Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

June 2023, Volume 36, Issue 1, Page 30-36

Indigenous technical knowledge of jhum cultivation in Nagaland, India

Mary N. Odyuo[1]* • Thejanei-i Nagi[2] • J. Longkumer[3] • Zuchanbemo K.[4]

[1]Associate Professor, Dept. of Agricultural Extension. SASRD, Nagaland University, Medziphema
[2]Research Scholar, Department of Agricultural Extension. SASRD, Nagaland University
[3]Professor, Dept of Agricultural Extension. SASRD, Nagaland University, Nagaland, Medziphema
[4]ATMA. Department of Agriculture. Government of Nagaland.

ARTICLE INFO

Article history:
Received: 25 October, 2022
Revision: 03 November, 2022
Accepted: 10 January, 2023

Key words: *Shifting, cultivation, traditional, technical, knowledge, Nagas.*

DOI: 10.56678/iahf-2023.36.01.5

ABSTRACT

In the State of Nagaland, India, since time immemorial, under the leadership of village chief the whole community of the village decides to select a patch of forest area for cultivation preferably a virgin forest popularly known as *jhum* cultivation or Shifting cultivation or 'Slash and Burn' agriculture. It is an integral part of the Nagas as their socio-economic culture is closely associated with different activities of this agricultural practice. Indigenous Technical knowledge (ITK) in agriculture has played a vital role in sustaining the shifting cultivation and surrounding environment. Thus, a research was conducted to identify and document the ITKs in *jhum* fields of Angami Tribe of Nagaland. Two blocks under Kohima District were purposively selected, under which two villages from each block were selected randomly for the study respectively and a sample size of 120 respondents were chosen randomly. All identified ITKs were documented by adopting descriptive research design. It was concluded that, the Angami tribe, besides other Naga tribes, possess a spectacular wealth of knowledge on Indigenous Technical Knowledge in *jhum* cultivation. This study documented a total of eight (8) ITK's of *jhum* cultivation. The fields are cut into beautiful terraces and slopes were leveled, bunds were made and divided into shorter ones for soil and water management; ITK for determining time of sowing was sowing seeds at full moon since it resulted in less pest and disease infestation; Mixing of ashes with soil and fallow period of 2 to 3 years allowed the soil to regain fertility; Tying a piece of cloth, Placing a long bamboo pole split in the middle and making of fire in the field were common practice for protecting the crops from birds and rodents; Uprooting and burying the weeds in the soil was the most common ITK for weed Management; The grains of paddy were stored in locally made bamboo structure called *'tsiinuo'.*

1. Introduction

Agriculture is the main source of livelihood for the people of Nagaland and as per 2011 census, 74 % of the population accounts to agriculture for livelihood (Statistical handbook of Nagaland, 2011) and *Jhum* cultivation is an integral part of the Nagas as their socio-economic culture is closely associated with different activities of this agricultural practice. At least 100 different indigenous tribes of north east India depends on *jhum* for their subsistence. "Nagaland possessed the second highest acreage under shifting cultivation next to Manipur. Land use pattern of Nagaland revealed that almost 16% of the total geographical area is under net sown area. About 1, 23,909 ha area is under shifting cultivation, which accounts for almost 7.5% of total area, 42% of total cropped area and 47.5% of net sown area" (Koutsuo *et al.,* 2014). This practice attracts diverse views on the ecological and economic impacts of large-scale deforestation of acres of forests for farming. Many consider it to be a diversified agricultural system well suited to heavy rainfall areas in moist forest and hilly tracts since the *jhum* farmers are totally dependent on rainfall for bountiful harvest which otherwise gives them poor yield, while others feel that the practice is primitive and inefficient.

*Corresponding author: maryodyuo@nagalanduniversity.ac.in

Shifting cultivation is the predominant means of subsistence for a majority of the people of all the north-eastern states of India except Sikkim (Tripathi and Barik, 2003). Shifting cultivation has been blamed for large-scale forest and land degradation and loss of wild biodiversity in north-eastern India and in other states of the country where such type of cultivation is prevalent. With increasing population pressure, and due to shortage of agricultural land, the fallow period in tropics has been shortened excessively and the period of cultivation has been extended for too long (Whitmore, 1998) causing severe degradation of the land. Though shifting cultivation is also considered to be an exploitative system which is destroying the nature by the optimal use of its natural resources, deforestation and ecological exploitation it is considered to be the major source of production in this parts of India i.e. the North-East India (prakash et. al., 2017). Jhum cultivation resulted in loss of forest cover, erosion of top soil, desertification etc. Increasing population pressure on food grains has resulted in land degradation. However Jhum cultivation still remains a predominant indigenous practice of farming in Nagaland (kithan, 2014).

Indigenous Technical knowledge (ITK) in agriculture has played a vital role in sustaining the shifting cultivation and surrounding environment. Indigenous knowledge is very useful and indigenous technical knowledge possessed by the farmers should be identified (Rizwana and Lyaquet, 2009). For the well being and for sustainable development Indigenous knowledge is vital as it has evolved after thousands of years of observation and experience. Linking indigenous knowledge systems of the farmers with research extensions, researchers output can be made more fertile and usable. For recording and dissemination of indigenous knowledge, there are no written documents. It must be gathered and documented for a particular community (Pandey *et al.*, 2017). Indigenous knowledge systems may appear simple to outsiders but they represent mechanisms to ensure minimal livelihoods for local people. They are often tuned to the needs of local people and quality and quantity of available resources (Pandey *et al.*2017). Thus, this research was carried out to document the ITKs in *jhum* fields of Angami Tribe of Nagaland, India on various aspects viz., Field preparation; Soil and Water management; Soil Fertility Management; Plant Protection; Weed Management; Post Harvest Management Practices; Seed Selection and Preservation and Time of Sowing.

2. Materials and Methods

The present study was conducted in the state of Nagaland. Nagaland, located in the Northeastern region of India, with an estimated population of over 1.5 million, covers an area of 16,579 sq km. Nagaland has 17 tribes living together in harmony and this Research was conducted on Angami tribe of Nagaland. Traditional agriculture has a rich and diverse history and in Nagaland, besides other Naga tribes, the Angami tribes possess spectacular wealth of indigenous knowledge and identified ITKs were documented by adopting descriptive research design. Two blocks namely, Chiephobozou and Sechü-Zubza blocks under Kohima District, were purposively selected, under which two villages from each block were selected randomly for the study *viz.*, Tuophema, Chiechama, Jotsoma and Sechüma respectively and a sample size of 120 respondents were chosen randomly. The primary data is qualitative in nature and was obtained through interaction with the respondents. For this study, the empirical measure of variable relating to age, family size, farming experience, land holding under farming and social participation was done by calculation frequency, percentage, mean (χ) and standard deviation (σ) and classified into different categories, such as,

Categories	Score range
Low	Below (χ –σ)
Medium	Between (χ –σ) and (χ +σ)
High	Above (χ +σ)

While, the rest were measured by using standardized tools and techniques developed by others. For documentation of Indigenious Technical Knowledge (ITK's), the ITKs which were adopted and practiced at present was firstly identified, then, a group of respondents were selected homogenously to discuss about the identified ITKs of *jhum* cultivation and were documented through Focus Group Discussion.

3. Results and Discussion

1.Socio-economic profile of respondents

The study revealed that, majority of the respondents were in the age range of 41to74 with a percentage of 62.5; Majority of the respondents *ie.*,93.33 per cent were male and only 6.67per cent of the respondents were female; 75 per cent of the respondents had medium size family (3to7); 98.33 per cent of the respondents had nuclear family type and only 1.7 per cent in joint type of family; 50.83 per cent of the respondents were living in semi-pucca house, followed by 43.33per cent living in kutcha house and 5.83per cent living in RCC house; 67 per cent of the respondents had farming as their primary occupation; 72.5per cent of the respondents had high farming experience (greater than 20 years); 30.83 per cent of the respondents were illiterate; 93.33 per cent of the respondents had medium land holding (1to5 acre); 70.83per cent of the respondents possessed TV; 33.33 per cent of the

Table 1: Distribution of respondents as per socio-economic status

Sl. No.	Particulars	Majority	%
1	Age	41-74 age	62.5
2	Sex	Male	93.33
3	Family size	Medium size (3-7 members)	75
4	Family type	Nuclear type	98.33
5	Housing type	Semi- Pucca house	50.83
6	Primary Occupation	Farming	67
7	Farming Experience	High Farming experience (>20 years)	75.25
8	Education	Illiterate	30.83
9	Total land holding under farming	Medium land holding (1-5 acre)	93.33
10	Material possession	Television	70.83
11	Total annual income	less than ₹30,000	33.33
12	Social participation		

respondents had income less than ₹30,000; 100 per cent of the respondents had medium social participation. This revealed that the respondents were active in social activities. Similar findings were found by Roy *et al.* (2013) in Almora district in Uttarakhand where majority of the respondents had medium social participation.

2. Description of ITK relating to field preparation

Paddy field: Slashing and burning was done on the seed beds of paddy as burning before sowing killed most of the soil borne pests. It also releases nutrients in the soil. Similar findings were reported by Tawnenga *et al.* (2008) and reported that "*Slash burning* depletes *soil* acidity, carbon and nitrogen but elevates phosphorus and cations thus maintains soil fertility". After burning, the field was ploughed and the clods were thoroughly broken and leveled before sowing the paddy seeds as this enabled uniform growth of the seedlings. Digging of the terraced fields was done during dry season (December-March) whereby they believed that by doing so, the soil borne pathogens were exposed to the sun and killed. Through solarization, intense summer sunlight can control pathogenic fungi and nematodes and kill weed seeds without using toxic chemicals (Gil, 2019). Soil borne fungi are responsible for diseases such as root rots, crown rots, fruit rots and wilts.

Jhum field: The understory vegetations were first cleared as they were closer to the ground followed by cutting down of the trees. The understory typically consists of trees stunted through lack of light, other small trees with low light requirements, saplings, shrubs, vines and undergrowth. This helped to clear off the field properly and helped in proper drying of the slashed vegetation or trees for easy burning. Also, bunds were made across the slope using stones or bamboos to prevent soil erosion.

3. ITK's used for determination of time of sowing

When the Cuckoo bird (*Hutu* in Angami dialect) calls, they believed it was time for sowing any kind of seed. When this bird calls, the rain season followed shortly after and seeds of any crop could be sown. This was the most common belief and practice known among the Angami tribe for determining the time of sowing, according to the elders. The call of this bird is heard by the end of March.

The time of transplanting paddy seedlings differed in the cold and warm areas as in cold areas it took more time to grow therefore transplanting was done earlier than warmer areas, hence, people depended on flowering trees for knowing the time (the present study area was at an altitude of 1444.2msl and temperature difference was between 4 to 28 degree celcius). The *Schimawallichii* tree (*Mechie* in Angami dialect) flowers two times in a year where the first flowering indicates the time for transplanting the paddy seedlings in cooler areas and for the warmer areas the indicator plant is the flowering of *Hedychiumspicatum* (*Nipe* in Angami dialect). Similar findings were also reported by Samati and Begum (2006) in their study among the *Pnar* tribe of Meghalaya. Another ITK for determining time of sowing was sowing seeds at full moon. They sowed the seeds at full moon since it resulted in less pest and disease infestation.

4. ITK's used for soil fertility management

Jhum fields:-The ashes left after burning of the *jhum* fields were mixed with the soil during sowing of crops. Ashes improved soil fertility and also reduced incidence of insect pests. Similar results were reported by Humtsoe (2011) in Wokha District.

While harvesting the crops from the fields, minimum vegetation was removed from the site so that crop residues could be used as mulching material or burned to release ash to the soil.

Weeds like Polygonum were uprooted collected and heaped or buried in the soil. Weeds when heaped or buried gets decomposed and turned into manure. Thus, it was found that nothing was wasted and all natural resources were utilized and applied appropriately and also leguminous crops were grown to make the soil fertile as these crops fixes nitrogen to the soil.

Fallow management was practiced by keeping the *jhum* field uncultivated for 2 to 3 years, similar findings were found by tripathi et al. which concluded that, due to the increasing population pressure, the intervening fallow period between two successive cropping in *jhum* fields has now been reduced to 2 years in most areas of north-eastern India leaving insufficient time for the shifting cultivation (locally called jhum) land to naturally recover, however, Shifting cultivation with at least 10 years of fallow period has been argued to be sustainable (Barik, 2007). This allowed the soil to regain fertility. During the fallow period the trunks of the trees which were chopped from time to time during cultivation were allowed to grow and also leguminous crops are grown.

While harvesting paddy only panicles were collected and straw was left behind which contributed to organic manure and humus for the next season again. In this manner no other extra manures were required.

5. ITK's used for plant protection

A very common practice of plant protection in the paddy fields of the Angami tribe was the practice of tying a piece of cloth and hanging to a long pole placed in the centre of the field. The movement of the object frightened the birds thus, prevented the crops from being attacked.

Making of fire in the field was also a common practice for protecting the crops from birds, most commonly identified birds were blue rock pigeon and house sparrow and rodents. This was usually done when the crops near the time for harvest.

To keep away the birds a bamboo piece split in the middle was left hanging in the field and when the wind blows the movement of the split bamboo produces sound which scared the birds away.

Traps made of bamboo were set in the field, catapults and stones were also used to kill birds and rodents that attack crops.

Similar findings of using piece of cloth, making fire in field, bamboo pieces split in middle and traps made of bamboo were similar with the findings of Humtsoe (2011) in Wokha District of Nagaland.

6. ITK's used for weed management

For the management of weeds, slashing and burning during dry season was a very common and effective method. When the weeds were slashed and burned not only the slashed weed plant were killed but also the seeds were burned too. Similar practice was also reported by CIMMYT (1981).

Uprooting the weeds by hoeing removed the roots as well and hand weeding was very common and an effective weed management practice.

Crops such as *Glycine max*, *Vigna umbellate,* and *Perilla frutescens* were sown in areas prone to weed infestation because such crops have vigorous vegetative growth and they suppressed the growth of weeds.

Weeding was usually done on sunny days where it was uprooted and exposed in sun to wilt and die quickly.

Another indigenous technical method of weed management identified was uprooting and burying the weeds in the soil or heaping the weeds in a place. In this way, the weeds would die and get decomposed and becomes a part of the soil.

7. ITK's used for post harvest management

Cleaning of thrashed paddy was done by using a winnowing basket (*'liherü'* in Angami dialect) to separate the chaffs from the grains. These chaffs were separated from the grains in the field itself and were left on the terrace plots as a manure for the soil.

The grains of paddy were dried on hot sunny days on bamboo mat on a flat ground surface to spread and get exposed to the sun evenly. Sun drying hardened the grain which enabled to remove the husk easily from the grain when it was milled. A bag of paddy grain could fill a bamboo mat and required two to three days for the grains to be sundried which is known by the crispiness on a bite of the dried paddy grain.

The grains of paddy were stored in locally made bamboo structure called *'tsiinuo'* in Angami dialect. The base of this was raised about one to two feet from the ground. In such structures the grains could be stored for many years without getting spoiled due to good aeration. Attack of rats was also less since the base was lifted above the ground level.

8. ITK's used for seed selection and preservation for next year

Seeds were selected from healthy plants on reaching maturity from the field per se. Big, healthy and attractive seeds were selected as these were usually the signs of a promising vigorous growth and were stored/preserved carefully, separately.

The seeds of crops such as cucumber, tomato, pumpkin, gourd, etc were smeared on a piece of cloth, sundried and stored since it was taken out from watery pulps. Also this way they had longer shelf life as they were spread evenly and dried.

The paddy seeds were separately collected carefully from the field during harvest. This was done to prevent mixture of unwanted varieties and select the varieties which will be sown in the next season.

Maize cobs, millets, spring onion, garlic, chilly, beans, peas, etc for seed purpose were tied and hung near the fireplace in the kitchen, or sundried to minimize damage from insect pests. The heat from the sun and smoke from the fire kept away the pests from attacking the seeds.

9. *ITK's used for soil and water management*

Terrace cultivation was one of the most noticeable feature of the Angami tribe. The fields are cut into beautiful terraces and slopes were leveled, bunds were made and divided into shorter ones. This decreased erosion, surface runoff and thus conserving nutrients *in-situ*, as well. This also helped in retaining or holding water in the paddy fields as the only source of irrigation was rainwater.

During cultivation season, rainwater was diverted from rivers and from small irrigation channels to the paddy fields for irrigation purpose.

Hollow pieces of bamboo are placed on the plots to transfer water to those terraces where it was difficult for the flow of water from the terraces directly and thus the paddy fields were irrigated uniformly.

4. Conclusion

Through this study it was concluded that, besides other Naga tribes, the Angami tribe possess a spectacular wealth of knowledge on Indigenous Technical Knowledge of *jhum* cultivation. This study identified and documented a total of eight (8) ITK's of *jhum* cultivation viz., Field preparation; Soil and Water management; Soil Fertility Management; Plant Protection; Weed Management; Post Harvest Management Practices; Seed Selection and Preservation and Time of Sowing. It was found that, ashes improved soil fertility and also reduced incidence of insect pests. The call of the Cuckoo bird (*Hutu* in Angami dialect) indicated the time for sowing any kind of seed. Weeds when heaped or buried gets decomposed and turned into manure, thus, weed manure and leguminous crops were used to maintain soil fertility. Sowing of seeds in full moon resulted in less pest and disease infestation. Birds and rodents were kept away by tying a piece of cloth on long bamboo pole in the middle of the field, making fire in field, bamboo pieces split in middle and traps made of bamboo. Crops such as *Glycine max*, *Vigna umbellate,* and *Perilla frutescens* were sown in weed prone areas. Seeds were selected from healthy plants on reaching maturity from the field. Terrace cultivation was one of the most noticeable feature of the Angami tribe which helped in retaining water in the paddy fields, as the only source of irrigation was rainwater.

5. References

Barik, S.K. (2007). Spatial and temporal variations in shifting cultivation in north-east India: Is sustainable land use possible with jhum around? In: Saxena et al. (Eds.) Shifting Agriculture in Asia: Implications for Environmental Conservation and Sustainable Livelihood. Bishen Singh Mahendra Pal Singh, Dehradun, pp. 53-64.

CIMMYT. (1981). Demonstration of an Interdisciplinary Approach to Planning Adaptive Agricultural Research Programmes in the Serenje District, Central Province, Zambia, 1978.

Dan, Gill. (2019). Put summer's intense heat to work: Kill weeds, fungus with sun, not chemicals. The Times-Picayune garden columnist.

https://www.nola.com/entertainment_life/home_garden/article_d1678f6a-62b0-525b-9eb9-3cb2c0490bc8.html assessed on 28-12-2022

Humtsoe, S. 2011. Traditional Farming and Indigenous Technical Farming of the Lotha - Nagas of Wokha District, Nagaland. Unpublished M.Sc. (Ag) Thesis, Nagaland University, SASRD, Nagaland.

Kithan N Longshibeni (2014). Indigenous system of Paddy cultivation in Terrace and Jhum fields among the Nagas of Nagaland. *International Journal of Scientific and Research Publications*; 4 (3). 1ISSN 2250-3153. www.ijsrp.org. Department of Anthropology, NEHU, Shillong.

Kuotsuo, Rukuosietuo., Chatterjee, Dibyendu., Deka Bidyut, C., Kumar, Rakesh., Ao Merasenla and Vikramjeet, Konsam (2014). Shifting Cultivation: An 'Organic Like' Farming In Nagaland. *Indian Journal of Hill Farming* 27(2):23-28.

Pandey , V., Mittal, R. and Sharma, P (2017). Documentation and application of indigenous technical knowledge (ITK) for sustainable agricultural development. *Asian Journal of Agricultural Extension, Economics and Sociology.*15(1).

Prakash N., Roy S. S., Ansari A. M., Sharma K. S., Sailo B. P. Punitha and Singh M. I. (2017). Jhum Improvement For Sustaining Farm Livelihood And Natural Resource Conservation In North Eastern Hill Region : Vistas And Frontiers. Edited Book, Director, ICAR Research Complex for NEH Region Umroi Road, Umiam, Meghalaya. R.B. Printing House, Nagamapal, Imphal, Manipur.

Rizwana, Lyaqet. (2011). Traditional knowledge used in paddy cultivation in Raipur district, Chhattisgarh, Indian Journal of Traditional Knowledge; 10(2):384-385.

Roy, M.L., Chandra, N., Kharbikar, H.L., Joshi, P. and Jethi, R. (2013). Socio-economic status of Hill Farmers: an Exploration from Almora District in Uttarakhand. *International Journal of Agriculture and Food Science Technology.*4(4):353-358.

Samati, H. and Begum, S.S. (2006). Plant indicators for agricultural seasons amongst Pnar tribe of Meghalaya. *Indian Journal of Traditional Knowledge.*5(1):57-59.

Tawnenga, Uma Shankar and R S Tripathi (1996). Evaluating Second Year Cropping on Jhum Fallows in Mizoram, North-Eastern India—Phytomass Dynamics Andprimary Productivity. *J. Biosci.* Vol. 21, Number 4, Pp. 563-575. © Printed In India

Tripathi, R.S. and Barik, S.K. (2003). Shifting cultivation in North-East India. In: Bhatt et al. (Eds.) Proceedings on Approaches for Increasing Agricultural Productivity in Hill and Mountain Ecosy stem. ICAR Research Complex for NEH Region, Umiam, Meghalaya, pp. 317-322.

Some references in Pictures

Terraced paddy fields

Making bunds in paddy fields

Cloth hung on bamboo pole to scare away birds

Standing paddy plants blown down by wind tied together (*Telhakhro*)


Mixed cropping


placed on the bunds of terrace plots


Hollow pieces of bamboo

Plate 1: Indigenous technical practices in paddy field


Maize cobs hung above fire


Chillies hung above fire in basket

Plate 2: Indigenous methods for preserving seeds


Mustard leaves dried in the sun after fermenting


Fruit flower of *Hibiscus sabdariffa* dried in the sun

Plate 3: Indigenous post harvest management practices