

Indigenous system of Paddy cultivation in Terrace and Jhum fields among the Nagas of Nagaland

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Abstract- Rice is the staple food and it occupies about 70 per cent of the total area under cultivation and constitutes about 75 per cent of the total food production in the state. For generations, Naga farmers practiced subsistence agriculture, under Jhum—a sophisticated form of slash and burn agriculture, clearing plots to plant rice intermixed with dozens of other crops. The Angami and Chakesang tribes of Nagaland have terrace cultivation of paddy wherever water is available for irrigation. Such indigenous knowledge system in the region had been developed through experience by tribal farmers using their ingenuity and skill and are believed to have sustainable agricultural base. Zabo system of rice cultivation is an excellent indigenous method of rain water harvesting used by the farmers in Phek district of Nagaland. The Jhumia of Kohima and Phek district of Nagaland plant alder trees in the jhum cycle area along with traditional agricultural crops such as rice. Since agriculture in Nagaland is dependent on the monsoon rain, cultivation is carried out only once a year. Researchers and planners should not ignore the actual knowledge these local people hold on efficient farming rather consider them for better implementation of any new farming practice/technique in the region. This paper is based on secondary sources such as books, Articles, Reports etc. The primary data which were qualitative in nature was obtained through interaction with few farmers or key informants in Kohima, Wokha and Phek districts of Nagaland.

Index Terms- Indigenous farming, Terrace cultivation, Jhum cultivation, Paddy, Soil degradation, Water harvesting, Conservation.

I. INTRODUCTION

The State of Nagaland lies between 25°60' and 27° 40' latitude north of the equator and between the longitudinal lines 93° 20' and 95° 15', having an area of 16,579 square km. The state comes under eastern Himalayan agro climatic zone. More than 90% terrain of the state is hilly. The state of Nagaland enjoys a salubrious climate. The torrential monsoon rains are an integral feature of the state's weather. The state records an average annual rainfall of 2000mm-2500mm. The climate of Nagaland is similar to those of other hilly states of the Northeast region. The major precipitation occurs between July- September but rainy season commences from May onwards. The mountain region is the source of several streams and rivulets.

Agriculture is the main stay of economy in Nagaland and rice is their stable food. The indigenous farming had been in practice by the Nagas since time immemorial. In this process they have developed skills and ideas on how best to grow their crops and

enhance its productivity. There also exists variation in the region in terms of soil and climatic conditions, geographical terrain, management practices etc which in a way is responsible for great diversity in rice cultivation among the people. Rice plays a significant role in the socio cultural life of the people in many parts of North east India. It occupies the primary position in a composite and varied mixture of crops. In Khezakenoma village in the Phek district of Nagaland, a particular slab of stone is believed to have had the power to multiply paddy spread over it for drying. The centrality of rice is also reflected in ceremonies of The Wanchos of Tirap district of Arunachal Pradesh. They believe that the rituals to protect paddy in the granary will also protect other grains. The people in the region also relate Rice to Goddesses. The Assamese Hindus believe that the goddess Lakhimi brought rice to earth. The Meities of Manipur have a rice goddess known as Phoinobi. The Adi seek the blessings of the goddess Mopin for a good harvest. According to the belief, Mopin gave the first ancestor of the Adi seeds for cultivation and method of sowing.

Terrace and Jhum cultivation of paddy are widely practiced by the tribal communities in the hill regions of Nagaland. Jhum cultivation is the traditional farming system in the Nagaland state. The Angami and Chakesang tribes of Nagaland have terrace cultivation of paddy wherever water is available for irrigation. Wet terrace rice cultivation is recent intervention in hilly terrain and now widely followed by Angami tribe in Kohima district, and Chakesang in Phek district. In the terrace field the outgrowth of weed along with paddy is a common phenomena and Polygonum is a vigorous weed on terraces. The productivity of rice under wet and wet terrace cultivation was found to be more as compared to rice under jhum cultivation. The lower productivity of paddy under jhum could be due to non adoption of improved agronomic practices as efficient rain water management, no intercultural operation as weeding, improper sowing, and no taking up sound plant protection measures.

There have also been reports of soil degradation caused due to excessive Jhumming and many People in the region have today started embracing terrace cultivation as an alternative due to its efficiency in terms of water management. Paddy cultivation in Nagaland can be further categorised into wet terrace paddy cultivation, wet paddy cultivation and Jhum paddy cultivation. Wet paddy cultivation are confined mostly in the valley areas and the Wet terrace as well as Jhum paddy cultivation are widely practiced in the hill areas of Nagaland. Thus this paper would look into the various practices developed and adopted in Paddy cultivation in the hill areas of Nagaland over the years based on their actual experience and knowledge system.

II. IMPORTANCE OF WATER IN INDIGENOUS FARMING

Agricultural cycle in India is dependent mostly on monsoon rain and water is considered significant in the plant life among indigenous farmers. Out of the Earth's available water resources 3% of this accounts to fresh water. Only 1 % of this is available for human activity, including agriculture. Nagaland is basically a land of agriculture and water is an essential product in for the growth and development of the crops. The amount of water necessary for crop production varies depending on soil conditions, crop variety and temperature etc. It has been reported that rice and maize are the major crops in Nagaland. Agriculture employs about nine-tenths of the population. Rice, corn (maize), small millets, pulses (legumes), oilseeds, fibres, sugarcane, potato, and tobacco are the principal crops. The crops that have a high yield in the state of Nagaland include rice, tobacco, oilseeds, pulses, fibres, potato and sugarcane. Apart from major crops the farmers of Nagaland also produce plantation crops like coffee, tea and cardamom. Potato and sugarcane are the two prime cash crops that generate revenue for the Nagaland economy. They also grow vegetables such as carrots, chillies, onion, melon, spinach leaf, cucumber, Brinjal, tomatoes and mustard.

In few places in Northeast India indigenous farming with efficient water management system have been identified and is in practice since centuries. The Apatanis have a multipurpose water management systems which integrates land, water and farming systems by protecting soil erosion, conserving water for irrigation, and paddy- cum fish culture. It has been experienced in Apatani inter- piedmont flat land of about 30 square km. The area is dominated by local tribe "Apatani" which developed this system to cultivate paddy and fish together (Singh, 1999). The tribal farmers in Muktapur, Jaintia hills district of Meghalaya have developed the indigenous technique of Bamboo drip irrigation. Betel vines planted with areca nut as the supporting tree are irrigated with this system, in which water trickles or drips drop by drop at the base of crop. In this system water from the natural streams located at higher elevation is conveyed with the use of bamboo channels, supported on ground surface by wooden or bamboo supports, to the site of plantation through gravity flow. Discharge of water upto 25 litres /min can be easily managed by manipulating the distribution systems. Water distribution is done with the use of bamboo channels, bamboo supports; water diversion pipes and strips. The whole system enables in distribution of 15 to 25 litres of water without any leakage at point. There may be several diversions at each stage depending on the availability of water resources and number of the plants to be irrigated. The system is laid out in such a way that ground clearance of channels reduces from few meters to 10 cm to 15 cm and this is done by reducing the height of channel supports (Borthakur, 1992).

Rainfall is one of the important climatic parameter influencing the cropping pattern, productivity, flooding and drought hazards, erosion and sedimentation. Irrigated system requires rainfall to replenish surface water or the aquifers. Irrigation is a vital means by which production can be sustained in various areas. The total area in the state under irrigation is 61,152.39 hectares. The farmers of Nagaland grow their crops on the basis of the rain conditions in the place. The agricultural planning in Nagaland is based on Rainfall distribution. A good

rainfall is also necessary for paddy cultivation. The cultivation of rice requires ploughing thoroughly and puddle with 3-5 cm of standing water in the field. The optimum depth of puddling is different for different types of soils. It is found to be around 10 cm in the clay and clay-loam types of soils. The purpose is to obtain a soft seedbed for the seedlings to establish themselves faster, to minimize the leaching losses of nutrients and thereby increase the availability of plant nutrients. However any additional irrigation is not necessary in regions with about 60 cm of well- distributed rainfall during the growing season. Most of the villages are scattered and perched on the hilltop and the cultivators traditionally cultivate the hill slopes either by making terraces or by Jhumming. Irrigation is provided only in terraced fields wherever the facilities exist to bring water from the sources by gravity system through M.I. Channels. Jhum paddy is dependent on natural rainwater and no effort has been made to store the rain water in the field.

III. PADDY CULTIVATION IN JHUM FIELDS

The major land use pattern is slash and burn cultivation locally known as Jhum. After two or three seasons, the farmers would leave the land for undergoing certain period of fallowing. That way the soil would be rested and its nutrients replenished. Shifting cultivation, is the chief means of livelihood of tribal people in the hilly areas of North eastern India. Winter cropping is practiced but their productivity in general is lower as compared to the summer cropping. The main reason behind this was that winter crops are followed just after the summer crops on the same plot of land without addition of any fertilizers or manures and also there is scarcity of water as the cultivation is dependent wholly on rainfall. The area is used for cropping usually for two years and left as fallow until the next Jhum cycle.

The increase in the population demand for food has led to increase in land use and resulting in decrease of fallow period. Jhum paddy comprises of about 56.50 % of area and 49.26 % of production of rice cultivation in the state. The practice of multiple cropping in Jhum fields is very much in vogue and is practiced by farmers of Wokha district in the state of Nagaland. About 20 to 40 crops are grown on the same plot of land as intercropping with paddy as the main crop. The farmers of Koio village under Chukitong block in Wokha district of Nagaland practice a suitable cultivation by growing a few cash crops on the same plot as an alternative to shifting cultivation. Here the farmers selected large cardamom as the main crop, and the boundary of the plantation is being done by planting Tung (Aleurite Montana). They grow oil seed crop on the boundary. The passion fruit is grown as the fencing crop around the main crop plantation area. Almost all the farmers have adopted this practice since the last 20 years as it increase income levels and to reduce the practice of shifting cultivation, which is affecting the soil fertility in Nagaland.

Inorder to restore the soil fertility, The farmers of Khonoma village of Kohima district grow Alder trees in great numbers along with rice and other agricultural crops. The idea behind this is that root nodules of Alder improve soil fertility by fixing atmospheric nitrogen. It also provides sheds to plantation crops like coffee at lower altitude and cardamom at higher altitude which further increases crop yield and reduces soil erosion. This

practice has been in use since about 100 years by the whole community. Normally, a Jhumia cultivates the field for 2 years within a 9 years span, but the alder-based system allows two harvests in every 4 to 5 years. In this cultivation system the Alder seedlings are planted on the sloppy land intended for cultivation and the alder grows fast till attain six to ten years old. At this stage initially the trees are pollarded, the leaves and twigs are burnt and ash is mixed with soil to prepare it for raising crops. Subsequently also pollarding is done once in every four to six years. Under this process coppice are cut except five to six on top of the main trunk and crop schedule is followed including fallow period of two to four years. The bigger branches stripped of leaves are used for fire wood, while the root of the tree develop nodules (colonies of Frankia) responsible for fertilizing the soil where as spreading nature of the roots helps in preventing soil erosion in slopes (Singh, 1992).

The other benefits could be found in the Alder foliage which is of low to moderate value and it is used as fodder for Mithun and other cattle. Soil erosion due to high rainfall and hilly topography is very high in most of the northeast state. There is a great need to check the rate of soil erosion. In this system the deep root system gives some stability in slopes that tend to slip and erode. Its seeds have been broadcast to stabilize landslides area effectively use to reforest abundant Jhum land areas because it grows as a pioneer in degraded habitats with low fertility soils. It is also planted to improve the stability of slopes liable to erosion and landslides and for mine reclamation (Rathore, Karunakaran & Prakash, 2010). 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. Alder based farming increases the yield of Jhum crops and it should be encouraged. This could be achieved through proper identification and validation in the areas it is practiced.

IV. TERRACE FORM OF PADDY CULTIVATION

A Terrace is a piece of sloped plane that has been cut into a series of successively receding flat surfaces or platforms, which resemble steps, for the purposes of more effective farming. This type of landscaping, therefore, is called terracing. Terraced fields both decrease [erosion](#) and [surface runoff](#), and may be used to support growing crops that require irrigation, such as [rice](#). Zabo is an indigenous farming system of Nagaland. This system has its origin in Kikuma village of Phek district of Nagaland, located at an altitude of 1,270 m above mean sea level. The area under this practice is 957.9 ha. The word "Zabo" means impounding of water. It has a combination of forest, agriculture and animal husbandry with well-founded soil and water conservation base. Water resource development, water management and protection of environment are inherent aspects of the system (Sharma *et al.*, 1994).

The irrigation water from the main water collection tank is passed through animal yard and it carries all dung and urine of the animals to the field below the slope. Beside this succulent branches and leaves of trees in the field for enhancing soil fertility. When it becomes difficult to get a suitable location for construction of water storage tanks, the runoff from the

catchment area is directly taken to the paddy fields for storage and irrigation later during the cropping period. Ngachan, Mohanty and Pattanayak (2012) on their work on 'Status paper on Rice in Northeast India described the various components of Zabo farming system as follows:

Forest land: The catchment area (about 1.5 ha or more) is kept under natural vegetation on upstream side of the pond to serve as water sources for the period during monsoon. Normally cutting or burning of trees does not disturb this area.

Water harvesting system: Adjacent to the catchment area, water harvesting ponds are dug out towards down stream with formation of earthen embankment. The size of the pond is usually kept as 24 x 10 x 2 m'. Silt retention tanks are constructed at several points before the run off water enters into the pond. The water harvesting system occupies about 0.2 ha area. Silt retention tanks are cleared annually as a part of maintenance of the water harvesting system.

Cattle shed: It is a common practice of every farm family to maintain an enclosure fenced with ordinary woods and branches of bamboo for open cattle yard, which is managed by a group of farmers by stocking cattle on rotation basis, preferably a little below the water harvesting pond. Buffaloes are the common animals available with the farmers, and 20-30 numbers are kept in one yard for 10-15 days. Washing of the cattle yard is done with run-off water, which goes afterwards to the rice fields for manuring. When there is an overflowing of water, it finds way through diversion passing through the cattle yard and washes down the manures to the field below. Split bamboo channels are used to carry such dung and urine from the cattle yard to the central point of the field from where it spreads in the entire field.

Agriculture land: Rice field are located in a lower elevation than the water-harvesting pond. The area of the rice fields varies between 0.2-0.5 ha. Use of green manure like *Albizia lebbek* and mekhonu tree leaves, application of cow dung and diversion of run off through open cattle yard are the usual methods of manuring rice crop. Chemical fertilizers are not at all used. Rice fields are thoroughly rammed at the time of puddling following different methods, viz., treading by human and cattle. Ramming by wooden sticks etc. to create a hard panso as to avoid percolation losses. Seepage losses through shoulder bunds are checked with the use of paddy husks on the upstream side. Zabo system of farming thus have conservation base to control soil erosion, proper management of soil fertility and available water and can be a potential substitute to shifting cultivation. However terrace farming also has its own limitation as most areas in the state are too hilly for bench terracing.

V. CONCLUSION

Indigenous farming systems though primitive and old still occupies a special place in the life of the Naga farmers. It has become a part of the custom and all their festivals and ceremonies revolve around it. The indigenous practices are soil and water conservation oriented as in the case of Alder based farming and Zabo system. But such systems are confined to certain areas and there is a need to expand it to other parts of Nagaland as well. Also such farming systems tend to depend largely on monsoon rain alone. Due to non-availability of well organized irrigation system, a vast area of land which if brought

under permanent irrigation, the food grain production in the state could be raised enormously. Technological advancements in many parts of the world have enabled people to indulge in double cropping and become self-sufficient, incorporation of such advanced technologies to manage water would help the Naga farmers carry out double or winter cropping. Though Nagaland is blessed with rich natural resources, faulty agricultural practices have resulted in serious environmental depletion. Therefore Much is to be learned from the local knowledge system of these people and their conservation strategies and further blend it with modern science.

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