

Livelihood Opportunities Arising Out of Development Project: A Case Study on Gumti Hydel Project of Tripura

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Abstract

The Gumti Hydel Project in Tripura, India, led to major socio-economic and environmental changes, especially for the tribal communities who were dependent on agriculture and natural resources. This study assesses the impact of the project, focusing on the loss of agricultural land and the emergence of alternative livelihood opportunities. Prior to the project, the total agricultural land was 158.809 hectares, with 42.11% dedicated to plain land cultivation and 57.89% to Jhum land. Post-project, this area decreased by 26.1%, with both plain land and Jhum land affected. The loss of agricultural land, particularly fertile farming areas, disrupted the livelihoods of displaced families, many of whom relied on agriculture for day-to-day livelihood. In response, fishing, boat transportation, and small businesses became the primary alternative livelihoods, with fishing emerging as the dominant occupation. Tourism, particularly in areas like Narikel Kunja, further boosted local economies, with small vendors thriving to cater to tourist demand. Despite these new opportunities, the displacement caused by the project has had lasting effects on food security and economic stability for local communities. This study suggests the need for inclusive development policies that balance infrastructure growth with balance livelihoods and ecological preservation, ensuring that displaced populations are adequately supported through rehabilitation and livelihood restoration strategies.

Key words: Agricultural land loss, Occupational transition, Livelihood opportunities, Hydel project, Tribal

Development projects often bring major socio-economic transformations, but they also come with a cost, particularly for communities dependent on natural resources, especially the tribal communities. One major consequence of such projects is the loss of agricultural land, which directly affects the livelihoods of rural populations. Cernea [1] researched on the socio-economic risks and displacement caused by large development projects, including hydropower dams. He discusses how the loss of agricultural land undermines the livelihood systems of displaced populations, particularly in rural and agricultural-based communities. He introduced the "risks and safeguards" model for mitigating the adverse effects of displacement and land loss, highlighting the importance of compensation and rehabilitation. Agriculture is not only a primary source of income but also rooted with the cultural identity and process of existence of many communities. The displacement caused by infrastructure projects like dams, hydropower plants, and urban expansions disrupts access to fertile land, leading to economic instability and social distress [2]. The focus of this study is to assess the extent of agricultural land loss resulting from a specific development project and to evaluate the alternative livelihood opportunities created in its aftermath. While such projects are intended to tackle economic growth and modernization, their benefits often come at the expense of vulnerable communities, particularly farmers and tribal groups who are forced to adapt to new realities. Richards [3] discusses hydropower and rural livelihoods, studies on how

displacement and land loss from dam construction leads to economic hardship for agricultural communities. His work provides a comparative analysis of cases in Africa and Asia, emphasizing that the loss of land impacts not just agriculture but also the social fabric of rural areas, with long-term effects on food security. By examining both the negative impacts, such as land loss and the potential opportunities arising from the project, this research aims to provide a comprehensive understanding of its socio-economic effects. This dual perspective is essential for developing inclusive policies and ensuring that development projects promote sustainable growth while minimizing harm to affected populations [4-5].

Hydropower development is often promoted as a sustainable energy source; however, its socio-economic and environmental impacts, particularly the loss of agricultural land, are matter of concerns. Singh [6] study was based on adaptive livelihoods after displacement, specifically in Southeast Asia. The study focuses on hydropower-induced displacement and how agricultural communities adapt by diversifying income sources. He discussed the importance of post-displacement recovery strategies and the impact of land loss on food systems. Objectives the study are:

- To find out the extent of Loss of Agricultural Land due to the project.
- To examine the livelihood opportunities arising out of the development project.

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MATERIALS AND METHODS

Overview of the Gumti hydel project

The Gumti Hydel Project situated in the Gumti River region in Tripura, India. The project stretched in the Gomati and Dhalai district. The project aimed to produce hydroelectric power and boost regional development, but its implementation involved the submerging of 46.34 square kilometers of land, including fertile agricultural fields and forest areas. The Dumbur Lake reservoir, while generating electricity and supporting fisheries, displaced thousands of households, particularly the tribal communities who were dependent on agriculture and forest resources. The project, which began operations in the 1970s, has had a profound impact on the local communities, particularly in terms of land use, livelihoods, and socio-economic transformations.

The Gumti Hydel Project, established in the Gomati District of Tripura in 1974, has had socio-economic and environmental impacts on the region. One of the most major consequences has been the loss of agricultural land, an important livelihood resource for the predominantly tribal population in the affected areas. The construction of the Dumbur Lake reservoir submerged vast tracts of arable land, disrupting traditional agrarian practices and posing long-term challenges for food security and economic stability.

According to the government records Tripura Gazetted notification of 1971, 1972 and 1973, the total affected families due to the construction of Dam was 4296 families (both tribal and non-tribal). It may be noted that non-tribal families affected were around 4-5 percent approximately and majority of the displaced families were Indigenous as per record of the Tripura Gazetted notification of 1971, 1972 and 1973.

The dam, built near the Gumti River in the northeastern region of Tripura, has a capacity of generating over 10 MW of electricity. It is one of the key sources of power for the state, which previously faced challenges in meeting its energy needs due to its relatively remote location and underdeveloped infrastructure.

Brief history of the study area

The construction of the Gumti Dam led to the displacement of several communities that lived along the riverbanks. The affected areas primarily included tribal and rural populations who were heavily reliant on agriculture, fishing, and other traditional livelihood activities. The submerged areas impacted land that was used for farming, which formed the backbone of the livelihood for these communities. According to reports, the displacement primarily affected tribal populations such as the Tripuri people and other indigenous communities, who faced significant challenges in adjusting to new environments.

The fierce protests by nearly 40,000 indigenous people whose fertile lands went under water erupted due to the project. Not even one-fifth of the people who were forced to give up their land were compensated because most of the indigenous communities do not have valid land record documents to prove ownership. During the initial plan period of 1970's, rehabilitation policy was not implemented, nor land records by the original land holders available. For that many land less youths became insurgents and perhaps the problems of militancy of Tripura has persisted in those periods.

Over 80% of the displaced households relied on agriculture and forest-based livelihoods, which were irreversibly disrupted [7]. Fishing emerged as an alternative livelihood due to the reservoir; however, not all displaced families benefited equally [8].

The displaced individuals were largely dependent on agriculture for their sustenance, and the loss of agricultural land severely impacted their food security and income generation capacity. In addition to agricultural land loss, the disruption of fishing and forest resources further compounded their hardships.

Data collection

Primary data: Household surveys and interviews with affected communities.

Secondary data sources

- Previous research studies.
- Agricultural department reports

Sample size

For assessment of agricultural land loss out of the total 1980 displaced household, 300 household were taken for research purpose, the 300 household were all from the resettled villages situated in Dhalai District of Tripura, Gandatwisa and Rashyabari sub-division. The data have been collected from numerous villages of five village committees which are, Pancharatan, Ultachara, Jagabandhu, Dhalajari, and Ramnagar. Purposive sampling method have been used for the data collection.

To find the livelihood opportunities due to development project, total 120 samples were collected with a variation of three separate types of livelihoods which is Fishing, Shop/street vendor and Boat Transporter. The 120 sample have been separately taken due to its geographical location which made this sample an easy access for this type of livelihood opportunities. The name of the sample areas is Mandirghat, Gram Panchayat- Mukhcherri, Sub-Division- Karbook, District- Gomati and the other sample area is Narikel Kunja, Gandatwisa, Dhalai, Tripura.

RESULTS AND DISCUSSION

The (Table 1) above have provided data on the land distribution before and after a certain event or intervention, with a target on plain land cultivation and Jhum land/Tilla. Before the intervention, a total of 158.809 hectares of land were categorized, with 66.8794 hectares (42.11%) allocated to plain land cultivation and 91.9295 hectares (57.89%) to Jhum land/Tilla. After the intervention, the total area decreased to 117.349 hectares. The area for plain land cultivation dropped to 51.2889 hectares, accounting for 43.71% of the total land, while the area for Jhum land/Tilla decreased to 66.0599 hectares, comprising 56.29% of the total. This shift in land use percentages highlights a reduction in both types of land, but the proportional distribution between plain land cultivation and Jhum land/Tilla remains relatively similar before and after the event.

Total area loss

There was a reduction of 41.46 hectares of agricultural land, from 158.809 hectares before the project to 117.349 hectares afterward, representing a loss of about 26.1% of the total land.

Plain land cultivation: The area dedicated to plain land cultivation decreased by 15.5905 hectares, dropping from 66.8794 hectares (42.11%) to 51.2889 hectares (43.71%).

Jhum land/tilla: The area under Jhum land cultivation decreased by 25.8696 hectares, from 91.9295 hectares (57.89%) to 66.0599 hectares (56.29%).

The reduction in agricultural land is a direct consequence of the Gumti Hydel Project, which involved the creation of the reservoir and other infrastructural changes. The loss of land for both types of cultivation has impacted local agricultural practices, leading to a decrease in available land for farming. This loss has had major impact on socio-economic condition for

the local communities, particularly for those whose livelihoods relied heavily on agriculture. The data suggests that the impact of the dam project has shifted land usage patterns, potentially disrupting local food production systems and agricultural-based economies.

Table 1 Extent of agricultural land owned before and after displacement (in hectares)

S. No.	Type of Land	Before			After		
		Plain land cultivation	Jhum land/Tilla	Total	Plain land cultivation	Jhum land/Tilla	Total
1	Size of land	66.8794	91.9295	158.809	51.2889	66.0599	117.349
2	Percentage (%)	42.11	57.89	100.00	43.71	56.29	100.00

The data from the above (Table 2) survey covers three key occupations in the Karbook subdivision, specifically in the Mukhcherri (Mandirghat) Gram Panchayat. Among the 520 total approximate sample size, the largest group of 250 individuals (48.1%) are fishermen, with 53 respondents (44.2%) selected for the study. This signifies fishing as a major livelihood activity in the area. The second-largest group consists of 80 individuals (15.4%) engaged in small businesses, shops, and street vending, with 32 respondents (26.7%) chosen for the sample. This reflects the presence of entrepreneurial

activities and informal markets in the region. Lastly, 200 individuals (38.5%) are involved in boat transportation, an occupation that plays a significant role due to the area's proximity to water bodies, with 35 respondents (29.2%) selected for the survey. Together, these occupations represent the primary livelihood sources in the area, with fishing, small businesses, and boat transportation being the key economic activities. The sample size of 120 respondents provides a comprehensive outcome of the local workforce engaged in these sectors.

Table 2 Livelihood opportunities arising out of the development project

S. No.	Sub-division	Gram panchayat	Occupation	Total sample	Sample taken
1.	Karbook	Mukhcherri (Mandirghat)	Fishermen	250	53
2.	Karbook	Mukhcherri (Mandirghat)	Small Business/Shops/Street Vendors	80	32
3.	Karbook	Mukhcherri (Mandirghat)	Boat Transporter	200	35
			Total	520	120

Occupation engaged (Field survey)

Among the 120 respondents, fishing emerges as the primary livelihood, with 53 individuals (44.2%) engaged in this activity. Boat transportation, which has grown significantly due to increasing tourist activity around areas like Narikel Kunja, employs 35 respondents (29.2%), making it the second-largest occupational group. Meanwhile, 32 respondents (26.7%) are involved in small businesses, such as running shops or working as street vendors, reflecting the region's entrepreneurial growth and dependence on informal trade. This distribution underscores the importance of fishing, tourism, and small-scale commerce as vital contributors to the local economy and livelihoods. The emergence of small shops and street vendors in Narikel Kunja highlights the transformative impact of growing tourism on local livelihoods. According to surveys, the area in the early 2000s was devoid of shops, covered in coconut trees, and primarily served as a resting spot for travelers between Mandirghat and Gandatwisa. Occasionally, it attracted picnickers but lacked any significant commercial activity during its initial stages. Post-2010, the scenario began to shift as the number of tourists visiting Narikel Kunja steadily increased. By 2018, street vendors had started establishing shops in the area. Today, these vendors play a crucial role in meeting the needs of tourists while sustaining their livelihoods. During the tourist season, vendors and shopkeepers earn an average of ₹3,000 per day, while their earnings drop to around ₹1,000 per day in the offseason. Vendors operating within Narikel Kunja contribute ₹50 daily to the Narikel Kunja Cooperative Society as a business fee.

Income distribution (Field survey)

Out of 120 respondents, the largest income group comprises 38 individuals (31.7%) earning between ₹20,001 and

₹30,000 per month, making it the most prevalent income range. This is followed by 35 respondents (29.2%) with monthly earnings of ₹15,001–₹20,000, and 24 respondents (20%) earning ₹10,001–₹15,000.

A smaller proportion of respondents falls within higher income brackets, with 6 individuals (5%) earning ₹30,001–₹40,000, and 3 individuals (2.5%) reporting monthly incomes exceeding ₹40,000. At the lower end, 14 respondents (11.7%) earn between ₹5,001 and ₹10,000, while no respondents report earning less than ₹5,000.

Type of livelihood (Field survey)

The data found two dominant livelihoods in the surveyed region: tourism and trade. Among 120 respondents, 67 individuals (55.8%) rely on tourism as their primary source of income, while 53 respondents (44.2%) are involved in trade, encompassing small businesses, shops, and street vending. This reflects a strong entrepreneurial foundation that sustains the local economy through goods and services. Collectively, these sectors highlight the region's economic diversification, blending traditional commerce with emerging opportunities driven by tourism.

The survey found fishing, boat transportation, and small businesses as the primary livelihoods in the Karbook subdivision, particularly in the Mukhcherri (Mandirghat) Gram Panchayat. Fishing emerges as the dominant occupation, with 44.2% of respondents engaged in it, followed by boat transportation (29.2%) and small businesses (26.7%). Tourism, particularly around Narikel Kunja, has significantly impacted local livelihoods, with small vendors and shops growing after 2010 to meet increasing tourist demand. The income distribution reveals that the majority of respondents earn between ₹15,000 and ₹30,000 per month, with tourism and

trade being the main drivers of economic activity. This data underscores the region's economic shift, from traditional occupations like fishing to tourism-driven commerce [9].

Discussions based on various research articles

The construction of the Dumbor Hydroelectric Project in 1974 led to the loss of 46,000 acres of land, including agricultural land, forested areas, and grazing lands. This extensive submergence significantly disrupted the livelihoods of local communities, particularly indigenous and tribal populations, who relied on these lands for farming, fishing, and other subsistence activities. The loss of productive agricultural land was a major blow to the rural economy, forcing many to migrate or seek alternative livelihoods. This highlights the substantial socio-economic and ecological costs associated with such large-scale development projects. Chakma [10] and Roy [11] focus on the Gumti Hydropower Project in Tripura, India, revealing significant economic transformations in the affected regions. Chakma discusses the shift towards economic diversification, with affected communities adapting to non-agricultural livelihoods, while Roy highlights the economic transformation in Gandacherra, including increased dependence on wage labor and small businesses. Both studies underscore the challenges of replacing lost agricultural income with sustainable alternatives. Debnath *et al.* [12]. The Gumti (Dumbor) Reservoir, the sole reservoir in Tripura, holds a significant role in the state's fish production. In 1978–79, fish production from the reservoir was recorded at 169 tonnes, sourced from 1.64 lakh stocked seeds. By 2011–12, production had increased to 313.2 tonnes with a stocking of 19.2 lakh seeds. Over the decade from 2002 to 2012, the average stocking density was 712 seeds per hectare, exceeding the recommended density of 400–500 seeds per hectare for medium-sized reservoirs.

The shift from agriculture to alternative income sources is a recurring theme in the literature. Datta [4] examined livelihood transitions among Gumti dam-affected households, revealing a gradual move towards non-agricultural activities such as wage labor and small businesses. Similarly, Ghosh [5] analyzed the economic transformations driven by the dam, identifying both opportunities and challenges in the region's new economic landscape. Tripura Forest Department [13] highlighted the socio-ecological consequences of the Gumti Hydel Project, noting that submerged agricultural land disrupted traditional farming practices and exacerbated rural poverty. The Gumti Hydel Project submerged vast tracts of fertile agricultural land, which was the primary source of livelihood for the local population, especially tribal communities. According to the Tripura Forest Department [13], the project inundated approximately 46.34 square kilometers of land, including highly productive fields. This has disrupted traditional agrarian systems, leaving many families without their primary means of income. Nearly 80% of the submerged land was previously used for paddy cultivation, the primary crop of the region. Cash crops such as jhum (shifting cultivation) crops, vegetables, and fruits were also lost, affecting both subsistence and market-oriented farming.

Tourism has emerged as a potential income generator in the Gumti dam region. Saha [14] noted that the scenic reservoir created by the project has attracted tourists, providing some relief to displaced populations. However, these benefits are limited and unevenly distributed, with many households still struggling to achieve economic stability.

Despite these improvements, the farm gate prices received by Gumti fishers remain disproportionately low compared to terminal market prices due to elongated marketing channels.

The Department of Fisheries (DoF) collects license fees of ₹75 per fisher annually, generating substantial revenue. However, redirecting this revenue toward reservoir development could significantly enhance fish production.

Under the Rashtriya Krishi Vikas Yojana (RKVY), licensed fishers receive ₹1,200 per head during the annual fishing ban period (July 1 to August 31) and are also provided with free boats and nets. Since 1978–79, the number of licensed fishers has grown from 285 to 2,027 in 2012–13. The DoF and Cooperative Societies share royalty collections on a 65:35 ratio, with the proceeds being allocated for the reservoir's development and fisher welfare. A preliminary analysis indicated that licensed fishers could earn approximately ₹3,000 per month, slightly exceeding the national poverty line threshold of ₹972. Sustainable and enhanced fish production in the reservoir could be achieved through improved management strategies, supportive policies, and the adoption of scientific aquaculture practices.

Impact on displaced communities

The displacement caused by the project disproportionately affected indigenous groups, particularly Scheduled Tribes, who relied on subsistence agriculture. Studies such as Debbarma [15] emphasize the adverse effects on traditional farming practices, forcing displaced families to adapt to alternative livelihoods such as wage labor, small-scale businesses, and migration. Sonrish [16] highlights the socio-economic marginalization experienced by Scheduled Caste and Scheduled Tribe communities displaced by dam projects across India, drawing parallels to the Gumti Hydel Project. The Gumti Hydel Project has also resulted in long-term ecological impacts. The loss of agricultural land and forest areas has disrupted local ecosystems and traditional land-use patterns. According to Ghosh [5], the project has transformed the regional economy but at the expense of environmental sustainability. Haque and Zaman [17] argue that development projects like these often exacerbate inequalities, with benefits accruing to urban and industrial areas while rural communities bear the costs.

Livelihood transitions

The loss of agricultural land has led to tremendous livelihood transitions. Datta [4] discusses the gradual shift from agriculture to non-agricultural activities, including tourism and cooperative ventures. Similarly, Chakma [10] points to economic diversification in the affected regions, albeit at the cost of traditional agricultural practices. Saha [18] notes that tourism, driven by the scenic reservoir created by the dam, has provided some income opportunities, but these remain limited and insufficient to compensate for the loss of agricultural land. Displaced families turned to fishing in the newly created reservoir, but limited access to equipment and market connections restricted their earnings. Displaced farmers, unable to cultivate their ancestral lands, were forced to seek alternative livelihoods. Many became wage laborers or shifted to fishing, which could not fully compensate for their previous income from farming. The loss of agricultural land directly reduced food production, leading to increased dependency on external food supplies and heightened vulnerability to food insecurity [19–21].

CONCLUSION

The Gumti Hydel Project has had a profound impact on the local agricultural landscape, leading to a reduction in available agricultural land. The loss of 41.46 hectares, approximately 26.1% of the total land, has particularly affected

plain land and Jhum cultivation, which were vital to the local agricultural economy. This land loss has shifted the region's livelihoods away from agriculture and towards alternative sources of income, notably fishing, boat transportation, and small businesses. With tourism playing a growing role, particularly around Narikel Kunja, local communities have adapted by engaging in tourism-driven commerce, small-scale trade, and informal markets. While these changes have provided new opportunities, they have also disrupted traditional agricultural practices, showing the socio-economic challenges faced by displaced communities. The evolving economic dynamics of the region suggest the need for careful management of natural resources and sustainable livelihood strategies to mitigate the negative consequences of development projects like the Gumti Hydel Project. By

acknowledging and addressing the long-term consequences of such projects, policymakers can ensure that development initiatives do not come at the cost of marginalized communities' livelihoods and ecological balance. While it has contributed to energy production and regional infrastructure, the loss of agricultural land and its ripple effects on livelihoods and ecosystems demand critical attention. Future development projects must adopt inclusive planning, incorporating measures for effective rehabilitation and sustainable livelihood restoration for affected communities. The submergence of fertile agricultural land and forests also led to deforestation, loss of biodiversity, and siltation in the reservoir. Despite its role in improving electricity availability in the region, the project has been criticized for its adverse impact on the indigenous population and the surrounding ecosystem.

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