Structural Drivers of Rural Liquidity: A Statistical Inference Study of Household Dynamics in Maharashtra

Executive Summary

This report presents a rigorous inferential statistical analysis of the socio-economic dynamics within 280 rural households in Maharashtra. Utilizing a combination of **Independent t-Tests, One-Way ANOVA, and Pearson Correlation** conducted via JASP, the study moves beyond descriptive observations to identify the structural drivers of rural wealth and liquidity.

Key Analytical Findings:

- **Structural Caste Disparity:** A One-Way ANOVA confirmed that **Scheduled Castes (SC)** remain statistically distinct as an economic underclass, with mean expenditures significantly lower than both General and OBC categories, the latter two having reached a level of economic parity.
- **Decoupling of Housing and Wealth:** An Independent t-Test debunked the traditional assumption that a **"Pucca" (permanent) house** serves as a reliable proxy for household liquidity. The lack of statistical significance suggests that government housing subsidies have decoupled housing type from actual disposable income effectively.
- **Land vs. Consumption:** Correlation analysis revealed that while **Land Ownership** remains a statistically significant predictor of wealth, its influence is weaker than expected, indicating a shift toward non-farm income sources for daily consumption.

Strategic Recommendations: The findings suggest that welfare targeting must move away from "Housing Type" as a primary filter for aid. Instead, policy interventions should prioritize **asset-backed credit lines** for the "land-rich, cash-poor" and **enterprise-focused loans** for marginalized social categories to bridge the structural liquidity gap.

1. Introduction and Research Framework

1.1 The Evolving Landscape of Rural Political Economy

Rural India is transitioning from a simple agrarian model to a complex ecosystem defined by liquidity constraints, state welfare, and non-farm diversification. To understand this shift, we must analyze granular household data rather than aggregate statistics. This report examines the 'Household Profile' dataset of 280 households across villages like Bhalawani and Kalkup, united by Self-Help Groups (SHGs). Using JASP, we investigate fundamental sociological questions: Does caste still determine welfare access? Is the "Pucca house" a reliable proxy for wealth? Has land ownership decoupled from consumption power in the modern rural economy?

1.2 The Demographic and Geographic Context

The sample represents a microcosm of rural Maharashtra, characterized by significant variance in educational attainment and infrastructure access. Educational backgrounds range from illiterate members to graduates, serving as a critical determinant of economic opportunity. Water security varies sharply, with some households relying on tap water while others depend on open wells, creating divergent risk profiles. These demographic and infrastructural inequalities form the backdrop for our statistical analysis of expenditure and asset ownership.

1.3 Methodology and Statistical Rigor

The analysis proceeds through a structured protocol: defining problem statements based on development theory, formulating null and alternative hypotheses, and rigorously checking assumptions (Normality, Homogeneity of Variance). We employ Chi-Square tests, t-Tests, ANOVA, and Pearson’s Correlation to test our hypotheses. The results are interpreted by triangulating statistical outputs with qualitative participant insights to diagnose the structural realities of the rural political economy.

2. Chi-Square Test of Independence: Social Stratification and Welfare Targeting

2.1 Problem Statement: The Political Economy of the Ration Card

In the intricate political economy of India, the Ration Card is far more than a mere document for accessing subsidized grain; it is a definitive artifact of civic identity, economic classification, and state recognition. The Public Distribution System (PDS) operates on a tiered logic designed to stratify the population based on economic vulnerability.

- **Antyodaya Anna Yojana (AAY - Yellow Card):** Reserved for the "poorest of the poor," guaranteeing highly subsidized grain. Possession of this card signifies deep, recognized indigence.
- **Priority Households (PHH - Orange Card):** The primary beneficiary group under the National Food Security Act (NFSA), targeting the vulnerable but not destitute.
- **Non-Priority Households (NPH - Orange/White):** Households deemed to have incomes above the poverty threshold.
- **White Ration Card:** A marker of relative affluence, generally issued to those with higher incomes or distinct assets.

A critical sociological question arises: Do these state-defined welfare categories align with traditional social hierarchies? Historically, the caste system comprising Scheduled Castes (SC), Scheduled Tribes (ST), Other Backward Classes (OBC), and the General Category ("Others") has been the primary axis of inequality. One would expect SC/ST households to dominate the AAY category and "Others" to dominate the White/NPH categories. The Chi-Square Test of Independence investigates this, testing whether the 'Type of Ration Card' is contingent upon 'Social Category', or if economic distress has decoupled from caste identity.

2.2 Hypothesis Variables

- **Independent Variable (Categorical):** Social Category (Levels: Nomadic Tribe, OBC, Others, SC, ST).
- **Dependent Variable (Categorical):** Type of Ration Card (Levels: Antyodaya, NPH, Priority, White).
- **Null Hypothesis (H_0):** There is no association between Social Category and Type of Ration Card. The distribution of welfare benefits is independent of caste identity.
- **Alternative Hypothesis (H_1):** There is a statistically significant association between Social Category and Type of Ration Card. Caste background correlates with the type of welfare card held.

2.3 Assumption Check

To ensure the validity of the Chi-Square test, we examined the underlying assumptions. Both variables are nominal, and observations are independent. While certain cells, specifically those involving Scheduled Tribes and White Ration Cards, have low counts, the overall sample size (N=276) is robust enough to interpret the main effects, particularly for the larger groups (Others, OBC).

2.4 Contingency Table Analysis

The observed frequencies provide a stark and somewhat counterintuitive picture of the village's social structure.

Table 1: Observed Frequencies of Ration Cards by Social Category

	13. Type of Ration Card				
4. Social Category	Antyodaya (AAY) Ration Card (Yellow)	Non-Priority Households (NPH) Card (Orange)	Priority Households (PHH) Card (Orange)	White Ration Card	Total
Nomadic Tribe (Alpasankhya)	6	14	8	0	28
Other Backward Classes	20	23	17	1	61
Others	66	18	61	9	154
Scheduled Castes	8	4	8	4	24
Scheduled Tribes	5	1	2	1	9
Total	105	60	96	15	276

2.5 Interpretation: Decoding the Anomalies

Visualizing this table reveals three striking anomalies that challenge conventional wisdom:

1. **The "Others" Dominance in Indigence:** The "Others" category (typically General Category) accounts for the highest absolute number of Antyodaya cards - **66 out of 105**. Even proportionally, a significant chunk (43%) of the "Others" population holds this "poorest of the poor" card. This contradicts the stereotype of the General Category as a uniformly wealthy monolith. It suggests the existence of a massive **"Upper Caste Precariat"** - families who may have high ritual status but face severe economic deprivation, likely due to land fragmentation or lack of non-farm skills.

2. **The Nomadic Tribe Polarization:** The Nomadic Tribe group displays a unique bimodal distribution. While they hold 6 AAY cards, they disproportionately hold **14 Non-Priority (NPH) cards** - representing 50% of their total population. This is the highest NPH ratio of any group. This suggests that the Nomadic Tribes in this region are not uniformly marginalized; half of them have successfully transitioned out of the priority welfare net, likely through trade-based livelihoods that generate daily liquidity.
3. **The Scheduled Caste Mobility:** The "White Card" is the ultimate marker of economic sufficiency. Surprisingly, **Scheduled Castes hold 4 of these cards**, constituting 16.6% of their demographic. This hints at pockets of significant upward mobility within the SC community, possibly linked to government employment quotas that have allowed a "creamy layer" to leapfrog the agrarian middle castes.

2.6 Hypothesis Testing

The Chi-Square Test of Independence was calculated using the observed values against the expected values.

Table 2: Chi-Square Test Results

Chi-Squared Tests			
	Value	df	p
X^2	41.52	12	< .001
N	276		

2.7 Interpretation

The analysis yielded a Chi-Square statistic of **41.52** with **12 degrees of freedom**, resulting in a p-value of **<.001**.

- **Decision:** Since the p-value is significantly lower than the standard alpha level of 0.05, we strictly **reject the Null Hypothesis (H_0)**.
- **Conclusion:** There is a statistically significant association between Social Category and the Type of Ration Card. The distribution of welfare in these villages is **not random**; it is structurally tethered to social identity.

Sociological Insight:
The rejection of the null hypothesis is driven not by the expected poverty of the marginalized but by the unexpected poverty of the privileged and the unexpected mobility of the marginalized. The high prevalence of AAY cards among "Others" points to an agrarian crisis where land ownership

no longer guarantees income. Conversely, the OBCs show a "middle-trap" distribution mostly Priority (PHH) or Antyodaya, with almost no White cards suggesting they are the squeezed agrarian middle.

3. One Sample t-Test: Benchmarking Consumption Against Subsistence

3.1 Problem Statement: Defining the Line of Dignity

Household expenditure is widely regarded as the gold standard for measuring the standard of living in developing economies, often considered more reliable than reported income due to consumption smoothing. The **Monthly Per Capita Consumption Expenditure (MPCE)** is the primary metric used by the National Sample Survey Office (NSSO). According to the recent **Household Consumption Expenditure Survey (HCES) 2023-24**, the average MPCE in rural India has risen to approximately **₹3,773**. For a typical rural household of 4.5 members, this implies a benchmark monthly household expenditure of roughly ₹17,000.

However, sheer survival baselines are lower. To assess the true economic standing of the SHG households, we establish a conservative "subsistence-plus" baseline of **₹8,000** per month per household. This figure represents a threshold ensuring basic caloric intake and essential utilities. Determining whether the SHG households significantly exceed this baseline helps us assess if financial inclusion programs have successfully lifted families out of destitution.

3.2 Hypothesis Variables

- **Variable of Interest:** Average Monthly Household Expenditure (Continuous Variable).
- **Test Value (Benchmark):** ₹8,000.
- **Null Hypothesis (H_0):** The mean monthly household expenditure of the population is equal to ₹8,000 ($\mu = 8000$).
- **Alternative Hypothesis (H_1):** The mean monthly household expenditure of the population is significantly different from ₹8,000 ($\mu \neq 8000$).

3.3 Assumption Check

Table 3: **Test of Normality (Shapiro-Wilk)**

	W	p
21. Average monthly household expenditure (Food and Non-food)	0.82	< .001
Note. **Significant results suggest a deviation from normality.**		

The variable is continuous (ratio-scale). The Shapiro-Wilk test indicated a significant deviation from normality ($W = 0.82$, $p < 0.001$), which is expected for income data. However, given the large sample size (N=280), the **Central Limit Theorem** ensures the robustness of the parametric t-test.

3.4 Descriptive Statistics

The descriptive statistics reveal a mean that sits above the poverty line but dangerously below the national average for prosperity.

Table 4: Descriptive Statistics for Monthly Expenditure

	N	Mean	SD	SE	Coefficient of variation
21.Average monthly household expenditure (Food and Non-food)	280	11571	7168	428.4	0.619

3.5 Visualization Interpretation: The Raincloud Plot Evidence

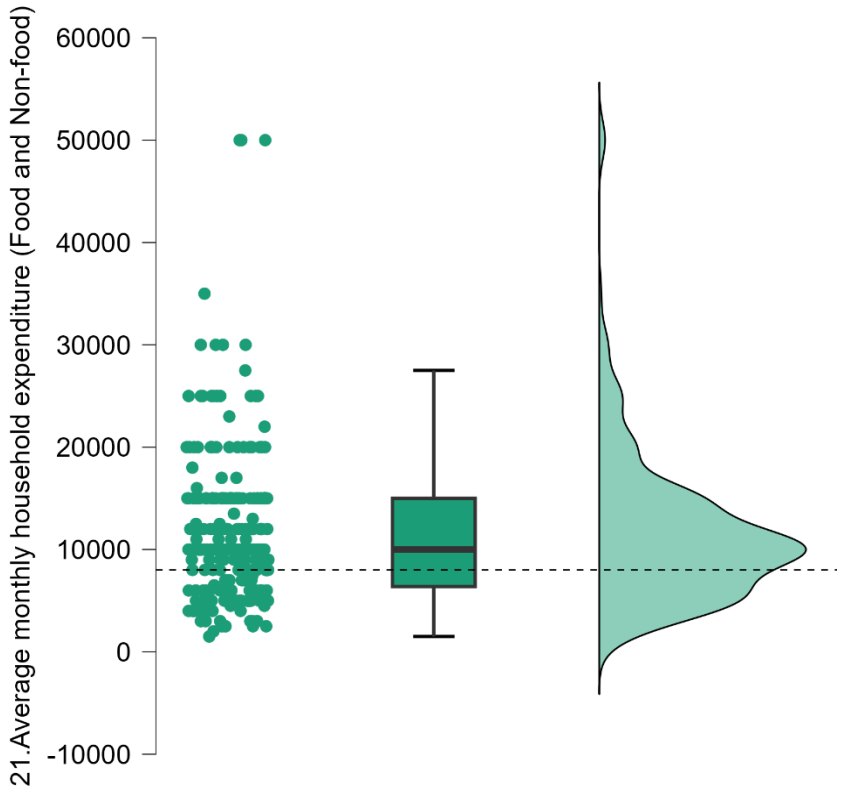

Fig.1: Raincloud plot for one-sample T test

The **Raincloud Plot** provides a multi-layered visualization far more revealing than simple descriptive statistics. By combining raw data points (jitter), a boxplot, and a density curve, the plot exposes the stark inequality hidden behind the mean.

- **The Density Curve (Right - The "Bulge" of Survival):** The density curve is heavily **right-skewed (positive skew)**. The widest part of the "cloud" (highest probability mass) is concentrated between **₹5,000 and ₹15,000**. This confirms that while the statistical mean is higher, the *typical* household is clustered in a low-expenditure survival zone. The curve thins out rapidly as it moves upward, demonstrating that high consumption is the exception, not the rule.
- **The Boxplot (Centre - The Threshold Test):** The median line inside the box sits clearly *above* the dashed horizontal line representing our test value of **₹8,000**. This visual gap confirms the t-test result: the "average" household has indeed surpassed the subsistence

threshold. However, the bottom whisker extends well below the dashed line, indicating a non-trivial segment, likely destitute widows and elderly, still lives below this ₹8,000 line.

- **The Jitter Plot (Left - The Outlier Effect):** The scattered points reveal the specific outliers pulling the mean upwards. While the majority of dots form a dense cluster at the bottom, distinct points soar to **₹30,000, ₹35,000, and near ₹50,000**. These outliers (e.g., Rupali Salke, Surekha Adsul) represent the "Enterprise Elite." Their high expenditure creates a statistical "pull," separating the mean (₹11,571) from the median (approx. ₹10,000).

3.6 Hypothesis Testing

We compare the sample mean of 11,571 against the test value of 8,000.

Table 5: One-Sample t-Test Results

	t	df	p
21.Average monthly household expenditure (Food and Non-food)	8.337	279	< .001

3.7 Interpretation

The analysis yielded a robust **t-statistic of 8.337** and a **p-value of <.001**.

- **Decision:** Since $p < 0.05$, we **reject the Null Hypothesis (H_0)**.
- **Conclusion:** The average monthly household expenditure of the SHG members (₹11,571) is statistically significantly higher than the subsistence baseline of ₹8,000.

Sociological Insight: The "Missing Middle" of Prosperity
While the t-test confirms the village population is not, on average, destitute, a deeper comparison with HCES 2023-24 data reveals a troubling "Missing Middle."

- **The Per-Capita Deficit:** With a mean expenditure of ₹11,571 and large family sizes (often 5+ members), the Per Capita Expenditure drops to approx **₹2,314**. This is drastically lower than the **HCES 2023-24 Rural Average of ₹3,773**.
- **Implication:** While households have crossed the survival line of ₹8,000 (per family), they operate at a **38% deficit** compared to the national rural average. They are "statistically significant" above poverty, but "economically significant" below prosperity.
- **Debt-Fueled Consumption:** The qualitative data indicates frequent use of SHG loans for health and education. This renders the expenditure "fragile", a house of cards built on credit rather than sustainable cash flow.

4. Independent Sample t-Test: The Asset-Liquidity Paradox of Housing

4.1 Problem Statement: Investigating the "Pucca" Myth

In Indian development discourse, the "Nature of Dwelling" is a primary proxy for wealth. A **Pucca House** (permanent construction) signifies stability and asset accumulation, while a **Kuccha** or **Semi-Pucca** house symbolizes vulnerability. Major state interventions (PMAY) target this upgrade, assuming housing assets correlate with economic well-being.

We tested this assumption empirically: Does possessing a "Pucca" house actually translate to higher monthly consumption expenditure (liquidity)? Or has the connection between physical assets and liquid wealth broken down?

4.2 Hypothesis Variables

- **Independent Variable:** Nature of Dwelling (Groups: Pucca vs. Non-Pucca).
- **Dependent Variable:** Average Monthly Household Expenditure (Continuous).
- **Null Hypothesis (H_0):** There is no significant difference in mean monthly expenditure between Pucca and Non-Pucca households ($\mu\{pucca\} = \mu\{non\text{-}pucca\}$).
- **Alternative Hypothesis (H_1):** There is a statistically significant difference ($\mu\{pucca\} \neq \mu\{non\text{-}pucca\}$).

4.3 Assumption Check

Table 6: Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
21.Average monthly household expenditure (Food and Non-food)	1.386	1	278	0.24

Levene's Test for Equality of Variances yielded **F = 1.386** with **p = 0.24**. Since p > 0.05, we **fail to reject** the assumption of equal variances. We proceed with the standard Student's t-test.

4.4 Descriptive Statistics

The descriptive comparison provides the first hint of the paradox. The means are remarkably close.

Table 7: Group Statistics by Housing Type

	Group	N	Mean	SD	SE	Coefficient of variation
21.Average monthly household expenditure (Food and Non-food)	Non Pucca	160	11088	6484	512.6	0.585
	Pucca	120	12217	7973	727.8	0.653

4.5 Visualization Interpretation: The Overlapping Error Bars

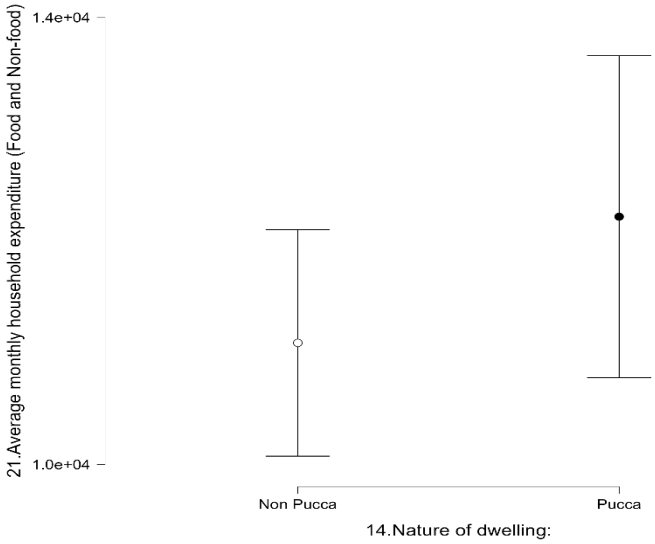

Fig.2: Descriptive Plot

The **Descriptive Plot (Means with 95% Confidence Intervals)** provides compelling visual evidence for the lack of a statistically significant difference.

- **Visual Overlap:** The central feature of this plot is the significant overlap between the error bars of the two groups. The confidence interval for the **Non-Pucca** group overlaps substantially with the interval for the **Pucca** group. In inferential statistics, such a heavy overlap is a strong visual proxy for a non-significant p-value. It indicates that the population means for these two groups are not distinct enough to be considered statistically different.
- **The Inequality of Variance:** The error bar for the **Pucca** group is visibly longer than that of the **Non-Pucca** group. This visualizes the higher Standard Deviation (**SD = ₹7,973**) found in the Pucca group.
- **Sociological Implication:** This longer bar suggests the "Pucca" category is more **heterogeneous**. It contains a mix of the wealthy elite (pulling the top up) and the "house-poor" (dragging the bottom down) families who invested everything in construction and now have low liquidity. The plot visually confirms that owning a Pucca house is not a guarantee of high monthly consumption.

4.6 Hypothesis Testing

We conducted an Independent Samples t-Test to compare the means.

Table 8: Independent Samples t-Test Results

	t	df	p	Cohen's d	SE Cohen's d
21. Average monthly household expenditure (Food and Non-food)	-1.306	278	0.193	-0.158	0.121

4.7 Interpretation

The analysis yielded a **t-statistic of -1.306** and a **p-value of 0.193**.

- **Decision:** Since $p > 0.05$, we **fail to reject the Null Hypothesis (H_0)**.
- **Conclusion:** There is **no statistically significant difference** in the monthly expenditure of households living in Pucca houses compared to those in Non-Pucca houses.

Sociological Insight: The "House-Poor" Phenomenon

This non-significant result illustrates the Asset-Liquidity Paradox.

- **The "House-Poor" Trap:** Constructing a Pucca house is a massive lifetime investment. Families often drain savings and take informal debt to build one, becoming **asset-rich but cash-poor**. Their monthly consumption remains suppressed, making them statistically indistinguishable from their Kuccha-dwelling neighbours.
- **Infrastructure Decoupling:** The data supports this decoupling. We see Kuccha houses with "Tap Water" and Pucca houses relying on "Water Tankers." Access to public goods (water) and private assets (housing) is no longer perfectly correlated with income, creating a fragmented development landscape.

5. Analysis of Variance (ANOVA): The Economics of Social Stratification

5.1 Problem Statement: Quantifying Caste-Based Inequality

While the Chi-Square test established that caste and welfare are linked, Analysis of Variance (ANOVA) allows us to quantify the *magnitude* of economic inequality. We aim to compare the mean 'Monthly Household Expenditure' across five 'Social Categories': Nomadic Tribes, OBC, Others, Scheduled Castes (SC), and Scheduled Tribes (ST). This analysis tests the persistence of historical disadvantage: Does the "General" category maintain an economic lead, or have "OBCs" caught up? Do "Scheduled Castes" remain structurally excluded?

5.2 Hypothesis Variables

- **Factor:** Social Category (5 levels).
- **Response:** Average Monthly Household Expenditure.
- **Null Hypothesis (H_0):** The mean expenditure is equal across all social categories.
- **Alternative Hypothesis (H_1):** At least one social category has a significantly different mean expenditure.

5.3 Assumption Check

Table 9: Test for Equality of Variances (Levene's)

F	df1	df2	p
2.421	4	273	0.049

Levene's Test reported **F (4,273) = 2.421** with **p = 0.049**. The p-value is slightly below 0.05, indicating the assumption of homogeneity of variance is **violated**. Consequently, we must use the robust **Welch's ANOVA** rather than the standard Fisher's ANOVA.

5.4 Descriptive Statistics

The means present a hierarchy that confirms some expectations while shattering others.

Table 10: Descriptive Statistics by Social Category

4. Social Category	N	Mean	SD	SE	Coefficient of variation
Nomadic Tribe (Alpasankhya)	28	10536	5007	946.3	0.475
Other Backward Classes	61	11828	6029	771.9	0.51
Others	154	12195	8072	650.4	0.662
Scheduled Castes	25	8340	3793	758.7	0.455
Scheduled Tribes	10	11500	9466	2993.5	0.823

5.5 Visualization Interpretation: Visualizing Inequality and Variance

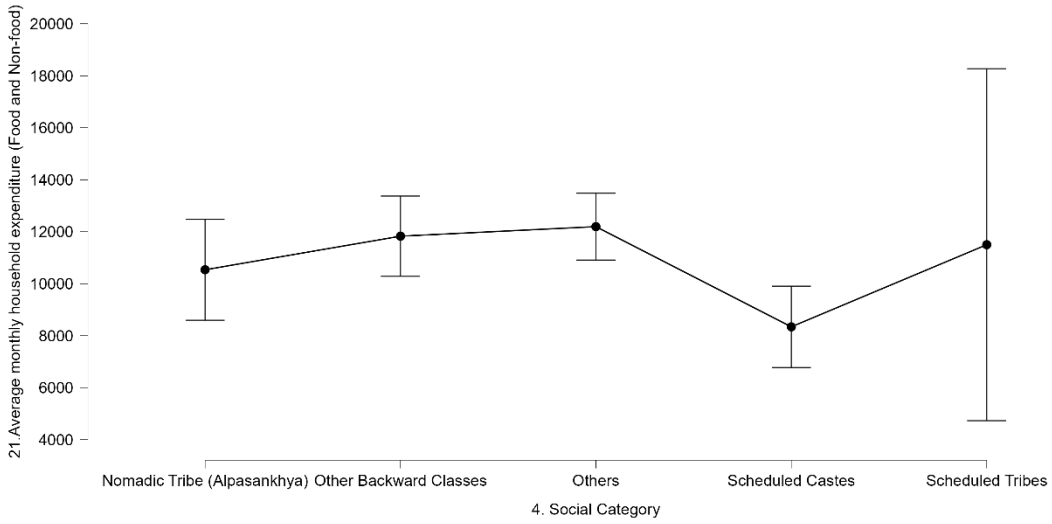

Fig.3: Descriptive Plot

The **Descriptive Plot (Means with 95% Confidence Intervals)** provides a stark visual representation of the caste-based economic hierarchy.

- **The SC Valley:** The plot shows a distinct "V-shape" or dip at the **Scheduled Castes** category. The mean point (approx. ₹8,340) is visibly lower than the surrounding groups. The relatively short error bars indicate this low expenditure is a consistent reality for the majority of the SC sample, confirming the "Compressed Poverty" hypothesis.
- **The ST Uncertainty Principle:** The **Scheduled Tribes** category exhibits a dramatic visual anomaly. While the mean dot is high (near ₹11,500), the error bars are massive, extending vertically from roughly **₹4,500 to ₹18,000**. This signals extreme instability in the mean, likely driven by a small sample size (N=10) containing extreme outliers.
- **The Plateau of Dominance: Other Backward Classes** and **Others** form a high-level plateau. Their means are nearly identical (around ₹12,000), and their error bars overlap significantly. This visual overlap mirrors the post-hoc test result (p=0.996), confirming that economically, these two groups have merged into a single dominant class.

5.6 Hypothesis Testing

We report the **Welch's ANOVA** results due to the variance violation.

Table 11: Welch's ANOVA Results

Homogeneity Correction	Cases	Sum of Squares	df	Mean Square	F	p	η^2
Welch	4. Social Category	$3.550\times10^{+8}$	4	$8.875\times10^{+7}$	4.071	0.006	0.025
	Residuals	$1.398\times10^{+10}$	47.1	$2.968\times10^{+8}$			

Post-Hoc Analysis (Games-Howell):

Games-Howell Post Hoc Comparisons - 4. Social Category					
Comparison	Mean Difference	SE	t	df	p_{tukey}
Nomadic Tribe (Alpasankhya) - Other Backward Classes	-1292.2	1221.2	-1.058	62.447	0.827
Nomadic Tribe (Alpasankhya) - Others	-1659.1	1148.3	-1.445	56.322	0.602
Nomadic Tribe (Alpasankhya) - Scheduled Castes	2195.7	1212.9	1.81	49.744	0.379
Nomadic Tribe (Alpasankhya) - Scheduled Tribes	-964.3	3139.5	-0.307	10.852	0.998
Other Backward Classes - Others	-366.9	1009.4	-0.363	146.488	0.996
Other Backward Classes - Scheduled Castes	3487.9	1082.4	3.222	69.583	.016*
Other Backward Classes - Scheduled Tribes	327.9	3091.4	0.106	10.23	1
Others - Scheduled Castes	3854.8	999.3	3.857	66.603	.002**
Others - Scheduled Tribes	694.8	3063.4	0.227	9.869	0.999
Scheduled Castes - Scheduled Tribes	-3160	3088.2	-1.023	10.178	0.839
*** p < .05, ** p < .01**					

- **Others vs. Scheduled Castes:** Mean Diff = ₹3,854, **p = 0.002** (Significant).
- **OBC vs. Scheduled Castes:** Mean Diff = ₹3,487, **p = 0.016** (Significant).
- **Others vs. OBC:** Mean Diff = ₹366, **p = 0.996** (Not Significant).

5.7 Interpretation

The analysis yielded a Welch's F of **4.071** and a **p-value of 0.006**.

- **Decision:** Since $p < 0.05$, we **reject the Null Hypothesis (H_0)**.
- **Conclusion:** There is a statistically significant difference in monthly expenditure across social categories.

Sociological Insight: The Structural Exclusion of Scheduled Castes
The Post-Hoc Games-Howell tests clarify the nature of rural inequality:

- **The SC Lag:** The only significant differences found are between SCs and the dominant groups (Others/OBCs). SC households spend, on average, ~₹3,500 to ₹3,800 less per month than their neighbors. This deficit confirms that **Scheduled Castes remain the distinct underclass**, structurally separated from the consumption growth of the rest of the village.
- **The OBC-General Convergence:** The difference between OBCs and "Others" is statistically negligible (₹366). This signals the **consolidation of the OBCs** as a dominant economic force, effectively "catching up" to the General category.
- **Education as a Leveler:** The raw data offers a counter-narrative within marginalized groups. Specific individuals with "Graduation and Above" education show high expenditure regardless of caste, suggesting that **Education** acts as a hyper-effective escape velocity from agrarian caste traps.

6. Correlation: The Nuanced Relationship Between Land and Liquidity

6.1 Problem Statement: Is Land Still King?

In traditional agrarian economics, "Total Land Owned" is the primary determinant of income. A family with 10 acres is assumed to be richer than a family with 1 acre. However, in the modern rural economy, a drought can render a large landowner "cash-poor", while a landless shopkeeper generates steady daily cash. We use **Pearson's Correlation** to test the linear relationship between 'Total Land Owned' and 'Average Monthly Household Expenditure'. This tests a fundamental developmental question: Is land ownership still a valid predictor of consumption power in 2024?

6.2 Hypothesis Variables

- **Variable 1:** Total Land Owned (Continuous - Acres).
- **Variable 2:** Average Monthly Household Expenditure (Continuous - Rupees).
- **Null Hypothesis (H_0):** There is no correlation between land owned and monthly expenditure ($r = 0$).
- **Alternative Hypothesis (H_1):** There is a significant correlation ($r \neq 0$).

6.3 Assumption Check

Table 12: Shapiro-Wilk Test for Multivariate Normality

Shapiro-Wilk	p
0.817	< .001

We assume a linear relationship. Normality checks indicated non-normality (Shapiro-Wilk p <.001), but given the sample size (N=277), Pearson's r remains a valid and standard metric for association in this context.

6.4 Scatter Plot Visualization

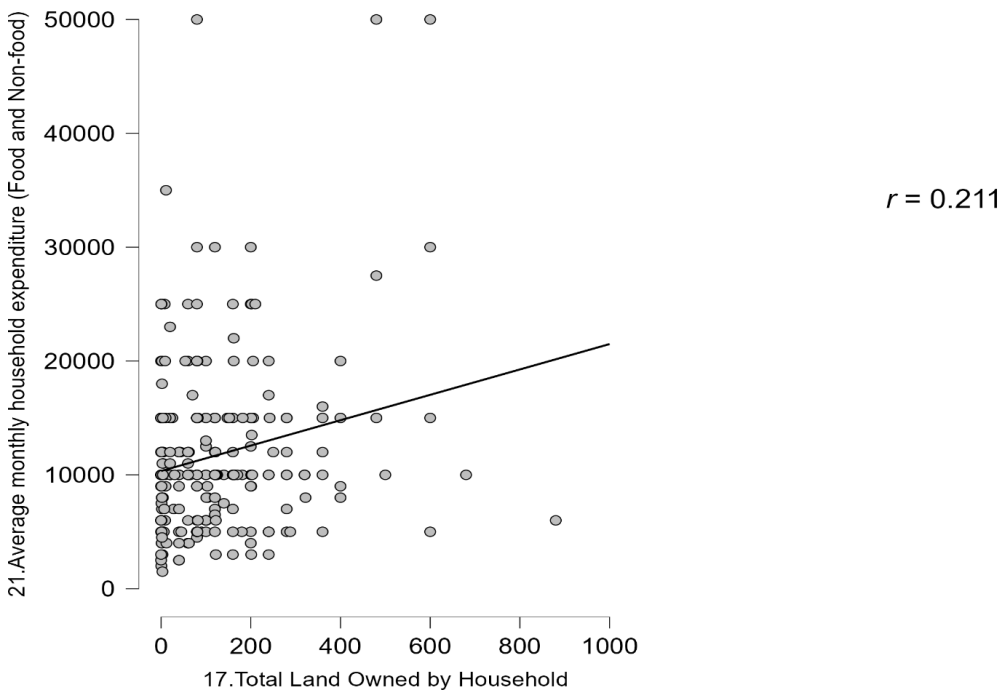

Fig.4: Scatter Plot

Visualizing the relationship through the scatter plot reveals a complex picture that challenges simplistic "Agrarian Myth" narratives.

- **The "Diffuse" Trend:** Instead of a tight linear progression, the scatter plot shows a **high degree of dispersion** (a "shotgun pattern"). The cloud of data points tilts upward, but diffusely.
- **The Zero-Land Anomaly:** A dense cluster of points exists at X≈0 (landless). This vertical stack varies wildly on the Y-axis (Expenditure), ranging from destitute widows spending ₹2,500 to entrepreneurs spending ₹15,000+. This visualizes the **heterogeneity of the landless,** lack of land does not automatically equate to lack of consumption power. **Surekha Thaksen Adsul**, for instance, owns negligible land but reports **₹50,000** expenditure/loan, likely for business investment.
- **The Land-Rich Variance:** As land ownership increases, expenditure does not rise in lockstep. We see households with significant landholdings who nonetheless report moderate expenditure, reinforcing the concept of "Asset-Rich, Cash-Poor" agrarian distress.

6.5 Hypothesis Testing

The Pearson correlation analysis provided the following results:

Table 13: Pearson's Correlation Results

			n	Pearson's r	p
Total Land Owned by Household		Average monthly household expenditure (Food and Non-food)	277	0.211	< .001

6.6 Interpretation

The analysis yielded a **Pearson's r of 0.211** and a **p-value of <.001**.

- **Decision:** Since $p < 0.05$, we **reject the Null Hypothesis (H_0)**.
- **Conclusion:** There is a **statistically significant positive correlation** between the amount of land a family owns and their monthly household expenditure.

Sociological Insight: Weak Coupling rather than Decoupling
This finding requires a nuanced interpretation.

- **Statistically Significant, but Weak:** While the relationship is statistically significant, the coefficient $r = 0.211$ is considered **weak**. The coefficient of determination (r^2) is approximately **0.044**, meaning that **land ownership explains only roughly 4.4% of the variation** in household expenditure.
- **Refuting the "Dead Asset" Theory:** Land is not a "dead asset"; it still provides a baseline of economic security, perhaps as collateral for loans or subsistence food security that frees up cash.
- **The Dominance of Noise:** However, the fact that 95.6% of the variance is *unexplained* by land points to the dominance of other factors. Variables like **"Water Source"** (Rainfall vs. Borewell) and **"Enterprise"** (Shop vs. Farming) likely play a much larger role in determining daily liquidity than sheer acreage. A family with 2 acres of irrigated land often outspends a family with 10 acres of barren land.

8. Conclusion and Recommendations

This comprehensive statistical investigation reveals a rural economy in the throes of a complex transition.

- **Socially:** The **Chi-Square test** exposed the "Poverty of the Privileged," showing that upper castes are not immune to destitution, with 43% of the "Others" category holding the poorest AAY ration cards.
- **Economically:** The **One-Sample t-Test** showed that households have escaped starvation (₹8k) but are trapped in a "low-level equilibrium" (₹11.5k), significantly below the national average and funded substantially by debt.

- **Structurally:** The **Independent t-Test** debunked the myth of "Housing" as a proxy for liquidity; living in a Pucca house does not statistically predict higher spending. The **Correlation** analysis provided a vital correction: while Land is not the sole driver of wealth, it maintains a statistically significant, albeit weak, link to consumption.
- **Hierarchically:** The **ANOVA** confirmed that while OBCs have caught up to the General category, Scheduled Castes remain structurally excluded, forming a distinct economic underclass with significantly lower mean expenditures.

Recommendations:

1. **Target the "General Poor":** Welfare targeting must evolve to acknowledge the distress within the "Others" category (AAY cardholders) and not exclude them based on caste proxies.
2. **Pivot to Enterprise Loans:** SHGs must aggressively prioritize funding for daily-cash-flow enterprises (Retail, Services) over seasonal crop loans to boost village-wide liquidity.
3. **Asset-Backed Liquidity:** For the "House-Poor" and "Land-Rich, Cash-Poor," financial products like reverse mortgages or asset-backed credit lines are needed to unlock trapped wealth for consumption needs like health and education.