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Preserving indigenous agricultural wisdom: Traditional tools of the PHOM tribe of Nagaland, India

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Abstract

The Phom tribe of Longleng district, Nagaland employs traditional jhum cultivation with culturally-adapted tools made from bamboo, wood, and iron. These implements support agriculture in challenging terrain while preserving indigenous knowledge systems. However, modernization pressures, youth migration from agricultural sectors, and climate variability threaten both the tools and the transmission of associated knowledge. A mixed-methods study was conducted across five villages using surveys (n=100) and in-depth interviews with 20 elders and artisan. Quantitative data were analysed using SPSS (descriptive statistics, one-way ANOVA, Chi-square tests); qualitative data through NVivo 12 thematic analysis. The study identified eleven traditional tools used in jhum cultivation. Age turned out to be a significant predictor of preservation beliefs (ANOVA $F=5.62$, $df=2$, $p<0.01$; $\chi^2=10.50$, $p<0.01$); farmers over 45 showed much stronger support than the 18-30 age group. Community support for preservation was surprisingly high at 97%, though 83% of young people showed little interest and 70% cited modernization pressure as a threat. When traditional tools were compared to modern equivalents, the traditional versions produced lower environmental impact. These findings suggest that Phom Naga traditional tools represent sustainable agricultural knowledge that needs urgent attention. Youth engagement programs, support for artisans, digital documentation, hybrid tool development, and policy frameworks like a Traditional Tools Bank could help preserve this knowledge

Keywords: Agricultural tools, indigenous knowledge, Nagaland, Phom Naga, sustainable farming, traditional agriculture

Introduction

Indigenous agricultural practices embody centuries of accumulated ecological and cultural knowledge that continues to offer viable solutions for sustainable food production in difficult environments. Throughout Northeast India, tribal communities have developed farming systems specifically adapted to local hilly terrain and subtropical climates. These systems successfully ensure food security, support biodiversity conservation and maintain cultural continuity outcomes that increasingly align with contemporary sustainability objectives. Nagaland's physical landscape presents distinct challenges: elevations ranging from 1,000-1,500 meters combined with annual rainfall of 1,800-2,500 mm render mechanized farming largely impractical (Census of India, 2011) ^[2]. The Phom Naga in Longleng district depend on jhum (shifting) cultivation, supplemented by wet paddy farming. Their implements, notably the yan (Naga Dao) and müleching (spade) are crafted from locally sourced materials (Rutsa V, 2024) ^[11]. Observation of these tools in practice reveals their effectiveness in minimizing soil damage while maintaining agricultural productivity. The design reflects adaptation to regional conditions through reduction of soil disturbance, erosion prevention and maintenance of soil fertility (Giri *et al.*, 2020) ^[5]. Yet these practices face serious pressure. Modernization, climate change and the simple fact that

young people aren't interested in farming threaten both the tools and the knowledge. Studies of other Naga groups, the Ao and Angami show the same pattern, where areas are more accessible, traditional tools get replaced by modern machinery (Singh *et al.*, 2015). In neighbouring states like Tripura, traditional tools remain cost-effective but fewer people use them (Giri *et al.*, 2020) ^[5]. Over in Mizoram, the tuthlaw (hoe) has become less common as younger farmers lose interest (Parmar. B 2019) ^[10]. These patterns across the region highlight why documenting this knowledge matters, it could disappear if no one pays attention. Longleng's agricultural profile illustrates the continued relevance of traditional methods. Jhum paddy cultivation occupies 5,465 hectares compared to 2,896 hectares of wet paddy, indicating the persistence of shifting cultivation in local agricultural systems (Nagaland Statistical Handbook, 2023).

Table 1: Jhum Calendar (Longleng District)

Month	Activity	Description
January-February	Land Clearing	Clearing bushes using yan
March-April	Planting	Sowing seeds with kuv
May-July	Weeding	Using phaklak and kuv
August-October	Harvesting	Using hahvehlungkheih
November-December	Storage	Using dap granaries

Source: Crop Calendar Longleng District, 2020 ^[3]

Table 1 outlines the jhum calendar, illustrating the seasonal activities that structure this traditional system. For instance, land clearing in January-February using the yan prepares fields for planting in March-April with tools like the kuv (hand weeder), while harvesting from August to October employs the hahvehlungkheih. Storage in dap (granaries) from November to December ensures food security, reinforcing the tools' integral role in sustaining both livelihoods and cultural practices (Crop Calendar Longleng District, 2020) [3].

Table 2: Brief Profile of Longleng District, Nagaland

Characteristic	Details
Area	515 km ²
Population	52,866
Literacy Rate	78.2%
Primary Occupation	Agriculture (80%)
Major Crops	Rice, Maize, Millets

Source: Census 2011 [2]

Table 3: Area and Production of Principal Crops for 2022-23

Crop	Area (Hectares)	Production (Metric Tonnes)
Jhum Paddy	5,465	10,930
Wet Paddy	2,896	7,240
Maize	1,200	2,400
Millets	800	1,600

Source: Nagaland Statistical Handbook 2023

Despite evident ecological and cultural significance, the Phom Naga's traditional tools face considerable threats. Modernization pressures, climatic variability, and declining youth participation in agriculture collectively jeopardize both the tools themselves and embedded knowledge systems. Similar challenges afflict other Naga communities and neighbouring populations as well, indicating a regional

phenomenon rather than localized concern (Singh *et al.*, 2015, Giri *et al.*, 2020, Parmar B, 2019) [5, 10]. These regional trends highlight the urgency of documenting and preserving indigenous agricultural knowledge before it is lost to rapid socioeconomic and environmental changes. Therefore this study attempts to address these concerns by focusing on the Phom Naga tribe's traditional tools in Longleng district. It aims to: (i) document the traditional agricultural tools of the Phom Naga tribe, and (ii) to assess community perceptions and preservation attitudes

Materials and Methods

Research Design: A mixed-method approach was used to collect the data. For collection of quantitative data a survey questionnaire was administered to 100 respondents, covering demographics, tool usage, farming practices and perceptions. Questions included Likert-scale items and open-ended prompts. Qualitative data was collected using In-depth Interviews with 20 key informants (10 elders, 10 artisans) explored used tool, craftsmanship and cultural roles. Interviews were recorded with consent.

Study area: This study was conducted in Longleng district, Nagaland, a Phom tribal area recognized for traditional agricultural practices. The area is geographically located at longitude 94°E -95°E and latitude 26°N -27°N. Jhum (shifting) cultivation remains central to Phom cultural identity and involves substantial communal labour, particularly female members. Local topographic conditions, steep slopes and limited landholdings favour this approach. The socio-economic context, wherein agriculture sustains 80% of livelihoods, renders the preservation question particularly urgent amid modernization and climatic pressures.

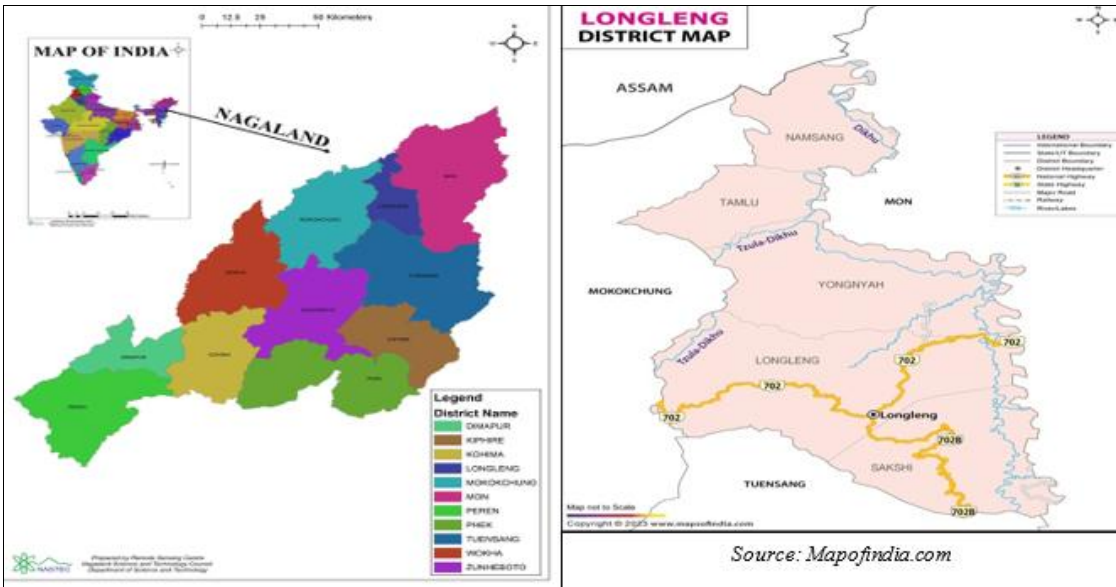


Fig 1: Map of Longleng district Nagaland, India

Data Analysis: Quantitative data was analysed using SPSS. One-way ANOVA tested differences in mean Likert-scale scores for preservation belief across age, education and marital status, and for modernization challenge across occupation. Chi-square tests assessed associations for binary

responses (e.g., Yes/No for preservation). Post-hoc tests (Tukey's HSD) identified specific group differences for significant ANOVA results. Qualitative data transcripts and field notes were imported into NVivo 12 for thematic analysis.

Results

Table 4: Description of the demographic profile of the respondents.

Demography	Category	Percentage (%)
Age	18-30 years	45
	31-45 years	30
	Above 45 years	25
Gender	Male	60
	Female	40
Education	Primary	50
	Secondary	30
	Higher Secondary	15
	Postgraduate	5
Marital Status	Married	72
	Unmarried	20
	Widowed	8
Income (Rs./month)	Below 20,000	3
	20,001-30,000	20
	30,001-40,000	53
	Above 40,000	24
Occupation	Farmers	52
	Housewives	12
	Government Employees	13
	Students	11
	Daily Wage Laborers	12

This table presents the demographic characteristics of the respondents in the study area, setting the context for understanding their socio-economic background. The age distribution reveals that the majority of respondents belonged to the age group of 18-30 years (45%), followed by 30% in the 31-45 years category, while those above 45 years constituted 25%. Regarding gender distribution, males comprised 60% of the respondents, whereas females accounted for 40%, reflecting the general demographic pattern in rural communities. In terms of educational attainment, most respondents had completed primary education, while a smaller proportion had attained secondary, higher secondary, or postgraduate degrees. With respect to marital status, the majority (72%) were married, indicating a predominance of settled adult participants actively engaged in livelihood activities. Income-wise, most respondents fell within the middle-income group and below, suggesting modest economic means typical of agrarian households. Regarding occupational distribution, a large proportion of respondents were farmers (53%), highlighting the agricultural base of the local economy. The remaining 47% were engaged in non-farm activities such as government and private services, self-employment, homemakers, student and daily wage labour.

Table 5: Traditional Agricultural Tools and Implements

Operation	Activities	Tool/implement
Land clearing	Cutting of trees, bushes and grass	Yan (Naga Dao), hah ven lungkheih (sickle), müleching (spade), phaklak (Bamboo rake)
Land development	Burning and clearing of trees, bushes and grass	Yan (Naga Dao), müleching (spade), phaklak (Bamboo rake)
Land preparation	Ploughing, seed bed preparation etc.	Müleching (spade)
Planting/seeding	Seed distribution, dibbling, drilling etc.	Müleching (spade), mühtow (storing basket)
Transplanting	Establishment of seedlings, uprooting and transferring the plant to new location	Müleching (spade), Shai (Bamboo backpack)
Crop husbandry	Irrigation, weeding, spraying of manure etc	Kuv (Hand weeder), müleching (spade), shai (Bamboo/cane backpack)
Harvesting	Gathering and cutting of ripened crops	Hah ven lungkheih (sickle), yan (Naga Dao),
Threshing	Separation of grain or seed from the husks and straw	Aüm (bamboo mat), mühtow (storing basket)
Winnowing	Separating grain from chaffs and other unwanted particles	Om (winnowing), aongshen (bamboo sieve)
Handling	Carrying grains and farm produce	Hang, kao, sham ha, mühtow (carrying and storing baskets)
Storage	Depository of grains	dap (Granary)

The study identified and documented eleven tools central to jhum cultivation, each serving specific functions within the farming cycle. These implements consist primarily of bamboo, wood, and iron-materials suited to local terrain and readily available regionally. Key tools include:

- 1. Yan (Naga Dao):** The yan is frequently employed by Phom farmers. It features a 20-30 cm bamboo handle with a long, flat iron blade (30-40 cm) with a sharp edge on one side. Observations reveal farmers using it for multiple purposes, butchering animals, clearing jungle and chopping timber.
- 2. Hah veh lungkheih (sickle):** The hah ven lungkheih is a C-shaped iron blade with sharp teeth fitted to a short wooden handle, totaling 25-30 cm in length with 1-2 mm thickness. During harvest periods, it is used to cut livestock feed and paddy straw, along with other crops.
- 3. Müleching (spade):** The müleching comes in three sizes: small, medium, and large. Each has a bamboo or hardwood handle and a mild steel blade. Smaller versions are used for seed planting while larger ones

handle land preparation, clearing jungle, digging and preparing seed beds

- 4. Phaklak (Bamboo rake):** The phaklak is made entirely of bamboo with an 80-100 cm handle that's 4-5 cm in diameter. It's light and useful during jungle clearing for removing weeds and unwanted debris and is also used for weeding in jhum fields.
- 5. Kuv (Hand weeder):** The kuv has a distinctive funnel-like shape made from bamboo and mild steel that allows farmers to distribute seeds evenly while also working for general weeding. It typically measures 25-30 cm long.
- 6. Om (winnowing):** Om are tools used for cleaning and winnowing grains. It is woven with bamboo strips. They are light in weight and are generally used by the female members.
- 7. Aongshen (bamboo sieve):** Aongshen is a circular bamboo sieve. The bamboo is sliced into thin slices and weaved. It is used to separate straw from the paddy and different kinds of unwanted components from thrashed

- materials and it is mainly used by women.
8. **Aüm (bamboo mat):** Aüm (bamboo mat) is a mat made of bamboo. It is woven with bamboo strips. It is a multipurpose mat used in threshing, drying of grains etc.
9. **Shai (Bamboo/cane backpack):** Shai (Bamboo/cane backpack) is made of bamboo or cane or both. It is generally used for carrying various agricultural commodities and even carry bamboo watering cans. It can carry weight ranges from 20 to 30 kg depending upon its size.
10. **Hang, kao, sham ha, mühtow (carrying and storing baskets):** Hang, kao, sham ha, mühtow (storing baskets) are generally made from bamboo. Mühtow is generally used for carrying seed materials in field and used for other domestic purposes. Hang, kao, sham ha are used for carrying of paddy and storing of grains.
11. **Dap (Granary):** Dap is the granary for storing of paddy. Bamboo or wooden planks are used to make it. In general, each Dap has a different size and storage

capacity. In the past, thatch grasses were used to cover the roof, but tin sheets are now commonly used.



Source: Field Survey, 2024

Fig 1: Identified Traditional Agricultural Tools and Implements from the study area

Table 6: Tool Efficiency Comparison

Tool	Task	Time (Hours)	Environmental Impact
Yan (Naga Dao)	Clearing 0.1 ha	2	Low (minimal soil disturbance)
Machete (Modern)	Clearing 0.1 ha	1.5	Moderate (requires fuel)
Müleching	Preparing 0.05 ha	3	Low (no compaction)
Mechanized Plow	Preparing 0.05 ha	2	High (soil compaction)

Source: Field Survey, 2024

The results indicate noteworthy differences. The yan cleared 0.1 hectares in 2 hours compared to 1.5 hours with a modern machete, slightly slower but with minimal soil disruption and no fuel costs. The müleching took 3 hours to prepare 0.05 hectares versus 2 hours for a mechanized plough but avoided the soil compaction that mechanized ploughing causes. Survey respondents demonstrated strong appreciation for traditional methods.

Table 7: Perceived Importance of Traditional Practices

Aspect	Percentage (%)
Should be preserved	97
Sustainable in the long run	90
Addresses food security	67
Maintains soil fertility	60
Reduces deforestation	73
Promotes sustainable agriculture	83

Source: Field Survey, 2024

Ninety percent of the respondent viewed traditional methods as sustainable long-term. However, only 67% connected these methods to food security provision, and 73% recognized broader agricultural sustainability benefits. Jhum cultivation continues to dominate locally, occupying 5,465

hectares relative to 2,896 hectares for wet paddy cultivation. Approximately 61% of farmers rely exclusively on traditional tools, while 39% employ hybrid systems combining traditional and modern methods, suggesting potential for integrated rather than exclusive approaches. Interview data and observational evidence reveal that these tools carry substantial cultural weight. The yan appears in festivals like Monyiiü, where it symbolizes strength and identity. Respondents noted the tool's role in connecting present generations to ancestors and maintaining cultural continuity. The tools used predominantly by women, the om and aongshen mark specific gender roles and cultural knowledge transmission patterns that would be altered if the tools disappeared.

Statistical Analysis Results

Survey respondents identified multiple factors threatening tool preservation: modernization (70%), youth disinterest (83%), climate change (77%), insufficient government support (70%), declining yields (64%), and land scarcity (40%). Statistical analysis addressed which demographic categories exhibited differential attitudes regarding preservation. Results revealed consistent associations:

Table 8: ANOVA Summary of Demographic Effects on Preservation Belief and Modernization Challenge

Independent Variable	Dependent Variable	Statistic	df	p-value	Conclusion
Age	Preservation Belief	F=5.62	2	<0.01	Significant, older more supportive
	Modernization Challenge	F=4.98	2	<0.05	Significant, older perceive more challenges
Education	Preservation Belief	F=0.45	3	0.72	No significant difference
	Modernization Challenge	F=3.15	3	<0.05	Significant, higher education sees fewer challenges
Marital Status	Preservation Belief	F=0.38	2	0.68	No significant difference
	Modernization Challenge	F=0.55	2	0.58	No significant difference
Occupation	Preservation Belief	F=2.75	5	<0.05	Significant, differences across occupations
	Modernization Challenge	F=0.85	5	0.52	No significant difference

Source: Field Survey, 2024

The emergent pattern is noteworthy. Age functioned as the strongest predictor consistently showing that older respondents (over 45) supported preservation significantly more than younger people (18-30 years). They also perceived modernization as a genuine threat, while younger respondents displayed less concern about losing traditional ways. Education demonstrated a more nuanced effect. Formal schooling did not predict whether people wanted to preserve traditions. Respondents across education levels expressed similar commitment to preservation. However, education did alter perceptions of modernization as a threat. Respondents with higher educational attainment perceived

fewer modernization dangers, possibly through greater confidence in adaptive capacity. Marital status showed no significant association with either dependent variable ($p>0.05$ for both measures), suggesting this demographic factor bears limited relationship to preservation attitudes. Occupation showed specific relevance to preservation attitudes. Differential occupational engagement with agriculture appears relevant to preservation attitudes while not substantially influencing modernization concerns. The type of work appeared connected to heritage preservation interests. Occupation, however, did not predict perceived threat from modernization.

Table 9: Summary of Chi-Square Tests

Independent Variable	Dependent Variable	Statistic	df	p-value	Conclusion
Age	Preservation Belief	$\chi^2=10.50$	2	<0.01	Significant association
	Modernization Challenge	$\chi^2=9.85$	2	<0.05	Significant association
Education	Preservation Belief	$\chi^2=0.58$	3	0.90	No significant association
	Modernization Challenge	$\chi^2=8.55$	3	<0.05	Significant association
Marital Status	Preservation Belief	$\chi^2=0.40$	2	0.82	No significant association
	Modernization Challenge	$\chi^2=1.20$	2	0.55	No significant association
Occupation	Preservation Belief	$\chi^2=12.10$	5	<0.05	Significant association
	Modernization Challenge	$\chi^2=2.50$	5	0.78	No significant association

Source: Field Survey, 2024

A combined interpretation of the ANOVA and Chi-Square tests offers a robust and highly confident view of how demographic factors shape cultural attitudes, with the findings being remarkably consistent across both statistical methods.

Age consistently emerged as the most powerful and pervasive predictor. The ANOVA for Preservation Belief showed a statistically significant difference, $F=5.62$ ($df=2$, $p<0.01$), and the Chi-Square test confirmed this with a significant association, $\chi^2=10.50$ ($df=2$, $p<0.01$), indicating that older individuals are significantly more supportive of cultural preservation. Similarly, for the Modernization Challenge, ANOVA found a significant effect, $F=4.98$ ($df=2$, $p<0.05$), and the Chi-Square test showed a significant association, $\chi^2=9.85$ ($df=2$, $p<0.05$), confirming that older individuals are significantly more likely to perceive modernization as a challenge. The role of education was more nuanced but consistent. For Preservation Belief, both ANOVA ($F=0.45$, $df=3$, $p=0.72$) and the Chi-Square test ($\chi^2=0.58$, $df=3$, $p=0.90$) found no significant effect or association. However, for the Modernization Challenge, ANOVA showed a significant difference, $F=3.15$ ($df=3$, $p<0.05$), and the Chi-Square test confirmed a significant association, $\chi^2=8.55$ ($df=3$, $p<0.05$), suggesting that higher education sees fewer challenges related to modernization. The influence of occupation was also specific. For Preservation Belief, ANOVA indicated a significant difference, $F=2.75$ ($df=5$, $p<0.05$), and the Chi-Square test showed a significant association, $\chi^2=12.10$ ($df=5$, $p<0.05$), confirming significant differences across occupations in support for preservation. In contrast, for the Modernization Challenge, neither ANOVA ($F=0.85$, $df=5$, $p=0.52$) nor the Chi-Square test ($\chi^2=2.50$, $df=5$, $p=0.78$) found a significant effect or association. This suggests that professional identity influences heritage views, while formal learning shapes the perspective on societal change. Marital status was definitively shown in both tests to have no significant influence on either cultural attitude.

The ANOVA results for Preservation Belief ($F=0.38$, $df=2$, $p=0.68$) and Modernization Challenge ($F=0.55$, $df=2$, $p=0.58$) showed no significant difference, and the Chi-Square tests for Preservation Belief ($\chi^2=0.40$, $df=2$, $p=0.82$) and Modernization Challenge ($\chi^2=1.20$, $df=2$, $p=0.55$) showed no significant association. This analysis confidently concludes that while age has a broad impact on both cultural attitudes, and marital status is irrelevant to both, education and occupation play very specific and distinct roles in shaping a person's cultural outlook. Specifically, occupation is significantly associated with preservation beliefs, and education is significantly linked to perceptions of modernization's challenges.

In a nutshell, the chi-square tests reinforced the ANOVA findings. When both statistical approaches were examined together, a clear picture emerged: age operates as the dominant factor shaping preservation attitudes. Older individuals consistently demonstrated stronger support. Education does not determine whether people want to preserve traditions, but it does shape whether modernization appears threatening. Occupation influences preservation attitudes but not modernization concerns. Marital status simply fails to matter for either question.

Discussion

The documented tools demonstrate evident advantages in Longleng's landscape. At 1,000-1,500 meters elevation with 1,800-2,500 mm annual rainfall, the Phom's traditional tools appear better adapted than modern alternatives when ecological impact is considered. The yan cleared land in 2 hours with minimal soil disruption, while the müleching avoided the compaction that mechanized ploughing produces. This alignment with contemporary findings explains why 90% of respondents viewed these methods as sustainable centuries of learning have demonstrated their effectiveness in this specific environment. Yet the threats are substantial and interconnected. Seventy percent cited modernization pressure, 83% noted youth disinterest, and

77% identified climate variability as concerns. The generational divide is marked: younger respondents (18-30) demonstrated far less commitment to preservation than those over 45. Similar patterns have been documented among neighbouring Naga groups and in Mizoram (Parmar B, 2019) ^[10] where accessibility to markets increases, tool abandonment accelerates. Education may offer possibilities here. Education may present intervention opportunities. The inverse relationship between educational attainment and perceived modernization threat suggests that educated younger individuals might recognize inherited knowledge value rather than dismissing it as obsolete. This possibility warrants empirical investigation through targeted educational interventions. The cultural embedding appears genuine. The yan's appearance in Monyiü festival and its symbolic associations with strength and identity indicate these tools function beyond utilitarian purposes. Gender-specific tools reinforce particular social roles and knowledge transmission pathways. Tool loss would involve loss of cultural transmission mechanisms. Statistical findings particularly age effects ($\chi^2=10.50$, $p<0.01$) confirm age as a dominant predictor, though underlying mechanisms require deeper investigation. Available evidence suggests the generational divide reflects combined influence of economic pressures and aspirational differences. These structural factors represent the core challenge that policy must address.

Conclusion

This study documents the Phom Naga's traditional tools and demonstrates their significance in sustainable farming and cultural continuity. Statistical analysis and qualitative findings confirm strong preservation support among older community members while younger respondents demonstrate substantially reduced interest. The identified threats, modernization, climatic variability and alternative livelihood opportunities are significant and warrant strategic intervention. Based on findings, several approaches merit consideration. Youth engagement programmes could reframe traditional agriculture differently not as outdated practice but as specialized knowledge with genuine environmental and economic benefit (Giri *et al.*, 2020; Parmar B, 2019) ^[5, 10]. Economic support for artisans, digital archives developed before knowledge loss occurs, hybrid tools combining traditional design with ergonomic improvements, and formal policy frameworks (such as a Traditional Tools Bank) all appear promising. Ecotourism centered on agricultural heritage may create economic incentives for younger generation participation. Future research should validate hybrid tool effectiveness through multi-year field trials. Longitudinal studies tracking adoption patterns would clarify intervention success. Comparative analysis of preservation strategies across neighbouring Naga tribes could inform regional approaches. Such extensions would substantially deepen understanding of which interventions actually succeed when communities face pressures to abandon traditional practices.

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