



Rural Female Employment Transformation in India: A Comparative Analysis Based on EUS and PLFS Unit Level Data

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KEYWORDS

Rural female employment, Labour force Participation, Logistic regression, Structural transformation, Employment trends

ABSTRACT

The paper discusses the structural change of rural female employment in India over three decades (1993-2024) based on the unit-level data of the Employment and Unemployment Surveys (NSSO-EUS) and the Periodic Labour Force Survey (PLFS). The paper examines how the sectoral structure of rural female employment has evolved between 1993 and 2024, identifies the socio-economic factors that predict rural female labour force participation and traces how their relative impacts have shifted over the period 2011-12 to 2023-24, and evaluates whether the observed U-shaped trend in female labour force participation reflects a genuine structural transformation or is instead the outcome of measurement issues and compositional effects. Using multivariate logistic regression and compound annual growth rate (CAGR), the paper concludes that agricultural employment is still predominant but in decrease with non-farm sectors (especially health, social work, and professional services) taking over an ever-growing proportion of rural women. Statistically significant and economically significant predictors of female employment are religion, social group (caste), education, marital status, age, and household size. It is important to note that the likelihood of Muslim women to participate is significantly lower than that of Hindu women and the inverse relation between education and employment probability in the rural areas is an indication of the structural constraints to quality employment. The paper contributes to the current discussions on feminisation of agricultural labour and quality of the female participation in economic activities, and presents evidence-based policy implications of education, social inclusion, and family supports interventions.

1. INTRODUCTION

Rural female labour force participation (FLFP) holds a centre-stage in the discourse of development in India and it is the nexus of structural economic change, gender relations and social transformation. In rural India, women have traditionally comprised a large portion of the agricultural labor force, working in crop production, animal rearing, and associated activities on a rural landscape that supports almost two-thirds of the national population (Patel and Dwarka, 2025). However, their economic involvement has not been a linear pattern and it is critical to determine its direction to formulate an inclusive policy of rural development.

The rural FLFP has had a long-established U-shaped pattern in the last 30 years. An extended downturn in the early 1990s to 2017-18, due to the increasing household income, further education of women, and changes in social expectations of female labour, was replaced by a steep and rapid recovery (Misra, 2025). This recovery is based on the U-shaped hypothesis developed by Goldin (1995), according to which women began to re-enter the labour market

as formal and semi-formal job opportunities doubled and the rate of female labour force involvement increased to 23.3 percent in 2017-18 and 41.7 percent in 2023-24 (Pattnayak et al., 2023). Approximately three-fourths of rural women, however, continue to work in agriculture and related industries, and self-employment represents close to 67 percent of women of rural employment in 2023-24 - a number that signifies not only a new wave of entrepreneurship but also yet another failure of the formal sector to absorb the women in any significant numbers (Sundari, 2020).



This brings up a major policy issue: is increased participation a sign of real structural change in the nature and terms of women's labour, or is it more likely to be a symptom of distress-induced labour supply when there is a lack of proper formal jobs? Although the literature about rural female employment is on the rise, there are three significant gaps. To begin with, the sectoral structure of female rural labor and its development in the long-run is under researched. Second, the time-varying relative significance of socio-economic determinants have not been given much comparative focus. Third, it is still unclear whether the recovery after 2017 is evidence of a true structural change or measurement artefacts.

The paper provides answers to these gaps through unit-level NSSO-EUS and PLFS data on 1993 to 2024 based on a combination of CAGR trend analysis and multivariate logistic regression. The paper is structured in the following way: Section 2 provides the literature review of the theoretical and empirical literature; Section 3 recounts the data and methodology; Section 4 communicates the empirical findings; Section 5 interprets the findings; and Section 6 makes the conclusion about the implications of the research.

2. LITERATURE REVIEW

Explaining the Decline and Recovery of Female Labour force Participation

The academic studies of FLFP in rural India has changed significantly, as the stream of ideas has shifted away from plain income-effect models to more elaborated, multi-causal models. A highly influential early study by **Kapsos, Bourmpoula, and Silberman (2014)** blames the downward trend in FLFP in the long run to increasing household income and a growing number of women entering education, arguing that any observed increase in human capital temporarily suppresses labour force participation. Although this income-effect hypothesis still explains the rise in the 1993-2017 era, it is not comfortable with the sharp recovery in 2017, which took place in the environment of ongoing educational growth. This is an indication that the income effect is not linear and permanent- an aspect that has not been adequately addressed in the literature with regard to theory.

The U-shaped path has been reported empirically (**Deshpande, 2023**), but its causal explanation is disputed. The methodological issue that (**Deshpande, 2023**) raise is that some of the observed growth might be due to an artefact of the alteration to the definition and measurement of economic activity at the PLFS compared to the previous NSSO rounds. Particularly, the PLFS represents a wider scope of subsidiary economic activity, which skews the listing of the rural women who practice unpaid or semi-subsistence work. Any form of analysis that blurs these methodological changes with actual behaviour change risks exaggerating structural change. This issue is the focus of the current paper that will examine EUS and PLFS data, but will retain consistency in the definition of the activity status across rounds.

Structural Dimensions: Sectoral Composition and Occupational Segregation.

The second dimension of literature is concerned with the quality, and not the quantity, of female employment. In a seminal work, **Srivastava and Srivastava (2010)** record the existence of occupational segregation: despite varying participation rates, women are still clustered in the low productivity, informally organised, and low paid sectors of the rural economy. Later studies have supported this discovery. **Sundari (2020)** shows that the economic liberalisation of India has not brought the same changes in the working conditions of women, the wage disparity, precarity, and a deficit of social protection are still entrenched. **Agrawal and Bhattacharya (2024)** further apply this discussion to the post-COVID-19 era by stating that the recent explosion in women participation can be explained by a distress reaction to household income shocks, not by an expansion of opportunity, which is also consistent with the literature on added-worker effects in developing economies. By demonstrating that women in rural areas are in some situations more economically empowered than their urban counterparts, **Biswas and Banu (2023)** contradict traditional paradigms and require more sophisticated understandings of women agency.

Another phenomenon that is interconnected and significant is the feminisation of agricultural labour. With the migration of male workers to urban non-farm jobs, women are increasingly doing agricultural work, despite the agricultural workforce reducing in absolute size. **Doss (2017)** offers the cross-country viewpoint, demonstrating that the further agricultural contribution of women is not necessarily followed by increased decision making power and access to productive resources, which is directly applicable to the Indian context. **Chandrasekhar, Sahoo, and Swaminathan (2020)** report on the impacts of seasonal male out-migration to rural women in India in terms of the renegotiation of farm management roles, which introduces a kind of de facto feminisation, which is not fully reflected in the usual employment statistics.

Female Employment Socio-Economic Determinants.

There has been growing interest in the role of identity-based social categories in the organization of labour market outcomes, namely caste, religion, and gender. **Alvi (2023)** presents nationally representative data to demonstrate that Muslim women are affected by FLFP much lower compared to their Hindu counterparts, despite adjusting for education and income, and attributes the difference to community-specific norms regarding female mobility and labour market segregation. This is confirmed and extended by **Kar (2025)**. Equally, **Datta, Endow, and Mehta (2020)** show that caste remains a significant factor in determining the employment trajectories of women: although Scheduled Tribe women are the most represented (mainly because of subsistence needs), General category women, especially educational ones, are less

represented (both because of social norms on occupational choice and its effect on spousal earnings).

At the domestic level, **Roy and Mukherjee (2013)** determine that marital status is a strong predictor of female employment, whereby unmarried women have higher chances of engaging in the labour force. Through instrumental variable techniques, **Khan (2021)** demonstrates that the overall net impact of male migration and remittances on female labour supply is ambiguous: the remittance can decrease the economic necessity, whereas the loss of male household members can also lead to an increase in the workload of women. Based on semi-arid tropical Indian panel data, **Sangwan and Kumar (2021)** associate female labour force participation with household nutrition, highlighting the non-market aspects of the women-led economy that the traditional employment data cannot capture.

Research Gap

Although the current literature has yielded a comprehensive body of evidence regarding individual aspects of rural female workers, there are still some significant gaps. First, the majority of studies are either descriptive or at one point in time hence it is hard to break the changes in the determinants of employment in the long run. The results of the comparative analysis of EUS (2011-12) and PLFS (2023-24) logistic regression in the current paper directly tackle this shortcoming. Second, the literature has not sufficiently addressed the conflict between aggregate participation trend and the quality of employment, the present paper addresses this gap by integrating sectoral and occupational CAGR analysis with individual level regression. Third, most importantly, the issue of methodology debate on comparability of measurement between NSSO and PLFS rounds has not been done systematically in research that makes use of this long panel; the current paper has explicitly recognised this issue and has addressed it partly by harmonisation of variable definitions. Collectively, these contributions make the study a stepping-stone between the descriptive trend analysis and policy-relevant causal inference of rural female employment in India.

Data and Methodology

The analysis of unemployment of rural non-farm employment in India has been made using the cross-sectional data provided by the National Sample Survey (NSSO), different rounds on Employment and Unemployment Survey and Periodic Labour Force Survey different round. NSSO and PLFS have applied stratified multistage sampling technique in the two rounds. This research has aimed at acquiring in-depth information on Rural Farm Employment (RFE) among females and their socio-economic dynamics in the context of 68th round of NSSO as well as PLFS 2023-24.

Variable Selection

Logistic regression has been applied in this study. Dependent variable is binary variable of Rural farm Employment among females i.e. whether females is receiving access to various employment activities of rural farm employment or not. The rate of avenues of employability is conditional on various socio-economic and other factors.

The independent variables in both cases are Age, Income, Education Level, Social Group, Household type, Religion, Household Size, Marital Status and Vocational and Technical Education.

Methodology

To check the association among socio-economic covariates and odds of getting access to employment activities among females in rural areas has been modelled using logistic regression ns. The mathematical equation representing logistic regressions of this study can be written as:

$$\left(\frac{P}{1-P}\right) = B_0 + B_1 \text{ Religion} + B_2 \text{ Social Group} + B_3 \text{ Education Level} + B_4 \text{ Household Type} + B_5 \text{ Vocational and Technical Education} + B_6 \text{ Income} + B_7 \text{ Household Size} + B_8 \text{ Marital Status} + B_9 \text{ Age} + u_i$$

Where P is the probability of getting access to different types of employment activities among females in rural India whereas (1-P) is probability of not getting access.

The interpretation of this analysis can be more understandable using odd ratios which has been obtained by taking antilog of different slope of co-efficient. The equation of odd ratio can be illustrated as:

$$\left(\frac{P}{1-P}\right) = (1+e^z)/(1+e^{-z}) = e^z$$

Where $\left(\frac{P}{1-P}\right)$ = is the odd ratio of getting involvement in various employment activities by females in rural India,

$$Z = B_0 + B_1 X_1 + B_2 X_2 + \dots \dots \dots B_9 X_9,$$

e^z = Antilog of Z.

After taking natural log of equation of Odd ratio, the obtained logit function can be written as: $L = \text{nlog} \left(\frac{P}{1-P}\right) = Z = B_0 + B_1 X_1 + B_2 X_2 + \dots \dots \dots B_9 X_9$

Where L is the logit model which is logarithm of odd ratios.

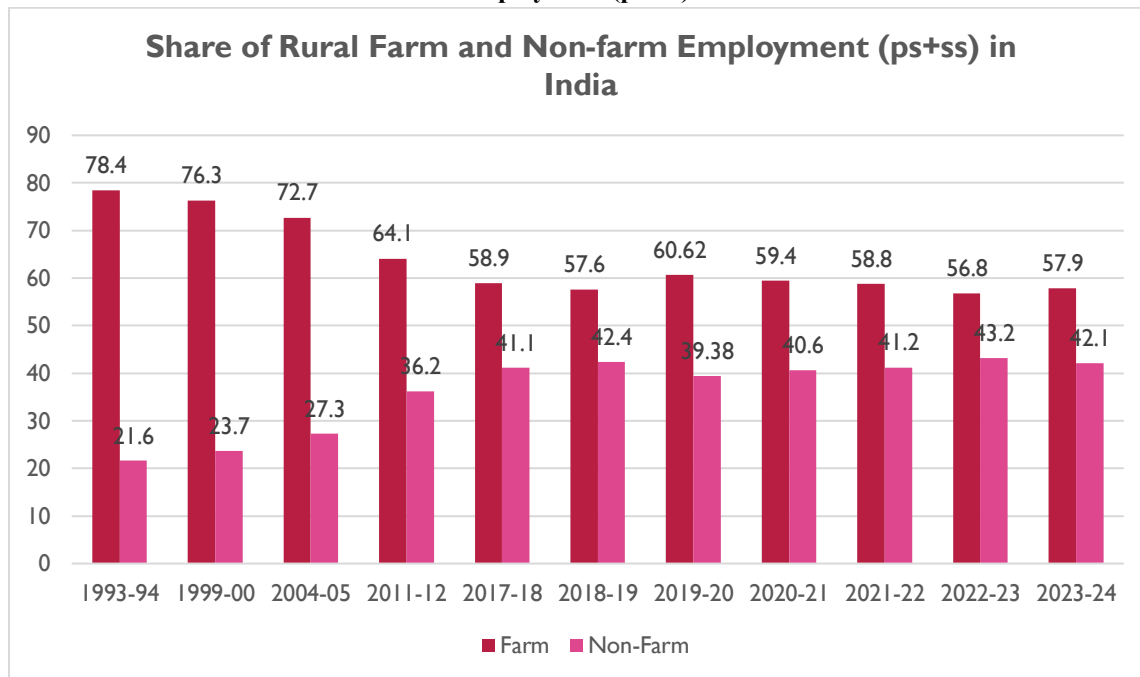
Variance Inflation Factor (VIF) tests have also been performed to ensure that there is no multicollinearity between the explanatory variables. Each of the binary logistic regression models has been tested with the Hosmer-Lemeshow goodness-of-fit test to ensure it is an acceptable fit.

For the sectoral and occupational trend analysis, compound annual growth rates (CAGRs) are computed for three sub-periods—2011–12 to 2017–18, 2017–18 to 2020–21, and 2020–21 to 2023–24—using the standard formula

$$\text{CAGR} = [(\text{End Value} / \text{Start Value})^{1/n} - 1] \times 100,$$

where n denotes the number of years in each period. All data are expressed as shares of total rural female employment to control for changes in the absolute size of the workforce.

Farm and non-farm employment (ps+ss) Share in Rural India

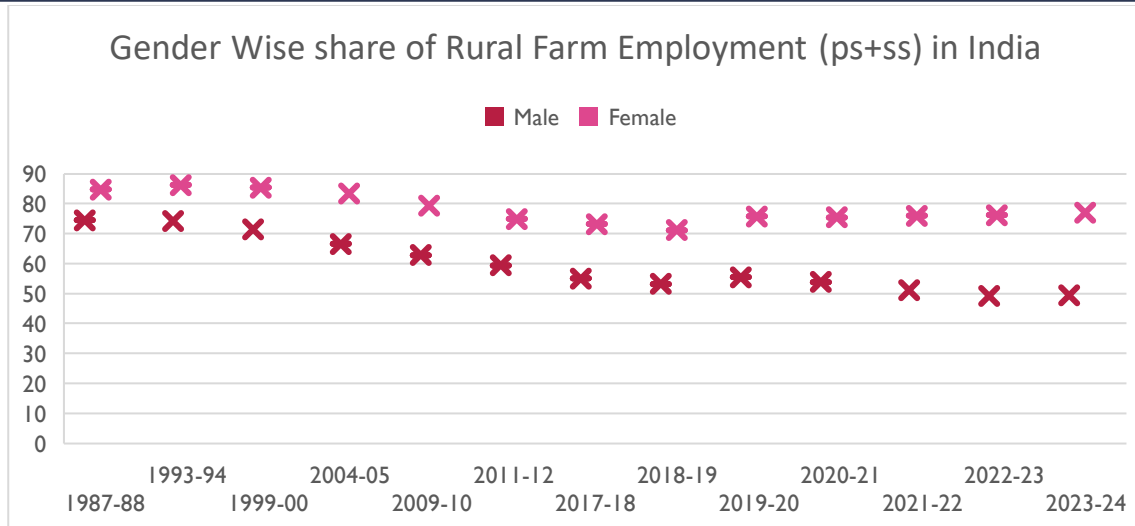


Source: Author's estimation based on NSSO and PLFS reports (various years)

This figure illustrates that between 1993-94 and 2023-24, there is a significant change in the structure of work in rural areas of the nation. The percentage of farm employment, which comprised approximately 80% of the rural employment in the 1993-94, fell down to approximately 58% in 2023-24- a decrease of more than 20%. Conversely, non-farm employment increased to 42.1% from 21.6% in the same time which shows rural livelihood diversification other than agricultural activities (Misra, 2025). The increasing agricultural production, increased education and skills, increased infrastructure and development of rural production and services all lead to this transformation. Although there were periods of change, including a slight increase in farm jobs between 2017-18 and 2019-20 because of the economic turbulence, overall, the trend has been that the rural economy of India is slowly transforming into a non- agricultural sector, as it has in other developing economies (Jha, 2023).

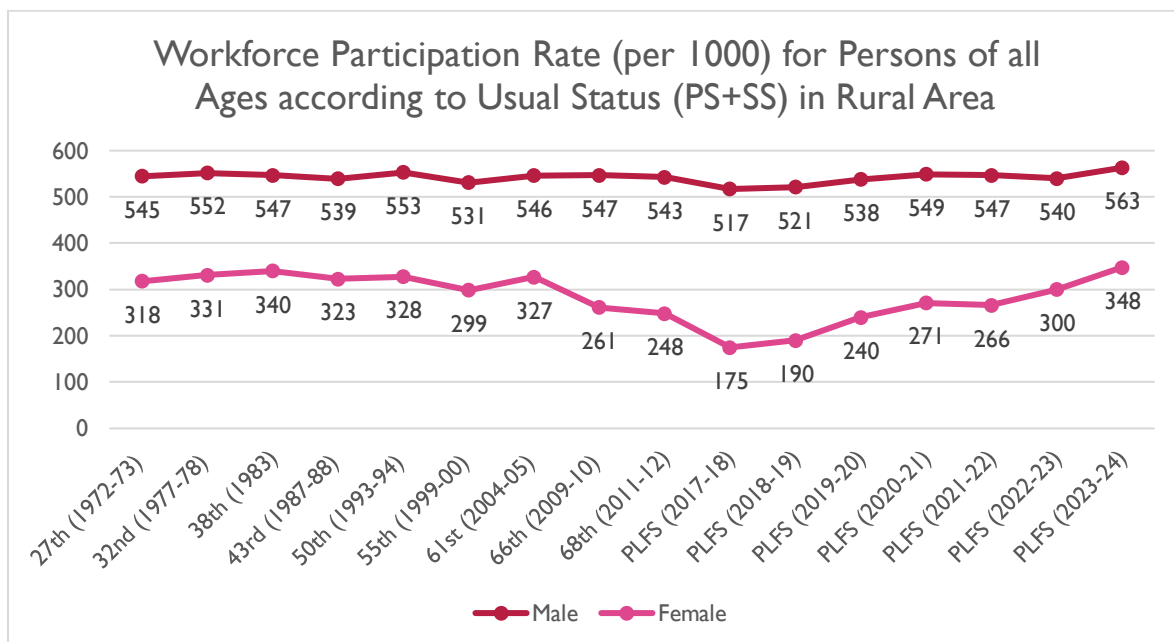
Gender Wise Rural Farm Employment share (ps+ss) in India

This chart indicates the gender distribution of agricultural employees in rural India in 1987-88 and 2023-24 and indicates that there are dramatic changes in the patterns of participation in this field. The employment of men in farms has suffered a drastic decrease as it was approximately 75 per cent in the late 1980s but currently stands at almost 50 per cent. This is a major shift in the gender balance of agricultural labour that indicates that men have gradually ceased to work in agricultural activities (Chand & Singh, 2022).



Source: Author's estimation based on NSSO and PLFS reports (various years)

On the contrary, the share of rural women employed in farm activities has remain persistently high, declining only marginally approximately 85% in 1987-88 to around 78% in 2023-24. This near stagnation in female sectoral diversification compared to the sharp 25% decline recorded for men underscores the structural constraints that continue to bind rural women to agricultural work, limiting their transition into non-farm employment opportunities (Srivastava and Srivastava, 2010). Convergence also means that women have not lost or reduced the role they play in agriculture as men turn to non-farm jobs. The rate of participation of men and women has now almost evened out to 50 percent, which is a drastic change in the domain of the male-dominated agricultural economy. The trend has changed over the years, and the significant changes have mainly occurred between 2000s and 2010s. Patel and Sethi (2022), Feminization of agricultural labour indicates macro-socioeconomic changes, such as male out-migration in search of non-farm employment, increased participation of women in agricultural decision-making and agricultural labour, and changes in the practice of agriculture (Doss, 2017).



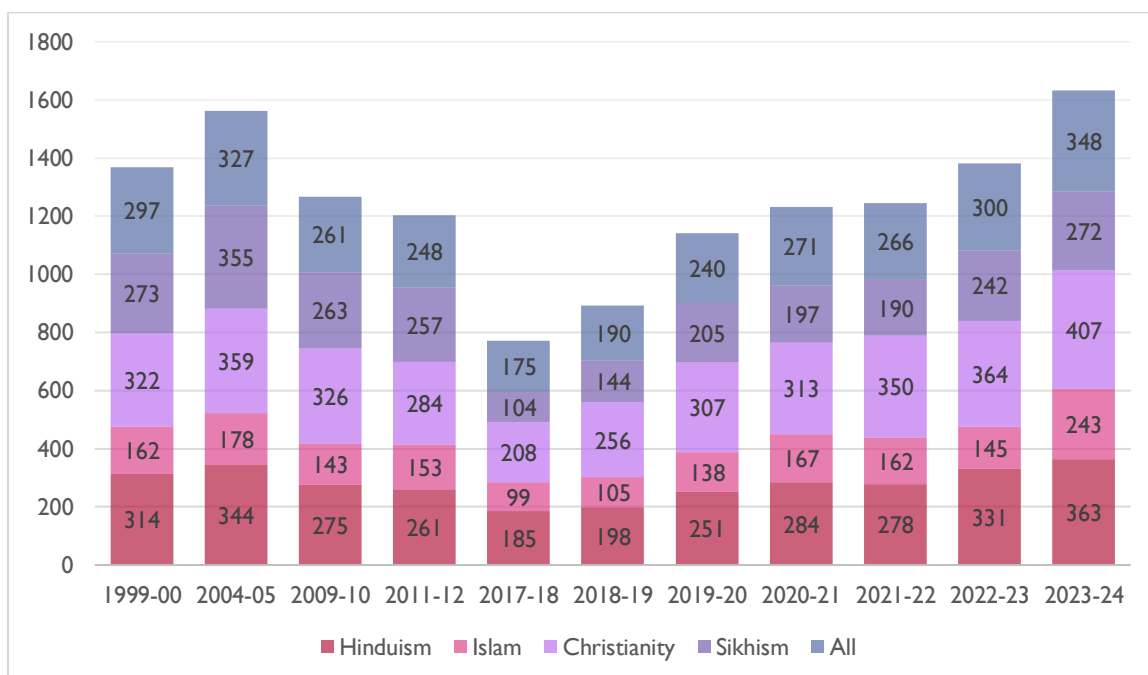
Source: Author's estimation based on NSSO and PLFS reports (various years)

This chart shows the workforce participation rate (WPR) per 1000 population in rural India of 1972-73 and 2023-24 disaggregated by gender under the usual status (principal and subsidiary combined). The statistics indicate that there is a steady disparity in the participation of males and females. The involvement of male workforce has not fluctuated much and has been averaged at 540-560 per 1000, over the last 50 years but with slight variations, which cannot point to any big picture.

The case of female participation has been much more turbulent, however, with the overall pattern over the years being downward further (then an upward upturn). In 1972-73, women participation was measured at 318 per 1000, dropped to historic low of 175 per 1000 in 2017-18 before recovering substantially to an approximate 348 per 1000 in 2023-24. This U-shaped pattern indicates complicated socioeconomic processes such as increased educational uptake amongst women, cultural change of gender roles, mechanization of labour, and increasing household income that had a short-term impact of decreasing economic contribution by women. The revival after 2017 indicate that circumstances have made or stipulated more women participation in the economy. The likely motivations are household income pressures, government efforts to encourage women to engage in the labour force, the growth in non- agricultural sectors and enhanced measurements of economic activities of women (Agrawal and Bhattacharya, 2024).

Female Workforce Religious Groups in Rural India.

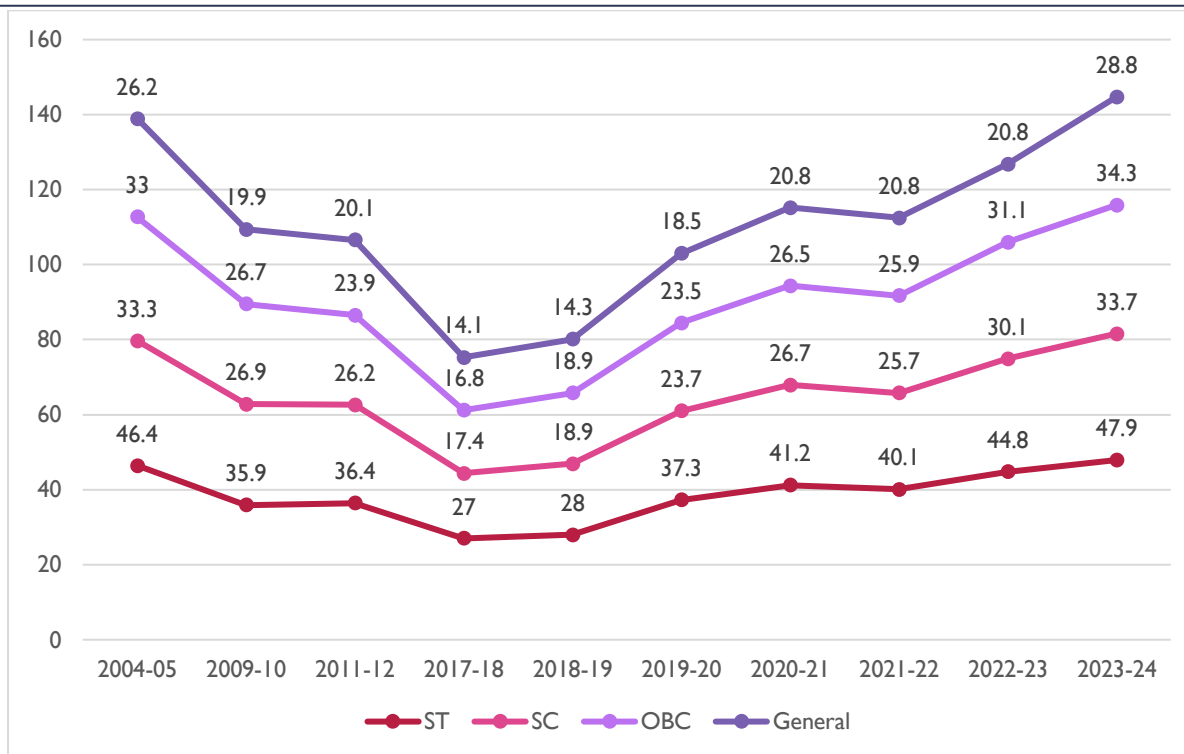
This graph focuses on the female workforce participation (per 1000 population) in rural India, across major religious groups in 1999-00 and 2023-24, measured under the usual status (principal and subsidiary combined). The statistics indicate that there are considerable disparities within and between communities as well as between time periods. Aggregate employment of females takes the shape of a U-shaped pattern, which starts high at 327 per 1000 in 1999-00 and then falls to 175 in 2017-18 after which it increases to 348 in 2023-24.



Source: Author's estimation based on NSSO and PLFS reports (various years)

The highest proportion of the population, Hindu women, follows the trend on a national level, as the participation decreased to 185 per 1000 in 2017-18 and increased to 363 in 2023-24. Muslim women do not participate, however, as strongly, and in 2017-18, their participation has dropped to 99 per 1000, but in 2023-24, it has soared to 243. The substantial variation experienced among Christian women ranging between 208 and 407 per 1000 whereas Sikh women show the most change, with a minimum of 104 in 2017-18 and a maximum of 355 in 2004-05.

Such religious disparities underline the complicated interaction of cultural standards, education levels, opportunities of economic activities, and social demands that influence the participation of women. The low turnout of the Muslim women in the 2010s was especially low and could be associated with the cultural restrictions, insufficient education or simply lack of access to the right job. However, the recent merging between people groups indicates that economic need and changing social moods are slowly diminishing the barriers of traditionalism. The results emphasize the relevance of community-sensitive strategies to uplift the economic empowerment of women and acknowledge the cultural differences that affect their labour decision-making (Ahmad and Khan, 2021).



Source: Author’s estimation based on NSSO and PLFS reports (various years)

This chart will compare the female labour force participation in rural India as per social categories such as Scheduled Tribes (ST), Scheduled Castes (SC), Other Backward Classes (OBC), and the General category between 2004-05 and 2023-24. The statistics point to the presence of considerable inequalities that are determined by social stratification (Ravi & Kapoor, 2024). The highest level of participation is always achieved by Scheduled Tribe women, starting at 46.4 percent in 2004-05, dropping to 27 percent in 2017-18 and regaining its strength at 47.9 percent in 2023-24. This is indicative of the subsistence-based livelihoods of the tribal societies, in which the role of women in the economy is the key to keeping the household alive.

The case of the General category exhibits the most U-shaped pattern start at 26.2% in 2004-05, which drops sharply, and then rises to 28.8% in 2023-24. This trend is attributed to the increasing household income and education levels, which initially decreased the participation of women in the labour force, then, changing social values and opening more economic opportunities that favoured the re-entry. The participation of SC women stayed comparatively steady between 33.3% to 34.7% and OBC women fluctuated with higher and lower levels of between 34.3% in 2023-24 and 16.8% in 2017-18.

The trend of equalisation of participation rates in groups since 2017-18 could be an indication that the structural barriers to the employment of women are being eroded, and economic necessities are gaining more importance than orthodox constraints. However, there is still the hierarchy, as ST women are the most active, then SC, OBC, and General category women. These trends highlight the interaction of social identity, economic need, and cultural demands as being complicated in determining women participation in the workforce.

Table-1: Industrial Classification of female Rural Employment (ps+ss) in India

Industrial Classification	2011-12 to 2017-18		2017-18 to 2020-21		2020-21 to 2023-24		CAGR
	2011-12 to 2017-18	2017-18 to 2020-21	2017-18 to 2020-21	2020-21 to 2023-24	2020-21 to 2023-24		
Agriculture	9.46	1.89	-0.24	-0.24	5.27		
Mining and Quarrying	-0.24	-0.12	-0.05	-0.05	-59.23		
Manufacturing	-0.29	-0.87	1.21	1.21	-0.93		
Electricity, Gas, steam and Air conditioning Supply	-0.13	0.01	0	0	-40.22		

<i>Water supply, sewerage, waste management and remediation activities (WS)</i>	-0.08	0.01	0.1	10.64
<i>Construction</i>	-6.25	0.73	-1.66	-26.39
<i>Wholesale and Retail Trade</i>	-3.01	0.09	0.47	-13.74
<i>Transportation and Storage</i>	-2.77	-0.41	0.08	-38.99
<i>Information and Communication</i>	-0.04	-0.03	0.03	-10.87
<i>Financial and Insurance Activities</i>	-0.17	-0.06	0.12	-12.73
<i>Real Estate Activities</i>	-0.06	0	0.02	-18.77
<i>Professional, scientific and technical activities</i>	-0.1	0.03	0.01	-9.56
<i>Administrative and support service activities</i>	0	-0.07	0.01	-11.92
<i>Public Administration, Defence</i>	-0.17	0.09	0.12	2.92
<i>Education</i>	3.32	-1.58	-0.09	13.74
<i>Human Health and Social Work Activity</i>	1.01	0.26	0	46.58
<i>Arts, entertainment, sports and amusement and recreation</i>	-0.11	-0.03	0.04	-37.39
<i>Other Services</i>	-0.91	0.03	-0.07	-24.66

Source: Author's estimation based on NSSO and PLFS unit level data

Table-1 offers the industrial classification of female rural employment growth rates in India through three periods along with cumulative compound annual growth rates (CAGR). The statistics show that the distribution of sectoral change is complicated, though the agricultural sphere remains the key source of women jobs (**Mamgain & Khan, 2021**). The highest growth in terms of positive growth is exhibited by agriculture, having a CAGR of 5.27. Nonetheless, its trend decelerates as the years go and the increase of 9.46% at the beginning becomes slightly negative (-0.24) in the final indicating the loss of absorption of women because of saturation or changes in labour demand (**Singaraju and Bora, 2021**).

The trends in manufacturing are unpredictable, as their growth is negative, experiencing negative growth of -0.29 percent and -0.87 percent in the first two periods before recovering greatly in 2020-21 with 1.21 percent before returning to its previous negative growth in 2023-24. Irrespective of this recovery, the total CAGR is found to be negative (-0.93%), as an indicator of structural problems. The most fluctuating sector is construction which saw a decline of -6.25% between 2011-12 and 2017-18 followed by slight recovery (0.73), then again, the decline was -1.66 and the net growth is -26.39. This turmoil mirrors the cyclical view of construction and the volatility of construction to changes in the economy and policy. The service industries are mixed. Education shows high growth (13.74%), but recent growth has been low whereas health and social work activities show extraordinarily high growth (46.58%), which should be considered as future female employment hubs with increased demand of social services and their traditional role of caregiver. On the other hand, mining, quarrying, transport and business services remain steadily decreasing, probably due to technological substitution, structural changes, or low accessibility to women.

In general, there is speculation that female rural labour is gradually but not evenly moving towards the non-farm sector, not agricultural employment. Nevertheless, the transition practice is slow and uneven, which proves the necessity of specific interventions to guarantee the female population access to new opportunities in the manufacturing sector, services, and other non-agricultural business sectors (**Patel and Sethi, 2022**).

Table-2: Occupational Classification of Female Rural Employment (ps+ss) in India

<i>Divisions</i>				
	2011-12 to 2017-18	2017-18 to 2020-21	2020-21 to 2023-24	CAGR
<i>Legislators, Senior officials and Managers</i>	-0.78	0.44	-0.81	-8.97
<i>Professionals</i>	0.22	-0.35	1.73	18.74
<i>Technicians and Associate Professionals</i>	2.45	-0.78	-2.08	-8.32
<i>Clerks</i>	-0.4	0.08	0.25	-0.94
<i>Service Workers and Shop & Market Sales workers</i>	-0.86	-0.61	1.99	1.35
<i>Skilled Agricultural and Fishery Worker</i>	5.31	7.29	1.57	11.46
<i>Craft and Related Trades Workers</i>	-4.04	-0.8	1.1	-13.37
<i>Plant and Machine Operators and Assemblers</i>	-2.6	0.27	-0.4	-42.82
<i>Elementary Occupations</i>	0.71	-5.55	-3.35	-9.65

Source: Author's estimation based on NSSO and PLFS unit level data

Table-2 explores the rural non-farm employment growth rates in occupational categories in India between 2011-12 and 2017-18, 2017-18 and 2020-21, and 2020-21 and 2023-24, as well as the compound annual growth rates (CAGR). The data indicate extremely heterogeneous trends, which should demonstrate the complexity of the rural transformation of the economy and changing requirements in skills. The best performance is recorded under the professional category whereby the CAGR stands at 18.74. Irrespective of volatility, such as that experienced in 2017-18 to 2020-21 with a decrease of -0.35% to 1.73%, respectively, this growth reflects the increasing demand in the rural markets of professionals in the fields of digitalization, better connectivity, and the growth of the service sector which necessitate the use of technical expertise.

Agricultural and fishery workers are exhibiting overall positive growth with a CAGR of 11.46 which emphasizes the fact that agricultural specific skills are still in demand in non-farm jobs. This encompasses extension services, aquaculture as well as farm management which is a modernization and commercialization of agriculture. Service workers and shop/market sales workers are resilient and their CAGR is generally positive (1.35), although initially downward, and has been recovering (1.99) in 2020-21 to 2023-24, which portrays an expanding rural retail and service markets. On the other hand, there are some occupational groups which demonstrate alarming decreases. Plant and machine operators and assemblers are the steepest in terms of the fall with a negative CAGR of -42.82, probably because of technological displacement or restructuring of the industry. Craft and related trades also fall (-13.37 CAGR) but there is a slight revival (1.1) in the most recent period which could be an indication of the revived interest in artisanal skills. Elementary occupations which are historically considered entry level jobs are experiencing a total negative CAGR of -9.65 and the negative changes have been higher in recent years which implies that unskilled labour or worker up-skilling is not in demand.

On the whole, the occupational change implies a slow but disproportionate change towards higher-end non-farm employment in rural India. This highlights the significance of skills development efforts to help workers to move to occupational categories with more growth potential and tap into new opportunities (Das and Mahanta, 2023).

Logistic regression model

This multivariate logistic regression model determines the predictors of the female workforce participation in rural India and the comparison of trends in 2011-12 and 2023-24. The logistic regression models for both 2011-12 and 2023-24 demonstrate strong and statistically robust fit. The pseudo-R² values (0.242 and 0.278), highly significant chi-square statistics, large sample sizes, absence of multicollinearity (VIF<10), and satisfactory Hosmer-Lemeshow calibration collectively confirm that the model specification is appropriate and that the estimated determinants of rural female employment are both statistically reliable and substantively meaningful. The comparison shows that relative significance



of the determinants has changed significantly between the two periods as structures of the rural labour market have changed and social dynamics of economic participation by women have changed. Religious identity turns out to be the most important predictor, as Muslim women will always have a low chance of being involved in the labour force than Hindu women, and the odds ratio is decreasing over time: it was 0.535 in 2011-12 and is 0.311 in 2023-24 (Alvi, 2023). The odds of other minority religious groups are also decreasing, with a range of between 0.794 and 0.536 (Kar, 2025).

Table: Logistic Regression estimates of Socio-Economic Determinants of Rural Female Employment in India: A comparative Analysis of EUS (2011-12) and PLFS (2023-24)

Female Employment in Rural India	2011-12			2023-24			
	Odd Ratios	Marginal Effect values	95% C.I.	Odd Ratios	Marginal Effect Values	95% C.I.	
Religion							
Hinduism (Ref)	1.00			1.00			
Islam	0.535***	-0.07***	0.535-0.535	0.311***	-0.27***	0.311-0.311	
Others	0.794***	-0.11***	0.793-0.794	0.536***	-0.13***	0.535-0.536	
Social Categories							
General (Ref)	1.00			1.00			
OBC	1.58***	0.13***	1.58-1.581	1.207***	0.12***	1.206-0.207	
SC-ST	0.856***	-0.09***	0.856-0.856	0.796***	-0.21***	0.795-0.796	
Household Type							
Self-Employed (Ref)	1.00			1.00			
Casual	0.584***	-0.17***	0.584-0.584	0.617***	-0.07***	0.617-0.617	
Regular	0.013***	-0.35***	0.013-0.014	0.339***	-0.28***	0.338-0.339	
General Education Level							
Higher education (Reference)	1.00			1.00			
Illiterate	1.412***	0.20***	1.412-1.412	4.382***	0.16***	4.380-4.383	
Up to Primary	1.1***	0.11***	1.1-1.1	2.098***	0.15***	2.097-2.099	
Up to Higher Secondary	1.04***	0.003***	1.04-1.04	1.482***	0.09***	1.482-1.482	
Vocational and Technical Education							
No (Ref)	1.00			1.00			
Yes	0.52***	-0.19***	0.52-0.52	0.678***	-0.023***	0.678-0.678	
Income							
Poorest 20% (Reference)	1.00			1.00			
Middle 60%	0.982***	-0.03***	0.982-0.982	0.889***	-0.11***	0.889-0.889	
Richest 20%	0.325***	-0.115***	0.325-0.325	0.506***	-0.16***	0.506-0.506	
Age							
18/45 (Ref)	1.00			1.00			
0/17	0.964***	-0.02***	0.964-0.964	1.030***	0.012***	1.030-1.031	
Above 45 years	1.017***	0.05***	1.017-1.018	1.169***	0.018***	1.169-1.169	
Marital Status							
Married (Ref)	1.00			1.00			
Unmarried	1.189***	0.09***	1.188-1.189	1.769***	0.08***	1.769-1.769	
Household Size							
More than 5 (Ref)	1.00			1.00			
0/5	0.927***	-0.06***	0.927-0.927	0.667***	-0.111***	0.666-0.667	
Pseudo r-squared	0.242	Number of obs	223195	Pseudo r-squared	0.278	Number of obs	240990
Chi-square	26.722	Prob > chi2	0.000	Chi-square	37.91	Prob > chi2	0.000

Source: Author estimates based on unit-level data of PLFS, 2023-24, Note: 1- (*p < 0.10, **p < 0.05, ***p < 0.01), 2-VIF < 10, Hence no multicollinearity among independent variables, 3- Hosmer-Lemeshow P-value > 0.05

The social category effects are contradictory: OBC women are more likely to be employed (1.58 in 2011-12 and 1.207 in 2023-24), whilst SC-ST women are less likely (0.856 and 0.796 respectively), highlighting that there have been some reductions in the inequality based on caste over the last few years but still the disparity remains apparent (Datta et al, 2020). Education and type of households are very important. There is a steadily lower odds of it among women of casual labour and the self-employed households (0.584 in 2011-12 and 0.617 in 2023-24). Education also creates a dilemma in that the lower the levels of school education, the higher the employment chances are in the range of 1.412 to 4.382, with women having primary school education in the range of 1.1 to 2.098. This is indicative of rural women being concentrated

in low-skilled agricultural work and informal service work, whilst higher education is associated with either stepping out of the labour force or unemployment since there are few relevant opportunities (**Sundari, 2020**). Another hypothesis that supports income hypothesis is the income effects where middle-income (0.982-0.889) and wealthy households (0.325-0.506) are less likely to work than women living in the poorest quintile. The age factor is also factored in that women above 45 years have growing odds (1.017-1.169), and young women (0-17 years) are marginal players. Marital status has an effect, as women who are not married are more likely to work (odds increase 1.189 to 1.769) due to the changing social norms and financial strain (**Roy and Mukherjee, 2013**).

Conclusion and Discussion

The empirical evidence emphasizes the multifaceted nature of the rural woman employment by applying the complex interaction between the structural economic transformation in India and gender specific labour market behaviour. The agricultural employment lost and the non-farm employment growth is a paradigm shift that is in line with the overall development trends. However, the rate at which women are leaving the agricultural industry is slower, which is indicative of occupational segregation and lack of mobility, which reduces their capacity to enjoy the advantages of new opportunities (**Kabeer, 2021**).

It can be argued that a unique U-shaped pattern of the female labour force participation makes traditional empowerment narratives difficult to tell. The sudden drop in 2017-18 can be associated with the increase of household income, strong cultural traditions and low-quality employment. The following recoveries in 2023-24 are indicative that policy measures, changing social views and need in the economy came together to provide more favourable environments. This discontinuous trend also stresses the relevance of contextual forces in defining the role of women in the economy (**Sundari, 2020**). Sectoral distribution brings out both continuity and diversification. The role of women in agriculture is still active and demonstrates the long-term role of agriculture in rural livelihood, whereas the increase in the proportions of women in health and social work represents the shift in demographics and the focus on service provision in policy. Infrastructure industries like water supply can be seen to be entering into occupation gradually and this signals a diversification of occupation and women have been able to explore the fields that were strongly controlled by men.

The second important trend is occupational upgrading. The professional jobs are an increase in professional jobs, which were traditionally occupied by women in informal and low jobs. This change is an indication of better education and skills development programs, but fair access among socio-economic lines is still an issue of concern. Simultaneously, the introduction of professional activity into the conventional industries like fisheries and agriculture implies that women are improving their financial position without leaving the well-known professional fields. Combined, these results reveal that the employment of rural females in India is influenced by structural change, cultural practice and policy changes. The education and social group affiliation, marital status, age, and household composition are among the determinants that may be useful in policy development. Participation is a not merely an aspect of economic growth but one which needs special interventions in order to break barriers in the system and to take advantage of enabling factors.

Policy implications are that the multi-dimensional approach such as better access to education, social integration, and arrangements that favor families should be implemented. Occupational upgrading and sectoral diversification emphasize the potential that women can be useful in most economic operations given that these environments are favorable. A more careful consideration should be given to gender-specific limitations in agriculture by guaranteeing women have equal opportunities to transform rural economies (**Banerjee and Bhat, 2025**). Further research is required on the maintenance of current increases in participation and should investigate quality of employment, income security and social protection. These long-term patterns are very important in the development of rural areas, poverty reduction, and gender equality by developing them in an inclusive and sustainable manner.

Limitations

First, every round of PLFS is cross-sectional, which does not allow making causal inferences. Findings can make associations between education level, social factors, and the quality of employment, but they cannot cause because there is a possibility of selection bias and unmeasured confounding variables.

Second, unlike EUS (2011-12), differences in survey design, sampling, weighting, and definitions of employment status compare EUS (2011-12) to PLFS (2017-18 to 2023-24). The cross-period comparisons are to be considered as the possible signs of general structural tendencies only.

Conflict of Interest

All authors declare that they have no conflicts of interest.

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