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# Shifting cultivation in relation to slope pattern and elevation in Karbi Anglong District of Assam

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**ABSTRACT**

Shifting cultivation is practiced along the hill slopes in Karbi Anglong District for subsistence living. It is an old agricultural system in which plot of land are cultivated temporally. Shifting cultivation involves cleaning of forest area in hill slope. Shifting cultivation is also an adaptive forest management practice in which hill and mountain are productively utilized. The aim of this research paper is to investigate the slope pattern and elevation of Karbi Anglong District of Assam. Another aim of this study is to analyze the distributional pattern of shifting cultivation and its relation to slope of the study area. Supervised Classification method with maximum likelihood algorithm has been used for land use classification and demarcation of jhum practiced area in Arc GIS 10.2.1 and this method is well recognized for the land use classification throughout the world. For ground truth verification and error reduction field study is carried out using the GPS. Elevation and slope map of the study area has been prepared with the help of contour line and SRTM (1arc) data downloaded from USGS of the study area. Digital elevation map has been prepared to show slope patter and elevation of Karbi Anglong district. Slope up to twenty degree are ideal for shifting cultivation in the study area.

***Key words :*** *Shifting cultivation, Slope and elevation*

## Introduction

Shifting cultivation is considered a strategy of resource management in which fields are shifted to exploit the nutrient capacity of vegetation. Shifting of fields is cyclical and rotational. Fields are prepared by removal of vegetation with the use of fire. Large number of people in the study area are dependent on shifting cultivation practice for their living. Slope and elevation are important parameters that provide varieties of topographical features in the study area.

Shifting cultivation is an important traditional cultivation in North East India. Out of the total geographical area of the North-East, i.e. 25.50 million hectares, Shifting cultivation accounts for 2.70 million hectares. About 4.50 lakh tribal families survive on jhum cultivation in North-East. In Karbi Anglong district, about 65% of the people are dependent on jhum cultivation. The people cultivate on the same plot of land after an interval of 8-10 years. So, the people have to move from one hillock to another in search of new plots of land. In the north-eastern states 4.92 lakh tribal families practise jhum on 4.53 lakh hactare in one year. The total area used by these families over the total shifting cultivation cycle was 2.69 million hactare (The National Commission on Agriculture, 1976). Within India, shifting cultivation or jhum, was once widely practiced in the tropical forests of South-Western, Central, and Eastern

India. Currently, this practice is pre-dominant in the seven states of North-Eastern regions of India, especially in the humid forests of the hill tracts. Over 100 tribal communities composed of more than 620,000 families in the region depend on jhum cultivation for their livelihood (Ramakrishnan, 1992).

Agriculture is the main source of income and livelihood of Karbi Anglong district. The economic development of the district highly depends on jhum cultivation as well as agriculture and some of allied activities. The topography of this district contains mostly hilly areas and some parts of plain and valleys and it has its own peculiarities in the system of cultivation. The type of cultivation of crops varies from place to place according to the variation of relief and altitude etc.

## Objectives

Based on the background outlined above, the main objectives for the study are

(i) To study about the slope pattern and elevation of Karbi Anglong district of Assam
(ii) To analyze the distribution of shifting cultivation and its relation to slope of the study area

### Study Area

Karbi Anglong district lies in between $25^{0}30'00''$ and $26^{0}37'00''$ North latitudes and $92^{0}08'00''$ and $93^{0}50'00''$ East longitudes. It is bounded on the North by the Morigaon, Nagaon and Golaghat districts of Assam on the east by the Golaghat district of Assam, on the south by the state of Nagaland and Dima Hasao district of Assam and on the southwest by the state of Meghalaya. Karbi Anglong district is genetically belongs to Meghalaya plateau. The altitude of the district varies from 300 meter in the North and 1600 meters in the South while that of the valley ranges from 75-150 meters.

## Methodology

Supervised Classification method with maximum likelihood algorithm has been used for land use classification and demarcation of jhum practiced area in Arc GIS 10.2.1 and this method is well recognized for the land use classification throughout the world. For ground truth verification and error reduction field study is carried out using the GPS. Elevation and slope map of the study area has been prepared with the help of contour line and SRTM

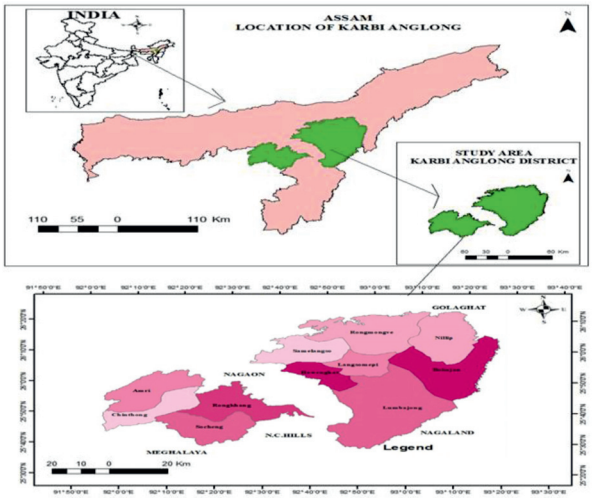


**Fig. 1.** Location of Karbi Anglong district

(1arc) data downloaded from USGS of the study area.

## Results and Discussion

### Slope pattern and elevation of Karbi Anglong District

The sloppy hills, fertile soil and accessible to the forest are an ideal site for shifting cultivation. Slope up

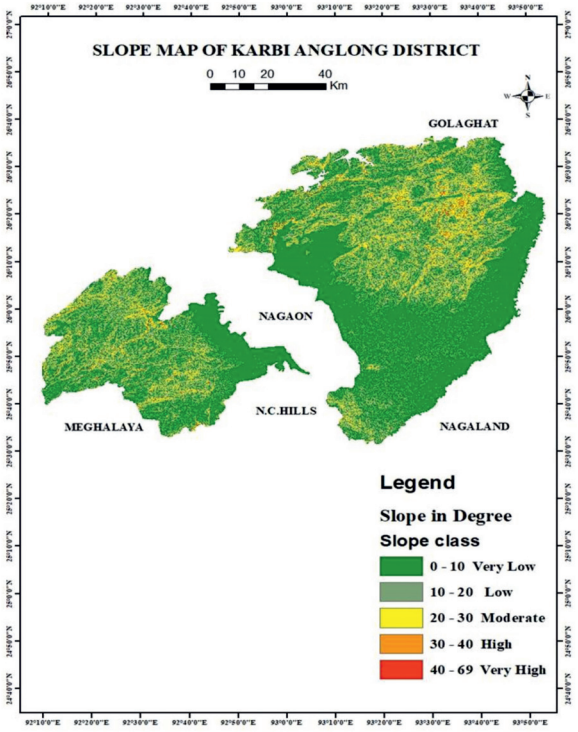


**Fig. 2.** Slope map of Karbi Anglong District

to 20 degree is considered as an ideal site for the selection of jhum fields. 0 to 20 degree slope area is easy to access by the native karbi people for practice of jhum. The area from 40 degree to 69 degree is very steep and not suitable for access.

**Table 1.** Area in different slope categories in Karbi Anglong District

| Slope | Slope Category in degree | Area Covered (sq.km) | P.C. of Area in Slope category |
|---|---|---|---|
| 1 | 0-10 | 6188.79 | 59.31 |
| 2 | 10-20 | 2931.02 | 28.09 |
| 3 | 20-30 | 1089.24 | 10.44 |
| 4 | 30-40 | 212.51 | 2.04 |
| 5 | 40-69 | 12.54 | 0.12 |

Shifting cultivation areas are found in different slopes ranging from gentle slopes to steep slopes. Slope aspect generally refers to horizontal direction to which a hill slope faces. In karbi Anglong district area under 0 to 10 degree is 6,188.79 sq km which is 59.31 percent of total geographical area. Area under 10 to 20 degree slope is 2,931.02 sq km, 20 to 30 degree is 1,089.24 sq km,30 to 40 degree is 212.51 sq km and 40 to 69 degree is 12.54 sq km in the study area. Large amount of area is under 0to 10 degree and only 0.12 per cent area is under 40 to 69 degree slope in Karbi Anglong district.

Digital Elevation Model of Karbi Anglong District shows elevation and area under DEM category. In Karbi Anglong District 3,269.89 sq km area is under 55 to 200 meter elevation. Area under 200 to 400 meter elevation is 2,791.46 sq km, 400 to 600 meter elevation is 1,891.59 sq km, and 600 to 800 meter elevation is 1566.09 sq km and 800 to 1372 meter elevation is 915.31 sq km in Karbi Anglong District.

**Table 2.** Area of different category of DEM

| Dem | Dem Category (m) | Area Covered (sq. km) | Percentage of Area in Dem Category |
|---|---|---|---|
| 1 | 55-200 | 3269.89 | 31.34 |
| 2 | 200-400 | 2791.46 | 26.75 |
| 3 | 400-600 | 1891.59 | 18.13 |
| 4 | 600-800 | 1566.09 | 15.01 |
| 5 | 800-1372 | 915.31 | 8.77 |

*Source:* SRTM, 3arc

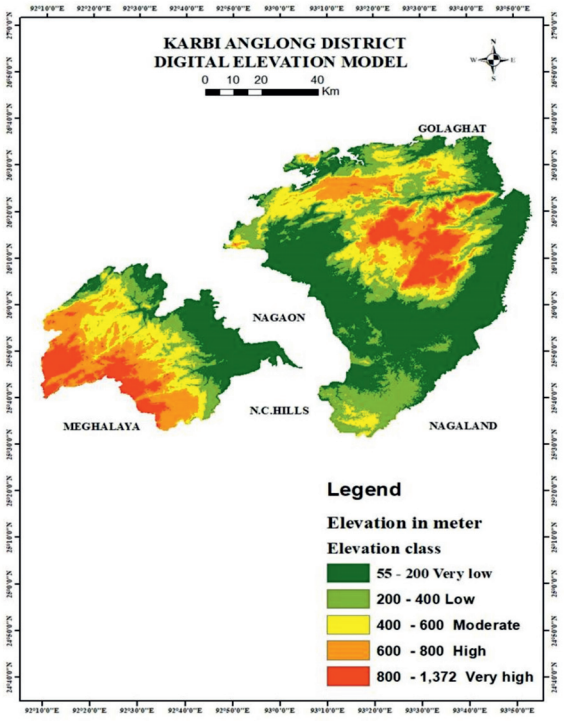


**Fig. 3.** Digital Elevation Model of Karbi Anglong District

## Shifting cultivation and slope of Karbi Anglong District

Shifting cultivation locally known as jhum cultivation in Karbi Anglong District has strong relation with slope.

Though the distribution of jhum fields is highly found in 0-40 degree slopes it spreads rapidly at high degree slope area. The jhum plots are highly found in 40 degree and 69 degree slope in 2017. Excessive jhumming induced highly degraded forest area for livelihood. The rugged topography always encourages people to practice their traditional method of cultivation. The available land in 20 and 40 degree slope is not sufficient for highly increased people to feed. The land area for settle cultivation is negligible for them to survive. So they rush to the

**Table 3.** Jhum field distribution on slope in 2017

| Slope in Degree | Jhum Area in sq. km in 2017 | Percentage |
|---|---|---|
| 0-20 | 780.5 | 86.78 |
| 20-40 | 117.54 | 13.07 |
| 40-69 | 1.33 | 0.15 |
| Total | 899.37 | 100 |

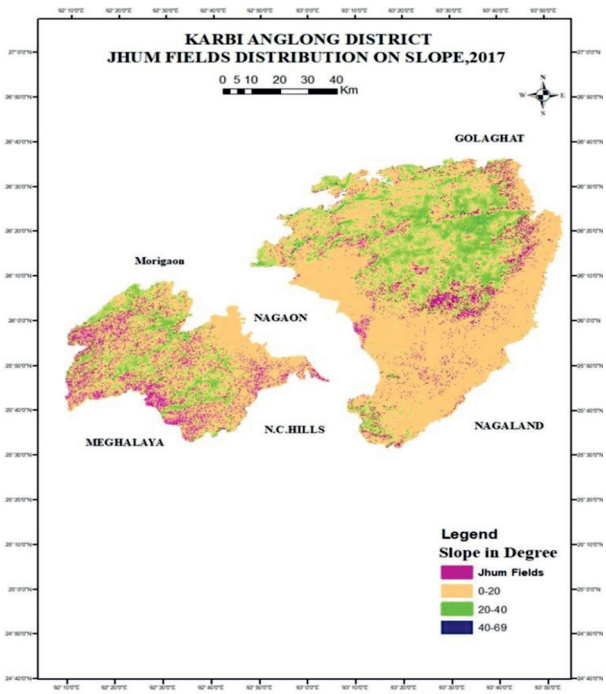


**Fig. 4.** Jhum field distribution on slope map of Karbi Anglong district

dense forest area and degraded the virgin forest cover for shifting cultivation.

In Karbi Anglong District jhum plot is mainly found in 200 to 1200 meter elevation. Digital Elevation Model of the study area shows that 177.71 sq km jhum area is under 41 to 200 meter elevation which is 19.76 percent of total geographical area. Shifting cultivation area under 200 to 400 meter elevation is 209.02 i.e. 23.25 per cent, area under 400 to 600 meter elevation is 170.3 sq km, area under 600 to 800 sq km is 177.02 sq km, area under 800 to 1372 sq km is 165.09 sq km in Karbi Anglong district. Area under jhum cultivation in the hill slope increased because population in the study area increased. Area under plain topography in the study area is less so people encroached forest land for jhum cultivation. People used to practice land for jhum as easy means of stay with arrangement of jhum plot with the help of village owner at lease. Now a days, new generation are not interested to engage themselves in age old practice so they hand over their land to the outsiders for practicing jhum at lease. The migrated people have no means to livelihood. They take plot at lease from villager for agriculture. The district has less plain area so they shifted to high altitude area for slash and burn.

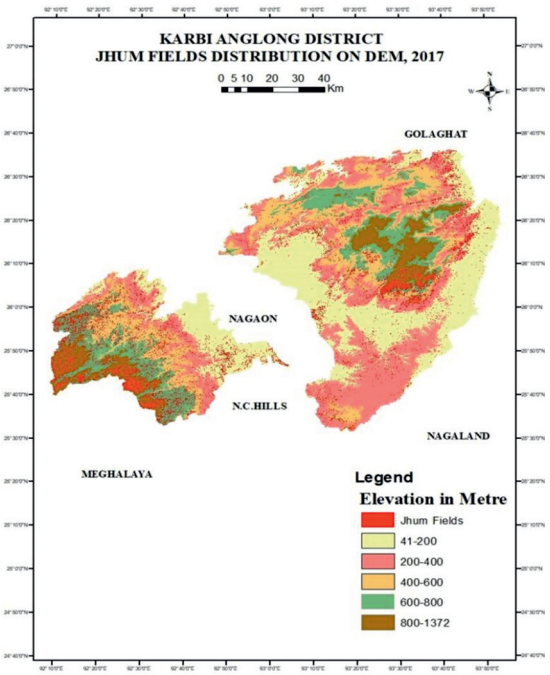


**Fig. 5.** Jhum field distribution on Digital Elevation Model

**Table 4.** Jhum field distribution on DEM (Elevation) in 2017

| Dem (Elevation in meter) | Jhum area in sq.km. in 2017 | Percentage |
|---|---|---|
| 41-200 | 177.71 | 19.76 |
| 200-400 | 209.02 | 23.25 |
| 400-600 | 170.3 | 18.94 |
| 600-800 | 177.02 | 19.69 |
| 800-1372 | 165.09 | 18.36 |
| Total | 899.14 | 100 |

## Conclusion

Shifting cultivation is the most complex agricultural form in India. In Karbi Anglong District shifting cultivation can be found at higher altitude. Shifting cultivation was practiced in large areas on hil slope of the district. Shifting jhum cultivation is the main cause for lost of biodiversity and environmental degradation. Shifting jhum cultivation also causes land and soil degradation. On the other hand jhum cultivation provides production of food and other resources. More scientific studies is required to identified agro forest farming system through integration jhum cultivation with trees plantation.

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