





Article

Indigenous Peoples' Psychological Wellbeing Amid Transitions in Shifting Cultivation Landscape: Evidence from the Indian Himalayas

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Abstract: Recent changes in the shifting cultivation landscape (SCL) of the Indian Himalayan region—a global biodiversity hotspot—is of great concern due to their implication to conservation and economic development of the region and their impact on ecosystem services as well as the wellbeing of the region's inhabitants. The present study investigated the changes in land use in the SCL and their impact on the psychological wellbeing of the indigenous people of the region. Longitudinal data for over 15 years on land-use patterns and cross-sectional data from 481 respondents across 52 villages representing six states in India's North East that are part of the Indian Himalayas were utilized for the study. To analyze subjective wellbeing, Cantril's self-anchoring scale was used, followed by focused group discussions to triangulate the self-reported responses. Results reveal that the respondents were aware of the effects of landscape changes on their psychological wellbeing. These changes mostly represented a decline in shifting cultivation (SC), land ownership, food systems, social cohesion, cultural fulfillment, the diversity of cultivated native plants, and the availability of wild edible plants. Although the decline in SCL led to a gain in the area under green cover, it led to a marked decline in the diversity of cultivated and wild edible plants. This, the respondents perceived as adversely impacting their wellbeing. Empirical analysis established positive effect of SC on the psychological wellbeing of the respondents. However, a decline in SC seemed to have had an adverse impact on the perception of their wellbeing and thus increasing the migration. Therefore, optimized and ecosystem-based approaches and frameworks of socio-ecological systems are essential to harmonize the ecosystem services with wellbeing of the people.

Keywords: agro-forest landscape; engagement and life satisfaction; indigenous people; plantation crops; psychological wellbeing; shifting cultivation landscape



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1. Introduction

The changing global environment and turbulent human initiatives demand strengthening the human and nature relationship, which may be vital for accomplishing the sustainable development goal [1]. The global level environmental dynamics is often governed by local-level land use changes, thus determining the regional ecological security [2,3]. The existing landscape spectrum determines the land-use changes [4,5], may govern the ecosystem structure, services and performances by changing biophysical indicators [6,7]. The natural and agro-ecosystems are the means to achieve the ends of local people, benefits often referred as Ecosystem services (ES) which is delivered under the three broad dimensions of provisioning of food, fiber, firewood, freshwater, ornamental, medicinal resources; regulating the climate water purification, carbon sequestration, pollination,

and biodiversity conservation service or habitat service and cultural i.e., hunting, and recreational activities [8,9]. However, the provisioning components of ES are largely being threatened by a range of factors like forest conversion and agricultural intensification; population growth, and climate change [10,11]. Human activities may alter the landscape pattern, impair ecosystem services (Figure 1), and thus affect the wellbeing of locals [12]. The reciprocal proximity of landscape hue, ecosystem services, and human wellbeing being noticed in a casual way, the research on this relationship, therefore becomes imminent [12] which is also the targeted goal of regional sustainable development [13].

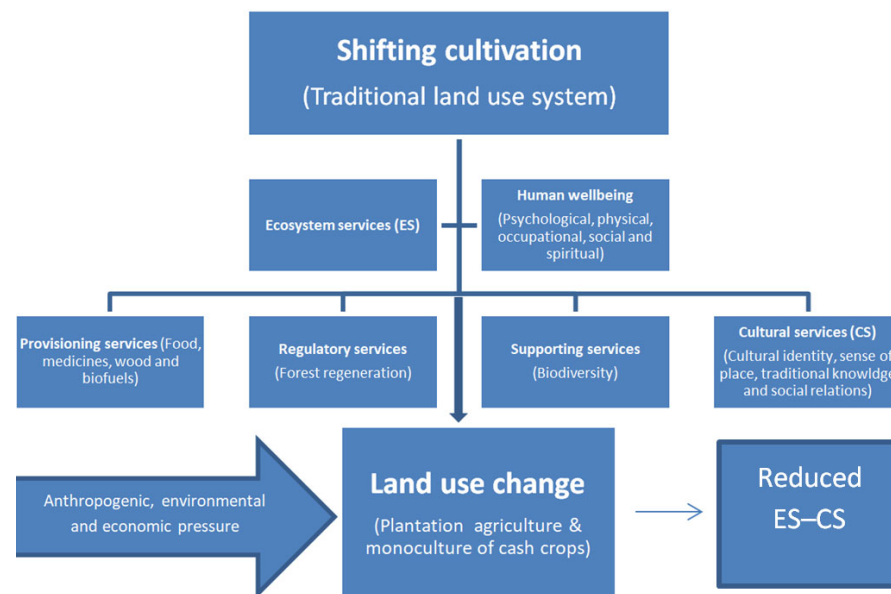


Figure 1. A conceptual framework of land use change in SC landscape and their influence on the ecosystem services.

Landscapes are also the basis for the evolution of social processes. Therefore, any human-led alteration in landscapes may impact the cultural values, conventions, and related social phenomena [14,15]. The social and ecological elements are also identified as integrated and interlinked between nature and culture comprising economic, social, and environmental processes [16–21]. The recent thoughts have designated the landscapes as spatial units wherein several basic processes of social and ecological systems unfold thus conceptualizing the landscapes as social-ecological systems (SEs) in itself which are exhibited as the interacting elements of bio-geophysical determinants and the related social actors [1,22–27]. Thus, the interdependence of the environment and human wellbeing is embedded in particular landscapes [28].

Over space and time, various pathways of land-use changes are identified which are unique as well as region and time period specific. For example, till the early twenty-first century, tropical deforestation was largely attributed to smallholder colonization of forest frontiers. The reality, in contrast, was the production of export-oriented commodities like, palm oil, soy, and beef by “large holders” which increasingly accounted for a large fraction of this deforestation, both directly and indirectly and thus pushing the smallholders into the frontier [29]. This implies examining the complexity of agroforestry landscapes using a socio-ecological lens using different such perspectives [30,31]. Therefore, empirically comprehending these issues becomes more pertinent at the current time of rapid change in population, socio-cultural aspects, land-use system, market, climate, and ecological changes. The myriad impact of land use and land cover change (LUCC) on local and regional climate, and human health induced or mediated by landscape changes also ought to be empirically documented [32].

Shifting cultivation sometimes referred to as “slash-and-burn agriculture”, “swidden”, and “rotational bush fallow agriculture”, is a type of traditional subsistence farming that

has been used for a long time by upland farmers in the tropics. In the humid tropics of the world's uplands, it is frequently practiced in Africa, Latin America, Oceania, and South and Southeast Asia and covers around 280 mha area worldwide [33]. More than 200 million people in Asia depend on this forest-based agriculture [34,35]. Because, practice involves periodic clearing of new forest patches for cultivation, shifting cultivators are also labeled as "forest eaters" although, such attribution of forest loss to shifting cultivators has been based on inadequate evidence [36], that has become a basis for the state to regulate or transform the shifting cultivation (SC) into other land uses.

Transitioning the land-use from SC to intensified cropping systems may enhance the household income, albeit compromise with customary practice, socio-economic wellbeing, livelihood options, and staple yields [37]. Intensive land use breeds dysfunctional consequences on ecosystem services (ES) enlarging the inequalities among poorer households who are heavily dependent on ES [38,39]. Thus, land use intensification-related empirical evidences need rigorous synthesis for comprehending the advanced landscape ecology and sustainability science in the changing climatic regime [32]. Further, the advancement of landscape sustainability science demands future research emphasizing the relationships among landscape patterns, ecosystem services, and human wellbeing *vis-a-vis* proactively integrating the complementary approaches across the social and natural sciences [40]. Forest landscapes as socio-ecological systems, demand comprehensive theorization for understanding the landscapes and associated actors' ability to manage them preferably in this century [41,42]. The locally managed landscape also governs the major dimensions of psychological wellbeing (attention restoration, stress reduction, and the evocation of positive emotions), physical wellbeing (promotion of physical activity in daily life as well as leisure time and through workable environments), and social wellbeing (social integration, social engagement and participation, and through social support and security) [43]. Moreover, the stronger emotional component of place identity also enhances the perceived wellbeing if people visit these places [44,45]. These places include personal and collective experiences, traditions, views as well as memories which usually locate our past, present, and future thus raising epistemological queries like how we come to know who and what we are [46]. This fact establishes that the wellbeing of indigenous people has a deep and complex relationship with the land. Besides, in the given context, therefore, the consequences of environmental changes on landscape value warrant careful attention from the local ecosystem's perspective [47] as only the indigenous mass are usually the most vulnerable and susceptible population affected by the environmental alteration [48]. Thus, this study was contemplated to capture the determinants of well-being of the indigenous communities in relation to the rapidly changing land-use systems with specific objectives of examining the land use change in the SCL of Northeast India, as a result of it, measuring the psychological wellbeing of indigenous people dependent on SC and, finally establishing the causality between the land use change and psychological wellbeing.

2. Materials and Methods

2.1. Study Area and the Community

The eight states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura constitute the north-eastern region of India which shares 7.98% of the geographical area and nearly 25% of the country's forest cover. This region also hosts two of the world's 36 biodiversity hotspots. Of the total geographical area of the northeastern region, 64.66% is accounted by forests besides sharing 56.1% of the total tribal population of India [49,50]. More than 200 different indigenous communities (60–94% of the total population) are dependent on forest products including non-timber forest products (NTFPs) as food and medicines [51]. Usually, land is owned by the community among the shifting cultivators; however, this system is being gradually replaced by private ownership of land [52].

Shifting cultivation (slash-and-burn farming or swidden) is locally known as *jhum* in Northeast India which is surrounded by forests and other natural landscapes are a source of

livelihood (Figure 2). Generally, women carry out the bulk of agricultural labour, whereas men clear and burn the sites and they are the custodian of biodiversity and traditional food system [53,54]. When the produce from the *jhum* is insufficient during external vulnerabilities, produce from the surrounding forests is utilized [55]. Despite low yields from the *jhum* lands, it is continued because it is part of their culture, their way of life, and also because it is less demanding than conventional farming [56]. More than 40 crops, with numerous landraces grown as part of SC by farmers sustain the livelihoods and food security in the region, which constitutes the bedrock of the indigenous food system that ensures food security through culturally accepted food [57,58]. Shifting cultivation is also a landscape in its own right (Figure 1) and is inseparable from land and its associated festivals, rituals, and their sense of bonding with nature [59–62]. The study hypothesized that *jhuming* or shifting cultivation is an integral part of the socioeconomic and cultural life of the indigenous communities, and any changes in the shifting cultivation landscape will affect the economic and cultural milieu of the life and livelihoods these communities.



Figure 2. A shifting cultivation landscape in Saiha, Mizoram, showing a mosaic of cultivated fields, regenerating fallows, and forests.

2.2. Sources of Data

To assess the changes in land use in the study region (Figure 3), we consulted the 2000 and 2019 editions of the *Wastelands Atlas of India* [63]. In India, SC is often considered a wasteland in official documents; the *Wastelands Atlas of India* is the only official source that maps SC. Further, data on forest cover and plantation crops were extracted from the Forest Survey of India, the Indian Institute of Oil Palm Research, the Rubber Board of India, and the Tea Board of India. To examine subjective wellbeing based on primary data, random samples of respondents were obtained from 52 purposively chosen villages representing six states constituting India's Northeastern region (Figure 3). The intensity of SC having the highest density of *jhumia* families was another criterion for selecting one district from each state. Within the selected district, keeping in mind the size of the state, either 50 households (smaller states) or 100 households (larger states) practicing *jhum* were chosen. The final sample comprised 481 respondents from 500 households, 19 households of which were excluded because of circumstances beyond our control. Following a primary survey in 2016/17, focus group discussions (FGDs) were conducted so that the information gathered earlier could be explicated and triangulated for a more comprehensive understanding of ground realities. We conducted six such FGDs at various locations (one FGD in each

selected district) and also spoke to the relevant stakeholders (including village heads, who are the traditional leaders and custodians of local opinion and actions) to elicit their views. Each FGD involved 8 to 12 participants. *Krishi Vigyan Kendra* (Agricultural Science Centers), forest department officials, and heads or principals of state-run schools helped in identifying suitable participants for the FGDs. Six FGDs were formulated at each of the six study locations and the first author participated in each FGD. Typically, the FGDs started with members of the research team introducing themselves, and then the participants doing the same. Through a session intended to break the ice, the research team could establish a good rapport with every member of each FGD. Consent to record the discussions was obtained verbally from all the participants.

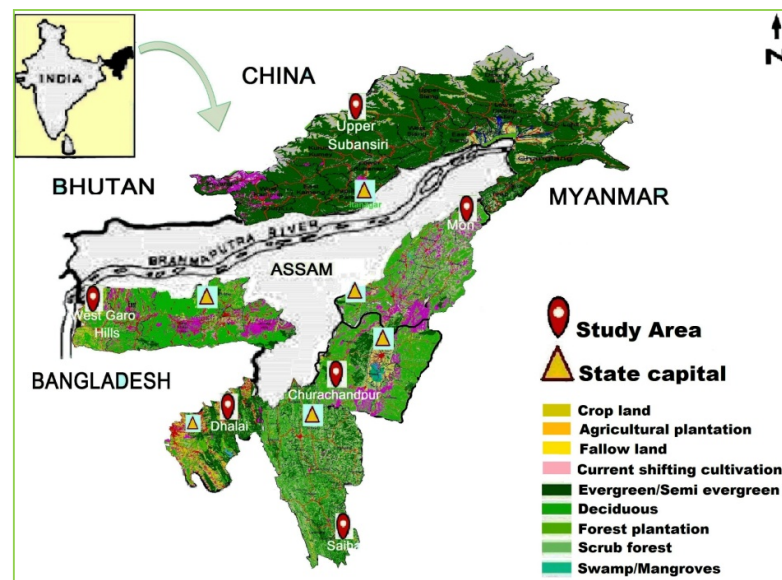


Figure 3. Map of Northeast India showing the study locations along with land use cover.

2.3. Description of Variables

No single standardized approach is available for assessing subjective wellbeing under all situations and for all purposes [64]. We chose Cantril's self-anchoring scale [65] because it is the most enduring, widely used, and reliable single-item measure [66]. A major advantage of the scale is enabling the respondents to anchor themselves based on their perspectives. The respondents were asked to imagine a stepladder with a spoke bearing numbers zero (the lowermost spoke) to 10 (the topmost spoke). It was explained to them that the highest spoke represents the best possible life for you and the bottom, the worst. The respondents were then asked two questions: 'On which spoke of the stepladder do you think you are at present?' and 'On which spoke do you think you will be in about five years from now?' We classified the respondents into three categories based on a system for classifying wellbeing into meaningful groupings [67]. The categories were as follows: thriving, struggling, and suffering; these were applied to each element, based on the rating assigned to each facet of wellbeing. 'Thriving' meant a rating of 7 or more for the present situation and of 8 or more in the future, scores that signaled a strong and consistent sense of wellbeing. 'Struggling' (ratings between 6 and 4) was defined as a moderate and inconsistent sense of wellbeing, and 'suffering' (ratings below 4), as a low and inconsistent sense of wellbeing. In other words, those respondents who viewed their current situation in a positive light and hoped to improve their lot over the next five years were categorized as 'thriving'; those who took a dim view of the present and showed little hope for the future were categorized as 'suffering'; and the rest, who appeared to be merely 'getting by', were categorized as 'struggling'.

A conceptual framework was designed for the subjective enumeration of the factors influencing human wellbeing which were most important to the respondents. The

framework comprised basic human needs, economic needs, environmental needs, and subjective happiness [68,69]. After enumerating the constituents of wellbeing related to life satisfaction as experienced by residents in SC landscapes, the groups were asked to rank those items in descending order of significance to their lives. Once the members of the group started listing these items, additional prompts were provided; for example, ‘What contributes the most to your happiness?’ Based on the observations of the six focus groups, the final list of factors that influence wellbeing was compiled and then structured to ensure that top-ranked statements (those with the most ‘likes’) were incorporated into the list. This list was then shared among members of the focus groups and also among key representatives of government agencies and communities who had expressed their willingness to offer additional responses. The completeness of the list was ascertained, based on the feedback obtained from these individuals and representatives. The wellbeing components were grouped under five categories: land use, food consumption, social cohesion, decision-making role of gender, and communication access. Land use comprised seven constituents of wellbeing; food consumption comprised five constituents; social cohesion, ten; decision making, six; and communication access, five. Thus, a total of 33 constituents were identified. Based on interactions with members of the FGDs and their perceptions of each component of wellbeing as changing for the better or for worse or not changing at all, a score was assigned to each level of change that represented the number of FGDs expressing their perception of a particular level of change. For example, under the component land use as one of the constituents of wellbeing, the indicator ‘access to education’ was rated as having changed for the better in FGDs, as having changed for the worse in FGDs, and as not having changed at all in FGDs. Each indicator under different components was similarly quantified in terms of the number of FGDs recording that the indicator had changed for the better or worse or not changed at all.

2.4. Establishing the Causality

The study primarily focused on FGDs for establishing the relations between the psychological wellbeing of jhumias (those practicing SC) and their behavioural attributes with jhum cultivation. However, for triangulating the results and for establishing the empirical association, quantitative analysis was performed—zero order correlation between all the selected variables and stepwise regression analysis (backward elimination method) with a carefully chosen set of independent variables keeping psychological wellbeing as the dependent one. The independent variables were those attributes that were anticipated to have influenced the psychological wellbeing of jhumias. The quantitative operationalization of the selected variables and their measurements are given in Table 1.

Table 1. Description of the selected variables.

Variables	Level of Measurement	Nature of Variable
Gender	Nominal (Male 1, 2 otherwise)	Indep.
Jhum Experience	Ratio (In years)	Indep.
Education	Ratio (Years of formal education)	Indep.
Access to mass media	Nominal (yes 1, 2 otherwise)	Indep.
Beneficiary of watershed development project	Nominal (yes 1, 2 otherwise)	Indep.
Migration	Ratio (In years)	Indep.
Non-Jhum Ownership	Nominal (yes 1, 2 otherwise)	Indep.
Jhum Ownership	Nominal (yes 1, 2 otherwise)	Indep.
Cropping period in Jhum	Ratio (Number of years)	Indep.
Fallow period	Ratio (Number of years)	Indep.
Psychological well being	Interval (Level of aspiration)	Depen.

The model utilized for stepwise regression analysis is depicted below (Draper & Smith, 1981) and this was done using SPSS -v25 and also matched with R programming.

$$b_{j,\text{std}} = b_j \frac{s_{x_j}}{s_y}$$

s_y and s_{x_j} denote standard deviations for the dependent variable psychological wellbeing and the corresponding j th independent variable. The percentage change in the square root of mean square error (RMSE), which will occur if the specified variables are added or deleted from the model, was estimated. This value was then used by the Min MSE method. This percentage change in RMSE was calculated using following formula:

$$\text{Percentage change} = \left[\frac{\text{RMSE}_{\text{previous}} - \text{RMSE}_{\text{current}}}{\text{RMSE}_{\text{current}}} \right] \times 100$$

3. Results

Considering the objectives, the results of the present study are presented under three subheads. Land use transition in the SCL narrates the recent changes in land use in different states comprising the study area (Section 3.1). The data collected from the cross-sectional survey is analyzed and presented under Section 3.2 which also includes level of self-reported subjective wellbeing. The final Section 3.3 highlights the changes in constituents of wellbeing and elucidates the perception of the respondents on different constituents of wellbeing. Graphics, data tables, and photographs are also employed suitably to supplement the narration.

3.1. Land Use Transition in the SCL

As mentioned in Section 3.2, land under SC is often recorded as wasteland in official documents; the *Wastelands Atlas of India* is the only official source that maps SC. Therefore, using time series data on land-use changes over last 15 years (2000–2015) from the *Atlas*, we depicted the changes (Figure 4).

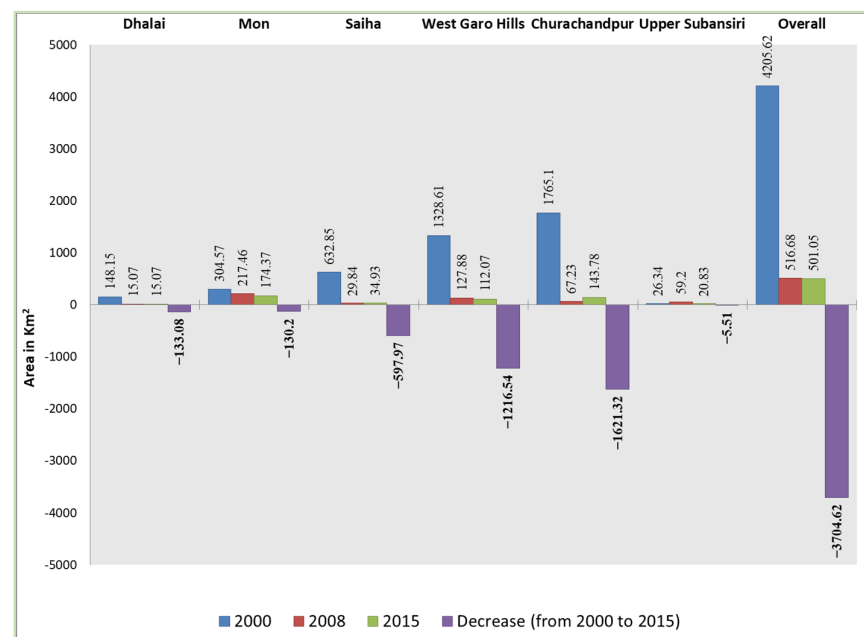


Figure 4. Transition in the area (km²) under jhumscap in six districts of India's Northeast (2000–2015).

The decline in the area under *jhumscap* (SCL) in the sampled districts of Indian Himalayas during the period 2000–2015 is shown in Figure 3. Marked changes in land use are immediately apparent. In 2000, about 4200 km² was under SC; however, within

15 years, it decreased by 3700 km² (88.08%). This pattern with about the same intensity was observed in nearly all the six districts. The maximum decline (91.8%) was observed in Churachandpur district of Manipur, followed by Saiha (94.48%) in Mizoram and West Garo Hills (91.56%) in Meghalaya. The maximum decline occurred during 2000–2008 and then it slowed down almost to a halt. This may be because of the enactment of the Forest Rights Act, 2006, of the Government of India (effective from January 2008). The Act recognizes that forest-dwelling communities have three kinds of rights, namely (1) rights to occupation and cultivation (individual rights), (2) rights for grazing, collecting fuel wood, fishing, ownership, and disposal of non-timber forest produce (community rights); and (3) rights to protect, conserve, regenerate, and manage the areas under community forest resources.

Usually, SC is considered the sole factor for forest loss/degradation and thereby it is often discouraged by the state [49]. As a result, the area under SC has drastically declined in the region (Figure 4). However, the forest restoration programmes and legislation helped to regain forest cover slightly (2.94%) between 2000 and 2015. The plantation agriculture particularly the oil palm and natural rubber has partly covered or converted the SC/fallow area in this region (Table 2 and Figure 5).

Table 2. Land cover transition in Northeast India (in Km²).

Year/Item	2000	2015	Increase (%)
Forest cover	163,799.00	168,607.00	2.94
Natural rubber	468.85	1556.20	231.92
Oil palm	0	273.11	100.00
Tea garden	3909.06	4571.33	16.94

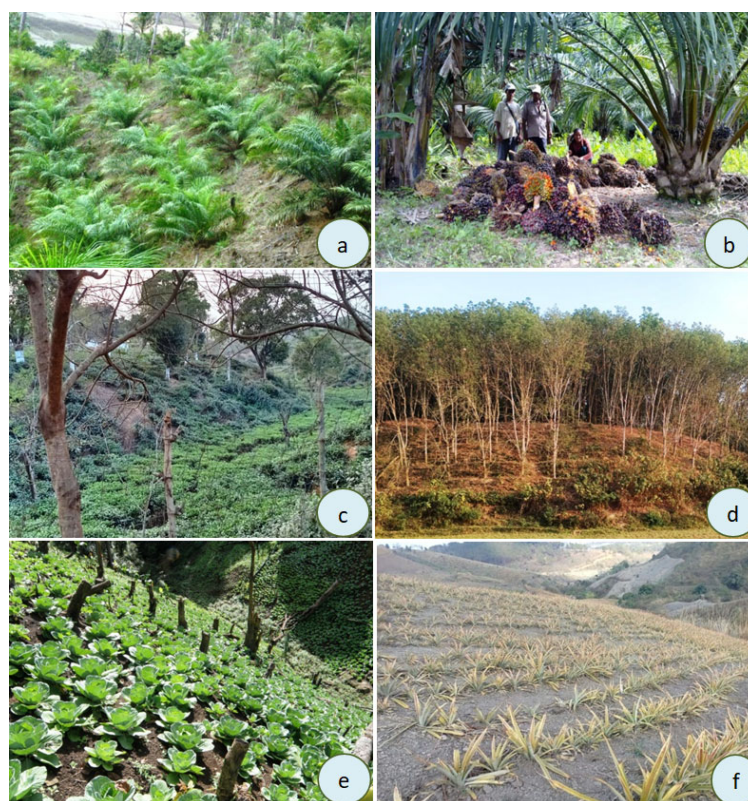


Figure 5. Oil palm plantations in Upper Subansiri and Saiha (a,b); tea plantations in West Garo Hills, Meghalaya (c); rubber plantations in Dhalai, (d); cabbage grown in Saiha, Mizoram (e); pineapple grown in West Garo Hills, Manipur (f), Northeast India.

3.2. Level of Self-Reported Subjective Wellbeing

The cross-sectional survey data of 481 respondents from across 52 villages of six states in Northeast India, were analyzed for self-reported subjective wellbeing. As mentioned above, the respondents were grouped into three mutually exclusive categories suggested by Gallup [67], namely thriving, struggling, and suffering, based on how they rated each given facet of wellbeing (Figure 6).

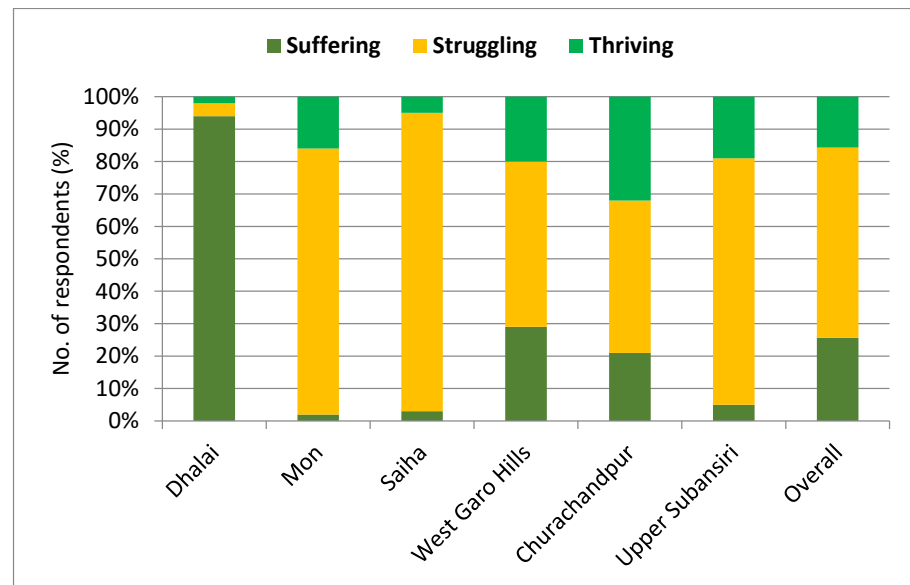


Figure 6. Level of self-reported subjective wellbeing of respondents, by district.

A majority (approximately 58%) of the respondents reported moderate or inconsistent levels of psychological wellbeing (Figure 6). At the time of the survey, they were either struggling or foresaw greater struggles in the near future. In Dhalai district in Tripura, 90% of the respondents belonged to the 'suffering' category. In West Garo Hills in Meghalaya, only about 30% in 'suffering' category, more than half in the 'struggling' category, and 20% in the 'thriving' category. In all the remaining five districts, the proportion of respondents in the struggling category exceeded that in the other two categories. About a quarter (26%) of the respondents perceived that their wellbeing was at high risk. They reported that they had inadequate access to the basic necessities of life, namely food, shelter, and clothing and rated their current life situation below 4 on a scale of 0 to 10. They believed that their lot was unlikely to be better in the next five years. Approximately 16% of the respondents expressed their level of wellbeing as strong, consistent, and progressive and assigned higher scores to both current and future levels of their wellbeing.

3.3. Changes in Constituents of Wellbeing

The agroforestry landscape is considered an integral part of the socio-cultural and economic dimensions of livelihood of the local community. Therefore, any decline in the area under SC is bound to affect the five constituents (Table 3) of wellbeing examined in the present study, namely land use, food consumption, social cohesion, the role of gender in decision making, and communication.

Table 3. Change, if any, and its direction in the constituents of wellbeing as reported by respondents.

	Constituents of Wellbeing	No. of Focus Discussion Groups		
		Positive Change	No Change	Negative Change
	Land use			
1	Nature of land ownership	-	-	3
2	Having sufficient food (local nutritious food)	2	-	4
3	Access to education	4	1	1
4	Level of income	4	-	1
5	Cultivating cash crops	3	-	-
6	Cultivating rice	1	-	1
7	Having livestock	-	-	2
	Food consumption			
1	Being adequately healthy	2	-	4
2	Food security	-	-	3
3	Indigenous food	1	-	4
4	Dietary diversity	1	-	5
5	Having a long life	-	-	2
	Social cohesion			
1	Healthful environment	2	-	3
2	Freedom of expression	3	-	1
3	Good governance	1	1	2
4	Cordial social relations among villagers (social cohesion)	1	-	1
5	Ability to practice religion	3	-	1
6	Mutual assistance and solidarity	-	-	2
7	Healthy relationships between couples	-	-	2
8	Ability to manage personal time	1	-	-
9	Congenial relationship in the family and household	-	-	2
10	Social equality	1	-	5
	Decision making: role of gender			
1	Self-planning about life	2	-	1
2	Making one's own decisions	2	-	-
3	Rejoicing and recreation	1	-	-
4	Being admired	-	1	3
5	Actively engaged in village-level participatory decision making	-	-	1
6	Income control by women	-	-	6
	Communication			
1	Access to means of communication	4	-	2
2	Rejoicing and recreation	2	-	4
3	Interpersonal communication	1	-	4
4	Personal wellbeing	4	-	2
5	Socio-cultural and emotional development	1	-	5

The changing geo-ecological perspective of SC has manifold implications for the satisfaction of the constituents of wellbeing of the indigenous people. In the case of land use, both 'access to education' and 'level of income' changed positively whereas 'having sufficient food' changed negatively, pointing to a decline in food diversity. These changes are reflected in some constituents under food consumption, namely 'dietary diversity', 'being adequately healthy', and 'indigenous foods'. Some constituents of social cohesion, namely 'freedom of expression' and 'ability to practice religion', changed positively whereas 'social equality' and 'healthful environment' changed negatively. Under decision-making, 'income control by women' was the most negatively affected constituent, followed by 'being admired'. Thus, the traditional women-dominated family system is being challenged due to changes in land use. As to communication, 'access to means of communication' and 'personal wellbeing' changed positively whereas 'socio-cultural and emotional develop-

ment', 'rejoicing and recreation', and 'interpersonal communication' changed negatively. Access to means of communication is particularly important because, for a society, social and psychological support services are as important as income-based wellbeing.

3.4. Stepwise Regression Modelling

A set of 10 independent variables that are likely to exert influence on psychological wellbeing were subjected to establish the association and causal relationship. The descriptive statistics (Table 4) indicated that respondents had about 25 years of association with *jhuming*. The related variables like the cropping period in *jhuming* were almost 2 years, and the fallow period was more than 5 years. With the increased mass media exposure (mean value 5.10) and encouraging a policy of government institutions towards settled and specialized agriculture in this fragile region, the *jhum* ownership *vis-à-vis* non-*jhum* ownership was comparable resulting into alarming migration (mean value 1.85). Albeit the psychological wellbeing of *jhumias* was found to be high (6.07) which indicates their level of contentedness with *jhuming* system.

Table 4. Descriptive statistics of the selected variables (n = 481).

Variables	Mean	Std. Deviation
Gender	1.05	0.214
<i>Jhum</i> experience	24.61	12.582
Education	5.10	5.113
Access to mass media	2.07	1.377
Beneficiary of watershed development project	1.93	0.255
Migration	1.85	0.353
Non- <i>Jhum</i> Ownership	1.43	0.495
<i>Jhum</i> Ownership	1.06	0.234
Cropping period in <i>Jhum</i>	1.6475	0.79139
Fallow period	5.68	3.429
Psychological well being	6.07	1.986

When the selected variables were subjected to zero-order correlation with psychological wellbeing, *jhuming* experiences and access to mass media exhibited significant positive association ($p < 0.01$) while non-*jhuming* experiences exhibited a negative and significant association ($p < 0.01$). Thus, it clearly establishes the importance of *jhuming* system of land management in their wellbeing status (Table 5).

Table 5. Correlation and stepwise regression model of *Jhumias*' psychological wellbeing.

Model	Correlation Coefficient	b Value	R Square	F Value	p Value
Non- <i>Jhum</i> ownership	−0.40517 **	−0.280	0.164	97.81 (at 479 and 1 df)	0.001
<i>Jhuming</i> experiences	0.34680 **	0.193	0.240	78.64 (at 478 and 2 df)	0.001
Access to mass media	0.36515 **	0.358	0.279	63.83 (at 477 and 3 df)	0.001
Beneficiary of watershed development project	0.02998	0.282	0.344	64.99 (at 476 and 4 df)	0.001
Migration	−0.15558 *	−0.142	0.370	57.99 (at 475 and 5 df)	0.001
Fallow period	0.17765 (NS)	0.126	0.385	51.48 (at 474 and 6 df)	0.001
Education	0.28485 *	0.112	0.396	46.08 (at 473 and 7 df)	0.001

* $p < 0.01$; ** $p < 0.1$; NS: Non- significant.

In stepwise regression analysis, seven variables were retained in the final model. Causation analysis established that *jhuming* experiences had a positive influence on psychological wellbeing, and on the hand, the non-*jhuming* exposure results in increased migration and thereby having a negative effect on the wellbeing of the *Jhumias*. Similarly, enhanced

educational opportunities and increased access to mass media had a positive and significant influence on the psychological wellbeing of *jhumias*.

4. Discussion

The present study documented the distinct changes in the SC landscape within the period of fifteen years (2000–2015) (Figure 4 and Table 2), mainly as a result of external interventions aimed at reducing forest loss and checking environmental degradation, the two being always assumed to be the adverse outcomes of SC. The sharp decline in the extent of SC during 2000–2008 (Figure 4) is mainly attributed to such policies and programmes aimed at replacing SC, emphasizing afforestation, raising plantation crops, and converting SC lands to settled agriculture. Such conversion of SC lands to other land uses reduced the net area available for SC and thus contributed to the reduction of fallow periods [70].

Amid such large-scale transformation, the respondents' self-reported and subjective levels of wellbeing reveal that most (nearly 85%) of those engaged in SC were either in the struggling category (nearly 60%) or in the suffering category (a little over 25%) (Figure 6). However, the differences in the level of wellbeing between the sampled districts may be attributed to situational factors that affect an individual's perception of her or his wellbeing [64] besides the socio-economic condition, level of dependence on SC, adaptive capacity, and cultural diversity among ethnic groups across the region. This preliminary study provides stronger causal evidence between the rate of decline of SC (land use change) and the self-reported subjective level of wellbeing (Table 4). Analysis of the FGDs reveals some of the drivers of wellbeing as reported by the respondents (Table 3). In the case of land use, the constituents that showed a positive change were access to education and the level of income—probably the result of growing cash crops—whereas land ownership turned out to be a negative constituent, as the ownership moved from individuals to large companies or to other more resourceful people. Sufficient food as a constituent of wellbeing also proved to be negative because of the increasing dependency on market-based foods, as did food consumption as a result of reduced diversity in diet and falling consumption of indigenous foods—which also had an adverse impact on yet another constituent, namely being adequately healthy. Indeed, the monoculture of cash crops (Figure 5a–f) is a serious threat to biodiversity and to food security [57], health, and wellbeing of the indigenous population in Northeast India [71]. Social cohesion was another category that was positively influenced by such constituents as freedom of expression and the ability to practice religion; however, the healthful environment is affected by changed cultivation practices (the traditional practices fostered togetherness), which also have a negative influence on healthy relationships between couples and congenial relationship among members of a household. In fact, having strong marital and family relationships and connections to the community may play an important role in supporting subjective wellbeing [72]. Above all, the most affected constituent of wellbeing was social equality. In the case of decision-making, women's control over their income is being eroded: in the past, their source of income was locally gathered produce; now, it is what is sold in the market, which is pocketed by men. This is a noteworthy social shift. The impact of the decline in SC and subsequent promotion of oil palm had serious implications for women's wellbeing in Mizoram because their role in settled cultivation of oil palm (Figure 5) is far more subservient than that in SC [73]. When we consider the preoccupations (*Jhuming*) of the indigenous people in Northeast India in the recent past, the most important was asserting and reclaiming where required their inalienable traditional rights to use, manage and control their ancestral land and land-based resources (flora and fauna, water body, and so on) in their own geo-ecologies; preserving their way of life; and resisting being absorbed into the mainstream and its emphasis on materialism and individualism [74]. Although the desire for material goods does play a crucial role, it is the emotional struggle to preserve group identity and its core values that form a major part of the struggle [59,75]. For the *Jhumias*, SC emerged as the source of many other benefits rather than merely a system of food production. Our analysis has clearly established that *jhuming* experience positively

impacted wellbeing on SC farmers while non-*jhuming* experience led to wellbeing that can be termed as struggling (Table 5). Thus, the concept of well-being includes not only positive feelings of happiness and satisfaction, but also feelings such as interest, commitment, trust and love [76]. Indeed, shifting cultivation is a way of life for the cultivators rather than just a farming technique [36]. Furthermore, cultivated and wild biodiversity in the SCL contributed to many traditional ethnic, culinary, and ethno-medicinal preparations; for example, *jhum* rice is the main substrate for many traditionally prepared alcoholic beverages. The by-products of *jhum*, particularly maize, the pseudostem of banana, and tuber crops are used to feed poultry and pigs. In fact, the *jhum* system gives locals access to culturally appropriate foods while also retaining their traditional eating practises, which have a significant chance of enhancing food security [58].

This empirical finding has been also reflected in the outcome of the FGDs (Table 3). Therefore, the perceptual mismatch between the local people and policy makers regarding the usage and benefits of SC land—demands close attention and reappraisal [70]. The urgent need, therefore, is for coherent policies aimed at transforming SC while reducing the negative impacts of this divergence in perceptions.

4.1. Policy Implications

The present study offers some key insights into (1) the extent of change in land use and of the decline in the area under SC in the Indian Himalayas, (2) the impact of those changes in the perception of psychological wellbeing by indigenous people of the region and, (3) dynamic changes in broad categories of the constituents of wellbeing in terms of the extent to which they contribute to the sense of wellbeing. These insights will help in devising ethical approaches to sustainable and inclusive development that values the needs of indigenous peoples. Later on, the findings will also prove useful to managers and policymakers in eliciting active participation of indigenous people in development. More specifically, in the context of Indian Himalayas, these findings would go a long way by taking advantage of the transition and ensure optimized trade-offs between safeguarding the wellbeing and livelihoods of vulnerable communities of the region and making inevitable changes in land use that may have adverse impacts on SC landscapes.

4.2. Limitations and Future Research

The panoramic view of psychological wellbeing presented here will be useful in monitoring the overall reaction of people and in forecasting the socio-psychological impact of changes in land use. However, any such assessment of psychological wellbeing is subject to somewhat random, contextual, and situational perceptions of individual respondents—perceptions that influence the responses to any questionnaire [64]. The assessment is also influenced by sources of information; future research should therefore undertake cross-cultural assessments of psychological wellbeing, which are likely to be more stable. Secondly, any analysis can only reveal associations among various factors, associations that may be causal but may also be due to some other factors.

5. Conclusions

Our study found that the shifting-cultivation landscape (SCL) of the Indian Himalayas is experiencing rapid changes in land use, mostly in favour of monoculture of plantations crops or cash crops owing to market pressure. Such changes in the SCL have manifold implications for the wellbeing of indigenous people of the region. Changes in land use have led to greater access to education and higher levels of income but, at the same time, have also led to a decline in food diversity, which means the indigenous people may not always have sufficient food. These changes clearly point to an unsustainable transition in the SCL—a multifunctional and biocultural landscape—given that a majority of the respondents reported moderate or inconsistent levels of psychological wellbeing and believed that their circumstances represented a continued struggle now and a greater struggle in the near future. The study thus emphasizes the importance of the *jhum* system of land

management to the wellbeing of indigenous people dependent on this agroforestry system for their livelihood as well as for fulfilment of their cultural needs. A more integrative conceptual approach that takes into account the perceptions of the indigenous people would help considerably in sustaining the SCL, which is highly fragmented at present, thereby aggravating the problem of managing such agricultural systems sustainably on different geographical scales. An integrated approach to landscape management may make the various subsystems within the SCL more sustainable and strengthen their multi-functionality, ultimately resulting in multiple favourable outcomes.

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