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Economic and Environmental Resilience of Tenant Farmers in Majuli, Assam

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Abstract: When agricultural land is unequally distributed, the land lease market can be essential in balancing factor endowments among agrarian families. With this backdrop, the study explores the economic and environmental sustainability of tenant farming among the Mishing tribe in Majuli, the biggest river island. The primary objectives are to compare the economic benefits of tenant versus owner farmers and to assess the resilience of the Mishing community to environmental challenges. Utilising purposive sampling, data were collected from the UjaniMajuli Block. Analytical methods include the Lekart scale, independent t-tests, and cost-benefit ratio analysis to evaluate economic benefits, complemented by field observations to assess resilience indicators. Results reveal that tenant farmers achieve a higher benefit-cost ratio than owner farmers for red and winter paddy, attributed to more efficient resource utilisation and adaptive agricultural practices. Despite strong resilience through traditional adaptive measures, there is a need for enhanced infrastructure and awareness programs. The study emphasises the necessity for targeted policy interventions and support mechanisms to enhance tenant farmers' economic stability and resilience in Majuli.

Keywords: Land lease market; Mishing tribe; Sustainability; Tenant farming.

Tenant Farming

The land lease market addresses imbalances in factor endowments, with labour-rich but land-poor families leasing from land-rich but labour-deficient households, enhancing resource alignment and productivity (Tesfay, 2020). Fixed rent tenancy, where tenants pay a pre-determined rent, is more efficient than sharecropping, as it incentivises tenants to maximise production and invest in improvements (ibid). Sharecropping, where tenants retain only part of the harvest, can lead to Marshallian inefficiency due to distorted incentives (Otsuka, 2007; Stiglitz, 1974). Despite inefficiencies, sharecropping remains common due to its risk-sharing benefits in uncertain agricultural environments (Bell, 1977; Sadoulet & de Janvry, 1995). The success of farming activities largely depends on the satisfaction a tenant farmer experiences in their relationship with their landlord. Tenant farming is considered a crucial entry point into the agricultural sector, enabling individuals to establish themselves in farming. Landlords benefit significantly from long-term contracts with tenants, as these tenants have established business contacts and possess expert knowledge about harvests and other farming-related issues, making the arrangement more reliable and secure for landlords (Athreya, 1990). When mutually compatible, fair agreements between landlords and tenants are likely to last longer (Mridul, 1994). The lack of appropriate attention and low profitability limits the monetary benefits to farmers.

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Recent changes in the agricultural sector include increased prices of subsidiaries and a hike in the demand for hobby farming. These factors have made it extremely challenging for new entrants, either as owners or tenants with limited capital, to enter the agricultural sector. Indian tenancy laws have played a significant role in improving crop sharing and providing higher tenure security for tenants (Banerjee et al., 2002). The mobility of tenant farmers has also contributed to turnover in the land tenancy market (Agarwal, 2003). When long-term landlord-tenant relationships are disrupted, it creates problems related to land ownership. Historically, tenant farmers often occupied the same land for nearly two generations (Stead, 2003). It is essential to make tenancy laws sufficiently rigid to enable poor farmers to enter the lease market. Equity and fairness in the distribution of operated land, wages, and employment can be achieved by allowing tenancy and restricting access to large farmers. The myth that poor farmers opt out of the lease market due to technological constraints is unfounded; rather, large farmers force them to withdraw to gain control. Mechanisation is viable only for large farms, and large farmers are under constant pressure to increase their landholdings to optimise the use of their assets.

Research on work outcomes in the sector has shown that poverty significantly affects farming practices, especially tenant farming (Olsen & Mehta, 2005). At the end of a lease period, established tenant farmers have an advantage during land bidding, while new entrants face barriers in obtaining leases from current occupants. Modern auction theory suggests that an asset valued marginally higher by one party can give the current tenant a competitive advantage in auctions, deterring disadvantaged tenants from bidding (Lipton, 2005). Over the years, the number of people renting land for agriculture in India has declined, although the number of people working in the agricultural sector remains substantial (Olsen, 2006). Tenancy laws have positively affected productivity, reduced agency costs for hired labour, and improved access to credit (Bardhan & Mookherjee, 2008).

Land Leasing and Tenancy Systems

A study of the tenancy system in Andhra Pradesh, India's principal rice-producing state, revealed that more than half of the agriculturists are tenant farmers, with the same ratio prevailing among paddy farmers. Major problems facing tenant farmers and laws protecting them were detailed in case studies from East Godavari, West Godavari, Krishna, and Guntur districts. Recommendations included proper implementation of laws and reforms, modernisation and mechanisation of agricultural practices, and financing for tenant farmers. These measures should be initiated immediately by the government and policymakers (Prasad et al., 1987).

Leasing agricultural land is restricted or banned in many Indian states. Formalising land leasing would improve agricultural production, develop the land lease market, and promote equity. Benefits for tenant farmers would include security of tenure, improved land use, better factor of production optimisation, increased labour mobility, and enhanced access to leased land (Haque, 2013). New entrants often need additional income from para-agricultural activities due to the unattractiveness of the sector in terms of rewards, high capital requirements, and difficulty in procuring land (Martin et al., 2014). In recent years, there has been an increase in tenant farmers and holdings under tenant farming (Hossain & Bayes, 2014). Acquiring the capital needed to start a farming venture remains a significant challenge. Leasing helps tenant farmers by providing land holdings and relieving them of the burden of substantial initial investments (Malek et al., 2015).

A study found that reverse tenancy in dryland agriculture in Southern India has persisted, with tenancy increasing in the form of sharecropping. Households' probability of becoming tenants is positively correlated with factors like the number of farm employees, bullock ownership, and male-headed households. In contrast, land ownership, age, household head education, and reliance on non-farm income are negatively correlated. Crop yield and profitability are typically higher on owned land than on tenured land. Reducing reverse tenancy requires risk-mitigating technologies and essential input availability (Deb et al., 2016). There has been a sharp decrease in tenanted holdings in recent decades. A prevalent view is that farmers can start by renting land and eventually buy the holding themselves (Learmonth, 2015). A study comparing input and output shares between tenants and landowners in various states highlighted the Bhagidari system of sharecropping in Gujarat. Due to leasing bans, the area under leasing has declined, though the Agricultural Census of 2010-11 suggests otherwise. The Bhagidari system, where the landowner makes decisions, could increase productivity through appropriate investments in the land (Kumar et al., 2017).

Socio-Economic and Environmental Challenges of the Mishing Tribe

The Mishing tribe on Majuli Island faces unique socio-economic and environmental challenges. As of the 2011 census, the tribal population in Majuli is 46.38 per cent, while Scheduled Tribes (ST) make up 23.93 per cent in the Lakhimpur district. The Mishing, residing along the Brahmaputra River, is significantly impacted by climate change, especially flooding, affecting their agriculture-based livelihood (Das, 2015). Their traditional stilt houses, "changghars," showcase innovative adaptation to frequent floods. Assam, including Majuli, is highly vulnerable to climate change, with 40 per cent of the area flood-prone. High poverty rates and reliance on agriculture further exacerbate their vulnerability, necessitating efforts to enhance resilience and adaptation strategies (Ibid). Historically, the Mishing migrated from Arunachal Pradesh and shifted from fishing and rearing to farming, facing socio-economic vulnerabilities like lack of land ownership and tenant farming (Das, 2015). This highlights the importance of understanding their adaptation and resilience to environmental changes.

We investigate the economic impact of tenant farming among the Mishing tribe in Majuli; the alteration in primary livelihood activities necessitates an in-depth analysis, especially as land scarcity compels reliance on tenant farming. This study aims to elucidate the effectiveness and implications of tenancy farming practices among the Mishing people, foregrounding the distribution patterns and outcomes necessitated by their unique socio-economic conditions. One of the study's objectives is to examine the resilience of the Mishing community to climatic conditions. Our investigation contributes to understanding agrarian strategies within transitioning communities, particularly under the constraints of limited land ownership.

Study Area

Majuli

The North Eastern Region (NER) contains the Island of Majuli, situated in the center of the Brahmaputra River. Majuli is the largest and most populated river island in the world, with its latitude ranging from 26°45′ N to 27°12′ N and its longitude from 93°39′E to 94°35′E. The island's borders are formed by the Luhit or KherkatiaXuti in the northeast, the Brahmaputra in the south, and Subansiri in the northwest. The district covers an area of 487.55 square kilometers and extends 80 kilometers from east to west and roughly 10-15 kilometers from north to south (Land et al., 2017). Majuli has a population of 167,304 (Census of India, 2011) and is divided into the Mauzas of Salmora, Kamalabari, and Ahatguri. It comprises 248 cadastral villages spread across 20 Gaon Panchayats. The island's elevation is roughly between 85 and 90 meters above Mean Sea Level (MSL). Majuli experiences flooding due to the tributaries of the Brahmaputra River, which bring a substantial amount of clayey sediments and fine silt. It is included in the preliminary list of world heritage sites maintained by UNESCO.

Methodology

The study is based on a field study of the Mishing tribal farmers in Majuli. The study used purposive sampling for a focused examination of the targeted population. First, Majuli district was selected due to its unique demographic, geographical, and socio-economic characteristics. Second, developmental blocks were chosen, with the UjaniMajuli Block selected through random sampling for its significant tribal population. In the third stage, within UjaniMajuli Block, two out of eight Gram Panchayats (GPs), Ratnapura-Gayan and Sriram, were randomly selected. Finally, one village from each selected GP was chosen: BonoriyaChoporiya from Ratnapura-Gayan GP (90 households) and Bechamar village from Bongaon GP (120 households). In each village, 45 samples were selected through purposive sampling to meet the study's objectives. This approach ensured a balanced and representative examination of the Mishing population in Majuli, with the reference period being 2023.

Hypotheses:

1. H_0: There is no significant difference in the economic benefits between tenant and own farmers, irrespective of landholding size.

The study uses an independent t-test to test the hypotheses. The benefit-cost ratio is calculated as - Income/Costs.

Results and Discussion

Most of this tribe's members are riparians who make their living by farming, fishing, raising cattle, raising pigs, and other means. The tribe lags considerably behind the rest of Assam or India due to political and administrative errors and other issues, especially in isolated places. Before settling in that village, most people were engaged in carpenter activities. The people in the village of *BonoriyaChapori* are involved in

farming activities. They do not have land for cultivation. So, they are engaged in tenant farming.

The analysis in Table 1 compares the costs and benefits of tenant versus owner farming of Paddy. Tenant farmers have lower overall expenses than owner farmers, who face higher costs due to the rental value of leased land, labour costs, and the imputed value of owned property. Tenant farmers exhibit a significantly higher Benefit-Cost Ratio (BCR) for both Red and Winter Paddy, indicating more efficient use of agricultural inputs and greater economic benefits per unit of cost. This efficiency is likely driven by tenant farmers' need to maximise returns to pay rent, leading to better cost management and innovative practices. The average BCR for tenant farmers is 4.87, compared with 2.05 for owner farmers, highlighting the importance of efficient resource utilisation and adaptive practices.

Table 1: Cost-benefits ratio of tenant farming

Villages	*Tenant farmers*		*Owner farmers*	
	Red paddy	*Winter paddy*	*Red paddy*	*Winter paddy*
V-1	3.57	6.98	1.51	2.57
V-2	4.64	4.27	1.97	2.15

Source: Author's Field Study
V-1*:* BonoriyaChapori
V-2: Bechamara

Cultivating winter paddy is profitable in both BonoriyaChapori and Bechamara, with Bechamara having an advantage due to better infrastructure and lower susceptibility to floods and wild animals. The residents of BonoriyaChapori have recently migrated in search of better livelihoods, reflecting a broader trend among the Mishing tribe moving to the plains of Assam for better opportunities. The Mishing tribe's livelihood has significantly changed due to assimilation with non-tribal groups in Assam (Pamegam, 1970). This assimilation has influenced various aspects of their life, including religious practices, with many adopting different forms of Christianity due to perceived restrictions and ignorance (Kuli, 1998), leading to the loss of traditional rites and rituals. Modernisation and non-tribal culture have also impacted marriage practices and festivals, showing a shift from traditional practices in some areas of Majuli. It is crucial to focus on the socio-cultural and political institutions of the Mishing society for their structural development, as these institutions symbolise the unity, identity, and integrity of the community (Morang, 2020).

Table 2: Results of the *t*-tests

Hypothesis	*t-statistic*	*p-value*	*Result*
Red Paddy Economic Benefit	6.486	0.023	Reject H0
Winter Paddy Economic Benefit	39.073	0.001	Reject H0

Source: Author's Calculation

The hypothesis testing results indicate a significant difference in economic benefits between tenant and owner farmers for Red Paddy and Winter Paddy. For Red Paddy, the t-statistic is 6.486 with a p-value of 0.023, leading to the rejection of the null hypothesis. This suggests a statistically significant difference between tenant and owner farmers in the economic benefits of Red Paddy cultivation. Similarly, for Winter Paddy, the t-statistic is 39.073 with an even lower p-value of 0.001, leading to rejecting the null hypothesis. This indicates a substantial difference in the economic benefits of Winter Paddy between the two groups of farmers.

These findings imply that tenant farmers might achieve higher economic benefits than owner farmers, possibly due to more efficient use of agricultural inputs, better cost management, or adaptive farming practices. The significant t-statistics and low p-values in both cases underscore the robustness of these results, highlighting the economic advantages that tenant farmers have over owner farmers in the context of Red and Winter Paddy cultivation.

Table 3: Resilience to flooding

Indicators	*Score*	*Trends*
Effective use of stilt houses	4.5	High resilience
Adequate drainage systems	3.2	Moderate resilience
Availability of flood shelters	3.9	Moderate resilience
Community awareness programs	3.0	Moderate awareness
Timely weather warnings	4.1	High effectiveness

Source: Author's Field Study

The resilience to flooding among tenant farmers in Majuli, India, shows strengths and areas needing improvement. Effective use of stilt houses demonstrates high resilience, protecting households from frequent and severe floods. However, drainage systems offer only moderate resilience, indicating a need for enhanced

solutions to manage excessive rainfall. The availability of flood shelters is moderate, highlighting the need for more equipped and accessible shelters. Community awareness programs are moderately effective, with significant room for improvement in flood risk and preparedness education (Olsen et al., 2005).

Timely weather warnings show high effectiveness, reflecting India's improved weather forecasting and early warning systems after the 2004 tsunami and severe cyclones (Lipton, 2009). These advancements help residents take timely action to protect themselves and their property. While the Mishing community in Majuli exhibits resilience through stilt houses and adequate weather warnings, enhancing drainage infrastructure, increasing flood shelters, and improving community awareness programs are essential to enhance flood resilience in this frequently impacted region (Banerjee et al., 2002).

Table 4: Resilience to drought

Indicator	*Score*	*Trends*
Use of drought-resistant crops	4.2	High adoption
Access to machanised irrigation facilities	2.0	Low access
Community water management	4.3	High management quality
Government support programs	3.1	Moderate support

The resilience to drought among tenant farmers in Majuli shows both strengths and areas for improvement. High adoption of drought-resistant crops helps stabilise agricultural yields and ensure food security. However, access to mechanised irrigation is limited due to high costs and unreliable water sources, highlighting the need for investment in irrigation infrastructure. Effective community water management ensures equitable distribution and efficient use of resources, serving as a model for other regions. Government support programs are moderately effective, providing some assistance but not fully meeting farmers' needs. Improving infrastructure and enhancing government programs, such as subsidies, financial aid for irrigation, and water conservation training, are crucial for boosting drought resilience. Addressing these gaps will significantly enhance the drought resilience of tenant farmers in Majuli and similar regions across India.

Table 5: Resilience to soil erosion

Indicator	*Score*	*Trend*
Use of soil conservation methods	3.4	Moderate usuage
Planting of cover crops	4.5	High adoption
Construction of terraces	3.3	Moderate construction
Regular soil testing	1.5	Low frequency
Awareness of soil health	3.0	Moderate awareness

Source: Authors' Field Study

The resilience to soil erosion among tenant farmers in Majuli shows strengths and areas needing improvement. The moderate use of soil conservation methods like contour plowing and crop rotation indicates that these practices are beneficial but not universally adopted. These methods prevent erosion and maintain soil health, especially in flood-prone areas like Majuli. A significant strength is the high adoption of cover crops, such as legumes and grasses, which play a vital role in protecting the soil from erosion, improving soil structure, and adding organic matter. This widespread adoption suggests that farmers understand the benefits of cover crops for maintaining soil fertility and preventing erosion. Terracing, which helps reduce soil erosion on slopes by creating flat areas to reduce runoff, shows moderate adoption. While some terraces are being constructed, there is potential for more extensive implementation to enhance soil conservation efforts further.

Regular soil testing is infrequent among farmers but essential for understanding soil health and making informed decisions about fertiliser use and crop selection. The low frequency of soil testing indicates a need for greater awareness and resources to support this practice, leading to better soil management and higher agricultural productivity. Farmers have a moderate level of awareness about soil health. While they understand its importance, there is room for improvement. Enhanced education and extension services could help raise awareness and provide farmers with the necessary knowledge and tools to implement effective soil health practices. The adoption of cover crops and some soil conservation methods in Majuli is commendable; there is a clear need for increased terracing, more frequent soil testing, and greater awareness of soil health. Addressing these gaps through better education, resources, and support from agricultural extension services could

significantly boost the resilience of tenant farmers in Majuli to soil erosion.

Table 6: Resilience to changes in rainfall patterns

Indicators	*Score*	*Trend*
Adaptation to changing seasons	4.5	High adaption
Use of rainwater harvesting	4.7	High utilisation
Flexibility in cropping patterns	3.8	Moderate flexibility
Dependence on diverse crops	3.6	Moderate dependence
Community adaptation strategies	4.5	High effectiveness

Source: Authors' Field Study

Tenant farmers in Majuli display effective resilience to changing rainfall patterns, combining several strong strategies with areas for growth. They adapt highly to seasonal variations, successfully adjusting agricultural practices to cope with unpredictable rainfall. The extensive use of rainwater harvesting helps ensure a reliable crop supply, reducing dependency on irregular rainfall. Flexibility in cropping patterns is moderate, suggesting that farmers can switch to more suitable crops based on weather conditions, though there is room for improvement. Dependence on diverse crops is also moderate, with some crop diversification present but potential for further variety to enhance resilience by spreading risk across different crops. Community adaptation strategies are notably effective, with strong collective efforts in managing changes in rainfall patterns. These strategies include shared resources, collective decision-making, and local knowledge exchange. Increasing flexibility in crop choices and enhancing crop diversification are essential to strengthen resilience further. The high effectiveness of community strategies underscores the importance of collective action in addressing environmental challenges and improving overall resilience.

Conclusion

The Mishing tribe in Majuli, Assam, blends traditional and adaptive livelihood practices influenced by socio-economic and environmental challenges. Traditionally engaged in farming, fishing, and livestock raising, many now turn to tenant farming due to land scarcity. Tenant farmers show higher efficiency and economic sustainability, with better Benefit-Cost Ratios (BCR) for Red and Winter Paddy than owner farmers. The Mishing community's environmental resilience varies. They use stilt houses for flood protection but need improved drainage systems and more flood shelters. Drought resilience is vital due to drought-resistant crops and effective water management, though mechanised irrigation and comprehensive government support are lacking. Soil erosion resilience benefits from high-cover crop adoption but requires better conservation methods and frequent soil testing. The community adapts well to changing rainfall patterns through rainwater harvesting and flexible cropping patterns, though diversification could enhance resilience. Enhancing infrastructure, government support, and community awareness programs are crucial for boosting the Mishing tribe's resilience. Addressing these gaps will significantly improve their socio-economic and environmental sustainability, ensuring a more resilient and prosperous future.

Policy Implications

Tenant farmers should be organised into self-help groups and federated at various levels to improve their bargaining power with banks for credit. The state should allow tenancy registration by Panchayat or revenue officials, and financial agencies should recognise these certificates for loans. Efficient adjudication systems for tenancy disputes will protect farmers' rights and encourage long-term investments. The involvement of Gram Sabha, Gram Panchayat representatives, and financial agencies will help formalise tenancy status and improve credit access. Facilitating access to both short-term production and long-term investment credit is crucial. Banks should offer credit under the interest subvention scheme for allied and non-farm activities, reducing financial burdens and encouraging diversification. Implementing skill development programs will enhance tenant farmers' agricultural and entrepreneurial skills, preparing them for micro-enterprises. Guidance for starting and managing small businesses will help diversify income sources. Removing land leasing restrictions, ensuring mandatory lease agreement registration, and financial recognition of these agreements will promote a dynamic agricultural sector. Strengthening institutional frameworks and fostering an entrepreneurial ecosystem with government incentives will increase tenant farmers' economic resilience and bargaining power.

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