

Traditional Land and Agriculture Management Techniques in Siku and Sibia Watershed, East Sinag District, Arunachal Pradesh

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Abstract: *Arunachal Pradesh, located in the northeastern region of India, harbors a rich diversity of traditional land and agricultural management techniques which are deeply rooted in its diverse cultural heritage and ecological landscape. This paper presents a comprehensive review of these indigenous practices, drawing upon scholarly research, ethnographic studies, and local knowledge repositories, especially in Siku and Sibia River Watershed in East Sinag District Arunachal Pradesh. The traditional land management techniques in the study area are intricately linked with the exclusive socio - cultural fabric of its indigenous communities. The watershed is mainly inhabited by the Adi tribe people. That is why main thrust is given to the agricultural and land related practice of Adi people. The Key observations include shifting cultivation (jhum), mixed cropping, rituals and community engagement. Extensive field study was conducted to examine the present scenario of the traditional practices. Mostly observational and interview method was incorporated. The traditional agricultural management techniques in the study area reflect an intimate understanding of ecological processes and seasonal rhythms. Indigenous knowledge systems indicate planting schedules, natural pest control, crop rotations, and other methods optimizing productivity while minimizing adverse environmental impact. These practices also foster social cohesion and intergenerational knowledge transmission within communities, reinforcing cultural identities and resilience in the face of environmental change. It was also observed that traditional land and agricultural management techniques in the watershed is facing challenges in the contemporary time. Rapid socio - economic changes, external influences and population growth create threats to the sustainability of these age - old practices.*

Keywords: indigenous, communities, management, change

1. Introduction

Sustainable agriculture is one which is 'economically viable, socially acceptable and ecologically sound' (Conway, 1987; Kleinman et al., 1995). Land management is very important practice especially for good agricultural growth. Proper land and agricultural management provides with sustainable environment, improved health and well being, socio - cultural development and economic opportunities. Indigenous land management system can also be referred as the "caring for country", which includes a very wide range of environmental and cultural heritage management activities undertaken through individuals, groups and institutions across the world (Smyth D, 2011). It is also notable that the understanding of farmers' knowledge and their insight of factors that control their land management practices are of supreme importance for promoting sustainable land management. Agricultural practices in tribal areas are generally diverse, ranging from a variety of shifting cultivation systems, fallow systems home kitchen gardens to sedentary systems like valley rice cultivation (Ramakrishnan, 1993; Kumar and Ramakrishnan, 1990). The cultural groups in north east India have adopted various agricultural practices, which utilize different ecological niches (Choudhury and Sundriyal, 2003). In North - east India, shifting cultivation or 'jhum' is practised by more than half a million families from over hundreds of tribes (Ramakrishnan, 1992). The varieties of traditional land management techniques and skills are witnessed to be developed in the field of agriculture by different tribes of Arunachal Pradesh also. The *Adi* tribes of Arunachal

Pradesh are also pioneers. They have traditionally developed various sustainable land use management techniques which have been passed on from generations. Especially, in the state of Arunachal Pradesh where 62.29 % of working population is engaged in agriculture (NSSO Report 2001). The traditional knowledge and expertise of the inhabitants of the villages of Siku and Sibia Watershed in the East Siang of Arunachal Pradesh in north - east India were evaluated in terms of the cultural and social cohesiveness associated with managing the land, water and agro - biodiversity. The farmers of *Adi* tribe mostly depend on shifting cultivation, popularly called jhumming, settled agriculture and adjacent forest for livelihood (Sarangi, 2009). The *Adi* tribal community exercises individual or institutional control over the natural resources within their surroundings. (R. Saravanan, 2009).

In the recent past the increasing modernization in the field of agriculture and other land use resource management systems have continued to decline the function of the intergenerational experiences concerning traditional practices of land management (Kangalawe, R. Y et al.2014)

The Siku and Sibia watershed is characterized by sub - tropical and temperate forest with huge diversity of potential land resources which have the prospective of different and multiplicity agricultural practices in the area. Both shifting and permanent agricultural practices prevail over the area; which is also the prime source of their subsistence. This study tries to provide a insightful idea about environmentally sustainable and economically viable indigenous land

Volume 13 Issue 3, March 2024

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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management system, the current status and its future prospective, which can be helpful for the policy makers and planners for proficient management of limited resources in fragile Eastern Himalaya region in particular and other mountain regions in general. If the traditional land management techniques are not being passed on to younger generations leading to extinction of such knowledge base. Therefore, the present study aims to document the traditional land management techniques and its relevance. Objective of this paper is to have an empirical study and to document and demonstrate the traditional land management techniques within the *Adi* tribe of the above-mentioned watershed and to have an insight and future prospects. To conserve the above mentioned traditional knowledge, there is a very high need of scientific research and documentation in particular.

2. Study Area

River Siku and Sibia are located in the East Siang district of Arunachal Pradesh and are the tributaries of the river Siang. In between these two rivers and the Mighty Siang river in the south there is an extensive plain area with a gentle slope northward. These two river watersheds mainly cover the Major portion of Mebo circle, some part of Namsing circle, East Siang and some part of upper catchment includes Upper Siang.

The study area i. e. Siku and Sibia river basin is extended between 28°5' N latitude to 28°20' N latitude and 95°20' E

longitude to 95°30' E longitude. It covers a total area of 530Km². As per the Census 2011, there are 19 villages in the Memo circle i. e. Bodak, Ayung, Ranaghat, Mebo village, Mebo H. Q. Silluk, Aohali, Motum, Ralling, Sigar, Nyopok, Kiyit, Borguli, New Borguli, Seram, Kongkul, Namsing, Godam and Mer with the total household of 34, 205, 27, 280, 375, 139, 40, 125, 35, 68, 295, 216, 121, 39, 148, 25, 299, 60 and 120 respectively.

The study area is a part of the Siwalik ranges situated in the southern portion of the East Siang district. The area is highly dissected in the upper region of the watershed with several small rivers and gullies in between. According to the geological survey of India, the region belongs to three types i. e. Upper Siwalik, the Middle Siwaliks and the Lower Siwalik. The region is also having an extensive plain drained by the Siang River and its tributaries.

The weather patterns of the area experiences the tropical humid type of climate with hot and humid in summer and dry mild winter seasons. The district is dominated by mountains with different altitudinal variations from 140 meters to 1500 meters, above the mean sea level. Climatic conditions of East Siang district shows that the mean maximum temperature is estimated as 31°C and mean minimum temperature was 12°C. In this district the rainfall generally starts during the month of May and reports of high rainfall were recorded in the months from June to September.

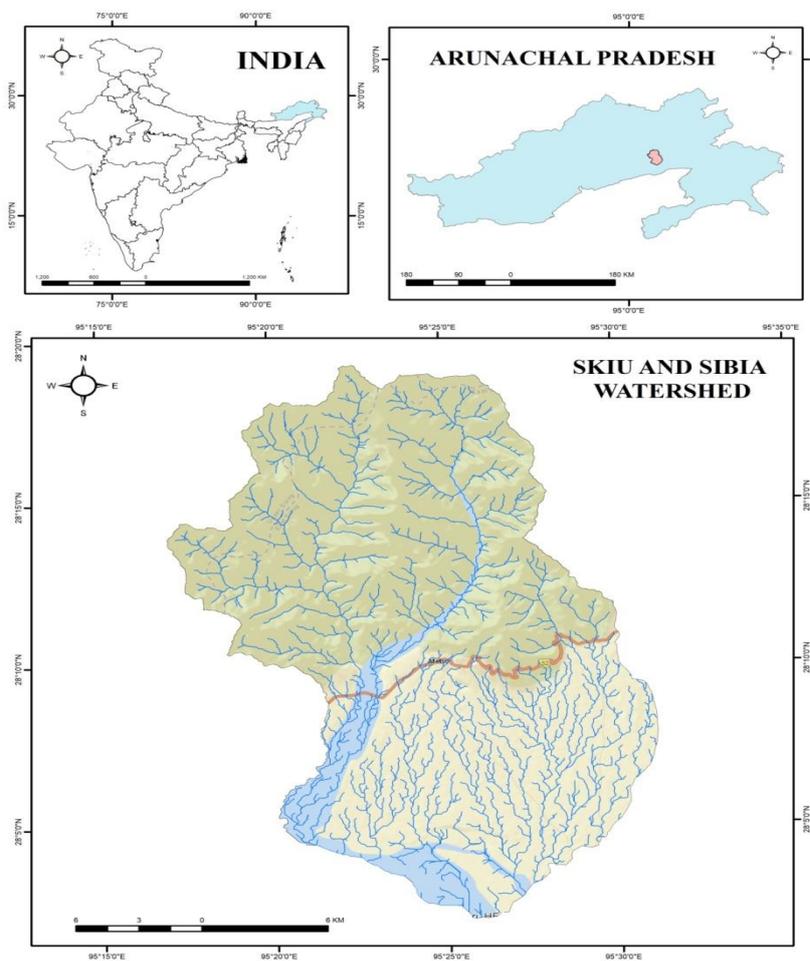


Figure 1: Location Map

3. Material and Method

To collect the data about traditional land and agriculture management system, extensive field survey was initiated in the villages within the watershed. Local farming households were approached with verbal consent. Farmers from each village was interviewed regarding their shifting or settled cultivation, changing practice in the last years, use of fertilizers or weedicides based on structured interviews. Snowball sampling method of interview was used. We interviewed people with different economic conditions in the village. Significant information regarding the traditional farming practices by the local people was gathered. Here, mostly the elderly farmers were interviewed using a standardized questionnaire. While the farm surveys made it feasible to illustrate current agricultural practices among the peoples. The objectives of the study were explained to ensure the proper collection of information. Elderly and experienced persons were asked about the rituals and associates practices in the agricultural fields and also tried to understand the changes occurred in due course of time. The field data were than compiled categorized explained to establish the idea and the current status of the traditional land and agricultural management practices.

4. Findings

Traditional Farm Practices

The *Adi* tribe follows natural farming and by default the *Adi* tribal farmers are practicing organic cultivation. The farmers also practice the crop rotation based on availability of land. In the upper and mid - hill areas, direct sown Rice, Maize, Ginger Mustard are generally followed. In foot hill areas, irrigated rice is cultivated as a monocrop and some time pulses are also raised as an intercrop. Woman plays a very significant role as shifting cultivation is largely undertaken by the women of the community. They frequently visit the *jhum* fields, do weeding 2–3 times during one agricultural cycle and in a regular basis they bring back firewood from the fields to be utilized in the other household practices.

Maintenance of land fertility

Farmers here have developed some remarkable traditional methods for maintaining the soil fertility and have strong belief that application of chemical fertilizers or other manures will make the soil worst and very unsuitable for the crop growth and health near future. The maintenance of

fertility of *jhum* land is done through in - situ integration of burnt vegetation and in kitchen garden and orchard by applying manure of domestic animals. Soil erosion and degradation in the slops of *jhum* land is tried to be controlled by keeping partially burnt long wooden logs across the slope of the land. These partially burnt logs, after the cultivation period gets decomposed and add additional nutrients to soil. And hence the fertility remains intact for a longer period. The input for all forms of agriculture is from the system itself. However, there is exchange of seed and planting material within the community.

Ecological Pest and Diseases Control Methods

Over the generations, the farmers are following the ecological pest & diseases control measures. For instance, Citrus grandis (Pummelo) leaves are used as insecticidal and repellent for the control of the pest. Household ash is very commonly used as a repellent to control pests and diseases of the paddy crops. Animal bones are tied with horticultural plants used as attractants for attracting pest predators. Some pests are controlled mechanically or manually also. For example, Citrus trunk borer (*Anoplophora versteegi*) is mechanically controlled by inserting sharp bamboo sticks in the affected trunk. Apart from this, numbers of traditional traps are used for control of rats in specially the rice fields. After harvest of rice crop, grains are kept in well protected indigenous granary, which protects the grains from any kinds of pest and fungal diseases.

Traditional irrigation technology

In traditional system, irrigation has been modified over many years through community involvement and fair sharing of water resources. Water is tapped near the foothills of the valley and is channeled through to major canals on either side of the valley to supply the agricultural land. After that the water is distributed through numerous small canals so that every plot of land is well supplied with irrigated water for mainly wet rice cultivation.

Rituals related to agriculture

People here perform some rituals to have good paddy. For example some special *puja* are performed and animal are scarified. They also make some bows and arrows. Arrows are thrown towards paddy fields and also towards the sky. They believe that flying arrows in the sky helps in preventing hailstones which often severely damage their paddy.

Table 1: Showing the Major rituals related to agricultural activities

S. No.	Name	Month	Link to agriculture	Description of the rituals
1	Aran	February (mid)	Symbols the beginning of the agricultural cycle	Gifts and worships offered to the ancestors and relatives for better future.
2	Roje	February (late)	Connected to field preparation	Slashing and if necessary burning of secondary forests undertaken
3	Ettor	March (early)	Connected to crop field protection	Fencing by of fields done in community level
4	Mopin	March (late)	Associated to agricultural field preparation	Prediction the fortune of the agricultural season using a <i>shaman</i> *
5	Pyne	May (early)	Associated to burning of fields and planting different crops	Festival preceding to burning and planting crops in the case of shifting cultivation and planting crops in the case of settled cultivation
6	Dinya taku	May	Connected to crop germination process	Planted crop fields are inspected for new shoots
7	Solung	May (late)	Associated to harvest of crops	Prayers offered to spirits/gods for a healthy crop production
8	Kabey	June (early)	Connected to harvest	Evil spirits are warded away to ensure a healthy crop

				production
09	Aligudung	July	Related to weeding of the crop fields	Community weeding of crop fields undertaken after this festival
11	Takkin	July (late)	Associated with pest prevention/control	Prayers offered to the spirits not to get effected by pests and pest - infected crops removed
12	Leeday	September	Connected to harvesting of the crops	Stones tied to few crops which symbolize strength and also prayers offered to spirits
13	Dokang	October (late)	Associated to harvest	Some newly grown rice or other paddy is harvested, prepared and eaten in community level

Source: *Field Survey*

Diversity maintenance

The *jhum* cultivation system in general has a high crop diversity comprising of, pulses like rice bean oilseed and vegetables with rice as the major crop. Maize crop is sown sparsely in the entire area associating rice. Millets crops are grown in the boundary lines of the *jhum* lands. Some of the root crops like local yam and colocassia are sown just after harvesting rice and maize. The yield from *jhum* land in the initial year is generally higher than the following year. However, it is observed that the yield from wetland rice cultivation in the valleys is always higher than *jhum* cultivation. All the *Adi* farmers with their age old experience in farming developed a comprehensive knowledge on the nutrient content and medicinal properties of various plants and of course they are the master in this field. Small millets, indigenous pulses, oilseeds and many more forest plants form important component of food source for these tribal people of Arunachal Pradesh. The neighboring forest products are still utilized on everyday basis as nutritional supplements and some such products are also seen in the local market.

Integrating knowledge sources

The community has strong faith in their traditional agricultural practices. They never replace them with modern practices unless thoroughly convinced of its ecological implications. There have been formal extension agencies like state agriculture and horticulture departments, multiple cropping projects (MCP) Kripsi Vigyan Kendra (KVK), irrigation and flood control department (IFCD), but they have been limited to supplying some inputs (seeds/fertilizer) which farmers have rarely used. Until now, the practices followed in the *jhumming* are purely traditional, gained from years of experience from the ancestors. However, in the settled agriculture mainly horticulture and wet rice cultivation, the farmers sometimes add modern knowledge from agencies, for example new knowledge on maintenance and rejuvenation of old declining orchards and use of improved seed/planting material. Other than all the age old traditional techniques are highly preferable for the *Adi* tribe farmers.

Role of *Adi* Tribal Village Council: *Kebang*

Adi tribal peoples have a very well organized village council which is called *Kebang*. *Kebang* administers the village affairs, manages and deals with the day - to - day unsolved problems of the villages and sometimes also individuals. When necessary they regulates, formulates laws and issue ordinances for the overall well - being of the society. The *Kebang* was formed in a natural way. The village's elders become by default become village *Kebang* members. The *Kebang* is a Democratic institution and *Adi* tribal people are traditionally republican democratic and socialists in

aspiration. The *Kebang* does not rule out in a way of capitalistic economy, however, at the same time, they attach importance to the sociolistic ideology. Equality in distribution of wealth and opportunities are on their main objectives (Danggen, 2003).

The Role played by *Kbang* in Agriculture & Natural Resource Management is one of its kinds. Very important and crucial activity played by *Kebang* is the allotment of new land area for agriculture. New farm lands in particular *Jhum* lands are allotments to the interested farmers are initiated mostly by the *Kebang* for the cultivation. Before they start their cropping season, bamboo based community fencing to protect and demarcate the crops and lands are carried out by the *Adi* community members as per the *Kebang* administration. In some instances, type of crops and cropping pattern are also regulated by the *Kebang* based on the recourses availability. The *Kebang* regulates the water distribution system from the rivers and riverlets. They initiate the construction of the small checkdams and small irrigation channels by community work. To control some of the plant pest and diseases community campaigns as well as field activities are arranged and performed by the *Kebang*. To preserve soil heath and nutrient condition and also to provide grass and fodder to household animals, *Kebang* may passes instructions to maintain fallow land during the particular season.

Natural Resource Management & Bio - Diversity Conservation

The *Adi* tribe is exclusive in having traditional rights over land, water and forests within their control. Generally, there are no written land records of ownerships. However, traditional boundary demarcation of plot of land between the villages and clans are maintained through natural features like rivers, hills and other permanent landmarks which is honored and accepted by every mebers. If there be any dispute arising between the clans, villages and tribes, the same is settled cordially by the village elders through the system of *Kebang*. Bamboo, tokopatta and rattan/cane have the highest demand as non - wood forest products as they are used by the *Adi* community for so many purposes. (N. Kumar Et Al., 2015) Fishing, hunting, and utilization of non-timber forest products are part of their culture (Misra and Dutta, 2003). The *Kebang* exercises control over the Forest resources, mainly timber and non-timber forest products utility behaviors are regulated by the *Kebang*. To discourage haphazard hunting, the *Kebang* allows only limited community hunting during certain specified periods and during community rituals and also in the demarcated forest area. The breaching of *Kebang* direction in conserving bio - diversity and natural recourses by the individuals or groups are punished by imposing fines.

5. Conclusion

The *Adi* tribes of the study area practice their own way of traditional farming system with wide variety of crops, which provide food, fodder, fuel, fiber, nutrition and medicine to the community. Most of these vegetables and land races, which have specific nutritive values, are facing the danger of extinction today. Therefore, cultivation of these endangered and under exploited plants in different ecological situations is essential to conserve biodiversity and utilize their potential for upliftment of economically poor population. Further, the approach to agricultural development should be built on locally available asset base, rather than modifying it. Fusion of traditional and modern techniques might be the sustainable route. Throughout the study it was observed that there is decreasing tendency of participation of young generation in the traditional method of farming. This is the huge crisis for the sustainability of the traditions and traditional methods.

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