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Socio-economic determinants influencing the rice-based farming system practices of farm women in North Bihar, India

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Abstract

In India, Agriculture serves as the mainstay for a huge number of people. The present study aims to determine the factors influencing participation of farm women in rice-based farming activities in rural areas of Bihar. The research was undertaken in Samastipur district of Bihar state, where a total of 160 rural women farmers were selected through a simple random sampling method. The present study examines the relationship between women's participation in rice-based farming systems and various independent variables, as well as the predictive strength of these variables. The results revealed that possession of agricultural implements, involvement in decision making, adoption of rice production technologies and women's contribution were positively and significantly associated with their participation in rice-based farming activities. In contrast, factors such as age, education, size of family, social participation, landholding size, income and overall socio-economic status showed a significant negative correlation with their level of participation.

Keywords: Participation, rural farm women, socio-economic status, rice-based farming practices, North Bihar

Introduction

India's rural economy traditionally relies on agriculture, livestock, and household-based activities. Bihar, a state in eastern India, has an economy predominantly dependent on agriculture, with rice being a major staple crop in North Bihar. Rural farm women play a crucial role in farming systems by participating in diverse agricultural and allied tasks, thereby contributing significantly to employment generation and household income ^[1-2]. Women in these systems assume multiple roles, and the value of their labor is often equivalent to that of other family members. Their employment status ranging from unpaid family workers to wage earners across different settings, including their homes, villages, and other locations where they may exchange services for goods or wages ^[3]. In Bihar, the large-scale seasonal and long-term migration of men for employment in sectors such as construction, services, business, and agricultural labor has led to women emerging as the principal managers of both agricultural and domestic responsibilities. This includes active participation in farm-related decision-making and household management ^[4-5]. Thus, any comprehensive analysis of agricultural production, especially in rice-based systems, must account for the indispensable role and participation of women.

Methodology: The research was concentrated in the

Samastipur of Bihar State. District containing 20 blocks from which two rice-growing blocks namely Pusa and Kalyanpur were selected at random. Subsequently, two villages were randomly chosen from each selected block, resulting in a total of four villages. From each village, 40 farm families were selected through a proportionate stratified random sampling method based on landholding size, making up a total sample of 160 beneficiaries. Data collection was carried out through a structured and pre-tested interview schedule, which included various variables relevant to the study. The data obtained were analyzed through various statistical tools like frequency, percentage, mean, and t-test for interpretation of the findings.

Results and Discussion

Socio-economic characteristics of farm women

The socio-economic and personal characteristics of the rural farm women were analysed individually.

Age

Table 1 shows that the majority of the respondents (55 percent) were middle age. In Dighara village, 62.50 per cent of the respondents were of middle age whereas, in Kalyanpur villages 57.50 percent women were middle age. In both the villages Mahamada and Rampura 50 percent respondents were middle age.

Table 1: Respondent's distribution according to their age

Age (years)		Mahamada	Dighara	Kalyanpur	Rampura	Total
Young (≤ 35)	n	12	10	11	10	43
	%	30	25	27.5	25	26.68
Middle (36-55)	n	20	25	23	20	88
	%	50	62.5	57.50	50	55
Old (> 55)	n	8	5	6	10	29
	%	20	12.5	15	25	18.13

N=160

The pooled data showed that 55% of the respondents were of middle age, 26.88% were young, and 18.13% belonged to the old age group. Among the villages, Mahamada had the highest proportion of young respondents at 30%, followed by Kalyanpur with 27.5%, and both Dighara and Rampura

with 25% each. Rampura village had the highest percentage of old-aged respondents at 25%, followed by Mahamada (20%) and Kalyanpur (15%), while Dighara had the lowest proportion of elderly respondents at 12.5%.

Caste

Table 2: Respondent's distribution by Caste

Caste		Mahamada	Dighara	Kalyanpur	Rampura	Total
General	n	6	7	8	10	31
	%	15	17.5	20	25	19.37
OBC	n	20	22	24	25	91
	%	50	55	60	62.5	56.87
SC/ST	n	14	11	8	5	38
	%	35	27.5	20	12.5	23.76

N= 160

Table 2 clearly indicates that the majority of women respondents (56.87%) belonged to the OBC, followed by 23.75% from the SC, while only 19.17% were from the General. The proportion of OBC women was highest in Rampura (62.50%), followed by Kalyanpur (60.0%), Dighara (56.0%), and Mahamada (50.0%). This trend is attributed to the fact that most agricultural land in these villages is owned by individuals from the General caste.

Among the caste groups, rural women from the SC and ST communities were the second largest group involved in farm activities after the OBC. The proportion of General caste women respondents was recorded as 25.0% in Rampura, 20.0% in Kalyanpur, 17.5% in Dighara, and 15.0% in Mahamada.

Educational level

Table 3: Respondent's distribution by Educational level

Educational level		Mahamada	Dighara	Kalyanpur	Rampura	Total
Illiterate	n	14	10	9	8	41
	%	35	25	22.5	20	25.62
Low (1-2)	n	14	18	13	16	61
	%	35	45	32.5	40	38.13
Medium (3-4)	n	8	10	9	8	35
	%	20	25	22.5	20	21.87
High (5-6)	n	4	2	9	8	23
	%	10	5	22.5	20	14.38

N= 160

It is evident from Table 3 that 25.62% of the rural women were illiterate. Among the villages, the highest proportion of illiterate women was found in Mahamada village (35%), followed by Dighara (25%) and Kalyanpur (22.5%). The lowest percentage of illiterate women was recorded in Rampura village.

The pooled data revealed that a majority of the respondents belonged to the low educational category, followed by the medium educational category (38.13%), while only 14.38% fell under the high educational category.

Specifically, 45% of rural women in Dighara village were in the low educational category, followed by Rampura (40%) and Mahamada (35%). In Kalyanpur, 32.5% of the respondents belonged to the low educational group.

In the medium educational category, the highest proportion of women (25%) was from Dighara village, followed by Kalyanpur (22.5%), and Mahamada and Rampura, each with 20%.

Regarding the high educational category, the highest percentage (22.5%) of respondents belonged to Kalyanpur village, followed by Rampura (20%). The lowest percentages were found in Mahamada (10%) and Dighara (5%).

Family size

The size of a family significantly influences the economic behavior of rural households, especially in terms of income generation and expenditure patterns.

Table 4: Respondent's distribution according to family size

Family size		Mahamada	Dighara	Kalyanpur	Rampura	Total
Small Family (<5 members)	n	12	10	12	13	47
	%	30	25	30	32.5	29.38
Medium Family (5-7 members)	n	22	26	24	23	95
	%	55	65	60	57.5	59.37
Large Family (>7 members)	n	6	4	4	4	18
	%	15	10	10	10	11.25

N=160

Table 4 indicates that a majority of respondents (59.37%) had a medium-sized family, while only 11.25% had large families, and 29.38% had small families. The data further reveals that the highest proportion of medium-sized families was found in Dighara village (65%), followed by Kalyanpur (60%). In Rampura and Mahamada villages, medium-sized families accounted for 57.5% and 55% of respondents, respectively. Regarding small families, the highest percentage was observed in Dighara (32.5%) and the lowest in Rampura (25%), while Mahamada and Kalyanpur each had 30% of respondents with small family sizes. Large

families were least common, with only 15% reported in Mahamada and just 10% in each of the other three villages like Dighara, Kalyanpur, and Rampura.

Type of family

Various studies have indicated that members of nuclear families tend to make decisions more quickly and are more likely to take on responsibilities and risks compared to those in joint families. For the purpose of this study, respondents were categorized into two groups: nuclear and joint families.

Table 5: Respondent's distribution according to their family type

family type		Mahamada	Dighara	Kalyanpur	Rampura	Total
Nuclear Family (1 to 4 members)	n	28	25	27	26	106
	%	70	62.5	67.5	65	66.25
Joint Family	n	12	15	13	14	54
	%	30	37.5	32.5	35	33.75

N= 160

An analysis of Table 5 shows that the highest proportion of rural women living in nuclear families was found in Mahamada village (70%), followed by Kalyanpur (67.5%), Rampura (65%), and Dighara (62.5%). Conversely, 37.5% of respondents in Dighara village belonged to joint families, followed by 35% in Rampura, 32.5% in Kalyanpur, and 30% in Mahamada. Several studies have suggested that rural women involved in farm and allied activities are predominantly from nuclear families, as both husband and wife are often required to contribute to the household income. This observation is supported by the findings of

Awasthi and Dagwekar (1990), which highlight the influence of family structure on women's participation in agriculture and the amount of time they devote to it.

Occupation

Occupation plays a key role in shaping a family's economic status, cash flow, and decision-making processes. Based on their occupational status, the selected respondents were divided into four categories: labourers, cultivators, business and other allied traditional occupations, and service holders

Table 6: Respondent's distribution based on their occupation

Occupation		Mahamada	Dighara	Kalyanpur	Rampura	Total
Labourers	n	4	2	5	8	9
	%	10	5	12.5	20	11.87
Cultivators	n	26	28	26	24	104
	%	65	70	65	60	65
Business & other allied traditional occupation	n	10	10	9	8	37
	%	25	25	22.5	20	23.13
Service Holders	n	-	-	-	-	-
	%	-	-	-	-	-

N=160

Table 6 clearly shows that the majority of rural women (65%) were engaged in farming, followed by 23.13% involved in business and other allied traditional occupations, while 11.87% worked as labourers. Notably, there was not a single respondent employed in a salaried service. In terms of village-wise distribution, 70% of rural women in Dighara were engaged in agriculture, followed by 65% each in Mahamada and Kalyanpur, and 60% in Rampura. The study

indicates that agriculture was the primary occupation for most rural women, while other forms of employment were generally taken up as secondary sources of income, often linked to small, traditional agro-based activities.

Annual income

The socio-economic status of rural farm families is largely determined by their total family income. In this study,

annual income from all sources was used to assess the respondents' economic position. Based on their annual earnings, the respondents were classified into four categories: low income (up to Rs. 15,000), average income

(above Rs. 15,000 to Rs. 20,000), medium income (above Rs. 20,000 to Rs. 25,000), and high income (above Rs. 25,000), as shown in Table 7.

Table 7: Respondent's distribution based on their annual income

Annual income		Mahamada	Dighara	Kalyanpur	Rampura	Total
Low (Rs. 10,000 - Rs. 15,000)	n	4	4	10	9	27
	%	10	10	25	22.5	16.87
Average (Rs. 15,001 - Rs. 20,000)	n	14	10	12	12	48
	%	40	25	30	30	30
Medium (Rs. 20,001 - Rs. 25,000)	n	16	18	15	16	65
	%	40	45	37.5	40	40.62
High (> Rs. 25,000)	n	6	8	3	3	20
	%	15	20	7.5	7.5	12.5

N=160

Table 7 illustrates that the highest proportion of respondents from Dighara village (45%) fell under the medium annual income bracket of Rs. 20,000 to Rs. 25,000. This was closely followed by respondents from Rampura and Mahamada villages, each with 40% in the same income category, while Dighara also recorded 37.5% in this range. The study also showed that 40% of respondents from Mahamada, followed by 30% each from Kalyanpur and Rampura, and 25% from Dighara belonged to the average annual income group (Rs. 15,000 to Rs. 20,000). Overall, 30% of the total respondents fell into this category, primarily due to their reliance on agriculture as their sole source of income. Given that landholding size and family structure significantly affect income levels, this may explain why nearly one-third of rural women were observed in this income bracket.

Additionally, 8 respondents from Dighara, 6 from Mahamada, and only 3 each from Kalyanpur and Rampura reported an annual income exceeding Rs. 25,000, representing an average of 12.5% across all villages. This group typically consisted of those with larger landholdings and access to additional income sources.

The findings also revealed that 16.87% of the total respondents were living below the poverty line, earning less than Rs. 15,000 annually. These individuals were mainly landless labourers dependent on daily wages for survival.

Overall, 40.62% of the respondents were categorized under the medium income group (above Rs. 20,000 up to Rs. 25,000 per annum). This trend can be attributed to the predominant role of rural women in agricultural work, where agriculture remains the principal, yet increasingly costly and low-profit, livelihood option. The limited income-generating potential of agriculture appears to be the primary reason why most respondents fall into the medium income group.

Cropped Area

The respondents were grouped into four categories according to their size of land holding i.e. landless, marginal, small and medium farmers which have been shown in Table 8.

The respondents were classified into four categories based on the size of their landholdings, namely landless, marginal, small, and medium farmers, as presented in Table 8

Table 8: Respondents distribution based on cropped area

Cropped Area		Mahamada	Dighara	Kalyanpur	Rampura	Total
Landless	n	-	-	-	-	-
	%	-	-	-	-	-
Marginal (< 2.5 acres)	n	15	17	16	18	66
	%	37.5	42.50	40	45	41.25
Small (2.5 - 5 acres)	n	20	18	19	17	74
	%	50	45	47.5	42.5	46.25
Medium (> 5 acres)	n	5	5	5	5	20
	%	12.5	12.5	12.5	12.5	12.50

N= 160

Table 8 reveals that the largest proportion of respondents (46.25%) were small farmers with landholdings ranging from 2.5 to 5 acres. Marginal farmers, owning up to 2.5 acres, accounted for 41.25% of the respondents, while only 12.5% were medium farmers. Notably, there were no landless farmers among the respondents in this study.

Among small farmers, Mahamada village had the highest proportion (50%), followed by Kalyanpur (47.5%), Dighara (45%), and Rampura (42.5%). In contrast, Rampura had the highest share of marginal farmers at 45%, followed by Dighara (42.5%), Kalyanpur (40%), and Mahamada

(37.5%). Interestingly, 12% of respondents across all four villages—Mahamada, Dighara, Kalyanpur, and Rampura—were identified as medium farmers.

Landholding size plays a critical role in shaping the socio-economic condition of rural women and significantly influences their participation in household decision-making.

Social participation

The respondents were categorized into three distinct groups based on their level of social participation which as shown in Table 9.

Table 9: Respondent's distribution based on their social participation

Social participation		Mahamada	Dighara	Kalyanpur	Rampura	Total
Low (<1)	n	15	21	8	11	55
	%	37.5	52.5	20	27.5	34.37
Medium (1 - 3)	n	20	13	25	21	79
	%	50	32.50	62.50	52.50	49.38
High (>3)	n	5	6	7	8	26
	%	12.5	15	17.5	20	16.25

N = 160

Table 9 reveals that the medium level of social participation was reported by 62.50%, 52.50%, and 4.50% of respondents in Kalyanpur, Rampura, and Mahamada villages, respectively. In contrast, only 32.50% of respondents in Dighara village exhibited medium social participation. The highest percentage of respondents with a high level of social participation was observed in Rampura village (20%), followed by Kalyanpur (17.5%) and Dighara (15%). Mahamada village had the lowest proportion of respondents with a high level of social participation at 12.5%.

Regarding low social participation, Dighara village had the

greatest share at 52.5%, followed by Mahamada with 37.5%. Rampura and Kalyanpur villages had 27.5% and 20% of respondents with low social participation, respectively. Overall, pooled data indicated that 34.37% of respondents had low, 49.38% had medium, and 16.25% had high levels of social participation.

Socio-economic status

The standard of living of rural women tends to improve with higher socio-economic status. Accordingly, the respondents were categorized into three socio-economic groups—low, medium, and high—as shown in Table 10.

Table 10: Respondent's distribution according to their Socio-economic status

Socio-economic status		Mahamada	Dighara	Kalyanpur	Rampura	Total
Low (14 to 20)	n	15	21	8	12	56
	%	37.50	52.50	20	30	35.00
Medium (21 to 27)	n	20	13	26	21	80
	%	50	32.50	65.00	52.50	50.00
High (>28)	n	5	6	6	7	24
	%	12.50	15	15	17.50	15.00

N = 160

Table 10 shows that in Mahamada village, 50% of the respondents belonged to the medium socio-economic category, 37.5% were in the low category, and only 12.5% were in the high category. In Dighara village, the majority of respondents (52.5%) fell under the low socio-economic group, followed by 32.5% in the medium and 15% in the high category. Kalyanpur village had the highest proportion (65%) of respondents in the medium group, while 20% were in the low and 15% in the high socio-economic group. In Rampura village, 52.5% of the respondents had a medium level of socio-economic status, 30% had high, and 17.5% had low socio-economic status.

The pooled data revealed that half of the respondents (50%)

belonged to the medium socio-economic category, while 35% fell under the low category and only 15% were in the high category. These findings indicate that a majority of the respondents were in the medium socio-economic group, with roughly one-third in the low category and a relatively small proportion in the high category.

Extension Contact

Based on their level of exposure to extension agencies and the scores they obtained, the respondents were divided into three categories. The distribution of respondents across these categories, in terms of frequency and percentage, is presented in Table 11.

Table 11: Respondent's distribution based on their extension contacts

Extension Contact		Mahamada	Dighara	Kalyanpur	Rampura	Total
Low (< 5)	n	15	16	13	17	61
	%	37.50	40	32.5	42.5	38.12
Medium (5 to 10)	n	23	21	22	20	86
	%	57.5	52.5	55	50	53.76
High (> 10)	n	2	3	5	3	13
	%	5	7.5	12.5	7.5	8.12

N = 160

Table 11 shows that the majority of respondents across all four villages had a medium level of exposure to extension agencies—57.5% in Mahamada, 55.0% in Kalyanpur, 52.5% in Dighara, and 50.0% in Rampura. Additionally, the table reveals that a significant proportion of respondents had low levels of extension contact, with 42.5% in Rampura, 40% in Dighara, 37.5% in Mahamada, and 32.5% in

Kalyanpur. The highest proportion of respondents with a high level of extension contact was observed in Kalyanpur (12.5%), followed by 7.5% in both Rampura and Dighara, while only 5.0% in Mahamada fell into this category. The combined data indicated that 53.76% of respondents had a medium level of extension contact, 38.12% had low exposure, and only 8.12% had high exposure to extension services.

Adoption level

The respondents were categorized into three groups based on their level of adoption of recommended rice production

technology, namely low, medium, and high, as shown in Table 12.

Table 12: Respondent's distribution based on their adoption level

Adoption level		Mahamada	Dighara	Kalyanpur	Rampura	Total
Low (< 17)	n	7	14	11	15	47
	%	17.5	35	27.5	37.5	29.38
Medium (18 to 34)	n	21	18	18	17	74
	%	52.5	45	45	42.5	46.25
High (35 to 50)	n	12	8	11	8	39
	%	30	20	27.5	20	24.37

N= 160

The pooled data presented in Table 12 revealed that the majority of rural women (46.25%) across all four villages—Mahamada, Dighara, Kalyanpur, and Rampura—fell under the medium level of adoption category for recommended rice production technology. This was followed by 29.38% of women categorized under the low adoption level. Among them, Rampura village had the highest proportion of respondents in the low adoption category (37.5%), followed

by Dighara and Kalyanpur, while Mahamada recorded the lowest number of respondents in this category.

Overall level of participation of farm women in rice - based agricultural and related activities

Table 13 and fig1 present the data on gender-wise overall work participation of women in farm and related practices.

Table 13: Gender-wise distribution of overall participation levels in rice - based farming and related practices.

Practices			Men	Women	Jointly	Pooled
1	Rice-based production practices	n	60.30	64.40	35.39	160
		%	37.68	40.19	22.13	100
2	Livestock related activities	n	63.33	63.22	33.54	160
		%	39.58	39.51	20.9	100
3	All farm related work	n	61.81	63.76	34.51	160
		%	38.63	39.85	21.50	100
4	All allied tasks (Agril. + household)	n	38.01	100	22.01	160
		%	23.69	62.5	13.69	100
5	All farm and related work	n	49.86	81.88	28.16	160
		%	31.16	51.17	18.67	100

Table 13 highlights that women played a more prominent role than men in rice-based crop production activities, although a considerable number of tasks were carried out jointly. In livestock-related work, participation was nearly equal between men and women. However, in allied activities, women took the lead, performing 62.5% of the tasks independently, compared to 23.69% by men, with 13.69% completed jointly. Overall, women's involvement in farming and allied activities stood at 51.17%, significantly

higher than men's 31.16%, with joint participation accounting for 18.69%.

In the rice-based farming systems of North Bihar, women contribute to approximately 51.17% of agricultural activities. In contrast, men are often engaged in off-farm employment, frequently traveling to distant areas to earn a livelihood, which increases the workload and responsibilities of women within rural households.

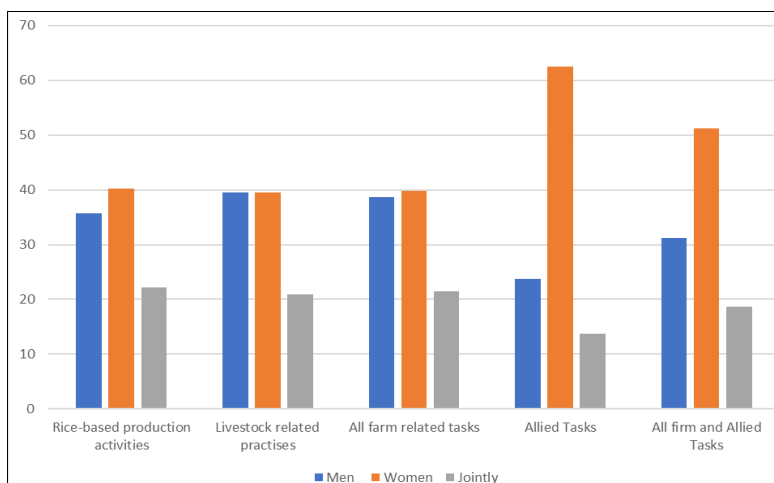


Fig 1: Level of work participation of women in rice-based farming system

Table 14: Mean participation scores of men and women in various rice-based farm and related practices along with calculated t-value.

Sl. No.	Types of practices	Mean scores		Mean diff	t- value
		Men	Women		
1	Rice - based production tasks	24.37	31.25	6.88	18.91*
2	Livestock related activities	4.37	4.18	0.19	1.29 NS
3	Related practices (Agril. + Household)	6.25	9.37	3.12	23.37**

*Significant at 0.05 level

**Significant at 0.01 level

NS - Non significant

As presented in Table 14, the t-values for participation scores revealed a significant difference between men and women in most farm and related activities, except for livestock-related activities. This suggests that men and women participated differently in these areas. Women exhibited notably higher mean participation scores than men in rice-based crop production and related activities, underscoring their greater involvement. In contrast, livestock-related practices showed no statistically significant difference in participation between the genders.

Association between selected socio-personal and economic characteristics and women's participation in rice-based farming systems.

This analysis explores the relationship between women's participation in rice-based farming systems and selected independent variables, as well as the predictive strength of these variables in determining rural women's involvement in rice-based farm practices.

Exploring the association between selected independent

variables and women's participation in rice-based agriculture

The relationship between the socio-personal and economic characteristics of rural women and their participation in rice-based farming activities was assessed using correlation coefficients, as detailed in Table 15. Out of sixteen variables examined, eleven showed a significant association with women's participation in rice-based farming systems. Specifically, factors such as possession of agricultural implements, decision-making ability, adoption of rice production technology, and women's overall contribution exhibited a positive and significant correlation, suggesting that higher levels of these variables are associated with increased participation in farming activities.

Conversely, the results indicate that as variables like age, education, family size, social participation, landholding size, income, and socio-economic status decrease, women's participation tends to increase. Meanwhile, variables such as caste, family type, occupation, farming experience, and extension contact did not show any significant relationship with their level of participation.

Table 15: Correlation coefficient of various independent variables with the dependent variable (Y), namely the rural women's participation

S.N.	Variables	r-values with dependent variable(Y)
1.	Age	-0.4094**
2.	Caste	-0.1175 ^{ns}
3.	Educational level	-0.2495*
4.	Type of family	-0.1044 ^{ns}
5.	Size of family	-0.2239*
6.	Social participation	-0.2748*
7.	Occupation	-0.0443 ^{ns}
8.	Landholding size	-0.3595**
9.	SES	-0.2088*
10.	Annual Income	-0.2633*
11.	Agril. implements	0.2608*
12.	Decision making	0.2918**
13.	Farming experience	0.3745**
14.	Level of Adoption	0.4635**
15.	Extension Contact	0.0163 ^{ns}
16.	Rural women's contribution	0.5851**

*Significant at 5%

**Significant at 1%

^{ns} - Non-significant

Age showed a significant negative correlation with women's participation in rice-based farming activities at the 1% level, indicating that as age increases, women's involvement in farm work tends to decline.

This indicates that younger farm women participate more actively in rice-based farming activities compared to their older counterparts. Older women often face physical challenges, such as difficulty in bending for extended periods during tasks like transplanting, which can limit their involvement. In contrast, younger women are generally

more open to adopting modern farming practices and are less bound by traditional norms that often influence the attitudes of middle-aged and older women. Their greater receptivity to new ideas and technologies may drive their higher participation in rice production activities. Therefore, training and capacity-building programmes should prioritize younger farm women to ensure effective dissemination and adoption of rice-based farming technologies within the rural community.

Education showed a significant negative correlation with

women's participation in rice-based farming activities at the 1% level, indicating that higher educational attainment is associated with a decrease in their involvement in farm work. Educated women in rural areas often feel idle and dissatisfied, preferring white-collar jobs over agricultural labor, which they may perceive as less prestigious. Consequently, they tend to prioritize careers in business or government and semi-government employment over active participation in crop production. This negative yet significant relationship suggests that education is not a key factor motivating women's engagement in various farming tasks.

The study revealed that larger family sizes tend to reduce the level and extent of rural women's participation. This may be attributed to the presence of more male members engaged in off-farm employment, often migrating to distant locations for income generation, thereby increasing the domestic responsibilities of women and limiting their participation.

Social participation showed a significant negative correlation (at the 1% level) with women's participation in farming activities. This suggests that increased involvement in social events may reduce women's engagement in agricultural work, likely because they prioritize maintaining harmonious relationships with relatives and neighbors. Their responsibilities in fulfilling social obligations often take precedence, thereby assigning secondary importance to farm-related tasks.

Landholding was found to have a negative and significant correlation (at the 1% level of significance) with women's participation in farm activities. As the size of landholding increased, women's involvement in agricultural work decreased. This inverse relationship may be attributed to the fact that women from large landholding families tend to focus less on fieldwork, as their farms yield higher overall production and they can afford to hire laborers. In contrast, women from small and marginal farms, with limited production, are more actively involved in farm operations to maximize yield per unit area. Due to their relatively lower socio-economic status, they prioritize their participation in crop production activities, while women from larger farms often assign lesser importance to direct agricultural work.

Socio-economic status showed a negative and significant correlation (at the 1% level of significance) with women's participation, indicating that as the socio-economic status of households increased, the level of women's involvement in farm activities significantly declined.

Income exhibited a significant negative correlation (at the 1% level) with women's involvement in farming activities, indicating that as income levels rise, women's participation in agricultural work tends to decline significantly.

Possession of agricultural implements showed a positive and significant correlation (at the 1% level) with women's participation, indicating that as the availability of agricultural tools increases, women's involvement in farming activities also rises significantly.

Decision-making showed a positive and significant correlation (at the 1% level) with women's participation, suggesting that as women's involvement in decision-making

increases, their participation in agricultural activities also rises significantly. Active engagement in decision-making enhances their confidence, encourages greater involvement in agriculture, allied, and household activities, and provides a sense of self-satisfaction. Empowering rural women in this way fosters a supportive environment for their continued and expanded participation in the agricultural sector.

Adoption of technology exhibited a positive and significant correlation (at the 1% level) with participation of women, indicating that higher levels of technology adoption are associated with increased involvement of women in farming activities. Women's engagement in rice-based farming systems is shaped not by a single factor, but by a combination of interconnected variables. Greater participation of women in agricultural work tends to enhance the adoption of technology, which in turn helps build their knowledge and skills, contributing meaningfully to their empowerment and efficiency in crop production.

The women's contribution showed a positive and significant correlation (at the 1% level) with their participation in farm activities, indicating that as women's involvement in agricultural work increases, their contribution to the family income also rises significantly.

Predictive strength of independent variables towards the women's participation in farm practices

Multiple regression analysis was conducted to assess the predictive power of the independent variables in explaining the variation in the participation levels of farm women. The standardized regression coefficients, being unit-free, allow for direct comparison of each variable's relative contribution to this variation. The level of participation in rice-based farming is not determined by a single factor, but rather by the combined influence of all the variables as components of an integrated system. In total, sixteen selected variables were included in the regression model for analysis.

Table 16 presents the predictive strength of various variables influencing work participation of women in the rice-based farming system. The regression analysis highlighted that variables such as landholding size, decision-making ability, farming experience, technology adoption, and contribution of women significantly influenced the dependent variable. Additionally, age, income, social participation, and SES were also found to be statistically significant but negatively correlated, suggesting that careful consideration of these factors in development planning could yield substantial benefits for rural women. Although manipulating these variables or leveraging them in a strictly statistical sense may be challenging—particularly in the context of social science research—the findings clearly indicate their importance in shaping women's participation. These variables should therefore be taken into account when designing development schemes, training programmes, or policy strategies targeting rural women. On the other hand, variables such as caste, level of education, type of family, size of family, occupation, possession of agricultural implements, and extension contact did not emerge as significant predictors in the analysis.

Table 16: Multiple regression coefficient of work participation of women with independent variables

S.N.	Independent Variables	Multiple Regression coefficient	t-Value	Standardised Regression coefficient	Ranking
i.	Age	-0.5740	-3.40**	-0.28443	V
ii.	Caste	0.9255	1.00	0.05975	XIII
iii.	Level of education	-0.0846	-0.12	-0.01053	XV
iv.	Type of family	-0.2468	-0.14	-0.00851	XVI
v.	Size of family	-4.0233	-1.50	-0.14478	VIII
vi.	Social participation	-5.2902	-3.32**	-0.53938	I
vii.	Occupation	-1.0253	-1.74	-0.11032	IX
viii.	Landholding size	4.5268	3.46**	0.22070	VI
ix.	SES	0.1412	2.99**	0.06852	X
x.	Income	-0.0685	-3.08**	-0.06453	XII
xi.	Possession of Agril. implements	-0.5027	-0.69	-0.05653	XIV
xii.	Decision making	-1.6783	3.00	-0.45717	III
xiii.	Farming experience	-1.1342	2.20*	-0.16931	VII
xiv.	Level of adoption	0.8364	5.28**	0.32230	IV
xv.	Extension Contact	0.3335	1.04	0.06531	XI
xvi.	Women's Contribution	3.3304	5.64**	0.48184	II

*Significant at 5% F - Value=13.01**

** Significant at 1% R^2 - 0.7203

The significant F-value i.e.13.01 indicates that the set of independent variables included in the study effectively explains the variation in the dependent variable. Furthermore, the coefficient of multiple determination ($R^2 = 0.7203$) suggests that approximately 72% of the variation in women's participation in the rice-based farming system can be attributed to the selected independent variables.

The table also presents the standardized regression coefficients, which highlight the relative influence of each variable. Among these, social participation, rural women's contribution, decision-making, and adoption level emerged as the most influential factors. Social participation was found to have the highest impact, followed by women's contribution and decision-making, ranking first, second, and third, respectively, in terms of predictive strength.

Conclusion

In conclusion, possession of agricultural implements, involvement in decision-making, adoption of rice production technology, and women's contribution were positively and significantly associated with their participation in rice-based farming activities. In contrast, variables such as age, education, size of family, social participation, landholding size, income, and SES showed a negative but significant correlation with participation of women.

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