana* and *Pinus khasiana*). Both bamboo and pines have high economic as well as traditional utilization values.

Nocte and Wancho follow almost same pattern of land use system such as *Zim* (agricultural land for paddy cultivation), *Chawat* (traditional homestead garden) and *Kap* (kitchen garden in *jhum* field), plantation area (for bamboo and palm leaves (*Livistonajenkinsiana*)), *Tham* (clan jungles) and settlement area. The traditional land use system is the result of practical experiments of several spans. These practices are still prevailing and strictly followed by every Nocte and Wancho farming communities. Traditional crops in their kitchen and homestead gardens comprises of topioca (*Manihot esculenta* Crantz.), *Dioscorea* sp., *Colocasia esculenta* L., sweet potato (*Ipomoea batatas* (L.) Lam.), ginger [*Zingiber officinale* L.), pumpkin (*Cucurbita moschata* Poir.), white gourd (*Benincasa hispida* Thunb.), coriander (*Coriandrum sativum* L.), soybean (*Glycine max* (L.) Merr.), brinjal [*Solanum melongena* Linn.), *Solanum nigrum* L., chilli [*Capsicum* spp.), bitter gourd [*Momordica charantia* L.), tomato [*Lycopersicum esculentum* L.) and sesame

[*Sesamum indicum* L.) etc. Nevertheless, these crops and vegetables are pioneer plants to be cultivated in mix-cropping system of *jhum*. Both the Nocte and Wancho tribes practices extensive plantation of *Livistona jenkinsiana* and Bamboo [*Bambusa pallida* Munro., *Bambusa tulda* Roxb., *Dendrocalamus hookeri* Munro., *Dendrocalamus hamiltonii* Nees. et. arm, *Pseudosasa japonica* Makino ex Nakai., *Schizostachyum dullooa* Gamble., and *Schizostachyum polymorphum* Munro.] in the plot of land attached with agricultural field as well as in the traditional homestead gardens. Both the bamboo and *Livistona jenkinsiana* possess high ethno-botanical utilization values and commercial returns. Recently, few people have also started cultivating tea and cardamom in their *jhum* fields.

In case of pine, bamboo and *Livistona jenkinsiana* plantations, the suitable distance is maintained and proper fences are provided to protect against wild and domestic animals. Harvesting and sowing seasons for every plant are followed strictly according to its age-old practices. In case of bamboo, October to December is considered to be the most suitable time for harvesting as it provides strength and immune against pests. Kitchen and homestead gardens are frequently visited and periodic weeding is done as per requirements.

Agro-ecosystem Management

1. Settled Agriculture

Settled agriculture completely meant paddy cultivation and is extensive[^] practice by the Apatani. Sometimes, paddy is supplemented with *Eleusine coracana* Gaertn. cultivated on elevated bunds between the rice plots. It is also cultivated pure on the dry land called *Yapyo*. With the development in farming innovation, the tribe has evolved unique skill of assimilated paddy with fish farming (traditionally called as *Aji-ngyii*) which was introduced in the 1980s with great success (Ramakrishnan 1984, 1992; Dolo, 2009). This system bears immense potentiality to be recognized as low-cost, but a sustainable farming practice (Saikia and Das, 2008). They incorporate 8 important indigenous

varieties of rice such as *Halyang emo*, *Nelyi emo*, *Empo emo*, *Missang piyaping*, *Hat emo*, *Tammi piyaping*, *Duley piyaping* and *Pulu piyaping* and 8 different fish varieties such as common carp [*Cyprinus carpio*], Indian major carp (*Labeo rohita*, *cirrhinus mrigala* and *catla catla*) and Chinese carp (*Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, *Oreochromis niloticus* and *Puntis javanicus*) in their wet paddy-cum-fish farming. Such types of agro-ecosystem has turned into highly productive with 500 to 600 kg of paddy per hectare. Fishes are usually cultured well with the late ripening paddy variety. The early varieties of paddy had higher density but reduced basal area as compared to the late varieties. However, economic yield per plant and per unit area of the early varieties was significantly lower than the late varieties. The economically viable, cost of cultivation being low with minimal external inputs making it a highly organic and productive agriculture. Needless to mention that the paddy field of Apatani agriculture is elegantly linked with animal husbandry comprised of *Bos frontalis* Lam., cattle, swine, and poultry.

The paddy-cum-fish farming has an intricate irrigation network of canals and channels to ensure distribution of water in every corner. They usually divide their large field (not perfectly watered) into two terraces gaining thereby the space of the dividing dam. The entire network of water canals ensure adequate water supply in each and every plots. Repairing of embankments and leveling of fields are done manually with the help of large flat wooden trays. The weeding of the paddy fields is done manually with the help of bamboo hoes where man and women both participate actively. Permanently flooded terraces are weeded two to three times and five to six times in terraces with less watered plots.

The fields are usually kept dry for a week before the harvest of the paddy so that the paddy seeds will mature well and dry. However, it is best to harvest fish after 5-6 months of stocking in the case of seasonal culture system; in case of continuous culture, harvesting is done on yearly

basis. The water is drained out, followed by collection of fish in the sumps or refuges and then it is netted out. However, at the same time fish culture in paddy field may sometime cause health risks if the input of pesticides in the paddy crop is not properly managed (Chen *et al.*, 1984). Therefore, proper care is being taken by Apatani farmer regarding performing of pesticide-free organic farming.

2. *Jhum* or Shifting Agriculture

Jhum Kheti is a local name for swidden or slash-and-burn fields or shifting agriculture practiced by the tribal groups in the north-eastern states of India. It is still the most widely practiced farming system in the sub-tropical and tropical zones of the eastern Himalayan region. A large section of the tribal population of the region and a majority of the tribal ethnic groups of Arunachal Pradesh have been traditionally practicing *jhum* with the exception of *Apatanis* of the Lower Subansiri district, *Khamtis* of Lohit district and *Monpas* of West Kameng district (Gupta, 2005). The length of *jhum* cycle plays a critical role in soil recuperation and the natural regeneration of vegetation, which in turn determines the health of the local economy. Thus, shifting cultivation is much better described as rotational agro-forestry, agroforestry with a burn cycle, or a form of forest gardening - terms that focus on the growth cycle and continuation rather than the cutting cycle. Farmers practicing shifting cultivation actually spend many more years growing trees and crops than burning them - protecting the soil, restoring nutrients, fallowing, and resting (Kerkhoff and Sharma, 2006).

According to the local cropping calendar, the *jhumias* usually manage their field by distinguishing it into two different phases, as the new field and the old field (Wangpan and Tangjang, 2012). In the new field, they usually intercrop important and subsidiary cereals like foxtail millet (*Setaria italica* L.), proso millet (*Panicum miliaceum* L.), finger millet (*Eleusine coracana* L.) and pearl millet [*Pennisetum glaucum* (L.) R.Br.], maize (*Zea mays* L.), topioca (*Manihot esculenta* Crantz.), *Dioscorea* sp., *Colocasia esculenta* L., sweet potato (*Ipomoea batatas* (L.) Lam.), ginger (*Zingiber officinale* L.)

and local vegetables. 36 indigenous upland rice varieties were recorded to be cultivated extensively by Wancho and Nocte in their *jhum* fields (Wangpan *et al.*, 2012). Their agriculture system is completely rain-fed. After cultivation cycle is over, the used plot is left fallow. The duration of fallow period in this region varies from 8 to 10 years allowing the land to undergo secondary succession restoring soil fertility status and improving physical properties such as soil aggregation and water-holding capacity through litter decomposition (Tangjang, 2009).

Sustainability of Agro-ecosystems

Highly evolved agricultural system and its proper management, sustainable farming practices including plantations and land management skills of Apatani are playing pivotal role in upgrading livelihood and excellent productivity. They always encourage sustainable harvesting of bio-resources which destined to ecological balance. Thus, in their agricultural system, the available resources are used very prudently to gain maximum production with less environmental degradation. Moreover, collaborated intensive farming of rice with fish and pines with bamboo are innovative and productive measures followed by them to ensure both land and biodiversity management.

On the other hand, the farming practices followed by Nocte and Wancho may be assume as outstanding management of available bio-resources in spite of inhospitable geographical features. The productivity of rice in settled type of agriculture usually exceeds the *jhumming* considering differences in geographical features. However, practice of mix cropping of subsidiary crops like millets, maize and other plants in *jhum* fields usually mend the gaps created by inaccessibility of rice in stock. Thus, overall outcome of farming practice followed in this region is remarkably sustainable. Although many ill-effects and disadvantages regarding *jhum* are being discussed by many researchers, it is still playing an important role in enhancing sustainability of this region. More



so, region still lacks acceptable alternate to *jhum*. Therefore, policy maker are contemplating on sustainable and traditionally acceptable alternate as *jhum* is deeply rooted into their traditional culture and believes.

Traditional community maintains the age-old practices for bioresources management and organic farming with little influence of modern scientific technology. They have rather strengthened the traditional systems of forest management, bamboo plantation and land and water resource utilization as compared to other northeast tribal communities who have been drawn by the wind of modernization. Appreciating the traditional knowledge treasured by them, it can be assumed that their farming practices are ecologically feasible in context of sustainability and durability. Hence, it could be concluded that sustainable harvesting of bioresources and its management are sought after social and cultural instincts.

The authors would like to thank the local farmers of the study sites for their cooperation.

REFERENCES

1. Chen, D.F. Meter, P.G. and Helbert, M.S. (1984) Organochlorine pesticides residues in paddy-fish in Malaysia and the associate health risk to farmers, *Bulletin of the World Health Organization*, 62(2): 251-253.
2. Dolo, M. (2009) Traditional Irrigation System: A Case of Apatani Tribe in Arunachal Himalaya, North East India, *Mountain Forum Bulletin*, 9(1) :9-11.
3. Gupta, V. (2005) Jhum cultivation practices of the Bangnis (Nishis) of Arunachal Pradesh. *Indian Journal of Traditional Knowledge*, 4(1): 47-56.
4. Kerkhoff, E, and Sharma, E, (2006) Debating shifting cultivation in the Eastern Himalayas: Farmers' innovations as lesson for policy. International Centre for Integrated Mountain Development (ICIMOD) Kathmandu, Nepal
5. Myers. N. (1998); Threatened biota, hotspots in tropical forests, *Environmentalist*, 8:1-20.
6. Ramalcrishna, P.S. (1984) The science behind rotational bush fallow agriculture system (Jhum). Proceeding of the Indian Academy of science (plant science) 93:379.
7. Ramakrishna, P.S. (1992). Shifting Agricultural and sustainable development: An interdisciplinary study from north eastern India, MAB Book series, UNESCO, (Paries and Paithenen publishing group UK).
8. Saikia, S. K. and Das, D. N. (2008) Rice-Fish Culture and its Potential in Rural Development: A Lesson from Apatani Farmers, Arunachal Pradesh, India. *Agric Rural Dev*, 6 (1&2), 125-131.
9. Sharma, N. and Shukla, S. P. (1992) Geography and development of hill areas: case study of Arunachal Pradesh. Mittal Publications, New Delhi
10. Tangjang, S. (2009). Traditional slash and burn agriculture as a historic land use practice: A case study from the ethnic Noctes in Arunachal Pradesh, India. *World Journal of Agricultural Sciences* 5:7 0-73.
11. Tangjang, S. Nima, D. N. Aran, C. and Litin, A. (2011) An ethnobotanical survey of medicinal plants in the eastern Himalayan zone of Arunachal Pradesh, India. *Journal of Ethnopharmacology*, 134(2011): 18-25.
12. Wangpan, T. Tangjang, S. Arunachalam (2012) A. Managing Upland Rice Under Typical Traditional Slash-and-Burn Ecosystem in the Hilly Arunachal Himalaya of Northeast India. *Indian Journal of Hill Farming* 25 (2): 10 -13.
13. Wangpan, T. and Tangjang, S. (2012). Slash-and-burn agriculture in Eastern Himalayan zone of Arunachal Pradesh Northeast India. *Current Science*. 102:1247-248.