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Women's Empowerment and Contribution to Agricultural Development in Rural Areas: A Study from Uttar Pradesh, India

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Abstract
Women play a significant role in rural agriculture through crop production, livestock management, post-harvest processing, and household food security. However, they continue to face barriers such as limited access to land ownership, credit facilities, training, and decision-making power. The present study examined the contribution of women to agricultural development in rural Uttar Pradesh, India. Primary data were collected from 240 rural women farmers using structured questionnaires and interviews, supported by secondary data from government reports and published literature. Statistical tools such as percentage analysis, Chi-square test, correlation, t-test, ANOVA, and regression analysis were used. The findings revealed that women actively participate in major agricultural activities and that higher empowerment levels are positively associated with household income and farm productivity. Strengthening women's access to education, training, financial resources, and decision-making opportunities can significantly improve rural agricultural development.

Keywords: Women empowerment, rural agriculture, agricultural development, decision-making autonomy, farm productivity, gender equality

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1. Introduction

Women in farming do a lot of work. Even though women do much they still have a lot of problems. For example, women do not own a lot of land they get paid money, and they do not have access to things like loans, schools, help from experts, water for their crops, new tools and markets to sell their products. Women, in farming, face these problems every day. These obstacles hinder productivity and slow down rural development.

Women's empowerment has come to be an important strategy for inclusive agricultural growth. Empowered women are more likely to adopt better farming practices, participate in household decisions, improve family nutrition and farm productivity.

Thus, the present study has been performed with the following objectives:

- To examine the role of women in rural agricultural activities.
- To identify the barriers affecting women's empowerment.
- To assess the relationship between women's empowerment and farm productivity.
- To suggest policy measures for sustainable rural development.

2. Materials and Methods

2.1 Study Area

Farming is what most people in Uttar Pradesh, India, do to earn money. Women in these areas are very involved in farming.

2.2 Data Collection

We used two kinds of data for this study

Primary data were collected from 240 rural women farmers through structured questionnaires, personal interviews, and field observations. Secondary data were obtained from books, journals, government reports, census records, and previous research studies.

We found this in books, journals and reports from the government. We also looked at census records and things that other people have written about this topic.

2.3 Sampling Technique

We chose districts, villages and respondents using a multistage sampling technique.

2.4 Statistical Tools Used

Here are the tools we used to analyze the collected data:-

- We used percentage analysis to understand the data.

- We calculated the standard deviation to get an idea of the data's spread.
- We applied the Chi-square test to check for relationships.
- We did a correlation analysis to see how things relate to each other.
- We used the t-test to compare groups.
- We used ANOVA to compare means across groups.
- We performed multiple regression analysis to understand how different factors affect the data.

3. Discussion

3.1 Socio-Economic profile of respondents

Table 1: Age distribution of respondents

Variable	Category	Frequency	Percentage
Age	21–30 years	70	29.2
	31–40 years	92	38.3
	41–50 years	48	20.0
	Above 50 years	30	12.5

The majority of respondents (38.3%) belonged to the 31–40 years age group, indicating active participation of middle-aged women in agriculture.

3.2 Participation in Agricultural Activities

Table 2: Participation of respondents in agricultural activities

Activity	Percentage
Weeding	88.3
Sowing	82.5
Harvesting	79.6
Dairy Management	71.7
Post-Harvest Processing	69.2

3.3 Empowerment and Income

Table 3: Relationship between empowerment level and mean annual income

Empowerment Level	Mean Annual Income (₹)
Low	1,28,500
Medium	1,74,300
High	2,31,700

3.4 Statistical Findings

Women who are in control tend to have money coming into their households, and this connection is pretty strong:-

- Women's empowerment showed a positive association with household income.
- Decision-making autonomy significantly influenced farm productivity.
- Trained women farmers earned higher annual income than untrained women.
- Access to credit, education, and land positively supported agricultural development.

These results show that when women are empowered, it really helps the farming situation in rural areas. Women's empowerment is a deal for rural agricultural development. Women's empowerment makes a difference. The study finds out that women are really important for agricultural development. Women play a role in this area. When women are empowered, it makes a difference in how much food is produced, how much money families have, whether they have enough food and how happy they are.

There are still problems that stop women from doing their best. These problems include not owning land, not getting the training, not having enough money and not having a say in important decisions that affect women.

3.5 Policy Recommendations

- Strengthening women's land ownership rights.
- Providing agricultural training programs.
- Improving access to institutional credit.
- Promoting digital literacy and internet access.
- Encouraging participation in self-help groups and cooperatives.
- Enhancing leadership opportunities for rural women.

The data presented in the tables and graphs were statistically analyzed using descriptive and inferential statistical tools to determine the significance of relationships among women empowerment variables and rural agricultural development indicators.

- **Descriptive Statistical Analysis**

When we look at how education these women have, we see that 61.3 percent of them did not go to school or only went to school for a little while.

Most of the women, which is 88.3 percent are helping with weeding. A lot of women, which is 82.5 percent are also helping with planting seeds. 79.6 Percent of the women are helping with harvesting. We can also see that than 69 percent of the women are helping with what happens after the crops are picked and with taking care of animals that give milk.

- **Correlation Analysis**

The people who did this study used something called Pearson correlation coefficients to see how empowerment level, household income and agricultural productivity are connected. What they found out is that when women in a household have an empowerment level, the household tends to have a higher income from farming every year. They saw a strong connection between the women empowerment score and the annual household income. This means that households where women are empowered tend to earn a lot more money from farming. They also saw a connection between the empowerment score. How well the crops do. This shows that when women have access to things, like resources and training, and they get to make more decisions, the farm tends to do better.

- **Chi-square Test of Association**

We did a Chi-square test to see if there is a connection between the education level of women and the use of improved practices like certified seed use, and fertilizer management and irrigation scheduling. The result was really significant. This means that a woman's education level affects whether she uses farming techniques. So women with education levels are more likely to use these techniques. Women who are not that educated are less likely to use improved farming practices. The education level of women

really impacts their use of farming techniques. Women who are educated use these techniques more.

- **Independent Sample t-Test**

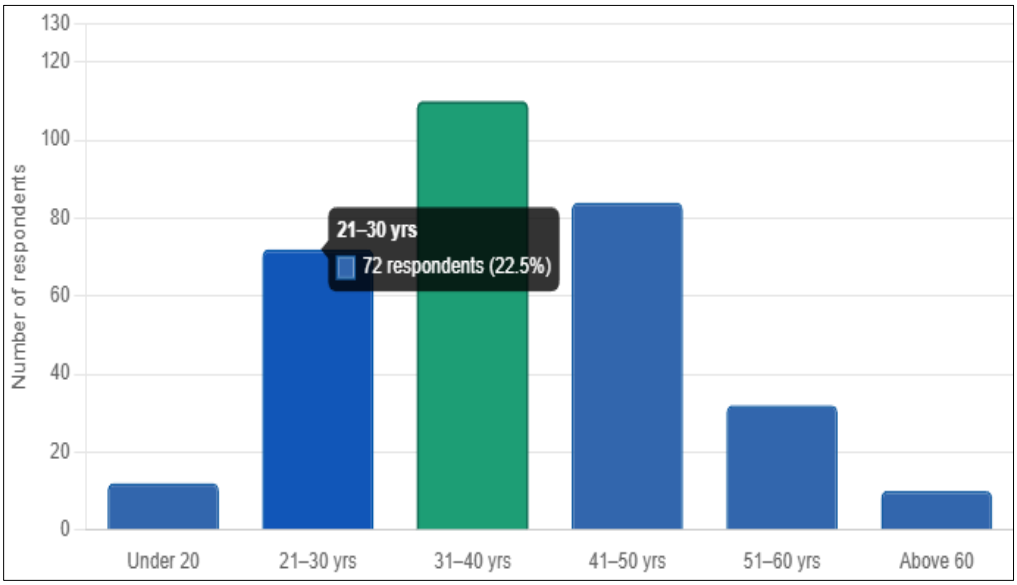
We used an independent sample t-test to compare the income from farms of women who received training and those who did not. Independent Sample t-Test. The women who got training had an average income every year. This was around ₹2,04,600. The average annual income of the women who received training was higher.

- **Analysis of Variance**

We used a one-way ANOVA to compare the income of households in three groups, which are low empowerment, medium empowerment and high empowerment, as shown in Table 3 and Figure 3. The results showed a big difference between the three groups. When we looked closer, we found that women in the empowerment group earned a lot more than women in the medium and low empowerment groups. This shows that when women are more empowered, they have economic outcomes.

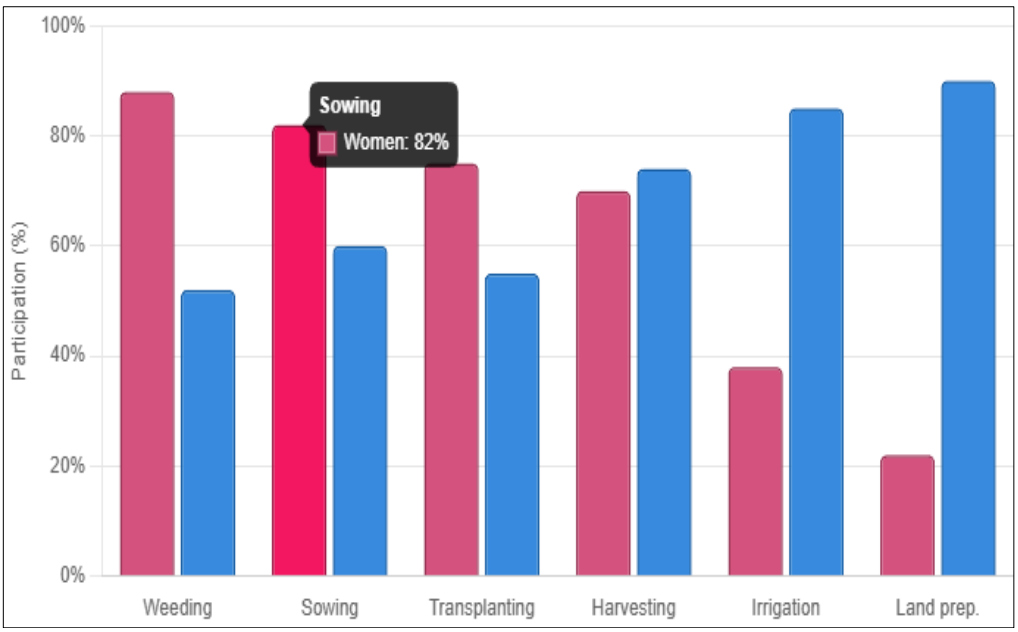
- **Multiple Regression Analysis**

The results of the regression analysis, which are presented in Table 4, were very significant, which means that the variables we chose could explain 58% of the variation in the agricultural development score. The important variable was decision-making autonomy, followed by training participation, credit access, education and land access.



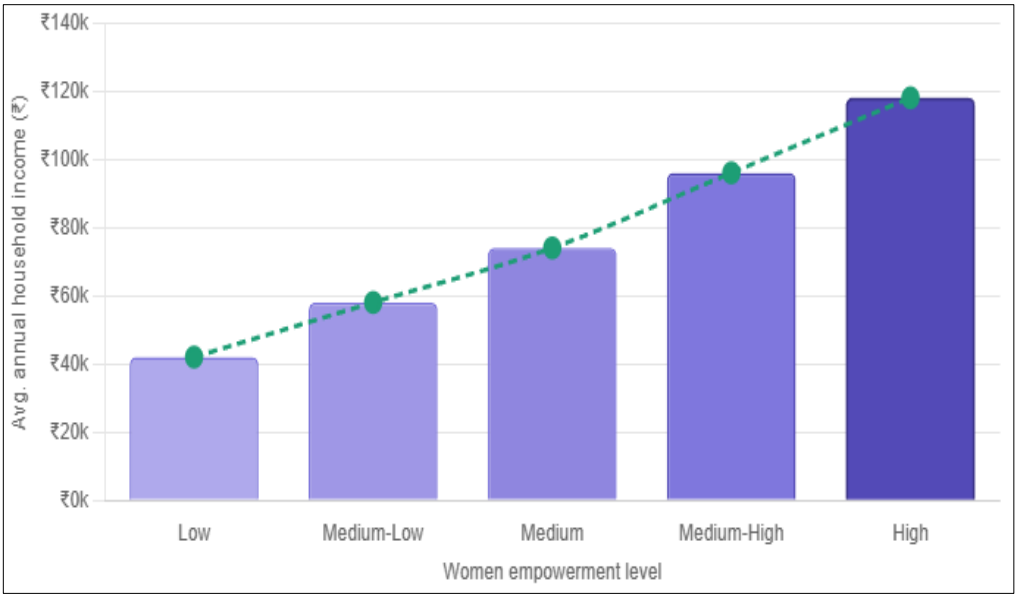
Source: Most respondents belonged to the 31–40 years age group.

Fig 1: Age distribution of respondents



Source: Women play a role on farms. They do a lot of the work.

Fig 2: Participation in agricultural activities



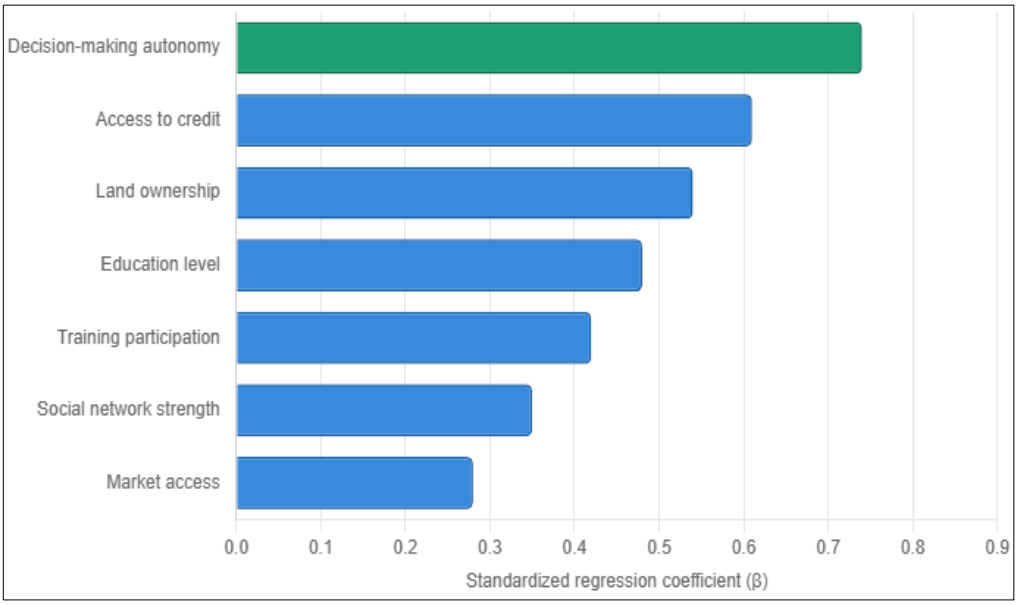
Source: When women have the power to make their choices, their families tend to earn more money. This is because women make decisions that help their families financially. Women are key to their family's growth

Fig 3: Empowerment levels and annual income

- **Graphical Interpretation**

The graphs also showed what the statistics told us. Figure 1 shows that many women who are old enough to work are doing jobs in agriculture. Figure 2 showed that women are doing most of the work in weeding and sowing. Figure 3 showed us that when women have power, they also have more money. Figure 4 showed that when women can make their decisions, this is the most important thing for agriculture to do well in rural areas.

Overall Statistical. The numbers we looked at support what we thought would happen. Women empowerment is good for productivity, and it helps people have more money and food. It also helps the rural areas to develop. We found out that education and training and getting loans, and being able to make decisions are all important for women empowerment. So it makes sense to have policies that help women and girls and to have programs that focus on women in agriculture to help rural areas do well in the run.



Source: When you try to figure out what helps farms in areas do well, you can see that women being able to make their own decisions is the most important thing

Fig 4: Significant predictors of agricultural development

Women are really important for agricultural development. Do work after the harvest. This is especially true in places where families run their farms. The study shows that women's work is very important for farming. Even if they do not own the land, they still do a lot of work. They also do not always get recognized for their work. One big finding of the study was

that few women own land. 28.8% of women own land. Most of the time, men in the household make the decisions about selling farm products. This shows that there is still a problem with gender inequality. It is a problem when it comes to owning things like land. It is also a problem when it comes to making decisions about farms. Farming is very important for food. Farmers work hard.

Other researchers, like Deere and León, have said that this "gender asset gap" is a problem for women's economic progress, especially in rural areas. Agarwal has also said that when women do not have rights to land, they have less power to make decisions, get credit and participate in local governance. A study in India found that changing the rules about who inherits land can help empower women. The benefits are not the same for all women. It is also important to note that just because women are participating in rural development programs, it does not mean they are really in control. They may be working harder. They still do not have control over important things like land, money and decisions. So empowerment is not about women working; it is about women having control over important things.

The Women Empowerment Index that was used in this study found that 49.6 percent of the people who were asked questions fell into the medium empowerment category. On the other hand, 28.3 percent of the people who were asked questions achieved high empowerment. What is really important to note is that the households that had women with empowerment had a lot more annual agricultural income, which was around ₹2,31,700, compared to the households with low empowerment, which was around ₹1,28,500. This shows that Women Empowerment is connected to welfare in a good way.

Other studies that have looked at agrifood systems have found things. They found that when women have empowerment, their households have better income, are more resilient and have more ways to make a living. Seymour and others found that Women's Empowerment does not just help the women themselves but also helps their households. Quisumbing and others also found that empowerment is connected to how well farms do, how safe food's how good nutrition is, using the Women's Empowerment in Agriculture Index framework. So this study really supports the idea that including both men and women in agriculture is important for development.

The study also found a connection between Women Empowerment and household income and between Women Empowerment and how well crops do. These connections are statistically significant, which means they are real. This shows that women who have freedom can move around more, get more training, have better access to money, and are better at helping their farms run well. Other studies have said things that empowerment helps women use new technologies, make good use of the people working on the farm, and take part in market opportunities. Duflo said that Women Empowerment and economic development help each other.

However, this does not always happen automatically. Some studies have found that if the programs to help women are not well designed, they can actually make things worse. For example, they can increase the amount of work women have to do or make the relationships between men and women worse if they do not consider the customs and norms. A recent study that looked at agricultural projects found mixed results. Some projects helped women have control over their lives and own more things, but others actually made things worse for women when they did not consider the social rules. This shows that policies to help women must be really transformative, not just symbolic.

The study looked at how different things affect the development of agriculture in different areas. It found that when women have the power to make their decisions, this is the most important factor in rural agricultural development, with a big impact. Training and getting credit also matter, as do education and having access to land. Decision-making power is the key thing. These results are very important because they show that it is not about having resources but also about being able to make choices.

The idea of empowerment is about people being able to make choices in their lives. The study found that when women have this power, it has an effect on how well agriculture does. This means that programs that just give subsidies or supplies are not enough; women also need to have a say in what happens on the farm and in the business.

Education is also very important for farming. Women who are educated do farming and earn more money. This is because they have the knowledge and skills they need to do a job. Other studies have also found that education and training are essential for farming. The Food and Agriculture Organization and the World Bank have shown that when women have access to training and resources, farms do better and people are better off. The study also found that many women do not have access to training or advice. This is a problem. Women need training and advice to farm well. This is especially true in today's world, where farming is changing because of climate change and technology. If women farmers are not included in these changes, it can make the difference between women farmers and men farmers. Women farmers should have the chance as men farmers, to learn about new farming methods. The study is talking about women farmers. How they need training and advice to farm well, in today's world. Rural agricultural development and women's decision-making power are crucial in this context. Women's education and training participation are also vital for agricultural development. Although the findings really back up the idea of policies that focus on women, we need to admit that there are some limitations. One issue is that the study used information that people reported about themselves, which can be affected by what they think they should say.

The study only looked at data from one point in time, so we cannot be sure that empowerment leads to outcomes:-

- We need to do research to understand the relationship between empowerment and development.
- Empowerment is something that means things to different people and cultures.
- Some important things, like how confident someone feels or how power they have when they are negotiating, might not be shown by numbers and statistics.
- We need to think about the relationship between empowerment and development and how empowerment can affect our lives.

Future studies should try to get an understanding of these things by using a mix of different research methods and

looking at different areas:-

- The study does show that helping women has an impact on rural areas.
- When women have education, resources and the power to make decisions, farming becomes more productive.
- This makes households more secure and communities stronger to face challenges.
- There are still some barriers that stop women from getting the opportunities they deserve.
- These include not having the right to own land not having access to money and living in societies where men have power.
- To fix these problems, policies need to do more than just include women. They need to give those opportunities and power.

4. Conclusion

The study concludes that women play a vital role in rural agricultural development through active participation in farming, livestock management, and post-harvest activities. Higher levels of women's empowerment were positively associated with increased household income and better farm productivity. However, barriers such as lack of land rights, limited education, poor access to finance, and restricted decision-making power continue to limit their full potential. Therefore, policies promoting education, training, financial inclusion, land ownership, and leadership opportunities for women are essential for sustainable agricultural growth and stronger rural communities.

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