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Assessing the impact of rehabilitation and relocation initiatives on the socio-economic livelihoods of forest dwellers

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Abstract

Rehabilitation and relocation of forest-dwelling communities from protected areas are important conservation strategies aimed at reducing human pressure on critical wildlife habitats while improving the socio-economic well-being of affected households. The present study assessed the impact of rehabilitation and relocation initiatives on the income, employment and livelihood activities of forest dwellers in Nagarahole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR) of Karnataka. Primary data were collected from 120 rehabilitated households through a structured and pre-tested interview schedule, and a paired t-test was employed to compare the socio-economic conditions before and after rehabilitation. The findings revealed that rehabilitation and relocation significantly influenced household livelihoods, although the extent of impact varied across the two reserves. In NTR, average annual household income increased from ₹1,53,570 to ₹3,21,875, representing a 95.94 per cent increase, mainly due to the emergence of agriculture-based livelihoods following land allocation. Employment shifted from forest-dependent activities towards agriculture, wage labour and private sector jobs, while access to land, livestock, credit and extension services improved considerably. In KTR, average annual household income increased by 21.80 per cent, primarily driven by enhanced wage labour opportunities. However, agricultural income, land ownership and livestock assets declined significantly after relocation because agricultural land was not allocated to most households. Although access to credit and extension services improved, livelihood outcomes were comparatively less favourable than those observed in NTR. The study concludes that rehabilitation programmes incorporating land-based support, livelihood diversification and institutional assistance are more effective in ensuring sustainable socio-economic development among relocated households while simultaneously contributing to long-term wildlife conservation goals.

Keywords: Rehabilitation, Relocation, Forest Dwellers, Socio-economic Livelihoods, Protected Areas, Tiger Reserves, Livelihood Diversification, Household Income, Wildlife Conservation, Karnataka

Introduction

Protected areas play a crucial role in conserving biodiversity and maintaining ecological balance. In India, tiger reserves have been established to protect endangered wildlife species and their habitats. However, many forest-dwelling communities have traditionally lived within these protected landscapes and depend heavily on forest resources for their livelihood. To create inviolate habitats for wildlife conservation and reduce human-wildlife conflicts, rehabilitation and relocation programmes have been implemented in several tiger reserves across the country. Rehabilitation and relocation are important conservation strategies that aim to balance ecological objectives with the welfare of local communities. Under these programmes, forest-dwelling households are voluntarily relocated from core or critical wildlife habitats to safer locations outside protected areas and are provided with compensation, housing, agricultural land, infrastructure facilities and livelihood support. The success of these programmes depends not only on effective conservation outcomes but also on their ability to improve the socio-economic conditions of the affected households.

Livelihoods of forest dwellers are closely linked to agriculture, wage labour, livestock rearing, collection of non-timber forest products (NTFPs) and other forest-based activities. Relocation

often brings significant changes in access to land, employment opportunities, income sources and institutional support services. While rehabilitation can create opportunities for improved living standards and diversified livelihoods, it may also result in challenges such as loss of traditional occupations, reduced access to natural resources and difficulties in adapting to new socio-economic environments. Therefore, assessing the impact of rehabilitation initiatives on the livelihoods of relocated households is essential for understanding the effectiveness of these programmes.

Karnataka is home to several important tiger reserves, including Nagarhole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR), where rehabilitation and relocation programmes have been undertaken to strengthen wildlife conservation efforts. The rehabilitation models followed in these reserves differ in terms of land allocation, compensation mechanisms and livelihood support, which may influence the post-relocation outcomes experienced by forest dwellers. Evaluating these outcomes can provide valuable insights into the strengths and limitations of existing rehabilitation strategies.

In this context, the present study was undertaken to assess the impact of rehabilitation and relocation initiatives on the income, employment and livelihood activities of forest dwellers in Nagarhole and Kali Tiger Reserves of Karnataka. The study compares the socio-economic conditions of households before and after rehabilitation and examines how changes in livelihood assets, employment opportunities and income sources have influenced their overall well-being. The findings are expected to contribute to the development of more effective and sustainable rehabilitation policies that simultaneously support wildlife conservation and improve the livelihoods of forest-dependent communities.

2. Methodology

2.1. Data

Primary data were collected through personal interviews using a well-structured and pre-tested interview schedule to ensure the reliability and consistency of responses. The information gathered covered socio-economic characteristics of forest dwellers, including income levels, employment status, and livelihood conditions. Data were also collected on factors influencing the willingness or unwillingness of forest dwellers to accept rehabilitation and relocation, as well as the challenges faced by both rehabilitated and non-rehabilitated households. In addition, information on constraints encountered during the rehabilitation process and stakeholders' suggestions for improving the effectiveness and implementation of rehabilitation programmes was obtained. The study aimed to identify and analyze the key socio-economic, institutional, and infrastructural factors influencing rehabilitation and relocation decisions among forest dwellers in Nagarhole and Kali Tiger Reserves.

2.2. Analytical tools used

Paired t test

Paired t-test was carried out to compare the status of rehabilitated and non-rehabilitated families. It is a statistical procedure used to determine whether the mean difference between two sets of observation is zero.

The formula for the paired t-test is given by

$$t = \frac{|\bar{d}|}{\frac{s}{\sqrt{n}}} \sim t_{(n-1)} \quad df$$

Where,

$$s = \sqrt{\frac{1}{n-1} \left[\sum d^2 - \frac{(\sum d)^2}{n} \right]} \quad \bar{d} = \frac{\sum d_i}{n}; \backslash$$

$d_i = (x_i - y_i)$ = difference between paired observations and
Where,

$\sum d$ is the sum of the differences.

2.3 Definitions of terms and concepts used

- **Tiger reserve:** A tiger reserve is a protected area designated for the conservation of tigers and their natural habitat. These reserves provide a safe environment for tigers to thrive, focusing on their protection from poaching and habitat destruction. They are often part of broader wildlife protection efforts aimed at preserving biodiversity.
- **Protected areas:** A protected area is a designated region where natural resources, flora and fauna are safeguarded from exploitation or destruction. These areas are managed to preserve biodiversity, protect ecosystems and maintain ecological balance. Human activities such as logging or hunting are restricted or controlled to ensure long-term conservation.
- **Buffer area:** A buffer area is a designated zone around a protected area, such as a wildlife sanctuary or reserve, designed to minimize human impact. It acts as a protective barrier, reducing encroachment and protecting the core area from external threats like poaching or deforestation.
- **Core area:** A core area is the central part of a protected region, such as a wildlife reserve, where human activity is strictly limited. It serves as the primary habitat for wildlife, ensuring minimal disturbance to preserve biodiversity and ecological balance.
- **Forest dwellers:** Forest dwellers are communities or groups of people who live in and around forests, often relying on the forest's resources for their livelihood. They typically have a deep cultural connection to the forest and engage in activities like hunting, gathering and traditional farming.
- **Restricted area:** A restricted area is a designated zone where access is limited or controlled due to safety, security, or environmental reasons. Entry is typically prohibited or allowed only under specific conditions, often to protect sensitive resources or maintain public safety.
- **Rehabilitation:** Rehabilitation refers to the comprehensive support provided to relocated families to help them re-establish their lives at the new location. It includes the provision of land (agricultural and homestead), compensation for assets, housing, basic amenities (like roads, water, electricity, sanitation), and access to livelihood opportunities.
- **Relocation:** Relocation refers to the voluntary shifting of individuals or entire villages from core/critical tiger habitats (the areas reserved strictly for tiger conservation) to safer locations outside these zones. The relocation process is based on the principle of mutual agreement and informed consent of the affected families and the Gram Sabha. It is carried out only after recognizing and settling the forest rights of the people under the Forest Rights Act, 2006. The aim is to create inviolate spaces for tigers while ensuring that the rights, dignity and livelihoods of forest dwellers are protected. To support this, the government provides a compensation package, which has been enhanced to ₹15 lakh per family since 2021.

There are two options in relocation / rehabilitation package

Option I (Relocation): Direct Cash Compensation

Under this option, families relocate independently and receive a lump sum payment of ₹15 lakh in a joint bank account. The amount can be used to purchase land, construct a house, or establish a livelihood at a location of their choice. Families are required to provide proof of land or asset purchase to access the full amount. This option offers greater flexibility and autonomy and is suitable for families capable of managing their own relocation process.

Option I has 2 components

- Option IA:** In case, the villagers through the Gram Sabha agree for receiving a payment of Rs. 15 lakhs per family (inclusive of the valuation for their assets), then the said amount would be deposited in the name of the beneficiary (a joint account with spouse in case of a married individual).
- Option IB:** In case, the villagers through the Gram Sabha do not agree for the above (option A) and demand due compensation for their assets then the following may be adopted:
 - Compensating the beneficiaries in proportion to the assets as per valuation done by the Collector.
 - Distributing the balance amount equally to all eligible families / beneficiaries.

The shortfall, if any, of compensation amount in proportion to the assets will be met by the State Government.

Option II (Rehabilitation): Government-Assisted Relocation Package:

Under this option, the Forest Department manages the entire relocation process for each family. The revised package of ₹15 lakh is split into specific components to ensure comprehensive rehabilitation

Out of the total amount, ₹5.25 lakh (35%) is allocated for procurement and development of agricultural land (2 hectares per

family). ₹4.50 lakh (30%) is reserved for settling forest rights and compensating for existing assets. An amount of ₹3.00 lakh (20%) is provided for homestead land and house construction, while ₹0.75 lakh (5%) is given as a relocation incentive to each family. Finally, ₹2.25 lakh (10%) is earmarked for creating community facilities

This option ensures that families are settled in new, planned villages with proper housing, infrastructure and public services. It also ensures continued government support, including help in accessing welfare schemes, creating sustainable livelihoods and regular monitoring. This package is suitable for families seeking a structured and secure relocation process (Gok report 2025).

3. Results and Discussion

3.1. Impact of Rehabilitation and relocation on Income

Table 3.1 presents the changes in household income before and after rehabilitation among forest dwellers in Nagarhole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR). The results indicate that rehabilitation and relocation had a positive impact on the economic condition of households, although the sources of income varied between the two reserves.

In NTR, the average annual household income increased significantly from ₹1,53,570 before rehabilitation to ₹3,21,875 after rehabilitation, registering a 95.94 per cent increase ($t = 4.12$). This substantial improvement was mainly driven by the emergence of agricultural income, which increased from nil to ₹1,98,000 after rehabilitation, indicating a successful transition from forest-dependent livelihoods to settled farming activities. Wage labour income, however, declined significantly by 10.60 per cent, from ₹1,25,130 to ₹1,11,875 ($t = 3.58$), suggesting reduced dependence on casual labour. Income from NTFPs and forest labour declined to zero after rehabilitation as households were no longer allowed to access forest resources. In addition, households earned ₹12,000 from other sources, reflecting the adoption of supplementary livelihood activities and diversification of income sources.

Table 3.1: Impact of Rehabilitation on Income of respondents in the study area (n=120)

Sl. No.	Source of income	Before Rehabilitation (₹)	After Rehabilitation (₹)	% Change	Significance (t-value)
A Nagarhole Tiger Reserve					
1	Income from agriculture	0.00	1,98,000	100.00	Not applicable
2	Income from wage labour	1,25,130	1,11,875	-10.60	3.58**
3	Income from NTFP	4,440	0.00	-100.00	Not applicable
4	Income from forest labour	32,000	0.00	-100.00	Not applicable
5	Income from other source	0.00	12,000	100.00	Not applicable
6	Average annual household income	1,53,570	3,21,875	95.94	4.12**
B Kali Tiger Reserve					
1	Income from agriculture	94,500	10,710	-89.33	4.05**
2	Income from wage labour	28,592	1,59,500	450.60	5.23**
3	Income from forest labour	48,000	0.00	-100.00	Not applicable
4	Income from MGNREG	9,480	4,212	-33.33	4.33**
5	Other sources of income	28,800	54,000	75.00	2.41*
6	Average annual household income	1,94,972	2,28,422	21.80	3.12**

In KTR, the average annual household income increased from ₹1,94,972 to ₹2,28,422, recording a significant increase of 21.80 per cent ($t = 3.12$). Although the increase was lower than that observed in NTR, it still indicated an improvement in the economic status of relocated households. Agricultural income declined sharply by 89.33 per cent, from ₹94,500 to ₹10,710 ($t = 4.05$), mainly due to limited access to agricultural land after relocation. In contrast, wage labour income increased remarkably by 450.60 per cent, rising from ₹28,592 to ₹1,59,500 ($t = 5.23$), and became the major source of livelihood. Similar to NTR,

income from forest labour reduced to zero after relocation. Income from MGNREGA declined by 33.33 per cent, while income from other sources increased by 75.00 per cent, indicating gradual diversification into alternative livelihood opportunities. Overall, the findings reveal that rehabilitation and relocation improved household incomes in both reserves. While income enhancement in NTR was primarily supported by agriculture-based livelihoods, households in KTR relied more on wage employment opportunities. These contrasting patterns suggest that the success of rehabilitation programmes depends on local

socio-economic conditions and the livelihood opportunities available to relocated households.

3.2 Impact of rehabilitation and relocation on employment

Table 3.2 presents the changes in employment patterns of households before and after rehabilitation in Nagarhole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR). The findings indicate significant shifts in livelihood activities following rehabilitation and relocation.

In NTR, none of the households practiced agriculture before rehabilitation due to the absence of agricultural land within the forest. After rehabilitation, all 60 households (100%) adopted

agriculture and worked an average of 65 days per year, reflecting a successful transition to settled farming. Participation in wage labour declined slightly from 60 to 53 households (11.66%), but the average number of working days increased from 157 to 179 days per year, indicating improved employment opportunities. Dependence on forest-based activities reduced considerably, with households engaged in NTFP collection declining from 27 to 4 (85.18%), while forest labour participation dropped completely from 16 households to none. Additionally, 7 households secured private sector employment after rehabilitation, working an average of 302 days per year, demonstrating diversification into employment.

Table 3.2: Impact of Rehabilitation on Employment of respondents in the study area (n=120)

Sl. No.	Employment type	Families Engaged (Before)	Families Engaged (After)	Avg. Days/Year (MD) (Before)	Avg. Days/Year (MD) (After)	% Change (Families Engaged)	% Change (Avg. Days/Year)
A	Nagarhole Tiger Reserve						
1	Agriculture (own land)	0	60	0	65	100.00	100.00
2	Wage Labour	60	53	157	179	-11.66	14.01
3	NTFP collection	27	4	20	20	-85.18	0.00
4	Forest Labour	16	0	57	0	-100.00	-100.00
5	Private Sector Job	0	7	0	302	100.00	100.00
B	Kali Tiger Reserve						
1	Agriculture (own land)	46	8	60	60	-82.61	0.00
2	Wage Labour	47	52	73	179	10.64	145.21
3	Forest Labour	24	0	302	0	-100.00	-100.00
4	MGNREGA	18	8	100	100	-55.56	0.00
5	Private Sector Job	23	27	302	302	-6.66	0.00

In KTR, 46 households were engaged in agriculture before relocation, working an average of 60 days annually. After relocation, only 8 households continued farming, representing a decline of 82.61 per cent, mainly due to the absence of agricultural land allocation. In contrast, wage labour participation increased from 47 to 52 households, while average employment days rose sharply from 73 to 179 days, an increase of 145.21 per cent. Forest labour ceased entirely, declining from 24 households to none after relocation. Employment under MGNREGA decreased from 18 to 8 households (55.56%), whereas private sector employment increased moderately from 23 to 27 households, indicating stable expansion of non-farm employment opportunities.

Overall, rehabilitation in NTR promoted a complete shift towards agriculture along with continued wage labour and emerging private sector jobs. In KTR, relocation resulted in reduced agricultural employment but substantially increased dependence on wage labour. In both reserves, forest-based employment was completely eliminated, highlighting the transition from forest-dependent livelihoods to alternative income-generating activities.

3.3 Impact of rehabilitation and relocation on livelihood

Table 3.3 presents the changes in key livelihood indicators of households before and after rehabilitation in Nagarhole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR).

In NTR, none of the households owned agricultural land before rehabilitation. After rehabilitation, all households acquired agricultural land with an average holding of 3.5 acres, indicating

a complete shift towards agriculture-based livelihoods. Livestock ownership increased from 13 households (21.66%) to 27 households (45.00%), reflecting improved asset creation. Access to credit doubled from ₹15,000 to ₹30,000 and became available to all households, showing a significant increase ($t = 2.64$). Similarly, access to extension services improved from 22 households (36.66%) to 42 households (70.00%), indicating stronger institutional support after rehabilitation.

In KTR, 90.00 per cent of households owned agricultural land before relocation, with an average holding of 2.6 acres. After relocation, land ownership declined sharply to 15.00 per cent and the average landholding reduced to 1.7 acres, representing an 83.33 per cent decline ($t = 3.70$). Livestock ownership also decreased from 23 households (38.33%) to 14 households (23.33%). Access to credit increased substantially from ₹17,000 to ₹1,20,000, recording a 605.88 per cent increase ($t = 12.92$), although the proportion of households accessing credit declined. Extension service access improved moderately from 14 households (23.33%) to 19 households (31.66%).

Overall, rehabilitation in NTR strengthened livelihood assets through land ownership, livestock development and improved institutional support. In contrast, KTR households experienced a significant decline in productive assets, particularly agricultural land and livestock, despite improvements in credit availability and extension services. These findings highlight the importance of land-based support in ensuring sustainable livelihood outcomes after rehabilitation and relocation.

Table 3.3: Impact of Rehabilitation on Livelihood Activities of respondents in Nagarhole Tiger Reserve (n=120)

Sl. No.	Livelihood Indicators	Before Rehabilitation		After Rehabilitation		% Change	Significance (t-value)
		Particulars	No, of HH %	Particulars	No, of HH %		
A	Nagarhole Tiger Reserve						
1	Ownership of agricultural land (Avg Acre / households)	0.00	00	3.5	100	NA	Not applicable
2	Ownership of livestock (no. of households)	13	21.66	27	45.00	-10.92	Not applicable
3	Access to credit facilities (Rs.)	15,000	25	30,000	100	100.00	2.64**
4	Access to agricultural extension services (no. of households)	22	36.66	42	70	90.91	Not applicable
B	Kali Tiger Reserve						
1	Ownership of agricultural land (Avg Acre/household)	2.6	90	1.7	15	-83.33	3.70**
2	Ownership of livestock (no. of household)	23	38.33	14	23.33	-22.39	Not applicable
3	Access to credit facilities (Rs.)	17,000	46.66	1,20,000	20	605.88	12.92**
4	Access to agricultural extension services (no. of households)	14	23.33	19	31.66	35.71	Not applicable

Note: Figures in the parentheses indicate percentage of households out of 60

4. Conclusion

The study assessed the impact of rehabilitation and relocation initiatives on the income, employment and livelihood activities of forest dwellers in Nagarhole Tiger Reserve (NTR) and Kali Tiger Reserve (KTR). The findings revealed that rehabilitation and relocation significantly influenced the socio-economic conditions of households, although the nature and extent of impacts varied across the two reserves.

In NTR, rehabilitation resulted in substantial improvements in household income, employment and livelihood assets. The allocation of agricultural land enabled households to shift from forest-dependent activities to agriculture-based livelihoods, leading to a 95.94 per cent increase in average annual household income. Livestock ownership, access to credit facilities and agricultural extension services also improved considerably, indicating strengthened livelihood security and enhanced economic opportunities.

In KTR, relocation led to a moderate increase in average household income (21.80%), primarily driven by increased wage labour opportunities. However, the absence of agricultural land allocation resulted in a significant decline in agricultural income, land ownership and livestock assets. Although access to credit and extension services improved, the reduction in productive assets made livelihood outcomes comparatively less favourable than those observed in NTR.

The study concludes that rehabilitation programmes that incorporate land-based support and livelihood development measures are more effective in ensuring sustainable socio-economic improvement among relocated households. The contrasting experiences of NTR and KTR highlight the importance of designing rehabilitation strategies that restore productive assets, enhance livelihood opportunities and strengthen institutional support systems. Such measures are essential for achieving both wildlife conservation goals and the long-term well-being of forest-dwelling communities.

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