

## **Impact of shifting cultivation on environment: an assessment on the behaviour of the farmers in Mokokchung Village**

**Maoginla T Longkumer<sup>1</sup>, Mudita Raj<sup>2</sup> and Vipin Solanki<sup>3</sup>**

<sup>1</sup>Student, M.Sc IInd year, Department of Geography, Lovely Professional University, India

<sup>2</sup>Assistant Professor, Department of Geography, Lovely Professional University, India

<sup>3</sup>Assistant Professor, Department of Geography, Lovely Professional University, India

**Abstract:** Shifting cultivation or slash & burn is a traditional agricultural activity practiced commonly in rural mountainous region. It is a system of rotating cultivation on a plot of land for 2-3 years and leaves it fallow for another 10-15 years. Since there have been many controversies about the impact of jhum cultivation the study was done to analyse the current situation of the practice of shifting cultivation as perceived by the local people of Mokokchung village. It was carried on with the method of primary analysis by preparing questionnaire, interviews with the local people and observations and secondary analysis of reviewing research paper, articles and governmental websites. The result shows that 68% of population practice shifting cultivation where out of it 69% of the locals depend on other activities other than agriculture but a high percent of people still practice it with the traditional method which is dangerous to the land and environment. It is suggested to the people that awareness on environmental impact of shifting cultivation is needed and they should engage on other sector and not dependent only on agriculture itself. Government policies should be adopted strictly to decrease the misuse of land caused by jhum.

**Keywords:** shifting cultivation, environmental impact, policies

### **Introduction**

Shifting cultivation refers to the 'slash and burn' agriculture and it is also commonly known as 'Jhumming' or 'Jhum cultivation'. This system is mostly practiced in the hilly regions consisting of cyclic nature. Shifting cultivation generally known as Jhumming is one of the most primordial system of farming which is thought to have originated in the Neolithic period. It is a system where a plot of hill slopes are cleared by cutting down and burning of forests and crops are then grown for 2-3 years in suitable seasons, after that the land is left fallow for another 5-6 years or more to regenerate soil fertility.

Apart from the term 'jhumming' it is also known by diverse names in different parts of the world. It is commonly termed as Milpa in Mexico and Central America, Roca in Brazil, Caingin in Philippines, Masole in the Congo and Central Africa, Ladcmg in Indonesia. It is practiced in the upland of Korea, China and Manchuria. It is also known as Kumari in Western Ghats, Bringa in Orissa, Watra in southeast Rajasthan.

Jhumming is a traditional farming system which is most widespread in the tropics. Jhum cultivation is a rotational farming system mostly prominent in the hilly regions. As late as 1950's Shifting burn method was a customary system of cultivating tropical upland and mountain soils, generally for yielding a minimum livelihood to the peasants. It forms the subsistence base for many communities practiced mainly by the rural population producing most of the food in the region.

Shifting cycle used to be 10-15 years that helps the land to rejuvenate naturally making it a sustainable land use practice in various socio-economic areas. But with the emergence of new generation and population explosion it is observed that the jhum cycle has gradually been decreased from 10-15 years to 2-3 years due to discarding and inhabiting of vacant land repeatedly causing soil erosion, deforestation and ecological inequality. Over the past years the productivity has declined even after using fertilizers leading to the equal values to the amount of yield and input where farmers face food shortages. However, apart from the negative impacts it is also important to study the productivity as most of the farmers in tropics having hilly terrain are still dependent on this type of cultivation.

## Statement of Problem

Shifting cultivation is an age-old practice which is carried out on hilly terrain and slopes. Often the practice has been criticized by environmentalists, foresters, and developmental practitioners and policy makers as being wasteful", and as a " Primitive, backward, destructive or mere precursor to more " modern, sustainable" and sedentary forms of agriculture (Thruppetal, 1997).

The village of Mokokchung is comparatively hilly in topography compared to mainland of India. With the increase of population in the course of time, various ill effects arise due to Jhum cultivation. As the population increases, the pressure on the land resource forces locals to reduce the time duration for jhumming. Limited fallow periods are no longer adequate to

regenerate the soil productivity and fertility. Therefore, there is decline in crop productivity, loss of biodiversity, habitat, Landslide, soil erosion; low nutrient and moisture in the top soil are some threats originating due to this method of cultivation. The Government Protected forest and also the village protected forest meant for conservation have been degraded a lot.

The World Wide Web is an online system where the documents or pages are interlinked with each other and that can be retrieved via internet. With the help of a web browser like Internet Explorer, Google Chrome, one can surf as many as web pages that may contain text, images, and videos. The user can navigate between them via hyperlinks. On March 12, 1989, Tim Berners Lee, a British computer scientist finalized a plan for what would ultimately become the World Wide Web (Choudhury, 2018). The proposal was meant for a more effective communication between the CERN employees but Lee finally realized that the concept has the potential to be implemented throughout the world (Khanzode and Sarode, 2016). Berners-Lee and Robert Cailliau decided to use hypertext in which the users can access information from web and can browse at their will. In this way, the first web service was finalized and tested to be named as Word Wide Web.

## **OBJECTIVES OF THE STUDY**

1. To study the existing scenario of shifting cultivation through the opinion of the local farmers in the study area.
2. To identify the negative and positive impacts of shifting cultivation on environment and livelihood of the people in that area.
3. To identify the strategy of government and non-governmental policies that has been implemented for the farmers.

### **Study Area**

Mokokchung village is located in Ongpangkong circle of Mokokchung district in Nagaland having a geo-coordinate of 26°19'35.18"N latitude and 94°31'54.43"E longitude. It has a population of 5,338 with 1,119 total numbers of household according to the population (Census 2011). The village is adjacent to Mokokchung town having an altitude of about 1350 metres

above sea level (The Morung Express, 2017). The study site comes under tropical climate and also receives enough rainfall annually that supports the prevalence of the shifting agriculture.



## Methodology

**Primary data collection:** Method for this research was done using primary data by making questionnaire and 175 household was covered in Mokokchung village. The sampling was randomly selected where 57% of respondents were male and 43% were female. Around 80% of the respondents were in the age from 40-70 years. Personal interview and group discussion were also held with the villagers who are involved in this activity. Field study and survey was also done along. This approach was used to analyze the behavior and instinct perceived by the people.

**Secondary data collection:** This includes reviewing of published and unpublished literature, reports from various newspapers, journals, books and articles. The data's were also taken from official government websites.

## RECENT TRENDS OF SHIFTING CULTIVATION

### Positive aspect of shifting cultivation

The existence of shifting cultivation in the tropic is a very diverse system of agriculture practiced in various slopes, topography, tools and implements, population density, ecological zones, cropping pattern, etc.,. It is a farming system based on labor intensive and low subsidy which provides sustainable food production and security to the farmers living in the mountainous area and in the most extensive hilly topography. There exists mixed cropping where the farmers can cultivate multiple crops for their sustenance almost 8-10 varieties of items in a specific jhumming land which is planted according to the best adaptation of the relief condition (Das S, 2014). This type of farming provides increase in output, produce less soil erosion, uses up the available water, light & nutrients. Shifting cultivation is most widely practiced in the hilly rural areas having less advancements and infrastructure so people practice it using traditional method of cultivation avoiding chemical fertilizers, pesticides and advanced tools, and so there is less damage of environment and also benefits the health. This practice was essentially started to be an ideal key to agriculture in the humid as long as the population concentration is not too high and the fallow period is long enough to regain its fertility. This system of agriculture is ecologically sound and meets a lot of human needs with immense effectiveness, mainly with regard to manual labor and other farming inputs.

### Negative aspect of shifting cultivation

In present years there are increasing indicators of the impact of Shifting Cultivation for depleting forest on the environment such as loss of biodiversity, change of climate, degradation of watershed, deforestation. The FAO, in 1957, declared shifting cultivation as the most severe land use crisis in the tropical world. Some studies claim that almost 30% of the world's vulnerable soils is exposed to shifting cultivation. It forms a significant part of about 850 million hectares of resulting forest management in humid tropical areas of Asia, Africa and America. It is a very diverse land use system. Because of the growing population pressure, uncultivated periods are significantly decreased and the method degrades resulting in soil erosion and decline of soil fertility and its productivity. In Amazon shifting cultivation account to have about one third of deforestation and at least half of its forest is responsible for cattle

ranching. At some stage of history, the shifting cultivation is however been practiced all over the forested part of the world.

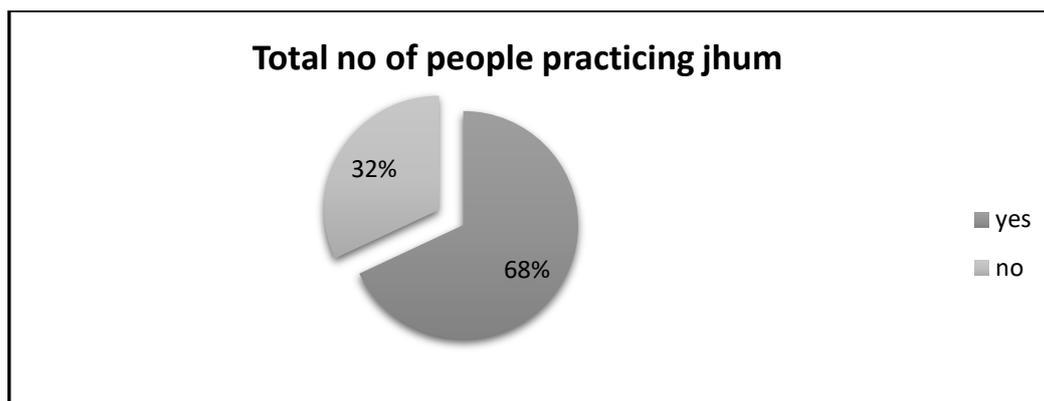
Forests are very important because they provide ample economic support and it is the most essential source of firewood and fuel. It also plays a vital role in preserving the biodiversity and providing ecological services like reducing soil erosion and improving water-flow. But due to the shifting agricultural practices it results in felling of vegetation, and burning speeds up the course of the impact of global warming as a direct effect. Continuous felling of trees for fuel and firewood together with forest burning has given rise to the problem of increase in temperature and shortage of water.

Most of the development agencies think shifting cultivation to be extremely wasteful and an irrational method of cultivation, which results in reckless reduction of forests and unfavorably affects the environment.

With the increase in population, more stress on land has increased with a shorter cycle of jhum. The profitable capacity of restoring soil fertility is no longer sufficient because of the short uncultivated periods therefore there is decline in crop productivity. The main reason following the persistence of this system of agriculture is in its compatibility with the physical settings.

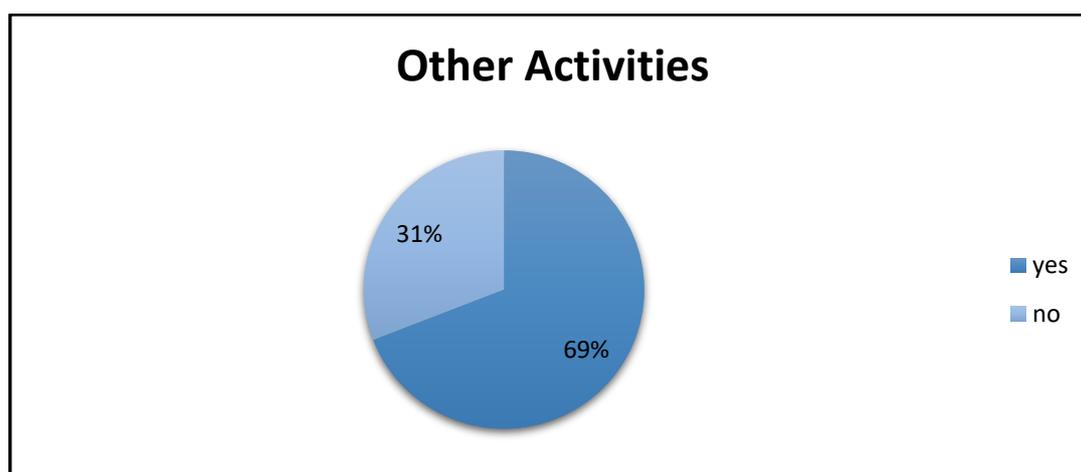
### **SHIFTING CULTIVATION, A BOON OR A BANE: FARMERS RESPONSE**

Mokokchung is a village located in Mokokchung District of Nagaland where the people of the rural communities are mostly dependent on environment for their livelihood. The area has a hilly terrain where shifting cultivation which is an age-old practice, is deeply embedded within the people. According to the data collected, 68% of the inhabitants in the village practice shifting cultivation (*figure 3.1*). The cutting of trees and burning are carried on during the winters in November till February and sowing begins from March to April according to the best favorable weather. They celebrate a festival on May first week every year called as Moatsu festival which is observed right after the sowing is done to express gratitude to the god for helping the crops to grow while, harvesting is done on August and September.



The land belongs mostly to the individual, clan or community and inherited land while there is no land owned by the government which is at a disadvantage side because the lands are more vulnerable as there is no implementation for the policies of sustainable land use or for protection.

Figure 3.2 shows that apart from agriculture 69% of families are engaged in other activities which are followed along for their livelihood while, 31% are still dependent on shifting cultivation. People are engaged in public and private sector and small scale business while most of them live depending on their manual labor, handicrafts, with shifting cultivation. It is a good sign that most people are engaging on other sector for livelihood instead on depending on agriculture itself which helps in the sustainable way of land use instead of putting pressure on it.



**RESPONSE OF THE LOCALS ABOUT SHIFTING CULTIVATION**

Q. What is the current time period of cycle of shifting cultivation?

**Table 3.1 Current cycle of shifting cultivation**

Current cycle of jhum according to the farmers	No of Response in per cent
2-4 years	51%
5-9 years	32%
10-15 years	17%

Source: Questionnaire

Table 3.1 shows the current cycle of jhum in the village has shortened where we see the time period is 2-4 years as responded by 51% of people, 5-9 years period by 32% respondents and 10-15 years by 17% respondents.

According to the farmers in the village the shifting cycle has drastically decreased in the past few years and as many as 56.6% of the farmers are of the opinion that it is related with the population pressure on the land since the inhabited land is being packed with roads and settlements with decreasing agricultural land which leads to the short fallow period and the land doesn't get enough time to regenerate its fertility. In support of the statement, Mokokchung district population data has been shown below:

**Table 3.2 Mokokchung district population data**

Description	2011	2001
Population Growth	60.94%	46.54%
Density/km <sup>2</sup>	121	75

The main crop grown in the area is rice and it can also be said as the most dominant food for the people. The vegetables they mostly grow is cucumber, maize, ginger and pulses. They find shifting cultivation to be very beneficial than other agricultural activities for their subsistence because it provides their basic needs where they do not need to modify the soil by using

artificial fertilizers or pesticides. They get enough annual rainfall where irrigation is not very necessary to grow their crops. Mixed crop farming is also implemented by the locals so that along with the main crop which they also get the benefits of growing other crops and plantations in the remaining fallow areas after sowing rice. Crops like tapioca, colocasia, ginger, pulses, seasonal vegetables and orange, pineapple, litchi are also planted for the few cultivated land.

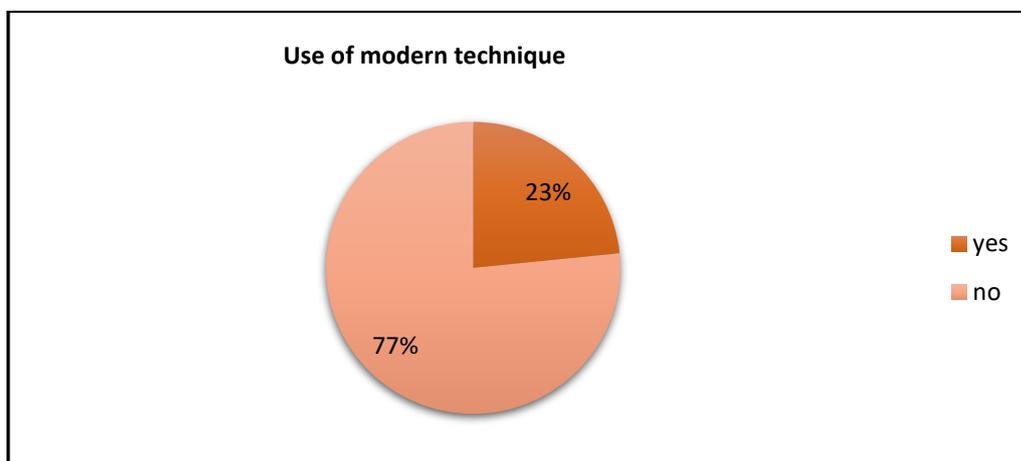


Fig 3.3 traditional cultivation with the use of modern technique.

The implementation of modern technique is less in the area. The people prefer to continue with the use of traditional method as seen in *figure 3.3*, which is cheaper and simple since they are more used to it, tools like dao, sickle, spade, hoe etc are used in different times of cultivation. The locals prefer to cultivate this cultivation because it is an ancient practice that has been done from their forefathers and it has been a tradition for them. They also do not have to wait for the land to gain its nutrients nor modify it with different techniques. According to the survey 58% of the respondents are of the opinion that it is related with the productivity of crops.

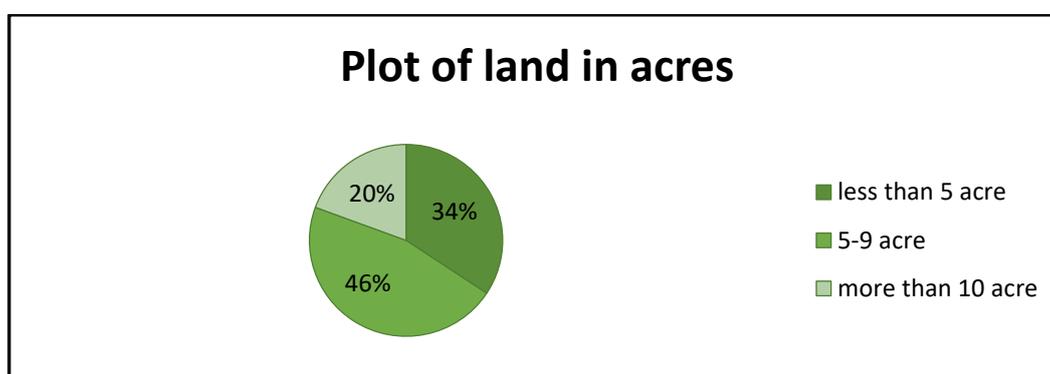
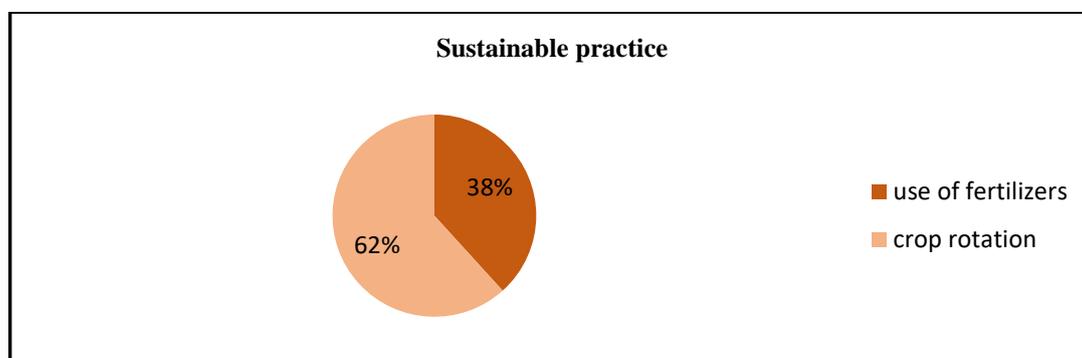


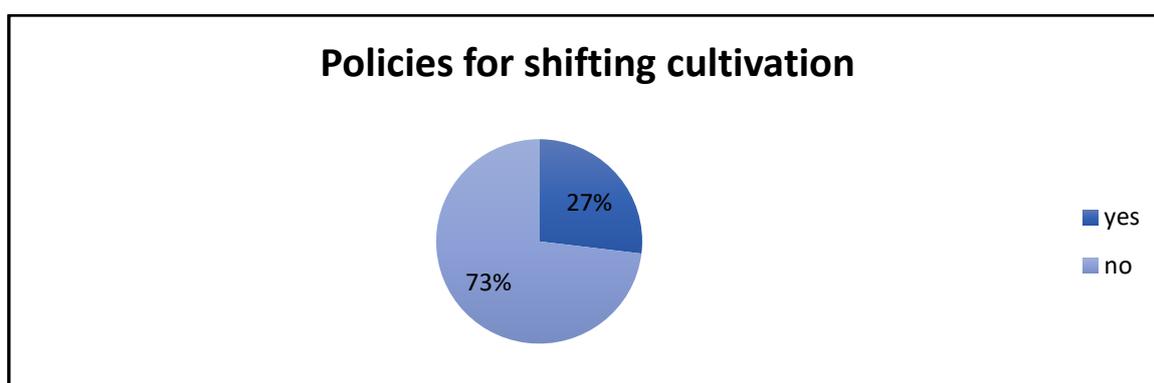
Fig 3.4 plot of individual land in acre

The plot of land in the area is mostly of individual property where every household have some plot of land with about 46% of respondents hold 5-9 acres of land, following by 34% having less than 5 acres of land and as less as 20% hold more than 10-acre plot of land. There is also some land that is used by common clan and sharing lands. *Figure 3.4.*



**Fig 3.5 response of how to sustainably practice shifting cultivation.**

The respondents were of the opinion that sustainable cultivation is important and it should be attained by taking measures. In *figure 3.5*, crop rotation is being preferred by 62% of the people for sustainable agriculture because various crops bring different nutrients and mineral to the soil for its fertility and productivity. While, 38% of people are of the opinion that using fertilizers is the best method to bring productivity in the land. According to the survey conducted most of the people were not aware of any governmental or NGO policy to support less practice of shifting cultivation. There are less or no governmental aids and subsidies for the farmers and 79.4% responded that they were not benefited by the government programs and aids in which they are aware of.



**Fig. 3.6 Policies of Government or NGO to control shifting cultivation.**

## **IMPACTING ENVIRONMENT- POSITIVELY OR NEGATIVELY**

According to the data collected it has been found that 71% of the responses agree to the environmental impact of shifting cultivation, the reason being negatively affected by deforestation, population pressure, demand on fire-wood etc. It has also been found out that the productivity of the crops has decreased due to the unsuitable soil of land, as there is decrease in the cycle of jhum that leads to the shorter time for soil to regenerate its soil fertility. The soil productivity effecting in crops yield when the jhum cycle period is shortened.

### **ILL IMPACTS OR REDUCED CYCLE OF SHIFTING CULTIVATION.**

#### **DEFORESTATION**

One of the main causes of today's problem is deforestation. Shifting cultivation has often been blamed for loss of forest cover and forest degradation because the land is being abandoned after few years of cultivation to regain its productivity naturally. But after 10-15 years the land is taken again to cultivate after cutting of trees and burning the land which seem to be a huge threat. There are many effects of jhumming with large scale deforestation which give rise to undesirable ecological imbalances. But there has been a debate for years among the scholars that jhum cultivation is only partially to blame for deforestation because it is not a permanent forest clearance, it causes less carbon as fallow period allow soil to regenerate its natural vegetation. As per the definition of deforestation by FAO, "the clearing of forest for Jhum is not deforestation but it is forest modification". Some argue that shifting cultivation is far from being a threat to forest in fact claims that it is vital for future preservation and maintenance of forest. However, we cannot foresee the fact that the clearance in the hill slopes leads to soil erosion and land slips at faster level.

#### **POPULATION PRESSURE**

With the track of time, different undesirable effect occurs due to shifting cultivation one of the main causes claimed to increase the short fallow cycle is also due to population increase. Short fallow is not adequate for land to restore their nutrients and soil productivity as a result there arises in low crop yield. The Mokokchung district overall has witnessed population growth due to immigrants and natural birth, leading the district to more demand of land for settlement and other resources which ultimately effects the surrounding natural vegetation of the village.

## **POLICY ANALYSIS**

Every year an extensive segment of forest area and agricultural land is being degraded and converted to wastelands due to shifting cultivation in the district and it is very important to provide laws and policies to the rural farmers at a wider level so they can be aware of the environmental degradation through this practice. The Indian government has implemented a policy of non-interference in the local self-government of the people of Nagaland at the village level to conserve their ethos, culture and governance structure marking the importance of jhum land management regulated by the village council.

Analysis of some Policy on National level of jhum cultivation-

- *National agro-forestry policy 2014*- this policy aims to promote plantation of trees for efficient nutrient cycle, to meet sustainable agriculture, incorporated with crop and livestock for more productivity, employment and livelihood of the people
- *North east forest policy 2002 (draft)* - the policy was recommended to increase focus on the people to wean away with the shifting cultivation.
- *National Forest Policy 1988 (NFP)* – the NFP policy gives importance to the environmental stability instead of exploiting economic gain from the forest resources, to conserve the heritage and preserving huge natural flora and fauna. It also states that shifting cultivation affects the environment and productivity of land and suggests rehabilitation by plantation and adopting alternative means to sustain the livelihood of the indigenous people.

### **Policy on State level of Jhum cultivation-**

*Nagaland State Action Plan for Climate Change*- the policy aims to promote agro forestry to intensify jhum in a limited area to provide enough productivity while conserving soil with sustainability.

*Nagaland Agricultural Produce Marketing (development and Regulation) Act, 2005*- An Agricultural Produce Market Committee (APMC) is established to regulate, develop and to protect the interest of farmers and to ensure malpractice in the marketing system of agricultural produce in the state. An organic agricultural produce in the market would be made to put an aid in the jhum cultivation.

## CONCLUSION

Shifting cultivation is an age-old traditional agriculture which is practice in most part of the rural area and the people are sustained by it. Through the study that has been conducted, it can be said that the shifting cultivation is being perceived as a medium by the people in the village without any differences in status of the family. People are somehow aware that this practice is impacting negatively on environment like loss of biodiversity, soil erosion, and change in productivity by short fallow cycle etc. but it is not so easy for them to do away or stop with this cultivation since it has been a cultural tradition for them and they are depended on it. The best way they can do is to use the land sustainably by using advance techniques to accumulate soil productivity and lengthen the period of jhum cycle. However, it has been found that there is a negative effect of shifting cultivation on environment which makes the soil unsustainable due to the short fallow period. Population growth and development in the surrounding area like towns lead to degradation and reduction of cultivated land and due to migration, a plot of land is being left fallow which makes the land unsuitable to cultivate.

It can be suggested that the locals in order to do a sustainable agriculture: -

- They should keep the jhum cycle period long enough for soil to regenerate its nutrients.
- Proper education and trainings should be given to the current farmers and the young generation engaged in agricultural activities.
- People should opt for other activities other than shifting cultivation like animal husbandry, horticulture, tree plantation, etc.
- Enterprises, policies, and laws should be provided for better socio-economic condition and also to improve environmental impacts.

This will help maintain the land use in more proper way without degrading it.

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