



Assessment of Changing Trends of Shifting Cultivation in Garo Hills Landscape of Meghalaya-A Geo-Spatial Approach

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Abstract

The North-Eastern part of India is rich in forest resources. But the forest resources are declining rapidly from the last two decades. The shifting cultivation is an important traditional agricultural practise in Garo hills of Meghalaya. Garo people are mainly dependent on forest resources for their livelihood. Due to forest based dependency of livelihood pattern, it has created environmental degradation like soil erosion, loss of forest resources, threatens of flora and fauna in this area. In 1999, the area of abandoned and current category of shifting cultivation was calculated 19.84 sq. km and 64.18 sq. km respectively. On the other hand, it was increased to 48.75 sq. km and 140.73 sq. km in 2009. The abandoned shifting cultivation area was calculated 43.02 sq. km and current 158.76 sq. km in 2013 for Garo hill district of Meghalaya. It is important to note that, more than 70% of shifting cultivation area was concentrated in the moderate and moderately steep slope for all the years of study period. It is proved that the trend of shifting cultivation pattern can easily be assessed through the Geo-spatial tools.

Keywords: Resources, shifting cultivation, agricultural, Garo hills, moderately steep slope.

Introduction

Shifting cultivation is an old and traditional agricultural method operative in hilly areas of tropical regions¹. Firstly, the forest cover is cut and burned for food crops and after final crop is harvested, the area becomes fallow and it is allow to recovering forest as well as soil nutrients². It is popular agricultural methods due to its well adoptability in local climate, soil types and its low cost^{3,4}.

The North-East part of India is rich in forest resources and is one of the eighteen ecological 'hot-spot' of the world. The total forest cover in this region was 64% of its total geographical area in 1991 as against the national average of 19.39%⁵. However, the forest cover area is shrinking rapidly for last two decades. The main causes of declining forest cover are shifting cultivation in the hilly areas and encroachment in the valley plains by the local people⁶. Shifting or jhum are a traditional agricultural practice operative mostly tribal people in the north-eastern hilly region^{7,8}.

The estimation processes of shifting cultivation in North-East India are many and interestingly estimated land differs from each other. FAO estimated the area under shifting cultivation in this region was 7.40 million ha in 1975⁹. But a task force of Planning Commission of India estimated the shifting cultivation area 3.81 million ha in 1983. In 1999 FSI estimated the area under shifting cultivation in North-East India where the states most affected by shifting cultivation are Nagaland, Mizoram

and Manipur with an area of 0.39, 0.38 and 0.36 million hectares respectively. In Arunachal Pradesh about 0.23 million ha is affected by shifting cultivation while 0.18 million ha, 0.13 million ha and 0.06 million ha of lands are under shifting cultivation in Meghalaya, Assam and Tripura^{10,11}. Table-1 highlighted the status of shifting cultivation in North East India.

Garo hill district of Meghalaya is rich in terms of flora and fauna. With the increasing rate of population, the flora and fauna of Garo hill district is in pressure¹³. Garo people are mainly dependent on forest resources for their livelihood and shifting cultivation is the main agricultural practices of Garo people of Meghalaya¹⁴. Due to forest based dependency of livelihood pattern, it has created environmental degradation like soil erosion, loss of forest resources, threatens of flora and fauna in this area¹⁵. For this purpose, the main objective of this paper is to study the changing patterns of shifting cultivation in relation to slopes in Garo hill districts of Meghalaya.

Study Area: The Garo Hill Districts of Meghalaya is under biogeography zone 9B (north-east India) and it is located between latitude 25°9' to 26°1' N and longitude 89°49' to 91°2' E (figure-1). The Garo Hill Districts of Meghalaya situated in the peninsular plateau areas in the South and Brahmaputra plains in the north. It is consist of three districts viz. East Garo Hill, West Garo Hill and South Garo Hill District with an area of 8,167 sq. km^{16,17}. The highest point of Garo hills is the Nokrek peak with an altitude of 1412m above msl¹⁸.

Table-1
Shifting Cultivation in North-East India

State	Annual Area Under Shifting Cultivation (Sq. Km)	Fellow Periods (Years)	Minimum Area under Shifting Cultivation one time or other(Sq. Km)	No. of Families practicing Shifting Cultivation
Arunachal Pradesh	700	3-10	2100	54000
Assam	696	2-10	1392	58000
Manipur	900	4-7	3600	70000
Meghalaya	530	5-7	2650	52290
Mizoram	630	3-4	1890	50000
Nagaland	190	5-8	1913	116046
Tripura	223	5-9	1115	43000
Total	3869	-	14660	443336

Source: Basic Statistics of NER 2002¹²

Deep gorges and abrupt slopes are found in the southern Garo hills along narrow plains of Bangladesh border. Maximum rivers flow towards Bangladesh plains in the south and the Brahmaputra valley in the north and the west. The important rivers of the north flowing are the Kalu, Ringgi and the Didak and south flowing are the Bhogai, Dareng etc.¹⁹. Garo Hill's peoples are largely dependent on the forest resources for their livelihood²⁰. The mining activity has a good effect on economic growth but it affected the surrounding environment, which leads to its degradation²¹. Government forest area is only 15% in the Garo Hills and remaining belongs to community reserve forest²².

Material and Methods

The base map of the Garo Hill District has been prepared from the Survey of India top sheets of R.F. 1:50,000. To identify the shifting cultivation area, three cloud-free IRS-P6-LISS-III data acquired on February-March 1999, 2009 and 2013 were used for the present study. The satellite digital data was processed and rectified using Survey of India (SOI) topographic maps for carried out to collect the ground information.

The Shifting Cultivation is identified based on the visual interpretation of the acquired satellite imagery with the help of ground verification. Mapping works of changes was processed and analysed in Arc GIS 9.2 and Erdas 9.1 of GIS environment.

To identify the location of shifting cultivation changes in Garo Hill district of Meghalaya, the digital elevation model (DEM) was generated from the digitized contour at an interval of 20 meter in Super Map 7C with 30 meter spatial resolution. The slope variation of this area was developed from generated DEM.

Extensive field work was done to identify the areas of shifting cultivation with the help of GPS.

Results and Discussion

Area statistics of shifting cultivation and its location in different slope categories are given in Table-2 and Fig.-2. It is found that the moderate and moderately steep slope is mostly used for shifting cultivation for all the years in Garo Hill Districts of Meghalaya. In 1999, the area of abandoned and current category of shifting cultivation was calculated 7.84 sq. km and 26.53 sq. km respectively in moderate slope. On the other hand, it was calculated to 7.05 sq. km and 18.76 sq. km for abandoned and current respectively in moderately steep slope. Moreover, the current shifting cultivation area was increased rapidly in 2009 (66.81 sq. km) and 2013 (73.48 sq.km) in the moderate slope; where as it was increased 35.38 sq. km in 2009 and 41.69 sq. km in 2013 in the moderately steep slope (figure-3). The main causes of concentration of shifting cultivation in moderate and moderately steep slope are accessibility and suitability of cultivation in these slopes.

In 1999, the current shifting cultivation area was calculated only 9.62 sq. km in steep slope. But it was increased to 19.46 sq. km in 2013. Likewise, the jhum cultivated area was found 4.24 sq. km in 1999, whereas it was increased to 11.89 sq. km in 2013. The trend of shifting cultivation area was decreased with the increase of slope from moderate to most steep. The main causes of shifting the area from moderate to steep slope are, the increasing rate of population, reduce the cycle of fellow periods of shifting cultivated area, the people are bound to move their shifting cultivation area.

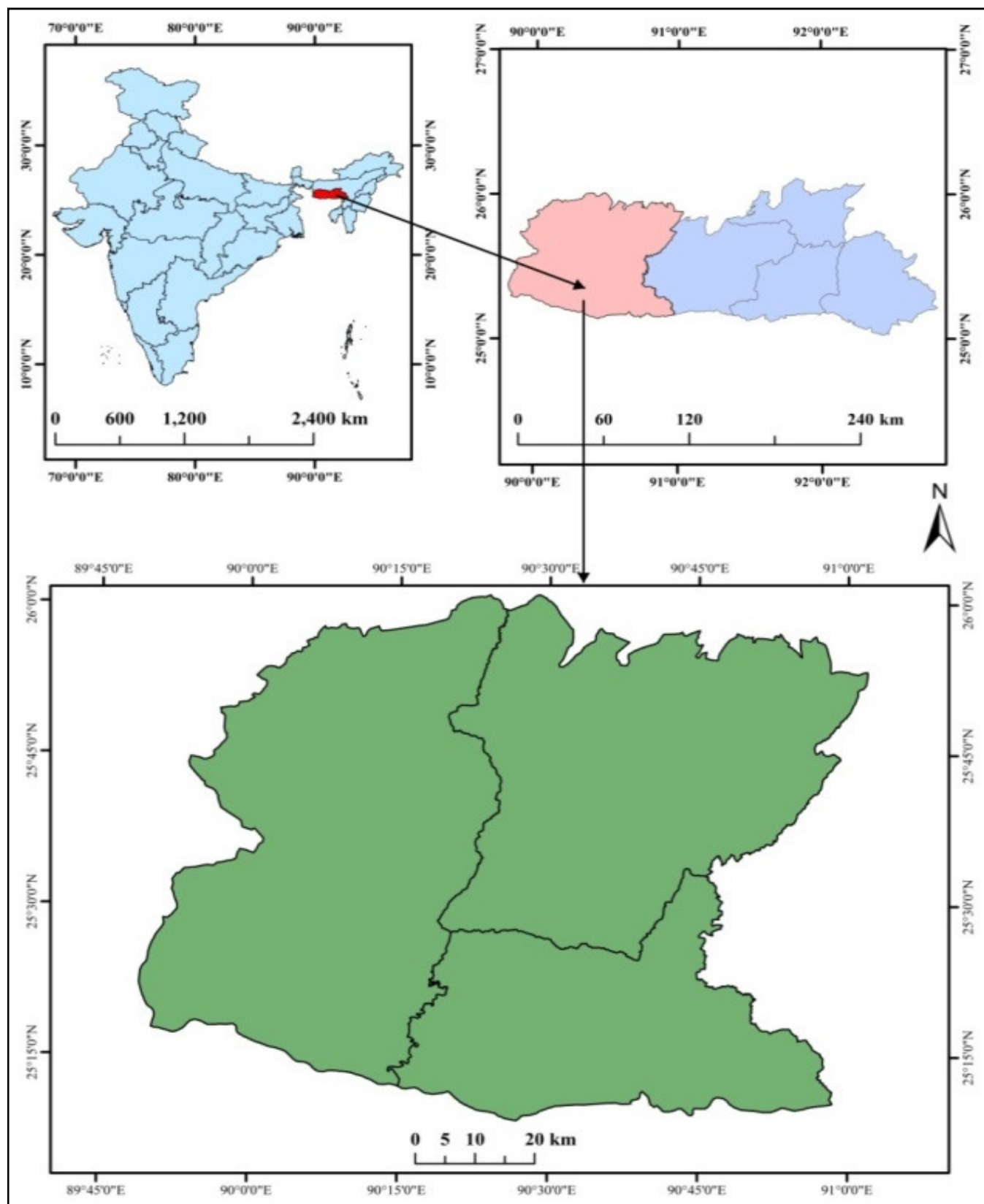


Figure-1
Location of Study Area

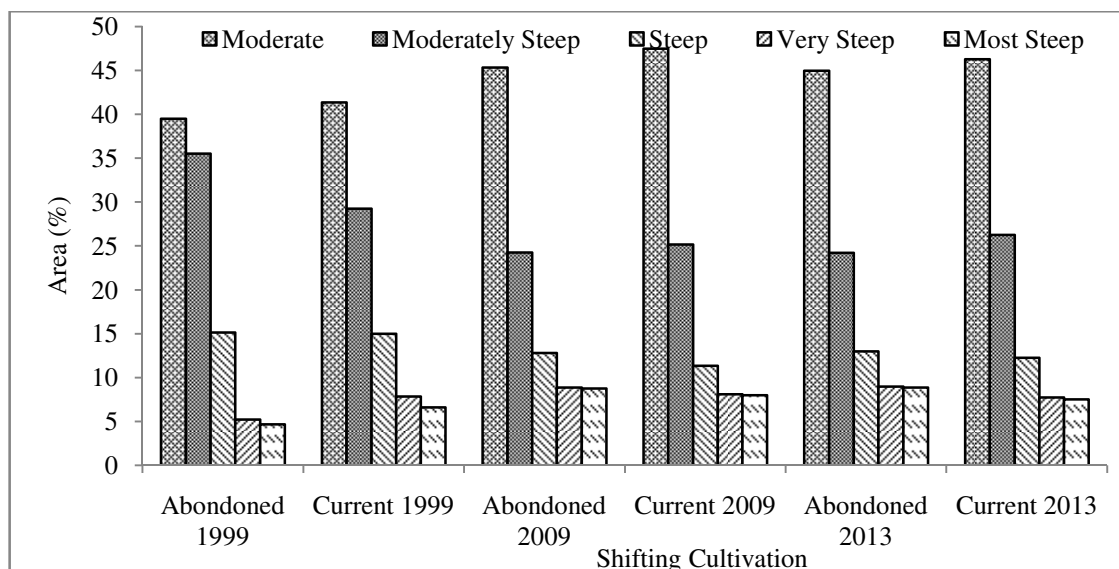


Figure-2

Area under Shifting Cultivation in Different Slope Category in Garo Hill Districts of Meghalaya

Table-2
Slope wise Distribution of Shifting Cultivation (Area in sq. km)

Year	Shifting Cultivation	Slope Category					Total
		Moderate	Moderately Steep	Steep	Very Steep	Most Steep	
1999	Abandoned	7.84	7.05	3.00	1.03	0.92	19.84
	Current	26.53	18.76	9.62	5.03	4.24	64.18
2009	Abandoned	22.10	11.82	6.24	4.32	4.27	48.75
	Current	66.81	35.38	15.97	11.37	11.20	140.70
2013	Abandoned	19.35	10.42	5.58	3.86	3.81	43.02
	Current	73.48	41.69	19.46	12.23	11.89	158.80

It is important to note that, more than 70% of shifting cultivation area was concentrated in the moderate and moderately steep slope for all the years of study period. The rate of shifting cultivation is decreases with the increasing rate of slope from moderate to most steep slope.

Conclusion

Shifting cultivation is an important factor of livelihood pattern of peoples of Garo hill region. It is important to note that the trend of shifting cultivation is decreases day-by-day due to implementation of new policies. There are some specific findings inferred from the present analysis:

Trends of shifting cultivation decreases due to awareness among mass about its negative impact in environment and the

implementation of Integrated Basin Development and Livelihood Promotion Programme (IBDLPP) in the hilly regions.

It is observed that the Garo Hill districts of Meghalaya dominated by the open forest cover mainly Betel nut, strawberry, Pine apples, chestnut, cashew nut, strawberry, palm tea estate and rubber plantation which are practices in the gentle and moderately steep slopes. The changing pattern of agriculture from traditional to plantation crops helps to reduce the trends of shifting cultivation.

However, it is necessary to take initiatives for more awareness among the mass, encourage trace cultivation and monitoring of moderately steep slope for reducing shifting cultivation.

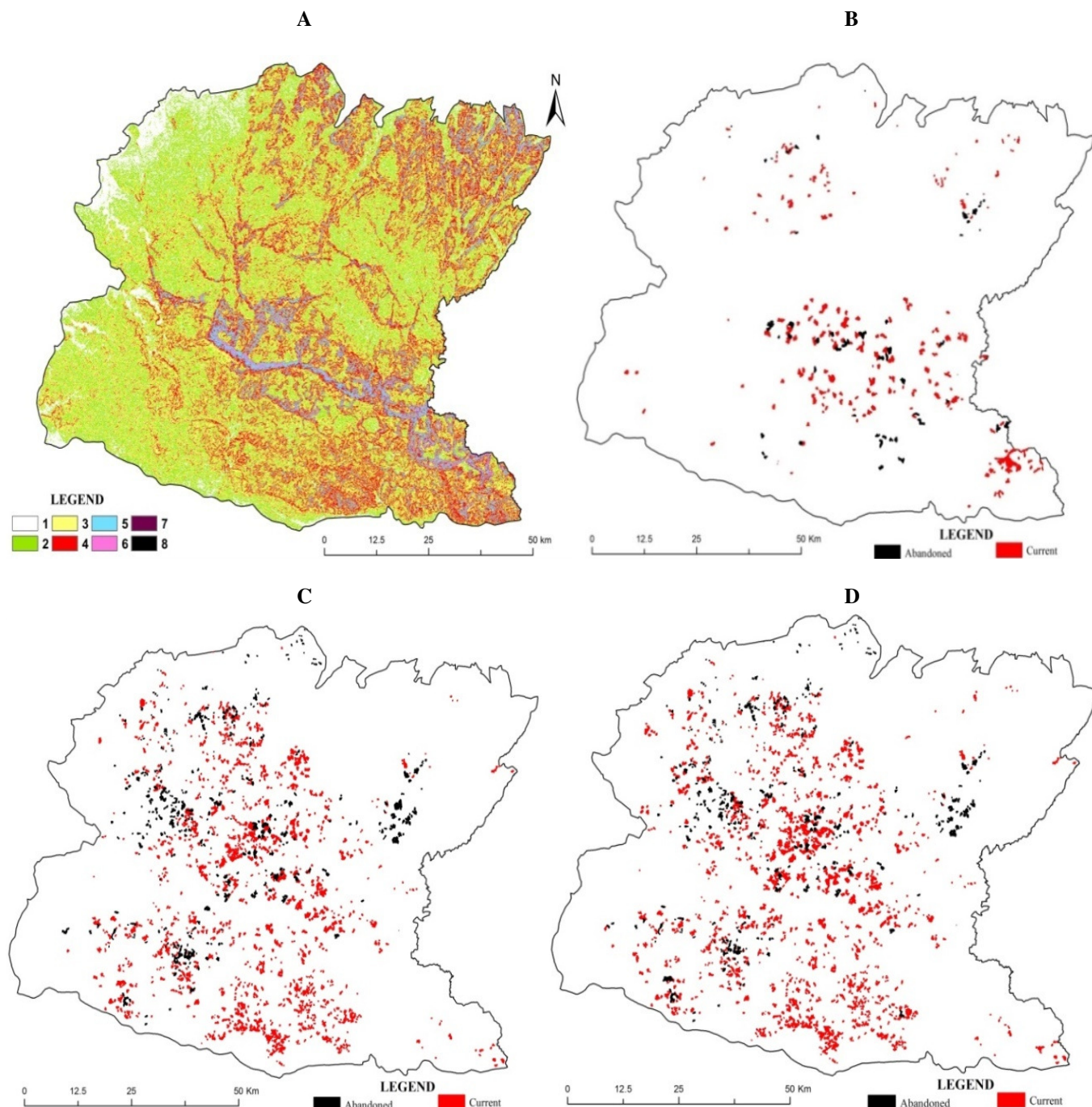


Figure-3

A. Slope Variations [Abbreviations: Slope in percent; 1. Very Gentle (0- 4), 2. Gentle (4-10), 3. Moderate (10-20), 4. Moderately Steep (20-35), 5. Steep (35-60), 6. Very Steep (60-100), 7. Most Steep (100-175), 8. Extremely Steep (> 175)]; B. Shifting Cultivation 1999, C. Shifting Cultivation 2009 and D. Shifting Cultivation 2013 in Garo Hill Districts of Meghalaya

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Figure-4

Burn the forest cover for shifting cultivation in Garo Hill Districts of Meghalaya

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