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Changing trends of Shifting cultivation and its drivers in Champhai, Northeast India

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ABSTRACT

We used the recent available spatial data on the extent of shifting cultivation in Champhai, northeast India from 1999 to 2016. Based on spatial distribution of jhum fields, topography and communities, 45 household were selected for socio-economic and household survey of the jhumias through pre-structured questionnaires. Logistic regression model was then used to analyze the inferential statistics and understand the contribution of the socio-economic condition of the jhumias to the decreasing trend of shifting cultivation. Result showed that jhum field of 1.0 to 2.0 ha was the most prevalent jhum size in the area. Socio-economic factors namely education and occupation significantly contributes to the decreasing trend of area under shifting cultivation in the district.

1. Introduction

Shifting cultivation (locally known as 'jhum') is a predominant agricultural practice for most of the communities inhabiting the upland in northeast India. In the last few decades, population growth, expansion of trade, economic and social change coupled with government efforts to change jhum to more intensive agriculture or other land uses with an aim to conserve biodiversity, and preserve ecosystem services have resulted in demise of jhum in North-East India. Recent studies reported the decline in area under shifting cultivation in the region[1-6]. Shifting cultivation nevertheless contributes 85% of the total cultivated land in North-East India[7]. Mizoram alone has about 63000 hectares of area under shifting cultivation, serving as a source of livelihood for almost 50000 families[8]. It was noted that 20% of Mizoram's population were directly or indirectly engaged in shifting cultivation (Agriculture Deptt. Report, 2009-10, Govt. of Mizoram). As per the Statistical Handbook of Mizoram 2017, Champhai have 30.49% of its population with farming as the only source of livelihood. However, there is still much to know about the extent of jhum in this part of the world, its contribution to farmers' livelihood and the drivers of its changing trends. Therefore, this study is an attempt to explore the underlying drivers for the decline in the jhum area in Champhai, Mizoram. For this study, we use the recent available spatial data on the extent of shifting cultivation in Champhai. Three sampled villages were selected for socio-economic and household survey of the jhumias (jhum farmers) through pre-structured questionnaires in 2016. The selection was based on the spatial distribution of jhum fields, topography and communities inhabiting the villages. A total of 45 households were randomly selected from Mizos and Peites dominated villages for the interview. Our focus was on households and communities for whom jhum was an integral part of livelihood, social and cultural systems but who through choice or necessity have partly or completely changed their source of livelihood. The questionnaire was addressed to obtain particulars on the household description, income and land ownership, land use types, present jhum practice, farmer's perception towards jhum, Government initiatives to control or improve jhum and its economic influence on the farmers. Logistic regression model was then used to analyze the inferential statistics and understand the contribution of the socio-economic condition of the jhumias to the decreasing trend of shifting cultivation.

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To acquire the current extend of shifting cultivation in Champhai district of Mizoram, we used the results of time-series analysis of Landsat images 6. They reported a decreasing trend in area under current jhum during the study period (1999-2016) wherein an average of 114.46 km2 of forest is annually slashed for shifting cultivation in Champhai. The spatial distribution of current jhum fields from 1999 to 2016 was then enumerated to ascertain the most favoured jhum size in the district. The land holding size was categorized according to Ministry of Agriculture, Government of India. Graphical representation of the number of jhum fields in each land holding class is shown in Figure 1. Over the study period, it was observed that all the land holding classes have experienced a decreasing trend in the number of jhum fields except for Small land holdings size (1.0 ha to 2.0 ha) where the number of jhum fields is almost constant over the years. This explains the prevalent jhum size in the study area which is in congruent with the findings of others8,9.

The net change in current jhum area from 1999 to 2016 in Champhai is presented in Table 1.

Table 1. Net change in jhum area over the past 17 years

Land holding class	Net change in Area (ha)	Net change (%)
Marginal (Below 0.5 ha)	0	0.00
Marginal (0.5 - 1.0 ha)	3.96	262.61
Small (1.0 - 2.0 ha)	14.44	28.24
Semi-medium (2.0 - 3.0 ha)	-18.90	-13.15
Semi-medium (3.0 - 4.0 ha)	-34.71	-16.57
Medium (4.0 - 5.0 ha)	-9.34	-4.58
Medium (5.0 - 7.5 ha)	-100.08	-24.52
Medium (7.5 - 10.0 ha)	-193.25	-43.82
Large (10.0 - 20.0 ha)	-470.81	-38.23
Large (20.0 ha and above)	-4776.41	-40.80

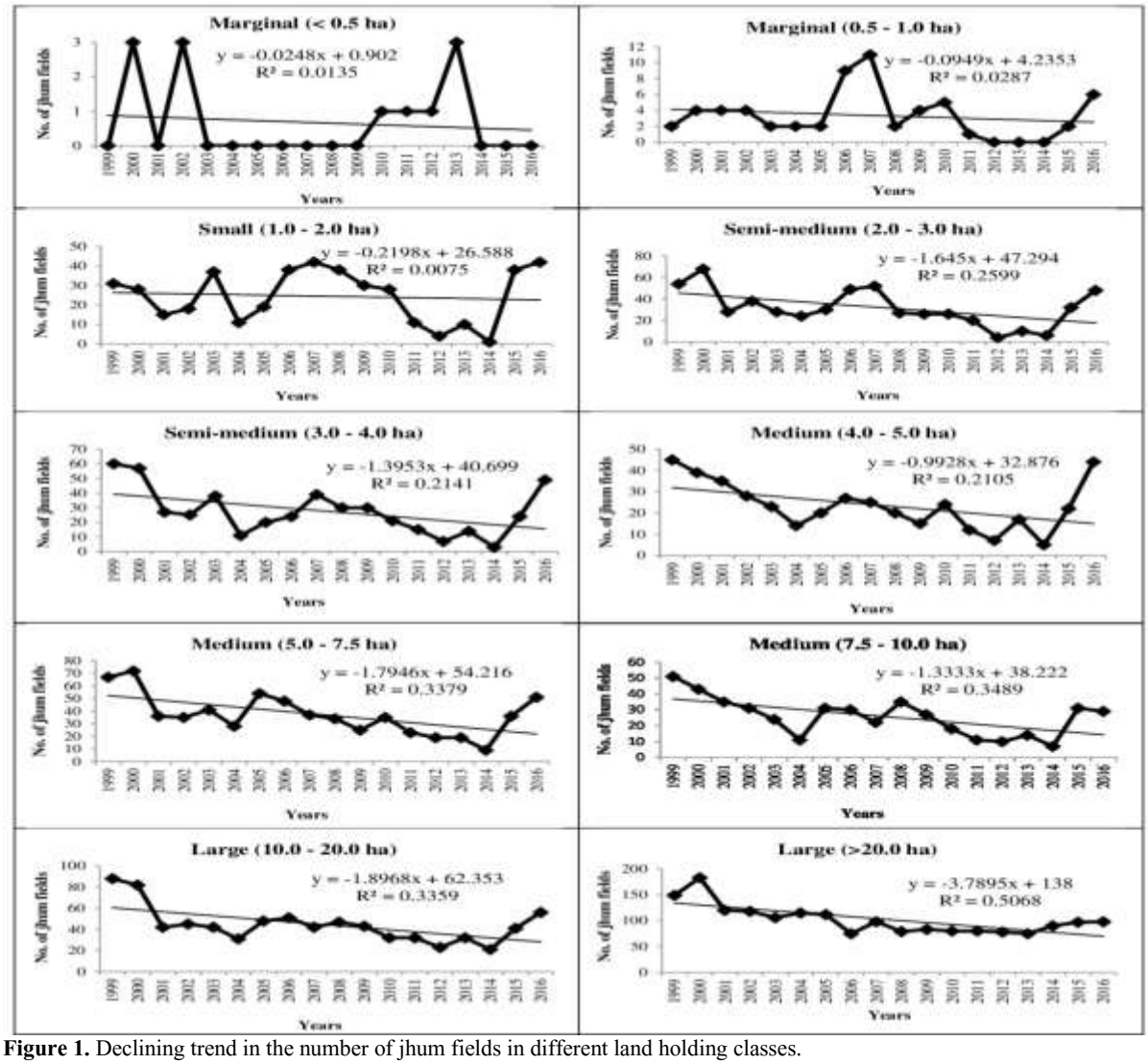

Figure 1. Declining trend in the number of jhum fields in different land holding classes.

Highest net increase in area (14.44 ha) was observed in Small jhum size while Marginal jhum size showed very high per cent increase (262.61%) over the past 17 years duration. The census data of Champhai was also acquired for the study period to understand the association between population and the extent of jhum. The report showed decadal population growth of 16.39% and 15.41% in rural and urban sector respectively from 2001 to 2011. However, increase in population did neither result in the increase of the district's total jhum area nor the preference of jhumias to bigger jhum fields. This explains for respondents involving in more than one type of land use systems[9]. It was also found that 52.54% of respondents were involved in homegardens and horticulture in addition to jhum cultivation.

Table 2 represents a summary of the socio-economic factors and the natures of their influence on the decreasing trend of shifting cultivation using binary logistic regression model.

The results showed a positive regression coefficient of education and occupation to the decreasing trend of shifting cultivation. We found that more than 82% of the respondent had some form of education up to graduation level and that an increase in education increased the odds ratio on decline in jhum area by a factor of 36.173. Of the total respondents, 66.67% were farmers, 20% were Government employees and 13.33% were daily wagers, however, some farmers were engaged in small scale business, carpentry and poultry under the New Land Use Policy (NLUP). Thus, it may be inferred that involvement in multiple occupation increases the odds ratio on decline in jhum area by a factor of 13.411. From the survey, it was found that only 7% of the respondents were aware of the detrimental effect of jhum on the environment. Despite the implementation of the New Land Use Policy (NLUP), 47.46% of the respondents still continue with shifting cultivation due to its multi-cropping system and cultural ethics associated with it. The farmer's response towards NLUP was not satisfying, as the alternative land-based activities under NLUP involved high investment and the outcome was a long duration, leaving the farmers with no source of income meanwhile.

Therefore, understanding this process of change will help to frame rational decisions on which land use to pursue, and which land use to discourage. Ultimately, the success of alternative land use will depend upon the gaining of confidence of jhumias over this alternative system through persuasion, demonstration and an applied fundamental research.

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Table 2. Logistic regression model on socio-economic factors influencing decrease in jhum area

Variable	**ß**	**S.E**	**Wald**	**df**	**Sig**	**Exp(ß)**	**95% C.I for Exp (ß)**	
							Lower	Upper
Age	0.014	0.064	0.046	1	0.830ns	1.014	0.894	1.150
Sex	4.781	2.741	3.042	1	0.081ns	119.224	0.554	2.568E4
Education	3.588	1.655	4.702	1	0.030*	36.173	1.412	926.703
Occupation	2.596	1.139	5.196	1	0.023*	13.411	1.439	124.992
Annual Income	-2.018	1.181	2.919	1	0.088ns	0.133	0.013	1.346
Land Ownership	-3.537	2.209	2.565	1	0.109ns	0.029	0.000	2.208
Other LU types	0.769	0.603	1.741	1	0.187ns	2.217	0.680	7.232
Distance of jhum	-2.050	1.294	2.510	1	0.113ns	0.129	0.010	1.626
Jhum Size	1.489	0.868	2.941	1	0.086ns	4.431	0.808	24.295
Parameters for site selection	-0.444	0.268	2.751	1	0.097ns	0.642	0.380	1.084
Family members involved in jhum	0.711	0.751	0.896	1	0.344ns	2.036	0.467	8.871
Cropping Period	0.982	0.973	1.017	1	0.313ns	2.669	0.396	17.984
Productivity	0.268	0.868	0.095	1	0.758ns	1.307	0.238	7.169
Constant	-11.985	7.279	2.711	1	0.100	0.000		
Model Chi-square = 29.560, Degree of freedom = 13, -2 Log likelihood = 29.144, Overall percentage = 88.6%, Number of cases = 45, * = statistically significant, ns = statistically not significant at 0.05 level of significance.								