



# ECONOMIC ANALYSIS OF FEMALE AGRICULTURAL LABOUR PARTICIPATION IN ODISHA

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## ABSTRACT

*In developing countries like India, agriculture remains a primary source of employment, absorbing a sizable percentage of women. However, their efforts are often overlooked. In rural Odisha, women actively participate in pre-harvest and post-harvest activities, contributing a substantial part of labour required in agriculture and related activities. 61.8% of the total workforce is engaged in agriculture, and a large proportion of women in Odisha (57.8%) is employed as agricultural labourers as per the latest census. Apart from overseeing domestic duties, these women augment household earnings. This paper analyses the contribution of women in Odisha's agriculture with an emphasis on their role in agro-processing, livestock management and crop production. The study, based on secondary data spanning the last decade, enquires into the contribution made by women to agriculture in rural Odisha, a state heavily reliant on agriculture for its economic activity. Despite significant advancements in various sectors, agriculture remains the dominant employer, especially for rural women. The Labour Force Participation Rate (LFPR) for females aged 15 years and above in the usual status has shown an increasing trend. The study further finds that although women's involvement in agriculture has continued to be a significant source of income, gender differences are reflected so far as women's role as workers is concerned, including their wages and working conditions. The paper suggests policy measures to improve gender-sensitive roles in agriculture that promote women's economic autonomy and the formalization of farm work, along with enhancing access to land, technology, and financial resources for female farmers. The findings suggest that improving labour conditions and creating more sustainable agricultural practices can significantly boost female labour participation in the sector.*

**KEYWORDS:** - Agriculture, Female labour, Participation, Rural Women, Regression

**JEL Classification Codes:** J43, J46, Q18, R11

## INTRODUCTION

The preservation of the fundamental life support system such as land, water, plants, and animals has historically been mostly the responsibility of women. Through the preservation of diversity and natural struggle, they have promoted crop security and preserved the health of the soil through organic recycling. They worked with local technology for food security, such as cleaning and winnowing food grains, and fell behind in technological advancements (Shiva, FAO, 1991). Therefore, it will be impossible to stop soil erosion, promote alternative land management approaches to shifting agriculture, and ensure the health of farm animals and economically important plants without the intellectual and physical involvement of women. Therefore, research on the degree and scope of women's involvement in the agricultural industry is crucial. In the economies of the majority of emerging nations, including India, women make up a significant portion of the productive labour. They contribute significantly to agriculture as female agricultural workers, farmers, co-farmers, female family workers, and as farm managers and farm 2 entrepreneurs in addition to male out-migration, widowhood, etc. (Nisha 2008). It is estimated that, rural women are responsible for production of more than 55 per cent food grains and comprise 67 per cent of total agricultural labour force (Shivaram, FAO 1988). A recent estimation by FAO (2011) showed that women agricultural labour consists of 43 per cent of total world agricultural labour force. The role of women in agriculture varies from country to country. Asian women contribute to about 50 per cent of the food production. In the Indian subcontinent, women are responsible for cultivating and producing 70-80 percent of the basic food crops. In developing nations such as India, where agriculture is fundamental to livelihoods, women's contributions to basic food crop production are significant. According to the 2011 census, female agricultural labourers made up a substantial portion, with 55.21 percent of total female workers, while other workers constituted 47.20 percent of all male workers. In Odisha, the 2011 census revealed that 61.8 percent of the workforce is involved in agriculture, with female agricultural labourers accounting for 57.8 percent of all women workers. In India, women have historically played and continue to play a vital and essential role in agricultural development and related



sectors. They are actively involved in various aspects of agriculture, including main crop production, agroforestry, social forestry, and fisheries. When considering the number of tasks performed and the amount of time dedicated, women's contribution to both subsistence and commercial agriculture surpasses that of men. A micro study conducted in the Indian Himalayas revealed that on a one-hectare farm, a pair of bullocks worked for 1,064 hours, a man for 1,212 hours, and a woman for 3,485 hours (Shiva, FAO, 1991). In the plantation sector, women are indispensable labourers (Shivaram, 1988). While women's contributions may vary based on the region and crop, they play a critical role throughout the agricultural process, from planting and harvesting to post-harvest activities. Despite working hard, spending longer hours and crucial contribution to agricultural production, their role has not been acknowledged. They are paid less or even left as unpaid workers.

It is a well-established fact, though often overlooked, that women play a pivotal role in agricultural development and related sectors, including crop production, livestock management, horticulture, post-harvest operations, agroforestry, and fisheries. The extent of women's involvement in agriculture, however, varies significantly across regions, and even within a single region, it differs among ecological zones, farming systems, and social groups such as castes and classes. Despite these regional and contextual differences, women are actively engaged in nearly all aspects of agricultural production, with the notable exception of ploughing. In certain activities, such as processing and storage, women dominate to such an extent that male workers are barely represented (Agarwal, 2003). Research on women in agriculture, both in India and other developing countries, consistently shows that women contribute more to agricultural production than is commonly recognized. They form the largest group of landless laborers, as most women lack land rights. Although women work extensively in the fields, at home, and in external markets, decisions regarding the household and its economy are typically controlled by their male counterparts. Census data from 2001 and 2011 reveals a shift in the agricultural workforce in India, with a notable increase in the number of agricultural labourers and a decline in the number of cultivators. In 2001, 31.7% of the workforce were cultivators, while 26.5% were agricultural labourers. By 2011, these figures had changed to 24.6% and 30%, respectively. This represents a 7.1% decrease in the number of cultivators and a 3.5% increase in agricultural labourers. One concerning trend highlighted by this data is the steady rise in the number of landless labourers over the past several decades.

Odisha's economy is primarily agro-based, with a large proportion of women in the labour force engaged in agriculture. More than 60% of the state's total workforce is directly reliant on agriculture. According to the 2001 Census, 34.15% of the male workforce were cultivators, and 26.39% were agricultural labourers. For women, however, 20.11% were cultivators and 53.90% were agricultural labourers. By the 2011 Census, the percentage of female cultivators had decreased to 13%, while the proportion of female agricultural labourers rose to 57.8%. This reflects a growing trend of women working as agricultural labourers both in India and specifically in Odisha. These women are employed across small, medium, and large industrialized farms, as well as plantations. A key characteristic of these women agricultural labourers is that many are marginal workers, meaning they work for less than six months a year, often on a seasonal or casual basis. As a result, they lack regular employment and do not receive social security or unemployment benefits. Therefore, it is essential to study the conditions of women farm labourers to better understand their contributions and the challenges they face within the agricultural sector. This paper aims to empirically analyse the nature and extent of women's involvement in the agriculture sector.

## LITERATURE REVIEW

A significant body of literature exists on the role of women in agriculture and related fields. However, here we provide a brief overview of some of the key studies.

**Doss et al. (2011):** This study emphasizes the underperformance of the agriculture sector in many countries due to the constraints faced by women. It highlights the significant heterogeneity in women's contributions to agriculture, both between and within countries, with variation influenced by crop types, production cycles, age, and ethnic group. The authors call for gender-sensitive policies based on sound data and analysis to address these disparities.

**Lal and Khurana (2011):** This research points out the significant role women play in agriculture and discusses the negative impacts of gender discrimination on their socio-economic status. The authors argue that women's work in rural areas is often undervalued, leading to a misrepresentation of their contributions in development efforts.

**Satyavathi et al. (2010):** This paper focuses on the impact of the Green Revolution and agricultural mechanization in India, noting how these developments worsened the conditions for rural farmwomen. Despite increased cash income in rural households, women had to take on additional burdens as unpaid labourers, contributing to their already high labour demands. This reflects the challenges of technological advancements in agriculture without corresponding improvements in gender equity.



**Sharma (1984):** Sharma's work explores the intersection of caste, class, and gender in North India's agricultural sector, showing that women's participation in agricultural production is influenced by their social position. The research indicates that while more women are working in agriculture, their roles have become more marginalized, with a shift away from being cultivators to unskilled labours, reflecting the negative consequences of capitalistic development policies.

**Mazumdar et al. (2009):** This study reveals that women primarily engage in homestead gardening, harvesting, and post-harvesting activities. The key drivers for their participation in agricultural work are the need to meet family needs and increase family income. It highlights the economic necessity that motivates women's involvement in agricultural labor, especially in post-harvest activities.

**Damisa et al. (2007):** This paper critiques the lack of adequate information on women's participation in agriculture, leading to the underestimation of their importance. The research identifies key factors influencing women's involvement in agriculture, such as income levels, tenure rights, and their contributions to agricultural production. These factors are crucial in shaping the role of women in rural economies.

**Rais et al. (2013):** Rais' study focuses on the economic status of rural women in Pakistan, particularly in agriculture and livestock farming. It finds that while many women are involved in agricultural activities such as crop production, livestock husbandry, and food processing, their participation is not fully reflected in their employment status, indicating economic and social challenges they face despite their involvement.

**Mishra (2009):** Mishra's research examines the factors affecting the efficiency of female agricultural laborers, with wages being a key determinant. Other factors include leisure time, family pressure, age, family support, health, and access to labor-saving devices. The study advocates for empowerment that changes the power structures marginalizing women in agricultural work.

**OBJECTIVES OF THE STUDY**

There are two specific objectives of the study as stated below.

1. To analyse the female labour in agriculture sector in rural Odisha.
2. To analyse wage Pattern of female in agriculture sector in rural Odisha.

**METHODOLOGY**

To analyse the status of women agriculture this study uses secondary data from government reports, census data and agricultural surveys. Simple trend line and graphs are used to show the female labour force Participation and wages paid to them over the years. The study used descriptive statistics, correlation matrix and regression analysis to analyse data. The study applied augmented dicky fuller test to check the stationarity of the variable.

**Women Agricultural Workers in Odisha**

Odisha had a population of 4.20 crore people, or roughly 3.47 percent of the nation's total population, according to the 2011 Census. According to the 2011 census, there were 175.42 lakh workers overall, with 86.1% of them living in rural Odisha and 13.9% in urban areas. Male employees make up 67.9% of the workforce, while female employees make up 32.1%. There are 107.08 lakh male workers, or 61% of the overall workforce, 41.04 lakh cultivators, or 23.4% of the entire workforce, and 67.40 lakh agricultural labourers, or 38.4% of the total workforce. Male workers make up 57.1% of all workers in rural areas and 85.5% of all workers in metropolitan areas. Additionally, it was reported that there were 68.34 lakh marginal workers overall, or 39% of all workers. According to the 2011 Census, the total number of workers increased by 22.9% from the 2001 Census. In the State, there were 56.1% of male workers for every male population and 27.2% of female workers for every female population.

**Table:1 Statistics of Women in Odisha in 2011**

Total Women Population	20.76 Million
Total Women Workers	5.64 Million
Total Women Main Workers	5.53 Million
Total Women Marginal Workers	3.72 Million
Total Women Cultivators	0.72 Million
Total Women Agricultural Labours	3.25 Million
Total Women Household Industry Workers	0.34 Million
Total Women Other Workers	1.30 Million

Source: Registrar General of India

### Feminization of Labour-force in Agriculture

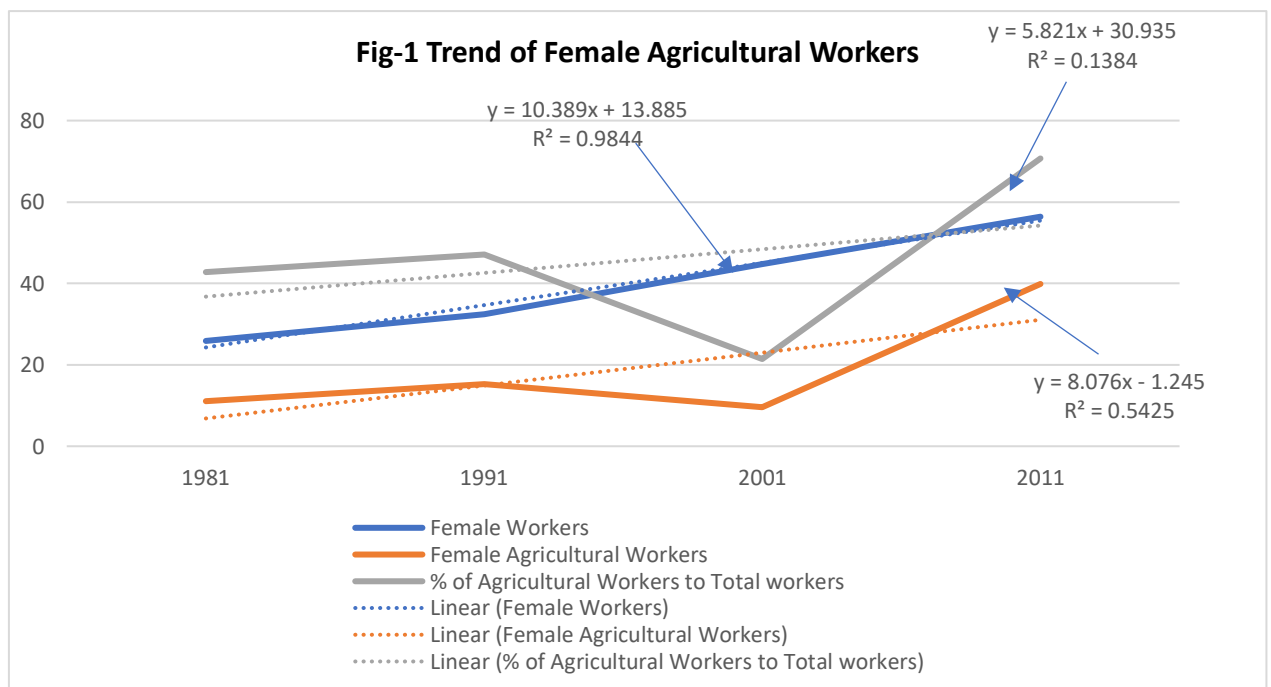
Given that the only major occupation for women workers in India is agriculture, this issue is crucial. Over the past 50 years, the number of women employed has grown from 40 million in 1951 to 150 million in 2011. Although it pays poorly and offers few prospects for advancement, it is also a last-resort profession. In Odisha, the proportion of women employed in agriculture rose from 42.75 percent in 1981 to 70.7% in 2011. The percentage of women employed in rural Odisha as agricultural labourers and cultivators was 76.2% and higher. In 2011, it was just 11.5% for urban Odisha.

**Table:2 Distribution of Female Workers in Odisha (In Lakhs)**

Year	Female Workers	Female Agricultural Workers	% of Agricultural Workers to Total workers
1981	25.87	11.06	42.75
1991	32.42	15.26	47.07
2001	44.75	9.59	21.43
2011	56.39	39.87	70.70

*Source: Census of India (2011)*

The table-2 clearly illustrate a growing trend of feminization in agriculture, both in India and specifically in Odisha. The ratio of female agricultural workers compared to the total female population is significantly higher in Odisha. The key point is that despite the increasing reliance on women in agricultural work, their contributions are often overlooked. Fig-1 presents Least square trend equation which has been computed and the coefficient are Positive for all variables. It implies that percentage of agricultural labourers has increasing trend over the decades.



### Sectoral Composition of Rural Workforce

Conversely, urban jobs are primarily expected to emerge from the growth of the industrial sector. However, due to its geographical location, which is distant from the seaport and being a border state, an industrial foundation has not been established despite the successful implementation of the 'Green Revolution' in the region. Additionally, some socio-cultural factors. Personal factors may also contribute to the low work participation rate of women in Odisha.



**Table:3 State-wise Comparison of female labour work participation Rate**

States	2001	Ranking in 2001	2011	Change in participation Rate	Ranking in 2011	Change in Rank
<b>Odisha</b>	<b>24.7</b>	<b>8</b>	<b>27.2</b>	2.5	<b>6</b>	-2
Andra Pradesh	35.1	1	36.2	1.1	1	0
Assam	20.7	9	22.5	1.8	8	-1
Bihar	18.8	11	19.1	0.3	9	-2
Gujarat	27.9	6	23.4	-4.5	7	1
Haryana	27.2	7	17.8	-9.4	13	6
Karnataka	15.4	14	18.2	2.8	10	-4
Kerala	15.4	15	18.2	2.8	11	-4
M. P	33.2	3	32.6	-0.6	3	0
Maharashtra	30.8	5	31.1	0.3	5	0
Punjab	19.1	10	13.9	-5.2	15	5
Rajasthan	33.5	2	35.1	1.6	2	0
Tamil Nadu	31.5	4	31.8	0.3	4	0
Uttar Pradesh	16.5	13	16.7	0.2	14	1
West Bengal	18.3	12	18.1	<b>-0.2</b>	12	0

Source: Censuses of India (Various Rounds)

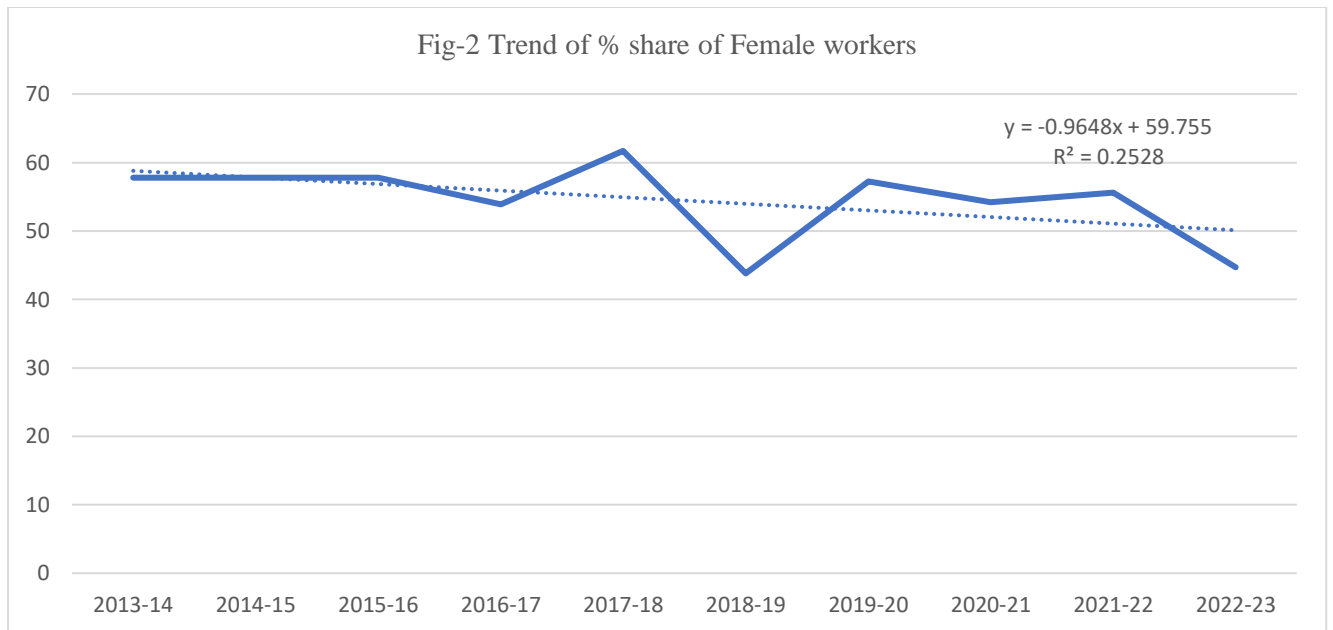
The early surge in the rural economy, driven by the Green Revolution in the 1970s and 1980s, disrupted the family farming culture and introduced widespread mechanization in agriculture. As a result, women's involvement in farming activities began to decline, with hired workers and mechanization replacing them. However, in the last decade, the proportion of women in agriculture has increased, rising from 24.7% in 2001 to 27.2% in 2011. This change can be attributed to the growing importance of allied agricultural activities, such as dairy farming and livestock development, which are labour-intensive and primarily rely on family and female labour, contributing significantly to the state's agricultural income. Female labour force participation rate is positive in all states except Gujarat, Harayana, MP, West Bengal, Punjab.

In 2018-19, the female workforce in agriculture in Odisha stood at 43.8%, and this proportion rose to 57.2% in 2019-20, and settled at 54.2% in 2020-21. In comparison, the industry and services sectors recorded lower female participation rates in the same period, with the industry sector at 21% in 2019-20 and the services sector at 19.6% in 2020-21.

**Table:4 Percentage Female employment share in agriculture sector in Odisha**

Year	Percentage Share of female workers
2013-14	57.8
2014-15	57.8
2015-16	57.78
2016-17	53.9
2017-18	61.7
2018-19	43.8
2019-20	57.2
2020-21	54.2
2021-22	55.6
2022-23	44.7

Source: Odisha Eco nomic survey



In contrast, the male labour force participation rate in Odisha’s agriculture sector has stayed within the range of 36% to 43% (with a surge during the Covid-19 pandemic), with numbers falling over the years. In parallel, the services sector has undergone expansion, with 33% of the male workforce. However, unlike female workers, there is an increasing presence of male workers in both the secondary and tertiary sectors. Fig-2 shows that there is declining trend female work participation rate because the coefficient of least square trend equation is -0.9648.

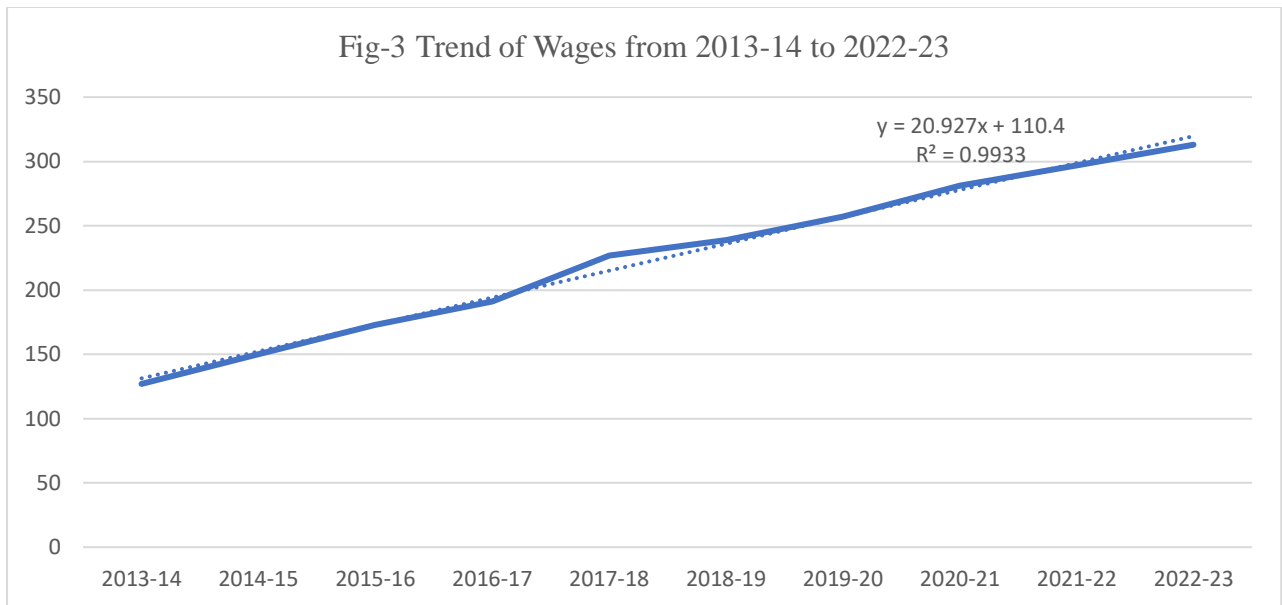
Wages for agricultural work in Odisha have been rising over time; however, they have not matched the growth seen in other states. As of 2021-22, Odisha stands at 28th out of 36 states and Union territories regarding daily agricultural wage rates. In 2019-20, the agricultural wages in Odisha were 6.1% lower than the national average. Over the span of two years, this disparity increased to 13%

**Table-5 State & year wise average daily wages of field labour agriculture (Female)**

Year	Wages	% change in Wage
2013-14	127	-----
2014-15	150	18.11
2015-16	173	15.33
2016-17	191	10.40
2017-18	227	18.85
2018-19	239	5.29
2019-20	257	7.53
2020-21	281	9.34
2021-22	297	5.69
2022-23	313	5.38

Sources: Ministry of agriculture and farmers welfare, GOI

The percentage change in agricultural wage rate is highest in year 2017-18 and lowest in 2018-19. The over all trend is observed to be positive(Fig-3) as the coefficient of least square equation is found to be 20.927.



**Table-6 Summary Statistics**

Variables	Mean	Std. dev	Min	Max
% share of female workers participations (fw)	3.991	0.113	3.779	4.122
Wages (wa)	5.378	0.303	4.844	5.746

Source- Authors Own Computation

The average percentage of female workers in agriculture is 3.991%, with low variability (standard deviation of 0.113), ranging between 3.779% and 4.122%, indicating stability in female labour participation. In contrast, the average wage level is 5.378, with a higher standard deviation of 0.303, suggesting more variation in wages, which range from 4.844 to 5.746. The data suggests that while female worker participation in agriculture remains relatively stable, wage levels exhibit greater fluctuation.

**Table-6 Correlation Matrix**

Variables	fw	wa
% share of female workers participation (fw)	1	
Wages (wa)	-0.453	1

Source- Authors own computation

The correlation matrix shows the relationship between female worker participation in agriculture (fw) and wage levels (wa). The diagonal values (1) indicate that each variable is perfectly correlated with itself. The off-diagonal value of -0.453 represents a moderate negative correlation between fw and wa, suggesting that as wages increase, the percentage of female workers in agriculture tends to decline, and vice versa. This inverse relationship may indicate that higher wages attract workers, including women, to other sectors or that lower wages in agriculture discourage female participation.

**Table-7 Regression Results**

Variables	Coefficient	P -Value	Std.Err.
Constant	4.899	0.000	0.632
fw	-0.168	0.188	0.117

Source- Authors own computation

The regression table presents the relationship between female worker participation in agriculture (fw) and wage levels. The constant (4.899) represents the predicted wage level when fw is zero, and its p-value (0.000) indicates statistical significance. The coefficient of fw (-0.168) suggests a negative relationship, meaning that an increase in female participation in agriculture is associated with a slight decrease in wages. However, the p-value (0.188) is above the 5% threshold, indicating that this relationship is not statistically significant. The standard errors (0.632 for the constant and 0.117 for fw) show the variability in the coefficient estimates. Overall, while the negative coefficient suggests a possible inverse relationship, the lack of statistical significance means that female worker participation in agriculture does not have a strong or conclusive effect on wage levels in this model.



**Table-8 Augmented Dicky-Fuller test**

Variables	Test Statistics	5% Critical Value
<b>fw</b>	-1.507	-3.000
<b>Ifw</b>	-2.460	-1.950
<b>wa</b>	-0.915	-3.600
<b>Iwa</b>	-3.621	-1.950

Source- Authors Own computation

The Augmented Dickey-Fuller (ADF) unit root test results indicate that both fw (female worker participation in agriculture) and wa (wage levels) are non-stationary at their levels, as their test statistics (-1.507 and -0.915) are greater than the 5% critical values (-3.000 and -3.600), meaning we fail to reject the null hypothesis of a unit root. However, after first differencing (Ifw and Iwa), both variables become stationary, as their test statistics (-2.460 and -3.621) are lower than the respective critical values (-1.950), allowing us to reject the null hypothesis. This suggests that both fw and wa are integrated of order 1 (I(1)), meaning they require first differencing to achieve stationarity, which is crucial for further time series analysis, such as cointegration testing, to examine long-run relationships.

## FINDINGS AND CONCLUSIONS

In 1993-94, 72% of the rural workforce was engaged in agriculture. However, in the following years, the involvement in rural agricultural jobs consistently decreased, falling to 52% by 2020-21. This pattern highlights a transition towards more varied employment options, reflected in the simultaneous expansion of other sectors. The proportion of employment in the industrial sector within rural regions rose from 9% in 1993-94 to 28% in 2020-21. In recent years, there has been a decline in agricultural employment rates within rural Odisha. In 2019-20, about 55% of the rural population in Odisha was employed in agriculture. This figure decreased to 51% in 2021-22. This trend is not unique to Odisha alone; rural India as a whole has seen a dip in agricultural employment rates. In 2019-20, 62% of rural workers were engaged in agriculture, and this declined to 59% in 2021-22. Overall, Odisha's rate was lower than the all-India figures.

The study concluded with a significant shift in the structure of rural employment in India and Odisha, with a clear decline in the share of the workforce engaged in agriculture. From 1993-94 to 2020-21, the percentage of rural workers involved in agriculture dropped from 72% to 52% at the national level, reflecting a broader trend towards diversification of rural employment. This transition is accompanied by a notable rise in industrial sector employment, which increased from 9% to 28% over the same period. Specifically in Odisha, agricultural employment fell from 55% in 2019-20 to 51% in 2021-22, a trend that mirrors the national decline. However, Odisha's agricultural employment rate remains consistently lower than the all-India average, suggesting that the state is undergoing a slightly faster pace of diversification in rural employment. These trends indicate that rural areas are gradually moving away from agricultural dependence, driven by the expansion of other sectors such as industry. This shift could be seen as a positive indicator of economic diversification, but it also highlights the challenges of ensuring sufficient opportunities and support for workers transitioning out of agriculture.

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