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JHUMING AND BIO-DIVERSITY OF NORTHEAST INDIA: A CASE STUDY

Md. Baharuddin Shah

Assistant Professor, Department of Geography, G. P. Women's College, Imphal – 795001

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Abstract

In Northeast India, jhuming *is a widely practised food production system. It has been criticized on ecological and socio-economic grounds. Large-scale burning of forest, destruction of natural habitats and the consequent reduction of species of fauna and flora are some of the conspicuous results of* jhuming*. It is often said to be damaging the environment. At least 6.2 lakh families are engaged in* jhuming *covering 1.73 million hectares of the hilly region of Northeast India. This system is a big threat to the bio-diversity of the region. Keeping these aspects in mind Ukhrul district of Manipur was selected as the study area for in-depth study. This paper seeks to highlight few objectives such as assessing the state of forest cover and the loss of flora and fauna in Ukhrul district in an integrated manner, identify the areas under forest through Remote Sensing and GIS. The paper also highlighted the issues of environmental degradation associated with* jhum *particularly in the short* jhum *cycle. This paper concludes with the identification of changes in the state of the forest and its area primarily due to* jhum *through Remote Sensing and GIS and thus, in the process, suggested ways to minimize the pressure on the very forest ecosystem.*

Keywords: *Forest cover, loss of flora and fauna, environmental degradation, jhum and ecosystem.*

INTRODUCTION

Forest loss, land degradation, loss of flora and fauna are visible in almost all the upland areas in North East India. The thick green cover of this area – said to be the water towers is disappearing at a faster rate than ever before, a phenomenon that has stirred global concerns and activism. The connection between loss of forest and stress on biodiversity and other natural resources such as land, air and water has been well established. Mainstream thinking is that the existing hill farming system called *jhuming*, practised by various hill tribes in the region are primarily responsible for the loss of forest cover. According to the MoEF (Ministry of Environment and Forest, 2001) Report, at least 6.2 lakh families are engaged in *jhuming* covering 1.73 million hectares of the hilly region of Northeast India.

Correspondence
Md. Baharuddin Shah *Assistant Professor, Department of Geography, G. P. Women's College, Imphal – 795001*

Slash-and-burn agriculture also referred to as shifting cultivation or bush fallow agriculture or *jhuming* is often said to be damaging the environment (Conklin, 1961; Cramb, 1989; Tobing, 1991) and is the primary cause of tropical deforestation (World Resource Institute, 1990; World Resource Institute and International Food Policy Research Institute, 2000; Indian Institute of Remote Sensing, 2002). It is characterized by rotation of fields rather than by crops, by a short period of cropping (1-3 years) alternating with long fallow periods (up to 20 or more years but often as short as 6-8 years) and clearing by means of slash and burn (Feizer,1958). In addition shifting cultivation is associated with poor crop yields and rapid soil degradation (El Moursi, 1984; Christanty, 1986).

Jhuming has a disastrous impact on the ecosystem of the area. The burning of dried wood results in the loss of precious biomass and the release of many harmful gases. The cutting down

of lush green forests results in loss of forest cover which leads to land degradation and an increase in the sediment load of rivers which is responsible for the siltation of reservoirs. Leaching, erosion and loss of fertility of soil take place rapidly. The Land-water system which is the basic life-supporting factor and a prime mover of socio-economic development has already fallen into the clutches of the law of diminishing returns with reduction of productivity vis-à-vis inputs and gross physical degradation of the system.

In Northeast India, *jhuming* is a widely practised food production system. It has been criticized on ecological and socio-economic grounds. Large-scale burning of forests, destruction of natural habitats and the consequent reduction of species of fauna and flora are some of the conspicuous results of *jhuming*. It has direct and indirect impacts on the ecosystem. It has become a system that is economically unviable and ecologically unsustainable. It is a system that leads to eco-degradation. It is a big threat to the bio-diversity of the region.

DATA BASE AND METHODOLOGY

In this paper, an attempt has been made to study the loss of forest cover and land degradation due to *jhum*. It also seeks to highlight few objectives such as assessing the current state of land use in an integrated manner. The paper highlighted the issues of *jhum* associated with environmental degradation, particularly in the short *jhum* cycle. Manipur has been selected as the study area because this state has suffered the maximum loss of forest cover due to *jhum* in the north eastern region. Five villages of the Ukhrul district of Manipur were selected for in-depth investigation of the problem. Data were collected mainly from primary sources through field surveys, the survey of the selected villages and survey of selected households. The survey was conducted based on questionnaire interviews. Fieldwork was done during the year 2011. For getting accurate information, the sampled villages and households were visited frequently.

The following methods have been used in this study:

1. Data for assessing the loss of forest covers, loss of soil fertility and soil erosion were drawn from a comprehensive survey of the selected villages, each lying in different tribal blocks and inhabited by different tribes. Out of the total 198 villages (as per the 2001 census), only 51 households were sampled from 5 sampled villages because of inaccessibility, bad or no roads, lack of transport, difficult terrain, tribal population and insurgency. Mostly the survey was conducted by foot.
2. In the 5 sampled villages more or less 10 per cent *jhumia* households were sampled and information regarding the number of households practising *jhum*, the area under *jhum*, loss of forest cover and loss of soil fertility etc. were collected.
3. A questionnaire was developed with the help of questionnaires used in similar studies (e.g. Christanty, 1986; Cramb, 1989; El Moursi, 1984; Tobing, 1991; Singh, 1978; Singh and Singh 1978; Shah, 2004). The questionnaire was designed precisely and vividly so that the respondents could answer without suspicion and hesitation.
4. For assessing the loss of soil fertility, soil samples were collected from the *jhum* fields in 5 the sampled villages before and after burning and tested at the Soil Testing Laboratory of Indian Council of Agricultural Research, Imphal to assess the pH value, organic carbon, phosphorus and potash. Methods of collecting soils comprised observing the colour, texture and nature of soil with naked eyes in a particular field by dividing it into four roughly equal parts. If the general nature of soil were the same in all the four parts of the field, then a little amount of soils were collected from four divided places and also from the centre by digging the earth up to a depth of 15-20 cms. in V-shape. All the soils were mixed and put to test. The same process was repeated once before and after the burning operation.

STUDY AREA

Five villages lying in the different tribal development blocks of Ukhrul district, Manipur were selected for in-depth study.

An attempt has been made to assess the cutting down of forest for *jhum* in the sampled villages of Lungphu, Khoripok, Nungbi Khunou, Mongkot Chepu and Ningchou of Ukhrul District, each lying in different T. D. Block. While selecting these 5 villages, it was kept in mind that those villages were a good representation of *jhumias* belonging to different cast groups. From the village Lungphu situated in Phungyar-Phaisat T. D. Block, 7 *jhumia* households were sampled. Likewise, 7 *jhumia* households from the village Khoripok situated in Kasom-Khullen T. D. Block, 20 households from the village Nungbi Khunou situated in Chingai T. D. Block, 11 *jhumia* households from the Mongkot Chepu village situated in Ukhrul T. D. Block and only 6 *jhumia* households from the village Ningchou situated in Kamjong Chassad T. D. Block were sampled. Thus, from the whole Ukhrul district which had 198 villages (as per the 2001 census), 51 households were sampled from 5 villages inhabited by different tribal groups (Figure 1).

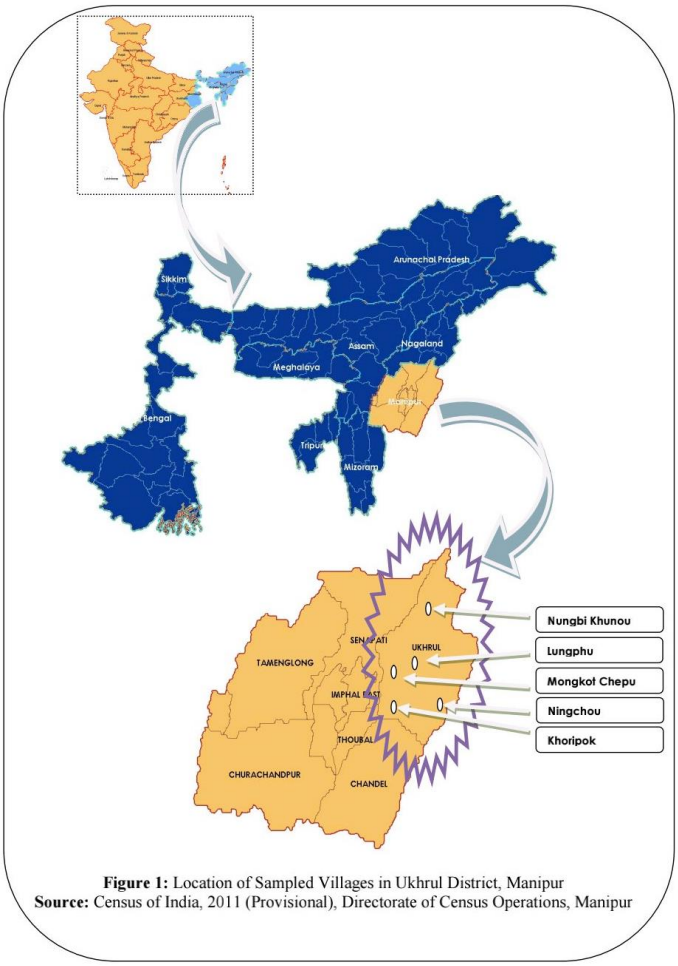

Figure 1: Location of Sampled Villages in Ukhrul District, Manipur
Source: Census of India, 2011 (Provisional), Directorate of Census Operations, Manipur

DISCUSSION

Loss of Forest cover

There was indiscriminate cutting and destruction of a large number of forest trees and vegetation in the process of *jhum* in the Ukhrul district. Though the exact information on this aspect is lacking in this region, yet people are aware of the degradation of the forest. An attempt has been made to assess by field survey the cutting down of forest for the purpose of *jhum* in the sampled villages of Lungphu, Khoripok, Nungbi Khunou, Mongkot Chepu and Ningchou.

In the 7 sampled households of Lungphu village, a total of 14.86 acres of forest have been degraded in practising *jhum*. On average, one household has degraded 2.12 acres of forest. If we calculate it for the whole village where 67

households were practising *jhum*, then it works out to be 142.04 acres. Thus, about 142 acres of forest has been degraded in the Lungphu village for *jhum* purpose (Table 1).

In Khoripok village which is lying in Kasom-Khullen T. D. Block of Ukhrul district, there were 46 households. Of these, only 40 households were practising *jhum*. More than 10 per cent stratified random sampling of the households practising *jhum* was conducted to assess the loss of forest. Thus, 7 households that were practising *jhum,* were sampled for in-depth study. In the 7 sampled households, a total of about 10.81 acres of forest have been cut for *jhum* practice. So, on average, one household has cut down 1.54 acres of forest. If calculation is done for the whole village where 40 households were practising *jhum*, then it works out to be 61.60 acres. Thus, about 62 acres of forest has been degraded in the Khoripok village for *jhum* purposes (Table 1).

Nungbi Khunou village which is located in Chingai T. D. Block had 186 households, of which only 176 households were practising *jhum* with or without terraced cultivation. Thus, 20 households that are practising *jhum* were sampled for an in-depth study. In the 20 sampled households, about 16.30 acres of forest have been degraded for *jhum*. So, one household has cut about 0.82 acres of forest for *jhum* purposes. In the whole village where 176 households were practising *jhum*, a total area of about 144.32 acres of forest has been cut down (Table 1).

Mongkot Chepu village lies in Ukhrul T. D. Block. It is a Kuki inhabited village where the whole land belongs to the village headman who has the exclusive right to allow a piece of land to the individual family for *jhum* for three consecutive years. Field survey reveals that though there were 104 households in the village, only 95 households were practising *jhum* with or without terraced cultivation and the remaining were practising only terraced cultivation. In the 11 sampled households, about 11.02 acres of forest have been cut down for *jhum*. So, on average, one household has degraded 1.00 acres of forest. If it is calculated for the whole village where 95 households were practising *jhum*, then it works out to be 95 acres. Thus, in Mongkot Chepu village, a total of about 95 acres of forest has been degraded for *jhum* purposes (Table 1).

Ningchou village is located in Kamjong-Chassad T. D. Block of Ukhrul district. Only 6 *jhum* practising households were sampled. In this village, a total area of about 9.58 acres of forest has been degraded in the current year for *jhum* purposes (Table 1).

In the five sampled villages of the Ukhrul district, 428 households were practising *jhum* and the *jhumias* have cut down about 526.44 acres of forest for *jhum*. Hence, the average area of forest lost in these five villages is 105.29 acres. If we calculate the total area of forest lost in Ukhrul district where 198 villages were practising *jhum*, then it works out to be about 20,847 acres or 8,440 hectares of forest were being cut down per year for the purpose of *jhum* (Table 1).

Table 1: Total Area of Forest Loss for practicing *Jhum* in the Sampled Villages of Ukhrul District

Sl. No.	Village	Total No. of household	Total No. of household practicing *Jhum*	No. of Sampled households	Forest Lost (in acres) in sampled households	Average Area of forest lost per household for *jhum* (in acres)	Total area of forest lost for *jhum* in the village (in acres)
1	Lungphu	73	67	7	14.86	2.12	142.04
2	Khoripok	46	40	7	10.81	1.54	61.60
3	Nungbi Khunou	186	176	20	16.3	0.82	144.32
4	Mongkot Chepu	104	95	11	11.02	1.00	95.00
5	Ningchou	35	30	6	9.58	1.60	48.00
Total	**5 Villages**	**464**	**428**	**51**	**62.57**	**1.23**	**526.44**

Source: Based on Field Survey (2011)

This assessment of forest loss in the Ukhrul district is more or less accurate if we compare it with the figures given by Manipur Remote Sensing Application Centre, Imphal based on

satellite imagery (TM/IRS, LISS II of 1986-87 and 1993-94 on 1:50,000 scale). In 1986-87, an area of 14,231 hectares was under current *jhum* while in 1993-94, the area under current *jhum* decreased to only 8,460 hectares. The figure of the 2011 assessment based on the field survey was 8,440 hectares under current *jhum*. It shows a slight decrease in area under current *jhum* from the previous years.

Land Degradation

On the deforested hill slopes, soil erosion goes on and this is another integral process with *jhum*. Absence of soil conservation measures augmented with high rainfall results in increased runoff, erosion of topsoil, a decline of soil fertility and low crop yields.

(a) Soil Erosion

The whole of the Ukhrul district is mountainous with steep slopes and wet weather conditions. Results of slope analysis showed that 81.58 per cent of the area falls in the very steep slope category. In such areas, the intensity of soil erosion is very high.

Field surveys revealed that the process of soil erosion begins when farmers enter the plots (hill slope under forest) either for the selection of a site or for cutting the forest vegetation. Their movement on slopes causes loose soil to disintegrate, forest litter and earthworm casting to slide down the hill. *Jungle*-cutting, burning, clearing and dibbling of seeds account for a considerable amount of loose soil material, ashes, earthworm casting and detached soil clods/stones to roll down the foothills. Through this process, 3.7 tonnes of soil materials per hectare was reported to slide down the foothills (Singh, 1978).

With the onset of the monsoon, soil erosion by water begins. Soil erosion from hill slopes (60-70%) under the first year, second year, abandoned *jhum* (first year fallow) and bamboo forest was estimated to be 146.6, 170.2, 30.2 and 8.2 tonnes per hectare per year respectively (Singh and Singh, 1978). These observations clearly indicate that the second year of *jhum* cultivation is more hazardous than the first year. However, a wide range of variations in soil erosion due to slope, crop canopy and agricultural operations had been recorded. Runoff and loss of organic carbon increased with an increase in slope up to 21 per cent, but it decreased linearly with further increase in slope. Soil losses, however, increased with an increase in slope up to 60 per cent but it decreased with a further increase in slope.

It is obviously true that high rainfall and steep hill topography is always associated with the problem of severe soil erosion, particularly when the land-use system has biotic interference. The loss of soil through erosion is widely known in the sampled villages where the survey was conducted. But the amount of soil lost in a particular year is not known due to the non-availability of measuring facilities. Decreasing the production of crops from the first year to succeeding years shows the deterioration of the quality of soil through erosion. Moreover, the high production rate of crops like paddy in one year cropping *jhum* fields mainly in *Tangkhul Naga* inhabited villages and low rate of production of paddy in 3 years continuous cropping fields in *Kuki* inhabited villages shows maximum loss of soil in the fields where intensive cropping is done.

(b) Loss of soil fertility

The practice of *jhum* affects the soil. Burning causes changes in the soil properties. Burning chemically alters a portion of the plant nutrient supply from an organic form to a mineral form in ash, which is often readily soluble (Debyle and Packer, 1974). When water runs over or passes through this ash, the soluble components are flushed out and lost from the site in the run-off.

An attempt has been made to assess the soil fertility in the sampled villages, Lungphu, Khoripok, Nungbi Khunou, Mongkot Chepu and Ningchou. Soil samples were collected (before and after burning) from each of the villages and were tested at the Soil Testing Laboratory of the Indian Council of Agricultural Research, Imphal, to assess the fertility status and changes in soil properties due to burning.

Table 2: Changes in Soil Properties before and after burning in the sampled villages of Ukhrul District (2011)

Name of the Sampled Villages	Soil Properties	Before Burning	After Burning	Changes
Lungphu	pH	4.20	4.60	+ 0.40
	Organic Carbon (%)	1.30	1.00	- 0.30
	Phosphorus P_2O_5 (Kg./Ha.)	4.20	4.25	+ 0.05
	Potassium K_2O (Kg./Ha.)	250	550	+ 300
Khoripok	pH	4.00	4.40	+ 0.40
	Organic Carbon (%)	1.15	1.00	- 0.15
	Phosphorus P_2O_5 (Kg./Ha.)	3.30	3.32	+ 0.02
	Potassium K_2O (Kg./Ha.)	270	600	+ 330
Nungbi Khunou	pH	4.10	4.40	+ 0.30
	Organic Carbon (%)	1.00	0.90	- 0.10
	Phosphorus P_2O_5 (Kg./Ha.)	3.70	3.71	+ 0.01
	Potassium K_2O (Kg./Ha.)	285	570	+ 285
Mongkot Chepu	pH	4.50	4.80	+ 0.30
	Organic Carbon (%)	0.94	0.85	- 0.09
	Phosphorus P_2O_5 (Kg./Ha.)	4.00	4.01	+ 0.01
	Potassium K_2O (Kg./Ha.)	300	600	+ 300
Ningchou	pH	5.00	5.50	+ 0.50
	Organic Carbon (%)	0.95	0.82	- 0.13
	Phosphorus P_2O_5 (Kg./Ha.)	4.96	4.97	+ 0.01
	Potassium K_2O (Kg./Ha.)	300	650	+ 350

Source: Based on Field Survey (2011)

More or less the same results were observed in all the soil samples which were tested from different *jhum* sites. It was observed that the pH value of soil has increased slightly in all the sampled soils after burning. The pH value ranged between 4.00 to 5.00 before burning and 4.40 to 5.50 after burning. The percentage of organic carbon in the soils decreased after burning. Organic carbon ranged between 0.94 to 1.30 before burning and 0.82 to 1.00 after burning. The amount of Potassium (K_2O) kg. per hectare increased substantially after burning. Potassium ranged between 250-300 before burning and 550 to 650 after burning. While the amount of phosphorus in kg. per hectare is more or less the same before and after burning. Phosphorus ranged between 3.30 to 4.96 before burning and 3.32 to 4.97 after burning. The results show that the soils are weak acidic in nature. It is also known that if the pH value of soil is higher, the percentage of organic carbon is lower. An increase in pH is related to an increase in the content of available potash. Generally, these hill soils are rich in potash while inadequate in phosphorus content (Table 2).

Loss of Flora

The flora of an area depended on the total environmental conditions of that area. It is common knowledge that disturbance of any one factor has its influence on the other like effect on vegetation as well as on flora. The vegetation of a region is the overall composition of dominant species and an account of the general physiognomy of the plant growth; the flora is an enumeration of all plants occurring in an area, usually without a commentary on the dominance of individual species. Shifting cultivation influences both vegetation and flora.

All the stages of *jhuming* (like the selection of the spot for cutting trees and shrubs, the process of cutting trees and shrubs in the spot, burning of plant material, cultivation on this spot for varying number of years depending on the fertility of the soil and finally abandoning the spot for a fresh spot) have a direct or indirect influence on the evolution of flora of the region. The soil of an area sustains plant growth and hence, changes in the soil, in turn, affect the flora. *Jhuming* affects the soil mainly due to (a) the removal of the tree canopy, there is no obstruction to mechanical

force, rain and the falling water dislocates soil, (b) rainfall causes an increase in leaching and acidity of soil and (c) increases acidity, renders soil unsuitable for plant growth and makes it further unsuitable and vulnerable to washing away. The humus which would have been created by the falling leaves and other vegetable material is not available anymore, further adding to the acidity of the soils. Such disturbances affect the micro-flora and micro-fauna of the soil which in turn affects the flora.

Table 3: Types of trees under attack in Ukhrul district (2011)

Name of the trees available	Main trees under attack
Alder (Alder Nepalensis), Prunush, Cirosirde, Symingtonia, Acacia auriculifornis, Parkia Javanica, Paraserrianthes falcolaria, Miachelia Oblanga, Omilina Arborea, Pinus Kerya, Robinia psedudoacacia etc	*Phoebe hainesiana, Alder, Pinus Kerya, Parkia Javanica and orchids of enumerable hues and kinds, epiphetic ferns and various species of plants and shrubs.*

Source: 1. http://ukhrul.nic.in
2. Based on Field Survey (2011)

Some observations regarding the changes in the flora of the *jhum* land in the study area were made. The area is gifted with rich flora and there are hundreds of varieties of trees, flowering plants, orchids of enumerable hues and kinds, epiphytic ferns, varied species of plants and shrubs. Some of the known species of plants and trees are *Alder, Prunush, Cirosirde, Symingtonia, Acacia auriculifornis, Parkia Javanica, Paraserrianthes falcolaria, Miachelia Oblanga, Omilina Arborea, Pinus Kerya, Robinia psedudoacacia etc.*(Table 3).

The following changes in the flora of the study area attributable primarily to *jhuming* have been reported:

- In some spots certain trees and shrubs are scarce and may become further rear or even eliminated from the flora of the region e.g., Phoebe hainesiana, Alder, Pinus Kerya and Parkia Javanica etc. are becoming scarce in most of the area of Ukhrul district where *jhuming* is practised.
- In the process of cutting trees and burning the site, many parasites and epiphytes get depleted or eliminated from the flora of the region e.g., unique species of orchids, epiphytic ferns and variant species of shrubs were collected from Ukhrul district but in subsequent visits, it could not be located from the same area, as the area had been under *jhuming*.
- After the tree cover is removed, components of the ground find the habitat no more suitable for their survival or reproduction but perished.

During the cropping periods several plant species, mostly weeds occur in the fields. The common ones are Spergula arvensis, Gnaphalium luteo-album, Galinsoga parviflora, Cardamine hirsuta, Polygonum runcinatum, Rumex nepalensis, Chenopodium album, Oxalis cornculata, Plartago major, Fridax procumbens, phorbia hirta, E. thymifolia, E. prosrtrta, Spermacoce hispida and some annual grasses. After the land is abandoned the species that gradually establish are mainly Eupatorium adenospermum, Gynura angulosa, Ageratum conyzoides, Lantana Camara, Solanun nigrum and S. Xanthocarpum.

The flora of this area is one of the richest in India. But at present except for some grooves, the vegetation is disturbed in most of the areas where *jhum* is practised. It is a common sight to observe treeless grass-covered hills in the study area.

Loss of Fauna

Wildlife in the natural situation constitutes the most important component of the ecosystem which participate effectively in the energy flow and biogeochemical cycling. Animal-plant and animal-animal can only participate in this unique process when their habitat and niche are preserved. *Jhuming* has led to habitat destruction and thus has threatened the very fabric of the survival of the wildlife. It destroys habitat continuity, micro-habitats etc. The lost habitat is not possible to reclaim even after many years of abandoning the site.

The problems which crop up for the wildlife due to *jhuming* can be divided into two categories direct and indirect. The direct problems which are associated with *jhuming* in relation to wildlife may be,

- Loss of habitat continuity which affects the wild animals mainly, elephants, tigers, leopards and other smaller mammals.
- Loss of top canopy occurs due to *jhuming* and this affects the behaviour of the langurs and gibbons. It also reduces the territorial area of species. Food exploration areas are reduced.
- In an exposed land due to *jhuming* the predator has more chance of being exposed against the prey. The result is a loss of energy.
- The tigers and leopards capture prey from a hideout with distinct posture which is likely to be affected by *jhuming*.
- The small mammals like porcubines, manis, hedger hog etc. are affected because *jhuming* exposes them to unknown situations.
- The *jhum* site cannot be reclaimed and restored in relation to wildlife when the *jhum*ias stop *jhuming* at that particular site. Restoration requires many more years. New forest areas with natural habitats are being destroyed. Thus, accumulating the harmful effects of *jhum* destroy wild animals.
- *Jhum*, a hundred years ago and a *jhum* at present, so far the total effect on wildlife is concerned, is multiplied many times because it is now associated with similar irreversible destructive patterns.

Indirectly *jhum* affects much more seriously than the direct methods.

- *Jhuming* upsets the ecological balance which brings imbalance in the hydrological cycle. It further disturbs the habitat. This ultimately affects the survival of the wildlife.
- Soil erosion reduces the soil fertility which further reduces the total energy production of the forest resulting in the shrinkage and loss of wild animals.
- Silting of the river causes floods and this leads to loss of wildlife in the plain areas.

The age-old practice of *jhuming* at present has become very harmful due to shorter *jhum* cycles, shrinkages of forest area etc. This has resulted in the destruction of habitat and the survival of wildlife. The tropical forest of Ukhrul district is also the habitat of many-valued species of birds and animals. Many threatened species like Tragopan blythii, Pangolin (anteater), Salamander, Tiger, Porcubine, Hooting Monkey, Leopard, Big, small and medium-sized black bears, Elephants, wild buffaloes, wild boars, Deers and stags, wild goats and many unidentified species are found in this region. Birds of various colours and sizes are also found here including some migratory birds.

Table 4: Animals and birds which are under threat in Ukhrul district

Name of the available animals and birds	Threatened species
Hoolock Gibbon, stump Tailed Macaque, Slow Loris, Clouded Leopard, Golden Cat, Marbled cat, Binturong, Spotted Linsang, Tragopan blythii, Pangolin, Salamander, Tiger, Porcubine, Hooting Monkey, Leopard, Black Bears, Elephant, Wild Buffalo, Wild Boars, Deers and Stags, Wild Goats, Wild Ox etc. *Among the birds, White Wood Duck, Pink Headed Duck, Grey Leg Goose, Mallard, Brahmini duck, Clucking-teal, Plover, Hoover Crame, Brown, Headed gull, Avocate White ibis etc.*	*Tragopan blythii, Pangolin, Salamander, Tiger, Porcubine, Hooting Monkey, Leopard, Black Bears, Elephant, Wild Buffalo, Wild Boars, Deers and Stags, Wild Goats, Wild Ox etc.* *Hoolock Gibbon, Clouded Leopard, Golden Cat etc. are perhaps extinct.* *Among the birds, White Wood Duck, Pink Headed Duck, Mallard, Clucking-teal, Avocate White ibis etc.*

Source: 1. http://ukhrul.nic.in
2. Based on Field Survey (2011)

The respondents from the five sample villages namely, Lungphu, Khoripok, Nungbi Khunou, Mongkot Chepu and Ningchou reported disappearing wildlife from their villages and neighbouring areas. The Javan Rhinoceros was seen roaming along the Khuga river valley in Churachandpur district as late as the beginning of the 20th century, but now it is extinct from Manipur and hence from India. The Wild Ox of Myanmar known as '*santhou'* in Manipur was last seen thirty years ago (Forest Department, Government of Manipur, 1997). In all probability, these animals have vanished from Manipur forever. The Hoolock gibbon, Stump Tailed Macaque, Slow Loris, Clouded Leopard, Golden Cat, Marbled Cat, Binturong, Spotted Linsang, Malayan Sun Bear, Smoth Indian Otter, Hog Badger, Malayan Giant Squirrel, Serow (*Sabeng*) and most of the other denizens of the forest are making a precarious existence in the forest of Manipur and all of them are on the verge of extinction.

Among the birds, the White Wood Duck, Pink Headed Duck, Grey Leg Goose, Mallard, Brahmini Duck, Clucking teal, Plover, Hoover Crame, Brown Headed gull, Avocate White ibis, Glossy Ibis, Indian Shag, Open Bill stork, Black Necked stork and a host of others have become extremely rare, and many of them are probably extinct from the state.

CONCLUSION

The study reveals that *jhuming* is leading to forest degradation and ultimately to the loss of valuable flora and fauna. It harms the bio-diversity of this hilly region. The reason for the dwindling wildlife is not far to seek. An explosion of the human population with intensive human activities has had far-reaching effects on wildlife. Rapid deforestation for *jhuming* has resulted in habitat destruction coupled with indiscriminate hunting of birds and animals. This has threatened many species which has led to their extinction. In the hills where people pride themselves as traditional hunters, it would be a pity soon enough if they are left with no animals to hunt at all.

On the other hand, it is almost impossible to stop a practice that has been going on for centuries which is closely associated with tribal customs and traditions. So, methods have to be devised for improving upon *jhum* cultivation through increased production and loss of environmental destruction. The messages of conservation are yet to reach the interior hills of Manipur, and so, only the economic development of the people would enable them to overcome the compulsions of overexploiting the living natural resources of the state.

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