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Mapping Determinants of Beneficiary Knowledge in TSP: Evidence for Targeted Extension Strategies

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HIGHLIGHTS

- Educational attainment, social exposure, targeted training, and institutional engagement were key levers for improving the effectiveness of TSP outreach and beneficiary empowerment
- Education, cosmopoliteness, training participation, and extension contact expressed significant contribution towards knowledge

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ABSTRACT

The study was conducted in 2024 to map the determinants of the knowledge levels of tribal beneficiaries enrolled under the Tribal Sub Plan (TSP) programme. A sample of 240 tribal farmers was considered as respondents under multi-stage random sampling, followed by a personal interview with a structured questionnaire for executing the process of data collection. More than half of the factors expressed a significant relationship with the knowledge level of TSP programme. Factors like education, cosmopoliteness, training participation and extension contact were prominently contributing towards knowledge level, as these, along with other factors, in total managed to elucidate about fifty-six per cent of the variation caused in knowledge level.

INTRODUCTION

Odisha, as a state of agrarian economy, is distinguished by its tribal diversity, being home to 62 tribal communities that constitute 22.1% of the state's population and thus enjoys the title of the third largest Scheduled Tribe (ST) populous state of the country as per the 2011 census. Notably, 94.5% of this tribal population lives in close proximity to nature (Palo et al., 2020; Bahubalendra et al., 2025), who have been historically excluded from mainstream development. Tribals have remained significantly disadvantaged across all major socio-economic parameters, with persistent poverty, low education levels, and poor health outcomes despite some gradual improvements, which is quite evident from the studies conducted by various authors (Rath, 2018; Behera & Dassani, 2021; Takri & Sahoo, 2022; Padhan, 2022). Thus, in this respect, many of the institution-backed initiatives for the upliftment of the tribal population and thus, the Tribal Sub Plan programme is one of those ventures.

Tribal Sub Plan (TSP) was introduced in the Fifth Five-Year Plan (1974-1978) period as a strategic tool that would ensure that benefits and resources of the general development areas is evenly distributed to the States, Union Territories, and Central Ministries in proportion to the tribal population in terms of space and in terms of finances (Makwana, 2017; Rathour et al., 2022). The emergence of Integrated Tribal Development Projects (ITDP) to address disparities in development between tribal and non-tribal areas, with a concentrated emphasis on area-based development. The initiatives were created to reduce poverty, increase educational levels, and eliminate exploitation among the tribal families. The plan involved

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measures of income generation, infrastructure development, administrative need strengthening, as well as capacity building (Mathew, 2024). But the initiative is yet to produce the results as were optimistically dreamt of during its initial implementation, whereby majority of the tribals were still below in poverty line in Odisha (Sethi et al., 2021). So, there might be issues related to the comprehensibility of the programmes amongst the tribal people, which would be causing such inefficacies and failures.

This investigation attempts to map out determinants of the knowledge level of beneficiaries enlisted under the programme, whose results prove to be vital for tailoring future interventions and communication strategies to enhance the effectiveness of the programme, which would lead to overall transformation of the tribal populace towards progress and sustainability.

METHODOLOGY

The study was conducted in Kendujhar and Rayagada districts of Odisha under the Tribal Sub-Plan (TSP), representing tribal-dominated areas with diverse socio-economic conditions. A multistage purposive sampling procedure was followed for the selection of blocks, villages, and respondents, yielding a total sample size of 240. The questionnaire, formulated after literature review and expertise consultation, was pretested on the officials, supported with an explanation in the local Odia dialect, and feedback obtained served insights for finalising the interview schedule (Jayasingh & Mishra, 2024). Data collection occurred through interviews in their workplace from September 2024 to May 2025.

Knowledge level refers to the extent to which the tribal respondents have knowledge about the existence and functioning of TSP scheme in their native vicinity. A structured knowledge test was developed to assess key aspects of the Tribal Sub Plan (TSP) programme. Relevant items were identified through expert consultation and pre-testing to ensure content validity. The test was administered to tribal farmer beneficiaries using culturally appropriate formats and local language. Closed-ended questions, such as multiple-choice and true/false items, were employed to evaluate factual understanding. Responses were scored objectively, assigning one point per correct answer. Item difficulty and discrimination indices were analyzed for refinement. Total scores were computed to derive a knowledge index, and respondents were categorized into low, medium, and high knowledge levels using the half-standard deviation method. Ethical considerations, including informed consent and contextual sensitivity, were maintained throughout the process.

Factors relevant to the study were chosen based on a comprehensive literature review, followed by the advice of expert consultation. Then, a structured questionnaire was prepared with the help of scales taken up for the suitability to measure the concern factor as an independent variable, with a pre-testing exercise followed by modifications to make it adaptable for the concerned sample. Pearson's correlation analysis was carried out to encompass the relationship of the concerned factors with that of the knowledge level of tribal respondents regarding the TSP scheme. Multiple linear regression analysis was employed to determine the relative contribution of the selected factors and their combined effect on the training effectiveness.

RESULTS

Association of profile characteristics with the knowledge level

The results presented in Table 1 highlight the association between selected independent variables and the knowledge level of Tribal Sub Plan (TSP) beneficiaries. Several variables showed a statistically significant positive correlation with knowledge level, indicating their strong influence.

Table 1. Association of selected independent variables with the knowledge level of TSP beneficiaries

Variables	Correlation coefficient	*p*-value
Age	0.432**	0.000
Education	0.593**	0.000
Family Type	0.112NS	0.083
Family Size	0.072NS	0.266
House Type	0.091NS	0.159
Farm Holding Size	0.08NS	0.216
Occupation	0.138*	0.032
Annual Income	0.125NS	0.053
Farming Experience	-0.432**	0.000
Cosmopoliteness	0.118NS	0.068
Training Participation	0.397**	0.000
Source of Information	0.761**	0.000
Extension Contact	0.821**	0.000
Social Aptitude	0.632**	0.000
Scientific Orientation	0.601**	0.000
Economic Aptitude	0.594**	0.000

*=Significant at 5% level; **=Significant at 1 % level; NS=Non-significant.

Among the most influential factors, extension contact, education and source of information exhibit very high positive correlations, all significant at the one per cent level of significance. These findings suggest that beneficiaries who are more educated, socially connected, and have better access to information and extension services tend to possess higher knowledge about the TSP scheme. Other positively correlated and significant variables include age, training participation, social aptitude, scientific orientation and economic aptitude. These factors further reinforce the role of personal development, exposure, and cognitive traits in enhancing awareness of the scheme. Interestingly, farming experience shows a significant negative correlation, implying that more experienced farmers may have lower knowledge levels about the TSP scheme, possibly due to reliance on traditional practices or limited engagement with newer institutional mechanisms.

In contrast, variables such as family type, family size, house type, farm holding size, and annual income exhibited low correlation coefficients and non-significant t-values, indicating no meaningful association with knowledge level. Occupation showed statistically significant positive correlation at a five per cent level of significance, suggesting a considerable influence on knowledge level. Overall, the analysis underscores the importance of education, extension contact, cosmopoliteness, and access to information in shaping beneficiaries' understanding of the Tribal Sub Plan scheme, while demographic and economic variables appear less influential.

Contribution of profile characteristics towards the Knowledge level

The regression model as depicted in Table 2, yielded an R^2 value of 0.578, indicating that approximately 57.8 per cent of the variation in the knowledge level of Tribal Sub Plan (TSP) beneficiaries is explained by the combined influence of the selected independent variables. The adjusted R^2 value of 0.563 further reinforces the model's robustness by accounting for the number of predictors and penalising the inclusion of non-contributory variables. The minimal difference between R^2 and adjusted R^2 suggests that most of the predictors included in the model were relevant and contributed meaningfully to explaining the dependent variable. This balance between explanatory strength and model parsimony enhances the credibility of the significant findings and supports the reliability of the regression framework used in the study.

Table 2. Multiple linear regression analysis for the factors affecting the knowledge level of TSP beneficiaries

Variables	b-value	Std. error	t-value	*p*-value
Age	0.023	0.37	0.062^{NS}	0.951
Education	5.470	2.41	2.27*	0.024
Family Type	-4.720	2.76	-1.710^{NS}	0.089
Family Size	-1.680	1.06	-1.585^{NS}	0.114
House Type	1.970	1.39	1.417^{NS}	0.158
Farm Holding Size	2.280	1.64	1.390^{NS}	0.166
Occupation	6.630	3.79	1.749^{NS}	0.816
Annual Income	3.550	1.90	1.868^{NS}	0.063
Farming Experience	-15.080	9.02	-1.672^{NS}	0.095
Cosmopoliteness	6.826	4.45	1.534^{NS}	0.095
Training Participation	2.540	1.18	2.153*	0.032
Source of Information	6.840	5.38	1.271^{NS}	0.205
Extension Contact	5.180	1.68	3.083**	0.002
Social Aptitude	7.910	9.15	0.864^{NS}	0.388
Scientific Orientation	8.550	6.76	1.265^{NS}	0.207
Economic Aptitude	0.234	0.34	0.688^{NS}	0.492

*= Significant at 5% level; ** = Significant at 1 % level; ^{NS} = Non-significant. Dependent variable: Knowledge level of TSP beneficiaries, R^2= 0.578, adjusted-R^2= 0.563

Among these 16 variables fitted in the model, four variables emerged as statistically significant contributors. Education showed a positive and significant influence, suggesting that higher educational attainment enhances beneficiaries' awareness and understanding of the TSP scheme. Training participation was also significant, highlighting the role of structured learning experiences in improving scheme-related knowledge. Extension contact proved to be a highly significant factor, reinforcing the importance of regular interaction with extension personnel in disseminating information and encouraging engagement.

The remaining variables, namely age, family type, family size, house type, farm holding size, occupation, annual income, farming experience, source of information, social aptitude, scientific orientation, and economic aptitude were statistically non-significant, suggesting that their individual contributions to explaining variation in knowledge level were limited within this model. Overall, the findings underscore the critical role of education, training exposure, and extension contact in enhancing tribal farmers' understanding of the TSP scheme, offering valuable insights for designing targeted interventions and capacity-building strategies.

DISCUSSION

The distribution of tribal respondents' knowledge about the Tribal Sub Plan (TSP) scheme reveals a layered awareness profile. Majority of them possessed medium knowledge but a few expressed high levels of it, which pictures about the general familiarity of the scheme yet less number of them managed to grasp it deeply and thus capable of engaging meaningfully with the facets of the scheme. The existence of ones expressing low extent of knowledge highlights a significant gap amongst the beneficiaries who were unable to reap the benefits of the scheme as this segment may face barriers such as low literacy, poor outreach, or geographic isolation. Their limited awareness underscores the need for inclusive communication strategies and targeted interventions. In their study conducted in Tamil Nadu on the same context, Satish et al. (2024) concluded that more than 90 per cent of tribals lack knowledge about various tribal schemes thus highlighting a significant gap in awareness as well as professing for the need for inclusive communication strategies. These results do points towards the importance of continued efforts for increasing the knowledge level of tribals regarding TSP scheme whose sole purpose is achieving their upliftment.

The level of knowledge a tribal farmer possesses about the Tribal Sub Plan (TSP) Scheme is shaped by a constellation of socio-personal and psychological factors, each contributing in distinct ways to their awareness, understanding, and engagement with the scheme. Age plays a prominent role in shaping knowledge levels. Younger farmers are generally more open to new ideas and technologies, making them more receptive to development schemes like TSP. In contrast, older farmers may rely more on traditional practices and have limited exposure to formal information channels, which can hinder their awareness unless targeted outreach is provided. Jayathilake et al. (2019) concluded that older farmers had limited access to new information as compared to rural youth. Education level was a strong determinant of Tribal Sub Plan knowledge. Farmers with higher education were better equipped to comprehend policy guidelines, interpret written materials, and engage with digital platforms. This literacy advantage enables them to access and process scheme-related information more effectively. Nagesha et al. (2022) stated that education had been a significant determinant of farmer's knowledge about government schemes like PM-Fasal Bima Yojana. Occupation also influenced exposure to the scheme. Farmers engaged in diversified livelihoods such as poultry, dairy, or forest-based enterprises that often interact with multiple institutions and markets. These interactions increase their chances of learning about TSP benefits. Conversely, those practicing subsistence agriculture might have fewer institutional contacts, limiting their awareness (Hatai & Singh, 2019). Training participation had a direct and positive impact on tribals as the one who attend government or NGO-led training programs are often introduced to Tribal Sub Plan modules, eligibility criteria, and application procedures. These structured learning opportunities significantly boost their understanding of the scheme. Source of

information is another critical factor whereby farmers who rely on formal channels—such as extension agents, newspapers, radio, television, or mobile apps—tend to have more accurate and comprehensive knowledge of TSP programme. In contrast, those depending solely on informal sources like neighbors or local leaders may receive incomplete or distorted information. Authors like Krishnan (2023) and Ndimbwa et al. (2020) stated the domination of informal sources of communication by the local people, quite unlike this context. Extension contact is a powerful enabler of awareness. Regular interaction with extension personnel, including Krishi Vigyan Kendras, Integrated Tribal Development Project (ITDP) officers, and agricultural officers, provides farmers with updates, clarifications, and encouragement to participate in schemes like Tribal Sub Plan programme. Srivani et al. (2022) inferred that tribal farmers had considerate extent of extension contact as related to awareness of about Pradhan Mantri Van Dhan Vikas Yojana activities. Social aptitude, defined by a farmer's ability to engage in community activities and group discussions, fosters peer learning and collective awareness. Farmers with high social aptitude are more likely to learn about Tribal Sub Plan programme through community platforms and local leadership networks. Scientific orientation reflects a farmer's inclination toward evidence-based thinking and modern agricultural practices. Those with strong scientific orientation are more curious about structured schemes and are better positioned to understand the technical and procedural aspects of Tribal Sub Plan programme. Katole et al. (2017) also identified scientific orientation as key psychological factor influencing technological adoption. Finally, economic aptitude defined as the ability to plan, budget, and assess financial risks—enhances a farmer's capacity to evaluate the benefits of TSP. Economically adept farmers are more proactive in accessing subsidies, loans, and development programs, making them more likely to engage with the scheme (Gaurav & Singh, 2012). The negative relationship of farm experience of tribal respondents to that of knowledge level of Tribal Sub Plan program can be owed to the fact that experienced tribal farmers often rely on traditional practices, resist external interventions, and have limited exposure to institutional channels. These factors reduce their engagement with modern schemes like the Tribal Sub Plan, despite their deep agricultural knowledge and long-standing field experience.

The regression analysis revealed that out of the 16 variables examined, only four emerged as statistically significant contributors to the knowledge level of Tribal Sub Plan (TSP) beneficiaries, offering critical insights into the drivers of policy awareness. The education level of respondents demonstrated a positive and significant influence, underscoring the role of formal learning in enhancing comprehension and engagement with development schemes such as the Tribal Sub Plan programme. This finding aligns with broader evidence that literacy and schooling improve access to institutional resources and the ability to interpret policy information (Aryal et al., 2024). Training participation also proved significantly contributing towards knowledge of the Tribal Sub Plan programme's beneficiaries, highlighting the value of structured learning platforms in equipping beneficiaries with relevant insights and procedural clarity. Such programs not only build capacity but also foster confidence in navigating scheme benefits. Extension contact positively influences Tribal Sub Plan knowledge by facilitating regular interaction between beneficiaries and field-level personnel. These engagements provide timely information, clarify scheme procedures, address doubts, and build trust, thereby enhancing awareness, understanding, and active participation in the Tribal Sub Plan programme among tribal communities (Muttanna et al., 2019). Collectively, these findings emphasise that educational attainment, social exposure, targeted training, and institutional engagement are key levers for improving the effectiveness of TSP outreach and beneficiary empowerment.

CONCLUSION

The findings illuminate critical disparities in the knowledge levels of tribal beneficiaries regarding the Tribal Sub Plan (TSP) programme, with implications for both programme efficacy and policy design. The identification of education, cosmopoliteness, training participation, and extension contact as significant predictors reinforces the need for multi-pronged policy interventions. Strengthening these dimensions through localised training modules, mobile-based information systems, and culturally attuned extension strategies can bridge the awareness gap. For TSP to fulfill its transformative mandate, future efforts must prioritise inclusive knowledge dissemination, adaptive outreach, and sustained engagement with tribal communities, ensuring that policy intent translates into tangible empowerment. A proactive and innovative extension outreach technique is strongly recommended to traverse the gap in the knowledge levels of tribal people for the effectiveness of the flagship programme.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the respondents regarding the study during the course of the data collection.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, they thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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