Reevaluating Shifting Cultivation in Northeast India: Balancing Traditional Practices, Sustainability, and Development

ABSTRACT

Shifting cultivation, particularly the jhum system, has been a long-standing practice in Northeast India, sustaining the livelihoods of indigenous communities. This paper examines the evolving perceptions of shifting cultivation, considering both its economic and environmental implications. While often criticized for contributing to deforestation, soil degradation, and biodiversity loss, recent research suggests that the practice can be more sustainable than traditionally assumed, especially when fallow cycles are maintained. The jhum system promotes biodiversity conservation through its use of mixed cropping and the protection of endemic species. However, challenges such as insecure land tenure and inadequate policies have hindered the adoption of alternative farming practices. This paper emphasizes the importance of integrating traditional ecological knowledge with modern agricultural techniques to enhance food security, preserve biodiversity, and improve the well-being of local communities. The study concludes that shifting cultivation, when supported by sustainable interventions and respect for indigenous practices, can be a valuable component of a comprehensive approach to land use and rural development.

Keywords: [Shifting cultivation, deforestation, traditional knowledge, biodiversity, fallow cycle } (Arial, inclined, 10 font, justified)

1. INTRODUCTION

Shifting cultivation has been practiced in the Northeastern Region of India since ancient times, as old as human settlements in the region. It is a traditional agricultural practice carried out across the hilly landscapes of the area [1]. The shifting cultivation, particularly the method of preparing Farm plot, requires clearing a patch of forest by slashing the trees and vegetative materials therein, which are then left to dry before these are set on fire to produce ash for treating the soil and preparing the farm bed for sowing.

Bos et al., 2020 [2], mentions that landscapes influenced by shifting cultivation span approximately 280 million hectares globally, with around 30-40 million individuals relying on this practice in Southeast Asia alone. Shifting cultivation is often portrayed as an economically inefficient and environmentally damaging form of agriculture. Although critics argue that the practice harms the environment by degrading the soil, water, and local biodiversity, numerous scientific and agroecological studies have shown this perception to be inaccurate [3], various scientific and agroecological studies prove otherwise. Terming this view as a 'false narrative', proponents of the practice say that shifting cultivation is perhaps more sustainable than settled agriculture and monoculture; practices that the government overtly promotes in the region [4,5,6].

The jhum system is a complex practice that interacts with both socio-economic and environmental factors. It is based on principles of common property, self-governance, shared labour, and traditional ecological knowledge. Additionally, it maintains a subsistence-based economy and a food production system that safeguards and sustains its own seed varieties and cultivation practices, which have been orally transmitted across generations for centuries. Many reports have highlighted the environmental concerns associated with shifting cultivation, including soil erosion, degradation, and loss of arable land, as well as biodiversity loss, deforestation, and carbon emissions, all of which contribute to ecological imbalances and climate change [7]. Jhum is distinguished by mixed cropping, which mimics nature regarding species diversity and is vital in the in-situ preservation of numerous varieties of edible food crops. Despite facing various

criticisms, the jhum landscapes is believed to serve as repositories for the original gene pools of biodiversity, which are conserved and maintained through indigenous food production practices and the ingenious management of fallow forests in the hills. While some modern economists and environmentalists perceive shifting cultivation as detrimental to the ecosystem, portraying it as disadvantageous and exerting negative impacts on the economy [8], the others maintain that practitioners of this practice are integral to conservation efforts [9,10]. Jhum is distinguished by mixed cropping, which mimics nature regarding species diversity and is vital in the in-situ preservation of numerous varieties of edible food crops [6]. Shifting cultivation has been practiced for generations, encompassing ancestral wisdom in food production, seed conservation, and farm management. This agricultural system has demonstrated remarkable resilience and adaptability, particularly in terms of crop selection and soil nutrient management. However, the primary concern is that the reduced fallow period is not allowing sufficient time for the land to naturally regenerate and restore its soil health.

Bawa et al.,1997 [11] further emphasized that deforestation and habitat fragmentation present more significant threats to biodiversity and wild genetic resources compared to climate change. Thus, whether we need to go for improved production or conserve the existing rich diversity of crops cultivated in shifting cultivation systems remains a dilemma that requires careful consideration [12]. Various efforts have been made till date to adapt to different strategies by various institutes such as ICAR, ICIMOD, Wildlife Works Carbon (WWC) and many other in different states of the region had met with limited success. This can be attributed to factors such as complex land tenure arrangements and inadequate infrastructure for marketing pose significant challenges. Furthermore, the introduction of modern agroforestry or the complete eradication of traditional shifting cultivation and associated local knowledge to promote monoculture cash crops has not been effectively integrated with meaningful economic improvements for the indigenous communities. This lack of a holistic approach that respects the socio-cultural context and traditional livelihood strategies has hindered the successful adoption of alternative practices in the region.

METHODOLOGY

The present paper is an attempt to analyze the practice of shifting cultivation in Northeastern region as an economic activity in the light of the changing perceptions on shifting cultivation in the region. The study is descriptive in its design and has utilized a qualitative approach. The paper mostly reviews the secondary literature hitherto available on shifting cultivation in the region and synthesizes the implications with respect to the changing perceptions during the last three decades (1985-2023). This paper argues that eradicating shifting cultivation is not a viable solution, but rather the solution lies in building upon and improving this traditional practice. The paper emphasizes that adopting alternatives such as cash crop monoculture is not an effective solution for protecting the interests of indigenous communities and the environment. It advocates for a more nuanced approach that recognizes the value of shifting cultivation and explores ways to enhance its sustainability and benefits to local populations and ecosystems.

1. Environmental Impacts of Shifting Cultivation and the Role of Fallow Cycles

The jhum cultivation system practiced by upland communities in India's northeastern region utilizes the ecological resources of forests to maintain soil health and enable food production on hillsides. However, concerns have been raised about the environmental impact of this practice. While shifting agriculture is commonly linked to low crop yields and rapid soil deterioration, emerging research suggests the traditional view of shifting cultivation as environmentally detrimental in terms of its impacts on soil is not well established [13]. A study conducted by Mukul et al.,2022 [14] found that shifting cultivation may not be as detrimental to soil quality, at least in the specific soil type and climate examined. The results indicate that geographic and site-specific factors can play a crucial role in shaping the impact of shifting cultivation on soil properties. The analysis suggests that patch size, slope, and fallow duration are important variables that influence the recovery process of soil macronutrients [15].

According to traditional knowledge jhum creates secondary vegetation that is preferred by herbivores like elephants, sambar and gaur and thus help to coexist. However, Where the jhum cycle has been reduced to 2-3 years, this may have detrimental impacts on the ecosystem and wildlife habitats. Consequently, reducing fallow periods is a concerning prospect. A long fallow period is crucial for restoring essential soil nutrients, and it may require up to 20 years to rehabilitate soil nutrient levels comparable to undisturbed forests [16, 17]. Research conducted by Saxena et al.,1984 shows that fallow cycles as short as 4–5 years in northeast India led to arrested succession, where soil seed bank became dominated by weedy shrubs over time. Frequent or short jhum cycles impede the ecosystem's ability to recover by subjecting it to repeated 'shocks' that disrupt its physical and biological processes. This Favors only those species capable of thriving in the face of such 'shocks', to the detriment of other flora and fauna.

Observation was also made by Bruun et al.2009 [18] where they found higher growth of pioneer species in fallows due to their shallow root systems and the ability to take up nutrients from the top layer. Studies found that shifting cultivation

fallows demonstrate faster recovery of vegetation in terms of basal area, regeneration, and species accumulation compared to other human-modified and abandoned lands, such as pastures, agroforestry sites, and plantations [19].

Another key concern is the deforestation linked to shifting cultivation, leading to carbon emissions and biodiversity loss. However, indigenous farmers often carefully protect their endemic species, which hold ecological value for their communities. The slash-and-burn technique is used to clear forest patches and prepare land for sowing. Research conducted by Levasseur et al.,2000 [20] in Arunachal Pradesh found that not all trees are felled during the clearing process. In fact, the preservation of species like *Artocarpus heterophyllus, Terminalia myriocarpa, and Morus levigata* while clearing vegetation, is quite common in the shifting cultivation system evolved by Mayan communities in the New World. For weeks, the felled tree branches and other vegetation are left to dry in the open. Just before the spring showers arrive in March, these materials are then purposefully set ablaze, a practice that is often criticized by scientists and experts as contributing to carbon emissions. However, villagers find fire to be the simplest way to remove unwanted vegetation from their farm plots and use the ashes as natural fertilizer to enrich the soil.

Deleterious effects of shifting cultivation such as forest and biodiversity loss, soil erosion, and similar environmental impacts are often consequences of shortened fallow cycles which are likely an offshoot of increasing human population. Therefore, rigorous and sustained investigations are paramount for enhancing our understanding of this issue, which is essential for the restoration and management of tropical forests rebounding from shifting cultivation and other human-induced disruptions. Extending the jhum cultivation cycle to 20-30 years shows promise for mitigating some negative impacts. However, it is crucial to also explore methods that can rapidly restore jhum fallows to forests and support natural soil rejuvenation. Modifying land use practices to enhance productivity is essential for sustainable agriculture. In this regard, traditional agroforestry solutions such as Homestead Agroforestry present a highly suitable approach which is variedly known as Bari in Assamese, Hembiri in Karbi, Nolaihaphai in Dimasa, Intathingri in Singpho, Shong in Jaintia/Pnar and so on. This strategy can strike a balance between agricultural productivity and environmental conservation, providing a sustainable pathway forward for communities engaged in shifting cultivation practices.

2. Underappreciation of the Significance of Traditional Customs and Practices Leads to Alienation

A key obstacle facing shifting cultivation is insecurity regarding land tenure. Often, indigenous and tribal populations lack clearly defined property rights over the lands they farm. This dearth of tenure security can precipitate conflicts, displacements, and impede investments in sustainable land management approaches [21]. The land ownership and tenure system of different tribes of the north-east is highly complicated and diverse. It ranges from private ownership to community ownership [22]. Among the Angamis and Chakhesangs of Nagaland, land ownership and inheritance rights are held individually. In the Naga community, land ownership is divided into distinct categories: family land held by members of a kinship group, privately owned individual plots, and communal clan and village lands managed by the village council of elders or the chief. In contrast, the Ang system among the Semas and Lothas vests land assets in the chieftain. Matrilineal societies like the Khasis, Jaintias, and Garos of Meghalaya pass ownership and inheritance to the youngest daughter of the Syiem, Nokma, or Doloi, but management and transfer decisions are made by their related advisers [22].

In Arunachal Pradesh, with no land-use policy and no clear identity of land ownership [23], suggesting any alternatives would just remain academic. The ability to acquire land depends on one's social standing. As a result, only a small number of individuals with extensive land holdings can adopt alternatives to shifting cultivation while maintaining their traditional practices. However, a person with limited land may need to take a risk in this situation, and ultimately, the alternatives may not be well-suited [12].
In Meghalaya, the prevailing land tenure system results in only 1145.19 sq km (5% of total forest areas) of forest areas being directly under the control of the State Forest Department, which includes Reserved Forests, Protected Forests, National Parks, Wildlife Sanctuaries, and Parks and Gardens. The remainder of the forest areas belong to communities, clans, private individuals, and District Councils [24]. And yet, the vital importance and role of these local communities in forest management and governance are consistently undervalued. To transition from shifting cultivation, it is crucial that the shifting cultivators, or Jhumias, are provided with land they can cultivate and generate profits from on a long-term basis [25].

Consequently, the forest department has failed to establish genuine partnerships with local communities, hindering effective forest stewardship. Various reports indicate that central planning has seldom recognized and respected the significance of traditional customs and practices that are deeply rooted in local cultures and often sustainable. These longstanding traditional practices have provided livelihoods for indigenous populations, yet policymakers have frequently overlooked their value and importance. On the other hand, increasing development in the northeastern region has weakened community control and led to privatization, the resulting transformation in land use patterns has compelled villagers facing financial pressures, such as for children's education and medical needs, to relinquish their land in

exchange for cash. However, investing agencies, including the government, should carefully consider the long-term social and environmental implications before introducing exotic cash crops.

3. Biodiversity and Ecosystem Services in Shifting Cultivation Landscapes

Research by Borah et al.,2022 [26] has uncovered the remarkable biodiversity present within shifting cultivation systems in Northeast India, a well-known biodiversity hotspot. Their findings indicate that active farmland and regenerating fallows support greater species richness than even old-growth forests in the region. While mature forests harbor a unique bird community, including vulnerable and endangered species, the avian communities of regenerating fallows increasingly resemble those of the undisturbed forests as succession progresses. Farmland and regenerating fallows had bird species richness similar to old-growth forests, consistent with research on multi-strata agroforestry systems in India [27] and elsewhere [28]. According to Norgrove et al.,2016 [29] management decisions by local communities can influence the rate of fallow recovery in shifting cultivation, that in turn can lead to varying degrees of biodiversity recovery across sites. Shifting cultivation landscapes in Northeast India hold significant potential for co-benefits. This can be realized by safeguarding old-growth forests from conversion to farmland, permanently abandoning mature secondary forests currently under shifting cultivation, and boosting carbon storage through natural forest regeneration within the shifting cultivation system [28,30]. Shifting cultivation can be a sustainable practice that supports biodiversity when large forest tracts are preserved, few trees are retained during farming, and fallow periods are lengthy [31].

Another threat is posed by large-scale plantations of commercial and perennial crops including rubber and oil palm in lands where shifting cultivation was prevalent [32,33]. The area under plantation crops grew significantly, and betel nut and citrus cultivation doubled and rubber plantations, which were previously absent, had spread across more than 70 km^2 by 2015 [34,35]. These rapid, large-scale changes in land use have strongly contributed to declines in agrobiodiversity and the ecosystem services that support the region, with both long-term and short-term consequences for food security [4]. The conversion of fallow forest lands into commercial plantations by tribal communities poses a concerning risk of inadvertently promoting monoculture, which could come at the expense of biodiversity and ecological well-being. This shift in land use, if left unaddressed, could have detrimental consequences for the delicate balance of the region's diverse and fragile ecosystems. Yet shifting cultivation is regarded as one of the major drivers of deforestation and forest degradation in this region and hence is discouraged in local land-use policies [36,14].

Numerous wild plants, with medicinal and nutritional value as well as cultivated crop varieties, thriving in shifting production system. A study conducted by Pandey et al.,2022 [37] in the Garo Hills region found that the food system biodiversity within the jhum landscape is strongly associated with dietary diversity among the Garo community. Nongrum et al. 2021 [38] observed that Garo women have higher levels of dietary diversity. They play a pivotal role in preserving the rich biodiversity by conserving the seeds of traditional crops [27]. However, the extensive changes in land use within the jhum landscape of Garo Hills, Meghalaya, have shifted the primary focus of farming to cash crops [34,35]. This monoculture-based approach has transformed food consumption patterns, ushering in a new food system that leaves both farmers and consumers vulnerable to market fluctuations [4].

Therefore, bolstering local food systems is a crucial priority to minimize external dependencies and vulnerabilities. This can be achieved by championing traditional, nutrient-dense crop varieties that are also resilient to climate-related stresses. The prioritization of monoculture crops for short-term financial gains poses a grave threat to the food security, nutritional well-being, and livelihood stability of low-income households who rely on the resilient and climate-adaptive practices of jhum cultivation. The introduction of hybrid and genetically modified high-yielding commercial crops has led to the neglect of indigenous crop varieties, with many traditional cultivars disappearing from the landscape. These native crops possess inherent advantages, such as resilience to climate change and resistance to pests, in contrast to the high-yielding varieties that require chemical inputs and cannot withstand environmental stresses. From a socioeconomic standpoint, the preservation and conservation of these traditional crop varieties is paramount, as they enable self-sufficient farming without dependence on external inputs. Recognizing the importance of indigenous agriculture, the Government of India has implemented incentives and awards, such as the Plant Genome Saviour Award, to encourage local farmers to cultivate and conserve their native crop diversity. Consequently, policies that support and enhance the viability of jhum cultivation can address the food security needs of indigenous communities while preserving their traditional ecological knowledge and practices.

4. The Legacy and Struggles of Shifting Cultivation in India’s Agricultural Policies

Shifting cultivation, which is more akin to agricultural practices, remains under the purview of the Ministry of Forest and Environment due to its colonial-era legacy, with limited involvement from the Ministry of Agriculture. India's agricultural policies and initiatives have largely overlooked and failed to support shifting cultivation practices. According to Darlong

2019 [39] these traditional farming methods are often sidelined and not regarded as integral components of mainstream agriculture. This has led to the perception that shifting cultivation takes place on forested lands. British colonial forest policies in India sought to assert state dominance over the interests of local communities, particularly those who safeguarded and managed forests based on their traditional practices and shifting cultivators were consistently targeted in this process [39]. Colonial rulers regarded it as a detrimental land-use practice, associating it with forest degradation and diminished revenue. This outdated mindset has persisted, shaping policies that continue to criticize shifting cultivation. Such perceptions have led to the policies that altogether ruled out traditional agriculture through legal enforcements (e.g., establishment of national parks) or provided economic incentives to people for adoption of modern agro-technologies [40].

A five-country study initiated by International Center for Integrated Mountain Development (ICIMOD), A mountain research and development think tank based in Kathmandu, Nepal, observed that 'indigenous farmers have much to teach the world about the efficient use of their landscape for combined agriculture and forestry'. Notably, the traditional practices maintain robust crop yields, prevent soil degradation, and foster biodiversity conservation - lessons that the world would be wise to heed [5]. This study made the government of India to pussyfoot and come up with a new policy document, released by NITI Aayog in 2018 titled, "Shifting Cultivation: Towards a Transformational Approach." However, according to authors of NITI Aayog Report on Jhum, Special Issue, 2023, five years have passed by since the document was released and there seems to be no action.

Jhum cultivation persists largely due to the absence of feasible alternative technologies. Several reports indicate that the farming system models developed by the Indian Council of Agricultural Research (ICAR) regional center were ill-suited to the region's diverse terrain and altitudinal conditions. A key factor is that the hillocks are generally not owned by a single individual, but rather shared among multiple families. The reports also assess alternative land use interventions suggested by the Indian Council of Agricultural Research to replace shifting cultivation [22]. However, simply replacing jhum cultivation is unlikely to succeed, and a more prudent approach would be to build upon and enhance this existing practice. However, externally supported initiatives in Northeast India, such as those financed by the India-Canada Environment Facility and the International Fund for Agricultural Development, seek to enhance shifting cultivation areas and livelihoods. The North Eastern Region Community Resource Management Project for Upland Areas (NERCORMP) project focus on adapting traditional jhum cultivation, encouraging more profitable crops, and converting jhum lands into community-conserved areas for sustainable harvesting of non-timber forest products. Another initiative is the Nagaland Environmental Protection and Economic Development Project (NEPED) project in Nagaland, which was launched under the Indo-Canadian Environmental Facility Program. Initially targeting around 1200 villages, the project has now streamlined its efforts to a more manageable scale. The aim is to link these activities with marketing opportunities and foster small-scale entrepreneurship leveraging the local natural resource base and ecological conditions. This process has embarked on addressing the economic and environmental challenges associated with jhum cultivation.

In the current market-driven landscape, these traditional practices require complementary modern inputs to fortify and maximize their productivity. Such interventions can be highly effective in mitigating regional economic disparities and improving the livelihoods of marginalized upland farmers. It is imperative to leverage traditional crop resources and deploy appropriate scientific solutions to drive advancements in agriculture. Not necessarily all the traditional ecological knowledge may be good, and therefore, we need to validate the traditional ecological knowledge through empirical analysis, which the scientific community is accustomed to, and then integrate the validated knowledge into formal academic and policy frameworks. This approach can help ensure that traditional practices are complemented with modern scientific inputs to enhance their effectiveness and contribute to more sustainable and equitable agricultural development.

Conclusion

Despite the global changes intruding into the socio-economic sphere of the tribal communities across Northeastern region of India, shifting cultivation continues to play an important role in providing livelihoods and food security to the rural tribal households. It seems that shifting cultivation is closely tied to the cultural identity of the tribal people. Therefore, its importance lies beyond mere economic concerns. Though with government interventions and under innovative shifting cultivation, the farmers in the region have switched to newer methods of cultivation, shifting cultivation continues parallel to sedentary cultivation accommodating at the same time the value system and needs of the tribal society.

The contribution of jhum to loss of forest capital may not be as severe as that of other factors such as logging or conversion of natural forests to plantations [40]. The study by Geist et al. in 2002 [41] suggests that complex interactions between multiple factors, rather than simplistic single-factor explanations, drive deforestation. The analysis indicates that public and individual choices at the fundamental level are largely influenced by shifting economic opportunities and policies at national and global scales, mediated by local institutional factors, rather than just being attributed to shifting cultivators and population growth. At the proximate level, regionally distinct agricultural expansion, wood extraction, dam building and massive infrastructure development contribute to deforestation whose devastating impacts are often ignored.

While the negative impacts of shifting cultivation cannot be ignored, it is important to consider the opposing perspective. Following a shifting cultivation cycle, the secondary growth forests can recover up to 80% of their tree species diversity [42] and more than 50% of their aboveground biomass [43] within a relatively short timeframe of approximately 20-30 years. This demonstrates the resilience of these ecosystems and their ability to regenerate. Furthermore, the practice of shifting cultivation is deeply rooted in the local traditions and socio-cultural values of the indigenous populations, providing essential livelihoods. Mounting evidence from research across the tropical and sub-tropical forest regions of Asia, central Africa, and South America - where shifting agriculture is a prevalent practice - demonstrates that indigenous farming systems effectively maintain high levels of biodiversity. These systems not only ensure food and nutritional security but also provide vital livelihoods for populations living in tropical forest areas.

Land-use conversions of forests for timber logging, monoculture cash crops, and infrastructure projects like hydroelectric dams typically benefit stakeholders who do not reside in the local landscape, unlike subsistence-based shifting cultivation [45]. Alternatives often proposed, such as intensive sedentary farming, monocultures, or agroforestry, may potentially have long-term harmful impacts on both farmers and forests.

Considering the intricate nuances and intricacies of the diverse local cultures and cultural practices, any interventions or initiatives must be carefully designed to align with the traditional frameworks to avoid alienation of the local communities and instead enhance their acceptance and ownership of such efforts. The traditional practices are deeply rooted in the socio-cultural fabric of the region and carry significant meaning and significance for the indigenous populations. Therefore, maintaining fidelity to these time-honored traditions is crucial to ensure the long-term sustainability and effectiveness of any proposed changes or alternative approaches. By viewing land use practices as dynamic, interconnected components of cultural and village landscapes, rather than as isolated and unchanging systems, we can gain deeper insights and address knowledge gaps. Introducing formal knowledge into community systems is a valuable endeavor, but it is crucial to first assess the community's receptiveness. For instance, if the community believes in burning practices for soil fertility, it is essential to educate them on alternative, more sustainable methods of maintaining soil fertility without the need for burning. The most effective approach is to facilitate a thought process within the community, rather than simply imposing knowledge from the outside.

The proposed approach should be to extend the jhum cultivation cycle to 20-30 years, while simultaneously reducing the overall jhum area through more sustainable land use choices. These alternative solutions should build upon traditional practices and indigenous knowledge, such as homestead agroforestry, rather than promoting market-driven monocultures like oil palm or exotic timber plantations, which can trap farmers in unfavorable situations. The goal should not be to eliminate jhum cultivation, but to enhance it as a viable and environmentally conscious livelihood option for the local communities.

The traditional mountain farmers prioritize local production-driven food self-sufficiency, low-input organic traditional agro-ecosystems for food security, and environmentally friendly approaches to land-use practices like improved management of jhum fallows and diversification of economic avenues to cope with environmental uncertainties and mitigate risks. Therefore, there is an urgent need to redevelop the largely fragmented landscapes of the region in a way that addresses their concerns for sustainable livelihoods, as neglecting these could have serious implications for human security in the region.

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