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# Indigenous Tribal Knowledge of the Karbi People and its Role in Sustainable Farming Practices

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**ABSTRACT**

Indigenous tribal knowledge (ITK) refers the traditional knowledge, myth and practices built by indigenous people experiencing with local environments and ecosystems. The "Karbi" are the indigenous tribal group of Assam mainly living in the Karbi Plateau region. Typically, they use their traditional knowledge for agricultural practices. By operating Farming practices such as jhum (shifting cultivation), the use of local seeds, agroforestry, and organic soil care etc. Karbi community maintain food security, protect biodiversity, and support their livelihoods. The study adopts basically qualitative methods and reviews of existing literature, reports, and case studies to explore the ecological and social importance of these practices. The analysis reveals the fact that while indigenous farming is adaptive and efficient, it has now faced a lot of obstacles from different grounds. The paper makes an attempt to gives idea regarding the mixed strategy by combining indigenous knowledge with modern sustainable farming, through community involvement and supportive policies to address these issues. Supporting indigenous knowledge is key to promoting sustainable agriculture and rural development in tribal areas.

## 1. Introduction

Indigenous Tribal Knowledge (ITK) has helped farming communities thrive for centuries by using local, ecologically balanced methods. As climate change, biodiversity loss, and unsustainable chemical farming become bigger concerns, ITK is now seen as a promising way to support agroecological change. In India, tribal communities, especially in the hilly, rainy areas of Northeast India, still use Indigenous farming methods such as shifting cultivation (jhum), agroforestry, mixed cropping, and the management of native seeds. The Karbi tribe in Assam's Karbi Anglong district is one example where these traditions are still live. However, they face growing challenges from new policies, market changes, and shorter fallow periods.

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Many studies examine individual Indigenous practices, but few bring together how Karbi ITK as a whole supports the three main pillars of sustainable agriculture, ecological, economic, and social and how it is coping with today's challenges. The paper addresses that gap by reviewing the literature up to 2022. It examines Karbi Indigenous farming as a connected social and ecological system, assesses its sustainability outcomes, and suggests ways to integrate traditional and modern methods through participation.

## 2. Literature Review

This section summarises key literature on indigenous agricultural knowledge and its role in sustainability, with emphasis on northeast India and Karbi Anglong.

### 2.1 Global Perspectives on Indigenous Knowledge and Sustainable Agriculture

Indigenous knowledge systems are now seen as essential for building sustainable and climate-resilient agriculture. Around the world, researchers point out that Indigenous and Local Knowledge (ILK) helps conserve biodiversity, restore ecosystems, and support climate adaptation (IPBES, 2023). The Intergovernmental Panel on Climate Change (2023) also advocates various practices like crop diversification, agroforestry, rotational farming, and ecological forecasting for making agriculture more resilient to changing global climate.

Current discussions around global sustainability are progressively highlighting connections between traditional Indigenous farming practices, regenerative agriculture, carbon sequestration, and the wider transition toward agroecological approaches (FAO, 2024). The Food and Agriculture Organization (2024) focuses the need to blend traditional knowledge with modern scientific innovations to attain the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 13 (Climate Action). Researchers also suggest that Indigenous systems often outperform industrial monocultures in maintaining soil health, supporting diverse landscapes, and sustaining agrobiodiversity. (Steffan-Dewenter & Kessler, 2025).

Thus, contemporary research views indigenous knowledge not as "primitive," but as a dynamic, location-specific system of knowledge grounded in generations of ecological observation and adaptation.

### 2.2 Indigenous Agricultural Knowledge in India

India, homeland of one of the world's largest indigenous populations holds a rich diversity of traditional farming systems specially in tribal and forested regions. National-level studies reveal that practices such as mixed cropping, traditional seed preservation, organic nutrient recycling, and community-based land management play a crucial role in promoting sustainable agriculture with minimal reliance on external inputs. (Mishra *et al.*, 2025).

Recent studies (2023–2025) highlights transitions of agroecology in tribal areas, especially in northeastern hill ecosystems. Traditional farming practices are increasingly being scanned through sustainability science frameworks, linking them to resilience theory, socio-ecological systems, and food sovereignty debates.

(Mallick & Singh, 2024). While planning policies for nationwide it is now considered indigenous farming as compatible with India's climate adaptation and natural farming missions.

However, study also reveals about institutional disadvantage of indigenous systems due to modern policies and marketing stress (Dhivya *et al.*, 2024). This opens another major research debate regarding the conflicts between traditional practices and state-led agricultural reforms.

### 2.3 Shifting Cultivation (Jhum) and Sustainability Debates

The practice of shifting cultivation, popularly known as jhum in Northeast India, has long been controversial in the discussion of sustainability. Previously documented mainly negative impacts of jhum; however, contemporary research presents a new outlook regarding the practice of jhuming.

Present studies reveal that if shifting cultivation is practised with adequate fallow periods (10–20 years), then it can support soil nutrient regeneration, biodiversity conservation, and creation of landscape mosaics that enhance ecological resilience. (Nunisa *et al.*, 2023). Rotational agroforestry and traditional land-use systems is also recognised by the Intergovernmental Panel on Climate Change (2023) as an important climate adaptation strategy.

The recent studies at regional level (2023–2025) bring into light that ecological degradation in jhum systems is mainly due to shortened fallow cycles, market integration, and land-use pressure, not merely the inherent flaws in the system itself (Bhardwaj, 2024). Thus, the recent studies increasingly support adaptive integration rather than complete replacement of shifting cultivation.

### 2.4 Karbi Anglong–Specific Studies and Integration of Indigenous Knowledge with Modern Sustainability Approaches

The Karbi tribe preserve the rich legacy of ecological knowledge, particularly in forest biodiversity, traditional crop systems, and resource governance which has been transmitted across generation. Research indicates that the Karbi people conserve a wide variety of wild edible plants, practice diversified cropping in jhum landscapes, and maintain sacred forest groves that serve as biodiversity sanctuaries, thereby displaying the lasting effectiveness of traditional land-use and resource management systems (Bordoloi *et al.*, 2025). Contemporary research illustrates that blending indigenous systems of resource management with participatory frameworks can significantly improve ecological restoration outcomes and contribute to long-term livelihood security. (Mallick & Singh, 2024). Parallel research also focuses the need to align indigenous knowledge with scientific approaches by establishing community seed banks, co-developing agroforestry systems, and incorporating local ecological indicators into extension services to achieve sustainable agriculture and climate adaptation (Mishra *et al.*,2025). Such integrated models boost adaptive capacity while addressing contemporary environmental challenges.

### 2.5 Research Gaps

A significant research gap is visible regarding indigenous farming systems in Northeast India in recent years. There is still insufficient long-term data to compare soil fertility, biodiversity, and productivity between long-fallow jhum systems and settled agriculture. We also lack enough evidence on carbon storage and climate resilience in indigenous agroforestry systems. The relationship between formal agricultural policies and the protection of customary land rights warrants further study. There is little documentation of the decline in traditional knowledge transfer among tribal youth, and few practical ways to expand indigenous agroecology without harming local social and cultural systems. To address these issues, researchers should use interdisciplinary, participatory, and field-based methods.

## 3. Methodology

### 3.1 Research Design

The study employs a descriptive-analytical research design to explore indigenous tribal knowledge and its application to sustainable farming among the Karbi tribe in the Karbi Anglong district of Assam. Because the research is exploratory and there is limited primary quantitative data, the study primarily uses qualitative methods and analyses secondary data.

### 3.2 Study Area

Karbi Anglong district is in central Assam and is one of the state's largest districts by area. It has rolling hills, forests, and mostly rural communities. The climate is humid subtropical, with ample rainfall and moderate temperatures, which support a variety of farming activities. The Karbi tribe is the largest group living in the district, alongside other tribal and non-tribal communities.

Agriculture is still the main source of income for the Karbi people, and jhum, or shifting cultivation, is their traditional farming method, especially in the hills. Besides jhum, the Karbi community also practices agroforestry, wet-rice farming in the valleys, and relies on forest-based activities for subsistence. This area was chosen for the study because indigenous farming practices are still important here, the region is ecologically sensitive, and there is existing research on Karbi farming systems. These factors make it a good place to study how indigenous knowledge supports sustainable agriculture.

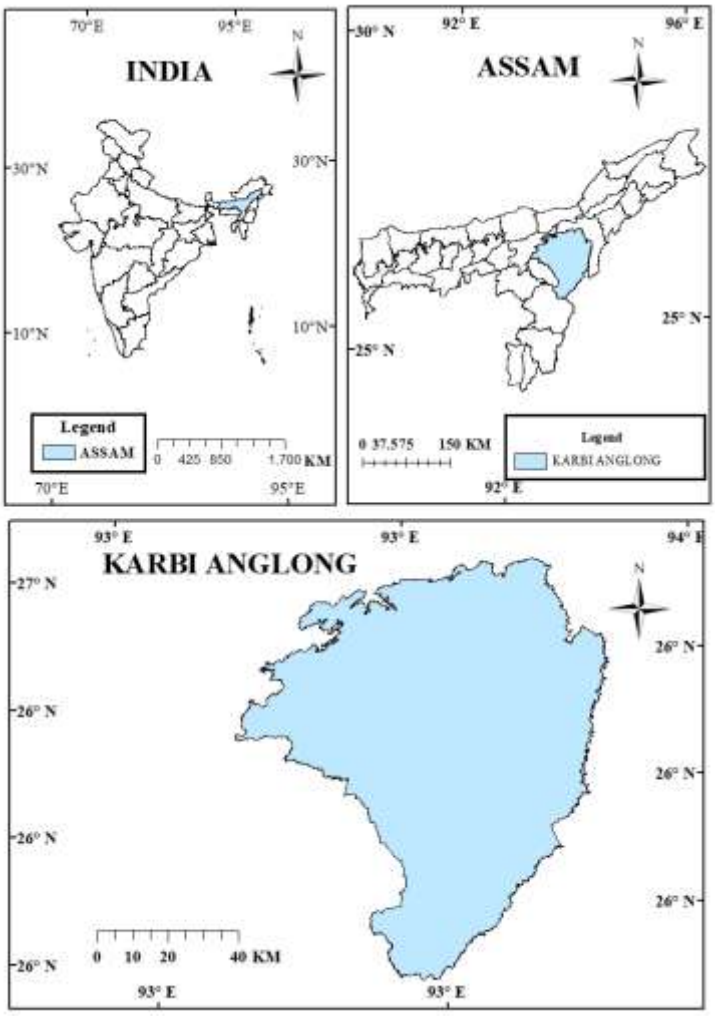



**Figure 1:** Map of the Study Area

### 3.3 Data Collection

A systematic approach was used to identify and select relevant sources.

**Table 1:** Summary of the Research Design

| Criterion | Description |
|---|---|
| Databases | Google Scholar, Scopus, Web of Science, Shodhganga |
| Keywords | "Indigenous tribal knowledge, "Karbi tribe, "jhum cultivation, "sustainable farming, "Karbi Anglong, "shifting cultivation, Northeast India" |
| Time frame | 2000–2022 (foundational literature), with selective inclusion of 2023–2025 studies for contemporary perspectives |
| Inclusion criteria | Peer-reviewed journal articles, government reports, doctoral theses, and case studies focusing on Karbi or Northeast Indian indigenous farming systems |
| Exclusion criteria | Non-English sources, opinion pieces without empirical data, studies focused solely on non-agricultural ITK, and duplicate publications. |

*Source: Compiled by the Author*

**Table 2:** Thematic Framework Linking Codes to Sustainability Dimensions

| Functional Domain | Initial Codes | Sustainability Dimension |
|---|---|---|
| Land-use systems | jhum, fallow cycles, forest clearing, agroforestry | Ecological |
| Crop diversity | Mixed cropping seed selection, intercropping, and local varieties | Ecological + Economic |
| Soil & nutrient management | ash application, organic recycling, fallow regeneration, leaf litter | Ecological |
| Pest management | botanical extracts, ash, manual weeding, crop rotation | Ecological + Social |
| Livelihood strategies | forest produce, labour sharing, subsistence crops, market surplus | Economic + Social |
| Knowledge transmission | intergenerational learning, rituals, customary institutions | Social |

*Source: Compiled by the Author*

### 3.4. Limitations of the Study

There are some drawbacks to this research. Firstly, as this study is mainly based on secondary data it has high chance to miss the recent changes in the field or differences within communities. Secondly, it faces problems to measure environmental indicators in detail without primary field surveys. Thirdly, this study is only restricted to the Karbi tribe; so, the findings may not apply to other tribes or regions. Moreover, this study faces academic contradictory regarding the interpretation of indigenous knowledge.

## 4. Results and Discussion

This research draws its conclusions from comprehensive analysis of various secondary data source related to the traditional farming practices and indigenous knowledge of the Karbi community in Karbi Anglong, Assam. This study sees mainly the traditional farming methods, their ecological and social roles, and includes a detailed case study of jhum (shifting) cultivation. It also reviews these methods within the wider context of sustainable agriculture and takes into consideration how they align with current environmental and development challenges.

### 4.1. Indigenous Practices and Their Sustainability Functions

The Karbi traditional farming system encompasses six interconnected practices that collectively support sustainable resource management. Table 2 summarizes these practices along with their respective functions and sustainability benefits.

**Table 3:** Indigenous Practices of the Karbi Tribe and Their Sustainability Functions

| Practice | Description | Key Functions | Primary Sustainability Dimension |
|---|---|---|---|
| Jhum (shifting) cultivation | Forest clearing, burning, mixed cropping (1–2 years), long fallow (10–20 years traditionally) | Nutrient cycling, weed/pest control, risk reduction, habitat heterogeneity | Ecological |
| Indigenous seed selection & conservation | Selection from healthy plants; storage using bamboo containers, ash treatment | Genetic diversity, climate adaptability, and seed independence | Ecological + Economic |
| Mixed cropping | Simultaneous cultivation of cereals, millets, pulses, vegetables, and tubers | Nutrient efficiency, pest suppression, food diversity, risk spreading | All three |
| Agroforestry | Fruit trees, fuelwood, bamboo, and medicinal plants around homesteads and fallows | Biodiversity, carbon sequestration, and supplemental income | Ecological + Economic |
| Organic soil management | Fallow cycles, leaf litter, natural composting; no chemical fertilisers | Soil organic matter, erosion prevention, and long-term productivity | Ecological |
| Traditional pest management | Botanical extracts, ash, manual weeding, crop rotation | Reduced chemical contamination, cost-effective, and environmentally safe | Ecological + Social |

*Source: Compiled by the Author*

### 4.2. Ecological Outcomes – With Critical Engagement

#### 4.2.1. Soil Health and Fertility

Current research reveals that if the jhuming cycle follows a long fallow period of 10 to 20 years, it will help recovery of soils on their own. The production of ash after burning plants and vegetation releases nutrients such as phosphorus and potassium for a short time. The growth of new vegetation during the fallow phase contributes organic material to the soil, thereby enhancing soil fertility and supporting microbial communities.

Although it is commonly believed that the degradation observed in jhum is caused by the system itself; but it is not the complete picture. Because, the external factors such as population growth and policy changes are also responsible for it. Some scholars argue that even traditional long-fallow jhum cultivation gradually reduces soil nutrients over centuries. However, recent palaeoecological studies from Northeast India clearly show that forest biomass and soil quality can recover itself within 15 to 20 years of fallow, which supports the idea that jhum is adaptively resilient to this regional ecosystem.

### 4.2.2. Biodiversity Conservation

Indigenous farming landscapes contribute towards maintaining high biodiversity by using mixed cropping and agroforestry, and by allowing land to recover during fallow periods. In jhum landscapes, different stages like newly cleared, cultivated, and fallow areas support varied habitats for numerous plant and animal species.

Steffan-Dewenter and Kessler (2025) found that jhum landscapes with mixed habitats support rich biodiversity than monoculture practices. Still, while old-growth forests are often recognized for supporting a richer assemblage of unique species than jhum fallows, comparisons are more meaningful when jhum systems are evaluated against alternative agricultural landscapes, such as tea estates and permanent monocultures. In such contexts, jhum cultivation typically maintains greater biodiversity and ecological complexity (Steffan-Dewenter & Kessler, 2025).

### 4.2.3 Climate Resilience

Crop diversification and the use of locally adapted plant varieties is may be a useful technique to make community resilience stronger in response to changing rainfall patterns and extreme weather conditions. Besides, indigenous farmers draw upon ecological indicators, including plant phenology and bird behaviour to make informed decisions regarding agricultural activities and resource management.

## 4.3 Socioeconomic Outcomes – With Critical Engagement

### 4.3.1 Livelihood and Food Security

Indigenous farming helps communities to meet their basic needs thereby less rely on buying food from outsides. Growing a variety of crops provides a rich diet contains grains, beans, vegetables, and wild foods. Gathering and collecting forest product also help earn extra income, especially when farming is less productive.

Although indigenous farming is ideal for the environment sustainability, it usually produces less for sale than commercial farming. Mallick and Singh (2024) in their study highlighted that tribal home-gardens in protected areas earn two to three times as much cash per unit area as jhum farming. This recommended that adding more variety to traditional practices, rather than replacing them, is most effective. However, limited access to infrastructure and capital makes it hard for indigenous farmers to earn more. (Mishra *et al.*, 2024).

### 4.3.2 Cultural Continuity and Knowledge Transmission

Farming is an important part of Karbi culture, traditions, and community life. By taking part in farming, younger generations learn from their elders and keep traditional knowledge alive. A serious problem is that less traditional knowledge is being passed down. In Northeast India, only about 35 to 40 %of tribal youth can name more than five traditional seed types, whereas over 80% of their grandparents could. This loss of knowledge is not well documented for the Karbi, but it is a pressing issue

### 4.4 Case Study: Jhum Cultivation – Strengths, Challenges, and Contradictions

#### 4.4.1 Traditional Cycle

The traditional jhum cycle begins with the community collectively choosing a forest area. They cut down the plants between February and March, then burn the area under controlled conditions from March to April. Under this traditional practice, farmers cultivate a diverse range of crops for one to two years during the April–December growing season. The land is subsequently left fallow for a period of 10 to 20 years to facilitate ecological recovery and the restoration of soil nutrients. Over centuries, this rotational system has contributed to the long-term sustainability and resilience of the local environment.

#### 4.4.2 Contemporary Transition

Over the past few decades, farmers in some areas have had to cut short the time they let their land recover from what was once a much longer rest period down to just three to five years driven by growing populations and changing rules around forest access. The land simply isn't getting the break it needs. Soils are losing their richness, aggressive weeds like Mikania micrantha and Eupatorium are creeping in and taking over, hillsides are washing away, and in some villages, harvests have dropped by nearly half.

Government pushes to settle farmers into fixed crops like tea and rubber have largely missed the mark not because the idea is wrong, but because they tend to ignore the customary land rights communities have held for generations and fail to understand why jhum farming exists in the first place. Bhardwaj, R. (2024) investigates cases in which migrating people away from jhum landscapes without proper alternative livelihood led to increased hunger and forced migration. (Bhardwaj, 2024).

#### 4.4.3 Adaptive Innovations

Contrary to the common perception that traditional practices are static, Karbi farmers exhibit a remarkable capacity for adaptation and innovation.

i. Integration of perennial fruit trees (mango, jackfruit, citrus) within jhum plots
ii. Partial conversion to home-garden agroforestry near settlements
iii. Terrace construction on gentler slopes
iv. Retention of select timber trees during clearing

These innovations challenge the "primitive vs. modern" binary and indicate the dynamic nature of indigenous knowledge.

### 4.5 Integration with Sustainable Farming – A Mix Strategy

The answer of the debates probably isn't to throw out jhum farming entirely or to treat it as something untouchable and perfect; the real opportunity lies somewhere in between. Looking at what the research tells us, three practical ways of blending the old with the new stand out as genuinely promising for Karbi Anglong.

**Table 4:** Integration Models for ITK and Modern Sustainable Agriculture

| Model | Approach | Evidence from the Karbi Context | Feasibility |
|---|---|---|---|
| Participatory agroforestry | Farmer-led trials blending ITK species with marketable trees and crops | Bhardwaj, R (2024) report a successful pilot in three villages | High (farmer acceptance documented) |
| Community seed banks | Local landraces preserved using traditional + scientific storage methods. | Mishra et al. (2025) model from Eastern UP adaptable to Karbi Anglong | Medium (requires external support) |
| Customary tenure recognition | Legal backing for traditional fallow cycles and community forest management | Mallick & Singh (2024) demonstrate positive outcomes in protected area buffer zones. | Low (policy reform needed) |

*Source: Compiled by the Author*

### 4.6 Summary of Results

Karbi indigenous farming is neither a perfect answer nor a relic of the past the truth is more nuanced than either of those extremes. Whether it actually works sustainably comes down to a handful of things that really matter: how long the land gets to rest, whether farmers have secure rights over their land, how communities connect to markets without losing control, and whether younger generations are still learning the old knowledge. When jhum is practised the way, it was meant to be, it can genuinely hold its own ecologically the problems mostly creep in from outside pressures, not from the practice itself. The most honest path forward is one that respects what indigenous communities already know while honestly addressing the real challenges they face not forcing change, but growing with it.

## 5. Conclusion and Recommendations

### 5.1 Conclusion

The Karbi community of Assam use many traditional farming methods that promotes sustainable agriculture, including mixed field layouts, diverse seed varieties, agroforestry, and the use of natural signs to guide decisions. These approaches go a long way in keeping the land resilient and diverse, but they're not without their pressures such as shrinking fallow periods, the pull of commercial farming, and policies that simply haven't kept up can quietly erode what makes them work. The goal shouldn't be to replace what indigenous communities already know; it should be to stand behind it. That means bringing farmers into the conversation through participatory trials, supporting community-led conservation, giving people real security over their land, and thoughtfully weaving in modern techniques where they genuinely help not where they simply displace. What the research keeps coming back to is this: indigenous knowledge isn't stuck in the past. It's flexible, it adapts, and within the landscape it grew from, it holds up scientifically.

### 5.2 Recommendations

The following recommendations are proposed for sustainable farming strategies among Karbi people:

i. One of the most meaningful things that can be done is helping communities capture and preserve their own knowledge on their own terms. Participatory video and digital mapping are powerful ways to do this, letting people tell their own story of the land in their own voice, rather than having outsiders document it for them. Alongside this, setting up community seed banks can safeguard the local crop varieties that have been quietly passed down through generations blending the wisdom of traditional storage methods like bamboo containers and ash treatment with modern checks to make sure seeds are still viable and ready to grow when needed.

ii. The agroforestry trials would weave together the plants communities have always known and valued local fruit trees, bamboo, medicinal plants with trees that can open up market opportunities, like coffee or rubber, where the land and climate actually support it. The key is that none of this should cut across how communities have traditionally used and related to their land — that foundation has to be respected, not worked around.

iii. Update district and state agricultural policies to recognise the customary land rights of Karbi communities. Change forest and land-use rules to allow long fallow periods of more than 10 years on community-managed lands. Involve tribal governance groups, such as village councils and traditional chiefs, in designing programs and making land-use decisions.

iv. Use both local ecological signs, like certain bird species, soil colour and texture, and the return of specific fallow trees, along with scientific measures such as soil organic carbon, biodiversity scores, and crop yields to monitor progress. Focus research on how much carbon indigenous agroforestry systems store and how knowledge is passed between generations.

v. Offer training to help communities add value to indigenous crops through processing, packaging, and certification. Build special markets for these crops, such as organic, fair trade, or those with geographical indications, and ensure that local communities receive higher prices through fair benefit-sharing.

### References

Bhardwaj, R. (2024). Reevaluating Shifting Cultivation in Northeast India: Balancing Traditional Practices, Sustainability, and Development. *Asian Journal of Research in Agriculture and Forestry, 10*(4), 514–523. https://doi.org/https://doi.org/10.9734/ajraf/2024/v10i4354

Bordoloi, S., Dey, A., Das, P. P., & Sarmah, A. (2025). Cultural ecology and indigenous conservation practices among the Karbi community in the Eastern Himalayan foothills of Karbi Anglong, Assam, India. *GU Journal of Social Science and Research, 1*(4), 152–161. https://doi.org/https://www.rgujournal.in/index.php/RGUJSSR/article/view/96

Borthakur, A., & Singh, P. (2021). Indigenous agricultural knowledge towards achieving sustainable agriculture. In Sustainable Agriculture Reviews. *Springer, Cham*, Vol. 50, pp. 401–413

Bos, S. (2020). *Exploring livelihood strategies of shifting cultivation: The case of Karbi Anglong, Assam, India (Doctoral thesis).* ETH Zürich / research collection

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/https://doi.org/10.1191/1478088706qp063oa

Centre for Environment and Energy, C. (2021). *Sustainable agriculture in India: Assessment and practices.* Council on Energy, Environment and Water.

Dhivya, D., Smith, J., & Brown, R. (2024). Integrating Indigenous Agricultural Knowledge with Modern Agricultural Systems: Challenges and Opportunities. *AgriBiol Journal, 93*(1), 196–208. https://doi.org/https://rootspress.org/journals/agribiol/article/download/1173/1171/6020

Dutta, S. (2021). Lesser-known edible fruits of the Karbi Anglong district of Assam. *International Journal of Farm Sciences*, 11(4):21-30.

Hansepi, L. (2022). Karbi women and environmental conservation. *Grassroots Journal of Natural Resources*.

Mallick, M., & Singh, P. K. (2024). Harvesting resilience: Tribal home-gardens as socio-ecological solutions. *Journal of Cleaner Production, 445*. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141174

Mallick, M., & Singh, P. K. (2024). Harvesting resilience: Tribal home-gardens as socio-ecological solutions for climate change adaptation and sustainable development in a protected area. *Journal of Cleaner Production, 445*. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141174

Mishra, S., Roopa, H. S., & Bhatt, J. P. (2024). Reviving indigenous farming knowledge in an input-intensive agriculture system: Evidence from Eastern Uttar Pradesh. *Frontiers in Sustainable Food Systems, 445*. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141174

Mishra, S., Roopa, H. S., & Bhatt, J. P. (2025). Reviving indigenous farming knowledge in an input-intensive agriculture system. *Frontiers in Sustainable Food Systems, 9*. https://doi.org/https://www.frontiersin.org/articles/10.3389/fsufs.2025.1685062/full

Mishra, S., Roopa, H. S., & Bhatt, J. P. (2025). Reviving indigenous farming knowledge in an input-intensive agriculture system: evidence from Eastern Uttar Pradesh. *Frontiers in Sustainable Food Systems, 9*. https://doi.org/https://doi.org/10.3389/fsufs.2025.1685062

Nunisa, B., Tamuly, D., Hojai, P., Panging, K., & Taropi, K. (2023). Soil fertility status in relation to fallow cycle in shifting cultivated areas of Dima Hasao. *International Journal of Plant & Soil Science, 35*(7), 120–128. https://doi.org/https://doi.org/10.9734/ijpss/2023/v35i72871

Nunisa, B., Tamuly, D., Hojai, P., Panging, K., & Taropi, K. (2023). Soil fertility status in relation to fallow cycle in shifting cultivated areas of Dima Hasao. *International Journal of Plant & Soil Science, 35*(7), 120–128. https://doi.org/https://doi.org/10.9734/ijpss/2023/v35i72871

Sarkar, R, & Bora, A. K. (2019). Role of Karbi people in practising jhum cultivation in Karbi Anglong District, Assam. (pp. Vol.17(02), 68–88). Journal of Xi'an Shiyou University, Natural Science Edition.

Steffan-Dewenter, I., & Kessler, M. (2025). *Comparing soil microbial diversity in smallholder plantain backyard gardens and main farms in Western and Central Africa.* Nature Portfolio, Scientific Reports.

Steffan-Dewenter, I., Kessler, M. (2025). Comparing soil microbial diversity in smallholder plantain backyard gardens and main farms in Western and Central Africa. *Nature portfolio*. https://doi.org/https://doi.org/10.1038/s41598-025-14533-8