

Agro - ecological management of natural resource management of the Galo tribe of Arunachal Pradesh, India

■ SUDIPTA SANKAR BORA, JYOTI PRASAD LAHAN AND MADHUMITA BAROOAH

Article Chronicle :

Received :
31.01.2013;

Revised :
17.04.2013;

Accepted :
18.05.2013

Key Words :

Galo, Jhum kheti,
Resource,
Management

SUMMARY : The importance of sustainable system of agriculture that co-exists with nature and be resilient to environmental stress has gained importance during the recent times. In contrast to the technology-intensive farming systems that have brought a variety of environmental and social problems, many ethnic tribes/communities such as the Galos of Arunachal Pradesh, India, have been practicing farming system that maintains harmony with the environment. Over the generations, the Galos have acquired traditional knowledge of sustainable use of natural resources. They traditionally practice shifting cultivation (*Jhum kheti*) which involves intensive labor and often employs the entire village during cultivation and harvesting of the crops. Their cropping systems are based on rich indigenous ecological knowledge gained over the generations. Field preparation, choosing of crop varieties and season of sowing, intercultural operations, soil and water conservation techniques, harvest and storage methods reflect their rich traditional knowledge of an agriculture system that is self-sustaining. This paper highlights the agro-ecological management of natural resources in Galo plateau of Arunachal Himalaya in North east India.

HOW TO CITE THIS ARTICLE : Bora, Sudipta Sankar., Lahan, Jyoti Prasad. and Barooah, Madhumita (2013). Agro - ecological management of natural resource management of the Galo tribe of Arunachal Pradesh, India. *Asian J. Environ. Sci.*, **8** (1): 36-40.

The twentieth century's growth in consumption, unprecedented in its scale and diversity, has been badly distributed, leaving a backlog of shortfalls and gaping inequalities. The world's dominant consumers are overwhelmingly concentrated among the well-off, but the environmental damage from the world's consumption falls most severely on the poor. In recent years, research on consumption and environment has found more attention and the results are stimulating (Stern *et al.*, 1997 and Princen *et al.*, 1997).

Ever-expanding consumption puts strains on the environment – emissions and wastes that pollute the earth and destroy ecosystems, and growing depletion and degradation of renewable resources that undermines livelihoods. Therefore, issues such as sustainable natural resource management and environmental protection are getting an utmost priority during last few years. Worldwide policy makers, scientists,

environmentalists and leaders are trying to address the issues in all the possible ways. In contrast to the present global scenario, in remote corners of the few countries, ethnic communities, with their traditional ecological knowledge, are silently practicing sustainable agriculture harmonizing co-existence with nature and conservation of biodiversity (Saravanan, 2010).

Arunachal Himalaya is the part of Eastern Himalaya with high ethnic and cultural diversity. It shares 2.5% of the total geographical area of the country, 15.76% of Indian Himalayan region and 43.62% of the Biological Hotspot, Eastern Himalaya (Dollo *et al.*, 2009).

Like many tribes of our country, tribal people of Arunachal Pradesh also depend on their surrounding forest ecosystem. They do not only use various plant and animal resources but also reflect heterogeneous beliefs and practices intricately associated with ecosystem. Study on such beliefs and practices have tremendous

Author for correspondence :

**SUDIPTA SANKAR
BORA**

Department of
Agricultural
Biotechnology, Assam
Agricultural University,
JORHAT (ASSAM) INDIA
Email:sudip.asm@gmail.com

See end of the article for
Copied authors'

implications as these can be perceived in the process of natural resource management. Thus, it has vital significance in maintaining the bio-diversity of the region.

EXPERIMENTAL METHODOLOGY

Target group :

Galo is one of the prominent tribes occupying the southern part of Abor Hills, bounded by in Simen River east, Subansiri in the west, Siyom River Bayor Adi (Hill) in the north, and Lakhimpur district of Assam in the south. The maximum population of *Galo* is mainly concentrated on West Siang District. The tribe is composed of several groups inhabiting a compact area, comprising of many villages, and all are culturally and socially linked together (Medhi *et al.*, 2009).

The *Galos* use to believe the '*Donyipolo*' as the Supreme God and regard themselves to be one of the descendants of '*Abo Tani*', the first semi divine human being on this earth. It has many sub groups such as *Bogum*, *Lodu Karka*, *Tai-Mara*, *Paktu*, *Karga*, *Karko*, and many others. Besides, they are also subdivided into some groups as per linguistic differences such as *Pugo Galo*, *Lodu Karka Galo*, *Bogum Galo* and *Chibo Lare Galo* etc. *Galo* language originated from Tani Language has certain affinity towards other tribes such as *Nishi*, *Apatani*, *Adi*, *Hillsmiri*, *Tagins*, and *Mishings* etc. (Post, 2007).

Like many other tribes of Arunachal Pradesh, they are highly co-operative and mutually linked up by kinship, ritualistic and friendship ties. The tribe practices clan exogamy and community endogamy, and believes in monogamy. They are agriculturists in nature and have good numbers of traditional ecological knowledge on sustainable management of their limited resources.

Location :

The majority of the mountainous population of the Himalaya depends upon agricultural and forest based natural resources for their livelihood (Ramakrishnan, 1997) while the resources are sustainably maintained with traditional ecological knowledge (Dollo *et al.*, 2005; Dollo, 2007; Farooque *et al.*, 2007).

Arunachal Pradesh is considered to be luxuriant in biodiversity and has been recognized as the 25th biodiversity hotspot in the world (Chowdhery, 1999). It is spreading over an area of 83,743 sq km with a variation in altitude from 150-6,500 m and unique climatic conditions. The original inhabitants of Arunachal Pradesh belong to 26 major tribes and 110 sub-tribes (Srivastava, 2009).

The study area was West Siang district of Arunachal Pradesh located at 94°02'E - 95°15'E and 27°29' N-29°23'N at altitudes between 60 - 5000 m. The region's climate is markedly continental in character with average annual rainfall of 3000 mm and temperatures ranging from 5°C in the month of

December to 38°C in the month of July. The total population of the district, which is inhabited by not only members of the *Galo*, but also *Adi*, *Memba* and *Khamba* tribes, is approximately 105,000. *Galo* people make up roughly one fourth of the population and are found in the southern part of this district.

Sample collection and research design :

In order to achieve the authentic information, the investigators had an extensive interview and discussion with the inhabitants of about 30 randomly selected *Galo* villages. The number of households per village was 12 - 20 (one village had 30). At least two households per village, inhabited by village elders and their families, were visited. Recommendations by the headman or village elders to visit certain knowledgeable persons in another village were sometimes followed. A questionnaire was prepared covering various agricultural practices, and ethnobotanical parameters. Although the questionnaire was prepared in English, the questions were translated to local dialects to facilitate the respondents in the study villages. Where this was not possible, photographs of the samples in question were taken and later shown to an expert or compared with specimens in the university collection. The vernacular names of the samples were written down phonetically, and notes were taken for various agricultural prospects such as crop production system, handicrafts etc. The interviewed people (20 persons aged between 45 and 70 years of age from each tribe) were asked simple questions. The information collected was compiled in to appropriate categories to suit the requirement of the study. In most cases the locals complied and with the help of illustrated identification guides and it was usually possible to identify the species in question.

EXPERIMENTAL FINDINGS AND DISCUSSION

The experimental findings of the present study have been presented in the following sub heads:

Agriculture :

Galo people practice two types of agriculture *i.e.* shifting agriculture/*jhum* agriculture (*Modii/Adi-Riike*) and terrace/wet agriculture (*Isii-Riike*). The agrarian economy has multifaceted character of which the households are main productive units and the members are directly involved in the agriculture operation irrespective of age and sex. Women are generally preferred for sowing as it is believed to increase fertility of soil and thus productivity.

Cropping pattern :

In shifting agriculture, a fresh of piece of forest land is cleared by felling trees and burning the debris which gives

natural manure. The shifting cultivation is commonly known as 'slash and burn cultivation'. The fresh plot of land cleared for first year of cultivation is called '*Riggp-Riike*' (i.e. fresh dry field) and in same field when the farming is repeated for second year in the successive, it is called as *Riiga-Riike* (i.e. repeated field). After cultivation for second year, the field is left fallow for second regeneration. This field again may be used for cultivation after ten to fifteen years, when it completely regenerates. They practice three types of shifting cultivation namely; *Peelek*, *Docho/Yappa* and *Rigne*. The '*Peelek*' is derived from combination of second syllable of the words '*Tepe*' means 'maize' and '*allek*' means 'full of' i.e. *pe + allek = pellek*. Hence, *pellek* means a field exclusively meant for growing maize. The term '*Docho*' is combination of the word '*Donam*' (to eat) last syllable of word and '*Acho*' (to come first). Thus, it is the field for raising crops for the first consumption. The harvesting of paddy is done in the month of June and July. *Rigne* means mother field or main field. Clearing of herbs and bushes start from last of November to January and sowing of seeds and crops take place in April month, harvesting in August and September. In plain areas (foot hill areas), they cultivate irrigated rice crop as a mono-cropping system, where assured irrigation is available through rivers and riverlets.

The mode of cultivation in shifting agriculture is depending on the human labour, use of simple tools and implement. The main feature of shifting cultivation is to clear natural vegetation and burn the debris and dibble seeds in clear field. After completion of two years, when the fertility of the soil is exhausted due to erosion of the top soil, the field is abandoned and left for regeneration and shift to the new area.

Natural resource management & bio-diversity conservation:

The tribe is unique in having traditional rights over land, water and forests within their jurisdiction and exercises control over the natural resources within their surroundings. There are no written land records of ownerships in the area. However, traditional boundary demarcation of land lines between the villages and clans are maintained through natural features of streams, hills and other land marks which is honoured by everyone.

Conservation of flora and afforestation programmes :

The tribe takes special interest in conserving natural flora and undertakes special conservation and afforestation programmes for the maintenance of natural vegetation. The violation of rules in conserving natural resources and bio-diversity by the individuals are punished by imposing fines.

Ecological pest and diseases control methods :

The farmers are preserving the ecological pest and diseases control measure knowledge over the generations. For example, *Citrus grandis* (Pummelo) leaves used as insecticidal and repellent for the control of the rice pest *Leptocorisa oratorius*. House hold ash is used as a repellent to control pests and diseases of the cultivated crops. A number of traditional traps are used for control of rats in the rice fields. After harvest of rice crop, grains are stored in well protected Indigenous Granary, which inhibits any pest and diseases of stored grains. Many insects are consumed as food by the tribe which not only serves as a measure of pest control but also a rich source of micronutrient and other therapeutic agents.

Traditional food habits :

Many indigenous varieties of cereals (mainly paddy and millet crops) pulses, oilseeds, vegetables and spices are being conserved under their cultivation system.

Some of the indigenous life supporting plants of the tribe are; Bamboo [*Bambusa indica* Arundinacea (Retz.) Poaceae], Indigenous leafy vegetables (*Brassica juncea* L. *Spilanthes acmella*, *Zanthoxylum rhetsa* DC., *Rhynchosyllum ellipticum* Wall ex Dietr DC., *Mussaenda glabra*), indigenous grain plants (*Phaseolus* spp., *Sorghum* spp., *Prema bengalensis*, *Zea* spp., *Sesamum* spp., *Eleusine coracana*, *Amaranthus spinosus*, *Pennisetum typhoides*, *Vigna* spp., *Coix lacryma* and *Fagopyrum esculentum* etc.), indigenous edible fruit plants (*Baccaurea sapida* Roxb. Murril (Euphorbiaceae), *Citrus deumana* Linn, *Adina cordifolia* Roxb., *Musa velutina*, *Garcinia lanceaefolia* etc.), indigenous vegetables (*Abelmoschus* spp., *Solanum melongena* Linn., *Amorphophallus campanulatus*, *Canvolvus* spp. *Colocasia esculenta* L.), indigenous spices and condiments (*Elettaria* spp., Wild chilli-*Capsicum* spp., *Curcuma amanda*, *Cassia tora.*, *Curcuma longa*, etc.).

Table 1 : Land type and source of livelihood of Galo tribe

Land type	Ownership	Source of livelihood
Permanent forest	Community	Timber, fire wood, cane, bamboo, palm leaves, medicinal plants, wild edible fruits, vegetables, flowers, habitat for semi domestic animal Mithun
<i>Jhum</i> forest	Individual family	Brinjal, chilli, green onion, ginger, paddy, millet, mustard plant, beans, lady's finger, pumkin, cucumber, bittergourd, arum etc. and acts as permanent forest during fallowing period.
Orchard	Individual family	Orange, lemon, pineapple.
Kitchen garden	Individual family	Local green vegetables, medicinal herbs.
Valleys (low land)	Individual family	Rice.

Toko (*Livistona jenkinsiana* Griff./family: Areaceae) has been observed to be a culturally important species, and an integral part of *Galo* livelihood. Leaves, stems and fruits are of great use to the tribe. Number of bioculturally important products are made out of the leaves and fruits of *toko* (Table 2).

Poka, a traditional rice wine plays an important role in the socio cultural life of the *Galo* tribe of Arunachal Pradesh. *Poka* is consumed during most of the festive occasions and celebrations. The starter culture (locally known as *Apong Kusure*) is concocted by women folk with rice flour and several herbs.

The North-East of India is among the most cultural-linguistically rich and diverse regions of all Asia. This is due as much to its position at the cultural-geographical crossroads of East, South, and South-East Asia as to its varied topography and difficulty of travel and access, and consequent opportunities for populations to develop to a degree independently in relatively isolated niches (Post, 2007).

Agriculture has traditionally been and continues to be the main source of livelihood of *Galo* life. Majority of the total workforce in the district are engaged in agricultural activities. The land is extremely fertile and can produce the best quality of agro-based, horticulture and floriculture products through organic farming. Alike other district of Arunachal Pradesh, it

has followed the practice of growing crops under organic conditions since time immemorial. In the context of the globalization of agriculture, organic products have higher market value & the district is in a unique position to take advantage of this. Strategic initiatives in the fields of animal husbandry, fishery and sericulture could result in generation of resources and overall development of the rural economy.

Forest and its forest products have great impact on the economy of the people and all the activities of the people revolve round the forests. Agriculture (*jhum*) and other associated activities like hunting, fishing and food-gathering have a direct link with their forests. The constructional materials like wood, bamboo and cane play significant role in building their traditional houses. In addition to that hunting and fishing implements, agricultural tools, dress and ornaments, domestic utensils and other implements are directly or indirectly linked with timber and forest products. Thus, the material culture of the people is dependent on the surrounding environment and forest ecology.

Conclusion:

The dense forests of the area are endowed with rich minor forest produce. *Galo* people collect firewood for fuel purpose, timber for house construction and making of agricultural wooden implements, furniture and other articles for domestic

Table 2 : List of handicraft items made of cane

Local name of the item	Uses
<i>Egiin</i>	Conical shaped carrying basket for grains
<i>Ebar</i>	Conical shaped basket for carrying vegetable products
<i>Patu/Lelli</i>	Carrying basket used by male folks
<i>Osi</i>	A square shaped shallow basket used for measuring units for grains
<i>Upo</i>	Plate mat basket used for spreading grains
<i>Opf</i>	Winnowing fan
<i>Piter</i>	Cage for chicken and duck
<i>Obo</i>	Umbrella used by folks in paddy fields
<i>Edir</i>	Fishing trap
<i>Bolup</i>	Hat used by male folk
<i>Hobuk</i>	<i>Dao</i> cover
<i>Esak</i>	Bow for hunting purpose
<i>Upuk</i>	Arrow made of bamboo and cane leaf

Table 3 : List of plants used in starter culture preparation

Local name	Botanical name/family	Part used
<i>Oin</i>	<i>Clerodendron viscosum</i> Vent/Verbanaceae	Leaves
<i>Hibe/Onyor</i>	<i>Debregeesia longifolia</i> (Burm. f.) Wedd./Urticaceae	
<i>Taka</i>	<i>Diplazium esculentum</i> (Retz.) Sw./Athyriaceae	
<i>Rare</i>	<i>Pilea</i> sp./Urticaceae	
<i>Oyik</i>	<i>Urtica hirta</i> BI/Urticaceae	
<i>Tita baigun</i>	<i>Solanum kurzii</i> Brace ex Prain/Solanaceae	Fruit

usage. However, deforestation coupled with industrialization is resulting in natural imbalance in this area. The damage done to the forests by the tribals is relatively less than the damage done by the other agencies to the natural forests. To solve this problem in some extent, it is essential that the tribals are made partners in the development, conservation and management of the forests with due share. Again, in view of the long-term sustainability issue within ecological limits, effective forest management policy should be administered.

Acknowledgement :

Authors are thankful to all the faculty and staff members of the Department of Agricultural Biotechnology, Assam Agricultural University, Jorhat, Assam. Thanks are also due to local informants and village headmen for their valuable support and co-operation throughout the field work.

Coopted Authors :

JYOTI PRASAD LAHAN AND MADHUMITA BAROOAH, Department of Agricultural Biotechnology, Assam Agricultural University, JORHAT (ASSAM) INDIA

REFERENCES

- Chowdhery, H.J.** (1999). *Floristic diversity and conservation strategies in India*, BSI, Kolkata.
- Dollo, M.,** Singh, K.I., Saha, D. Chaudhury, S. and Sundriyal, R.C. (2005). Livelihood and natural resources utilization pattern in an ethnically diverse area in Arunachal Pradesh. In : Bhatt, B.P. and Bujarbaruah, K.M. (eds.). *Agroforestry in north east India : opportunities and challenges*. ICAR Research Complex for NEH Region, Meghalaya, India, 55-70.
- Dollo, M.** (2007). Traditional farmers groups supporting sustainable farming. *LEISA*, **23**(1) : 22-24.
- Farooquee, N.A.,** Dollo, M. and Kala, C.P. (2007). *Traditional wisdom of apatani community in the management and sharing of natural resources in North Eastern India*. In : Misra, Kamal K. (ed.), *Traditional knowledge in contemporary societies: challenges and opportunities* Pratibha Prakashan, Shakti Nagar, Delhi, India. 110-126.
- Dollo, M.** Samal, P.K., Sundriyal, R.C. and Kumar, K. (2009). Environmentally sustainable traditional natural resource management and conservation in Ziro Valley, Arunachal Himalaya, India, *J. American Sci.*, **5**(5) : 41-52.
- Medhi, B.K.,** Athparia, R.P. and Jose, S.K. (2009). *Tribes of North-East India : Issues and challenges*, Omsons Publications, New Delhi, pp. 61-62.
- Post, M.W.** (2007). A Grammar of Galo. Ph.D. Dissertation. La Trobe University, Melbourne, Victoria, AUSTRALIA.
- Stern, P.C.,** Dietz, T.V., Ruttan, W., Socolow, R.H. and Sweeney, J.L. (1997). Consumption as a problem for environmental science. In : P. C. Stern, T. Dietz, V. W. Ruttan, R.H. Socolow and J. L. Sweeney (eds.). *Environmentally significant consumption : Research directions*, 1-11. National Academy Press, Washington, D.C., U.S.A.
- Ramakrishnan, P.S.** (1997). *Scientific basis of traditional wet rice cultivation by North-East India hills tribes*. In : Behera, M.C. and Roy, N.C. (eds.), *Trends in agrarian structure in the Hills of North East India*, Commonwealth Publishers, New Delhi, pp. 233-247.
- Saravanan, R.A.** (2010). *Traditional knowledge, innovation systems and democracy for sustainable agriculture: a case study on Adi tribes of eastern Himalayas of North-East India, innovation and sustainable development*, Author manuscript, published in ISDA, Montpellier : France.
- Srivastava, R.C.** and Adi Community (2009). Traditional knowledge of Adi tribe of Arunachal Pradesh on plants, *Indian J. Traditional Knowledge*, **8**(2) : 146-153.


 ★★★★★ of Excellence ★★★★★