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Agroeconomic Disparities between Tribal and Non-Tribal Farm Households in Chhattisgarh: An Econometric Decomposition Analysis

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Abstract

This study investigates agroeconomic disparities between tribal and non-tribal farm households in Chhattisgarh, India, using primary data collected from 1,200 households (600 tribal and 600 nontribal) across twelve districts through a multistage stratified random sampling design. The analysis quantifies differences in farm income, productivity, and access to productive resources. Descriptive statistics and mean comparison tests reveal significant gaps in landholding size, irrigation coverage, input use intensity, and annual farm income. To identify determinants of income differentials, log-linear regression models were estimated, controlling for education, landholding, irrigation access, credit availability, extension contact, and market distance. Results indicate that irrigation access, institutional credit, and human capital significantly improve household income. An Oaxaca-Blinder decomposition was applied to decompose the income gap into explained and unexplained components. The findings suggest that a substantial proportion of the disparity is attributable to differences in productive endowments, while a residual unexplained component reflects structural and institutional disadvantages. The study underscores the importance of asset enhancement and institutional inclusion strategies to reduce persistent agricultural income inequality in tribal-dominated regions of Chhattisgarh.

Keywords: Income disparity, Tribal agriculture, Log-linear regression, Oaxaca decomposition, Agricultural inequality

Introduction

Agriculture remains the principal livelihood source for rural households in Chhattisgarh, particularly among tribal communities who constitute a significant share of the state's population. Despite various development programs aimed at promoting inclusive growth, disparities persist between tribal and non-tribal farm households in terms of landholding size, irrigation access, input utilization, institutional credit, and market participation. These differences often translate into variations in farm productivity and household income. Previous studies on agricultural inequality in India have largely focused on specific regions or micro-level analyses, limiting the generalizability of findings. In a state like Chhattisgarh—characterized by a high concentration of tribal farmers, rainfed agriculture, and uneven infrastructural development—a broader state-level examination is essential to understand the structural nature of agroeconomic disparities. Tribal farmers are often constrained by marginal landholdings, limited access to irrigation, lower capital investment, and weaker institutional linkages. In contrast, non-tribal farmers may benefit from relatively better access to productive resources and services. However, it remains important to determine whether observed income gaps arise mainly from differences in endowments or from differential returns to those endowments. The present study addresses this issue by empirically examining agroeconomic disparities between tribal and non-tribal farm households

across selected districts of Chhattisgarh. Using primary survey data and econometric techniques, including log-linear regression and Oaxaca-Blinder decomposition, the study quantifies income differentials and identifies key determinants contributing to the observed gap. The findings aim to provide policy-relevant insights for reducing agricultural inequality and promoting inclusive rural development in the state.

Objectives of the Study

The present study aims to examine agroeconomic disparities between tribal and non-tribal farm households in Chhattisgarh. The specific objectives are:

1. To compare socio-economic and farm characteristics of tribal and non-tribal households.
2. To estimate differences in farm income and productivity between the two groups.
3. To identify key determinants influencing household farm income.
4. To decompose the income gap into explained and unexplained components using econometric techniques.

Research Hypotheses

Based on the objectives, the following hypotheses are formulated:

- **H1:** There exists a statistically significant difference in farm income between tribal and non-tribal households.
- **H2:** Productive assets such as landholding size,

irrigation access, education, and institutional credit significantly influence household farm income.

- **H3:** A substantial proportion of the income gap between tribal and non-tribal households can be explained by differences in observable endowments, while a residual unexplained component reflects structural or institutional disadvantages.

Literature Review

Agricultural income inequality has been widely examined in development economics, with particular emphasis on the role of productive assets and institutional access. Binswanger and Rosenzweig (1986) ^[2] highlighted that disparities in landholding and capital assets significantly influence agricultural productivity and rural income distribution in developing economies. Datt and Ravallion (1998) ^[7] further demonstrated that agricultural growth plays a crucial role in poverty reduction, though unequal access to resources limits inclusive development. In the Indian context, Chand *et al.* (2011) ^[5] reported widening farm income disparities due to differences in irrigation access, credit availability, and technology adoption. Birthal *et al.* (2014) ^[3] emphasized that diversification toward high-value agriculture improves farm income; however, small and asset-poor farmers benefit less from such transitions. More recent evidence by Das and Srivastava (2021) ^[6] used regression-based decomposition techniques to show that land size and crop productivity are major contributors to income inequality among agricultural households in India. Recent research also indicates that income diversification significantly reduces household income inequality, highlighting diversification as an important determinant of livelihood outcomes for rural farm families in India (Narayanamoorthy, 2025) ^[9]. Studies focusing specifically on tribal agriculture indicate structural disadvantages in terms of land fragmentation, rainfed cultivation, and limited institutional support. Kumar and Jain (2013) ^[8] observed that tribal farmers often operate under low input intensity and face constraints in accessing formal credit and markets. Studies focusing on tribal agricultural communities report entrenched income disparities linked to limited access to institutional resources, leading to cycles of debt and reduced land security (Agricultural disparities among tribal communities, 2025) ^[1]. A recent district-level study in Jashpur, Chhattisgarh by Singh *et al.* (2023) ^[11] reported significant differences in income composition and livelihood diversification between tribal and non-tribal households, with non-tribal households exhibiting relatively higher income levels and better access to non-farm opportunities. Further, a national survey conducted during 2022-23 shows that marginal farm households experience lower per capita income and higher income insecurity, confirming the persistence of agrarian income inequality (Indian Journal of Extension Education, 2023). Methodologically, the Oaxaca-Blinder decomposition approach (Oaxaca, 1973; Blinder, 1973) ^[10, 4] has been widely applied to quantify income gaps by separating

explained differences (endowments) from unexplained components (structural factors). However, comprehensive state-level empirical evidence on agro-economic disparities between tribal and non-tribal farm households in Chhattisgarh remains limited. The present study addresses this gap through a state-wide econometric assessment.

Materials and Methods

Study Area

The study was conducted in the state of Chhattisgarh, India, which is characterized by diverse agro-ecological conditions and a substantial tribal population. Twelve districts—Jashpur, Bastar, Dantewada, Kanker, Surguja, Korba, Raigarh, Bilaspur, Raipur, Durg, Balod, and Mahasamund—were selected to represent tribal-dominated, mixed, and relatively developed agricultural regions of the state.

Sampling Design and Data Collection

A multistage stratified random sampling technique was adopted for the study. In the first stage, twelve districts were selected to capture regional diversity. In the second stage, two blocks were selected from each district based on the level of tribal concentration. Subsequently, five villages were randomly selected from each block. In the final stage, ten farm households were selected from each village using systematic random sampling, ensuring equal representation of tribal and non-tribal households.

A total of 1,200 farm households were surveyed, comprising 600 tribal and 600 non-tribal households. Primary data were collected during the agricultural year 2023-24 through a structured questionnaire covering demographic characteristics, landholding size, cropping pattern, cost of cultivation, farm income, non-farm income, access to irrigation, institutional credit, extension services, and market access.

Variables and Analytical Framework

Farm income was considered as the primary dependent variable. Explanatory variables included education level, landholding size, irrigated area, access to credit, extension contact, and market distance. Descriptive statistics and mean comparison tests were used to examine differences between tribal and non-tribal households.

To identify determinants of income, a log-linear regression model was estimated. Further, the Oaxaca-Blinder decomposition technique was applied to decompose the observed income gap into explained (endowment-related) and unexplained (structural) components.

Model Specification

To examine the determinants of farm income and quantify disparities between tribal and non-tribal households, a log-linear regression model was employed. The logarithmic form was used to reduce heteroscedasticity and interpret coefficients as percentage changes.

The functional form of the model is specified as:

$$\ln(Y_i) = \beta_0 + \beta_1 \text{Tribal}_i + \beta_2 \text{Education}_i + \beta_3 \text{Land}_i + \beta_4 \text{Irrigation}_i + \beta_5 \text{Credit}_i + \beta_6 \text{Extension}_i + \beta_7 \text{MarketDistance}_i + \epsilon_i$$

where:

- Y_i = Annual farm income of the i th household
- $Tribal_i$ = Dummy variable (1 = Tribal, 0 = Non-tribal)
- $Education_i$ = Years of schooling of household head
- $Land_i$ = Total landholding (hectares)
- $Irrigation_i$ = Irrigated land area (hectares)
- $Credit_i$ = Access to institutional credit (1 = Yes, 0 = No)
- $Extension_i$ = Access to extension services (1 = Yes, 0 = No)
- $MarketDistance_i$ = Distance to nearest market (km)
- ϵ_i = Error term

The coefficient of the tribal dummy variable captures the income differential between tribal and non-tribal households after controlling for observable characteristics. To further decompose the income gap, the Oaxaca-Blinder decomposition technique (Oaxaca, 1973; Blinder, 1973) was applied. The total difference in mean log income between tribal and nontribal households was divided into:

1. Explained component - arising from differences in observable characteristics (land, education, irrigation, etc.).
2. Unexplained component - reflecting differences in returns to characteristics and possible structural disadvantages.

This approach allows identification of whether income disparities are primarily due to differences in endowments or differential returns to those endowments.

Results and Discussion

Socio-Economic Profile of Households

Table 1: Socio-economic characteristics of tribal and non-tribal households

Variable	Tribal (n=600)	Non-tribal (n=600)	t-value
Age (years)	45.2	47.8	1.92
Education (years)	6.3	9.8	8.74***
Landholding (ha)	1.42	2.36	10.21***
Irrigated land (ha)	0.48	1.21	12.63***
Annual farm income (₹)	98,450	1,78,320	9.85***

***Significant at 1% level

Interpretation

Non-tribal households possess significantly larger landholdings, higher education levels, and better irrigation access compared to tribal households. The average annual farm income of nontribal households (₹1.78 lakh) is approximately 81% higher than that of tribal households (₹0.98 lakh).

Cost and Return Structure

Table 2: Cost and Returns (Major Crop, ₹/ha)

Particulars	Tribal	Non tribal
Total Cost	42,300	58,700
Gross Return	75,600	1,08,400
Net Return	33,300	49,700
B:C Ratio	1.79	1.85

Interpretation

Although non-tribal farmers incur higher production costs due to greater input use, their gross and net returns are substantially higher, resulting in slightly better benefit-cost ratios.

Regression Results

Table 3: Log-Linear Regression Results (Dependent Variable: ln Farm Income)

Variable	Coefficient	t-value
Tribal (1=Yes)	-0.287***	-5.64
Education	0.032***	4.12
Landholding	0.214***	8.76
Irrigation	0.185***	7.94
Credit	0.118**	2.54
Extension	0.096**	2.31
Market distance	-0.015*	-1.89
R ²	0.62	

***Significant at 1%, **5%, *10%

Interpretation

The negative and significant coefficient of the tribal dummy (-0.287) indicates that tribal households earn approximately 25% lower income than non-tribal households, even after controlling for observable factors. Landholding and irrigation access are the strongest determinants of income.

Oaxaca-Blinder Decomposition

Table 4: Decomposition of Income Gap

Component	Value
Mean log income difference	0.51
Explained component	0.36 (70.6%)
Unexplained component	0.15 (29.4%)

Interpretation

Approximately 71% of the income gap is explained by differences in productive endowments such as landholding, irrigation, and education. However, nearly 29% of the disparity remains unexplained, suggesting structural or institutional disadvantages faced by tribal households.

Overall Findings

- Significant income disparity exists between tribal and non-tribal households.
- Asset endowments (land, irrigation) are the primary contributors.
- Institutional access (credit, extension) positively influences income.
- A residual unexplained gap persists, indicating deeper structural inequality.

Discussion

The findings of the study confirm the existence of significant agro-economic disparities between tribal and non-tribal farm households in Chhattisgarh. The descriptive results indicate that nontribal households possess larger landholdings, greater irrigation coverage, and higher educational attainment, which translate into higher farm income and returns. These results are consistent with earlier studies that highlight the importance of productive assets

and institutional access in determining rural income levels. The regression analysis further establishes that landholding size and irrigation access are the most influential determinants of farm income. Access to institutional credit and extension services also positively and significantly affect income levels, suggesting that institutional inclusion plays an important role in improving agricultural outcomes. The negative and statistically significant coefficient of the tribal dummy variable indicates that even after controlling for observable characteristics, tribal households earn lower incomes compared to non-tribal households. The Oaxaca-Blinder decomposition results show that approximately 71 percent of the income gap is explained by differences in endowments such as land, irrigation, and education. However, nearly 29 percent of the gap remains unexplained, which may reflect structural disadvantages, differential returns to resources, or limitations in market access. This suggests that asset augmentation alone may not fully eliminate income disparities without parallel institutional and structural reforms.

Conclusion and Policy Implications

The study provides empirical evidence of significant agro-economic disparities between tribal and non-tribal farm households in Chhattisgarh. The results indicate that differences in productive assets and access to institutional services account for a major share of the observed income gap.

Policy interventions should therefore prioritize:

1. Expansion of irrigation infrastructure in tribal-dominated regions.
2. Improved access to institutional credit and crop insurance.
3. Strengthening extension outreach and technical advisory services.
4. Promotion of income diversification through allied and high-value agricultural activities.

Additionally, efforts aimed at improving market connectivity and reducing structural barriers are essential to address the unexplained component of the income gap. Overall, reducing agro-economic disparities requires a combined strategy of asset enhancement, institutional inclusion, and structural reforms to promote inclusive agricultural development in Chhattisgarh.

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