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M Subha

Department of Mathematics,
Fatima College (Autonomous),
Madurai, Tamil Nadu, India

M Teresa Nirmala

Department of Mathematics,
Fatima College (Autonomous),
Madurai, Tamil Nadu, India

An empirical study using SPSS on women's empowerment through sustainable entrepreneurship

M Subha and M Teresa Nirmala

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Abstract

Empowering women through entrepreneurship has become a crucial tactic for attaining sustainable and equitable development. This study looks at how sustainable entrepreneurship might improve the socioeconomic empowerment of women working in environmentally friendly businesses such as organic farming, handicrafts, and industries based on renewable resources. Using a standardized questionnaire, 152 female entrepreneurs in rural and semi-urban areas provided primary data. The association between entrepreneurial variables and empowerment indicators was evaluated using descriptive statistics, correlation analysis, and chi-square testing using SPSS software. The results show that among female entrepreneurs, education, training, and financial access have a substantial impact on income growth, decision-making authority, and confidence. In order to help women-led sustainable businesses, the report emphasizes the necessity of focused training programs, better financial access, and governmental support. By advancing gender equality, decent jobs, and sustainable communities, the findings help accomplish Sustainable Development Goals (SDGs) 5, 8, and 11.

Keywords: SDGs, women's empowerment, green business, sustainable entrepreneurship, and SPSS analysis

1. Introduction

Women's empowerment has emerged as a key topic in the conversation about global development in the context of equitable and sustainable economic growth^[1, 3]. It is widely accepted that women's economic and social empowerment is necessary to achieve equitable development, lower poverty, and enhance quality of life. In recent years, women's entrepreneurship has gained more recognition as a potent instrument for empowering women through increased income output, decision-making capacity, confidence, and social participation^[22].

Through entrepreneurship, women can enhance their abilities, become financially independent, and assume leadership responsibilities. However, traditional corporate strategies usually prioritize profit maximization over environmental and ethical concerns. In this sense, sustainable entrepreneurship which integrates social justice, environmental responsibility, and economic viability has emerged as a game-changing tactic. Sustainable entrepreneurship is particularly relevant to female entrepreneurs, who often have close relationships to their communities and natural resources, because it emphasizes environmentally friendly production, responsible resource usage, and long-term societal benefits.

Organic farming, handicrafts, cottage industries, and enterprises that depend on renewable resources are among the sectors in India where women play a significant role. These sectors not only give women employment possibilities, but they also promote sustainable development locally. Despite supportive government programs and initiatives, women entrepreneurs continue to confront a number of challenges, including limited access to financing, a lack of professional training, inadequate market exposure, and social constraints^[5]. These barriers prohibit them from fully experiencing the advantages of empowerment and impede their capacity to develop as entrepreneurs.

Corresponding Author:

M Subha

Department of Mathematics,
Fatima College (Autonomous),
Madurai, Tamil Nadu, India

Empirical research indicates that factors including education, training, financial availability, and environmental awareness have a substantial impact on entrepreneurial success and empowerment. However, there is a dearth of quantitative research that specifically examines how sustainable entrepreneurship enhances women's empowerment, particularly in rural and semi-urban contexts, utilizing statistical methods like SPSS. The necessity for empirical studies that systematically examine the relationship between empowerment indicators and sustainable entrepreneurship is highlighted by the fact that the majority of present research is either conceptual or qualitative.

Given this, the goal of the current study is to investigate the ways in which sustainable entrepreneurship supports the economic and social empowerment of women. By collecting primary data from female entrepreneurs operating eco-friendly firms, the study aims to identify the key elements influencing women's empowerment. Descriptive statistics, correlation, and chi-square analysis are then applied using SPSS. In keeping with Sustainable Development Goals (SDGs) 5 (Gender Equality), 8 (Decent Work and Economic Growth), and 11 (Sustainable Cities and Communities), the study provides policy-relevant insights to encourage women-led sustainable companies^[20].

2. Literature review

2.1 Empowerment of Women and Entrepreneurship

Economic progress and women's empowerment are commonly acknowledged to be fueled by women's entrepreneurship. According to Kabeer (2016)^[11], women's empowerment is the growth of women's ability to make strategic life decisions, particularly in circumstances where this ability was previously limited^[17]. Through entrepreneurship, women can actively participate in household and communal decision-making, manage their finances, and increase their self-esteem^[12].

Numerous studies have found a positive correlation between women's entrepreneurship and social standing, autonomy, and income generating. Minniti (2010)^[2] emphasized that female entrepreneurs promote economic growth and social transformation by challenging traditional gender conventions. Similarly, Brush *et al.* (2008)^[3] assert that inclusive economic development depends on women-owned firms.

However, a variety of factors, including financial accessibility, institutional support, education, and skill development^[8], influence the degree of empowerment achieved through entrepreneurship. Without these advantageous conditions, entrepreneurship may not lead to substantial empowerment.

2.2 Sustainable entrepreneurship and inclusive development

The term "sustainable entrepreneurship" describes business ventures that produce social and environmental advantages in addition to economic value. According to Schaltegger and Wagner (2011)^[4], sustainable entrepreneurs are change agents who spot chances to use creative business models to address social and environmental issues^[18].

According to studies, sustainable businesses support community development, environmental preservation, and long-term economic stability. Sustainable entrepreneurship has been associated with improved livelihoods, employment creation, and poverty reduction in developing economies^[14]. Sustainable industries like organic farming, handicrafts, recycling, and micro businesses powered by renewable energy are seeing an increase in the participation of women entrepreneurs^[23].

According to research, women-led sustainable businesses frequently implement eco-friendly practices because of their close ties to household well-being and community welfare^[15].

These businesses empower women by increasing their income and developing their skills while also promoting sustainable development^[19].

2.3 The role of education, training, and financial access

Education and training have a major role in an entrepreneur's success. According to research, educated women business owners are more likely to use innovative tactics, efficiently manage resources, and sustain business growth. Through the development of technical skills, managerial aptitude, and environmental consciousness, training programs enhance business success. Access to funding is a significant factor influencing women's entrepreneurship. Lack of collateral, low financial awareness, and gender bias in lending can make it difficult for women to obtain formal credit. Empirical studies show that women entrepreneurs who have access to institutional finance experience increases in their income growth, self-assurance, and decision-making skills for their homes and businesses^[9]. Women's entrepreneurship has been positively impacted by institutional and governmental initiatives like women-focused credit programs and skill development programs^[16]. Reaching female entrepreneurs in rural and semi-urban areas is still lacking, though.

2.4 Measures of women's empowerment

The concept of women's empowerment is complex and includes social, psychological, and economic aspects. Income growth, decision-making authority, self-assurance, and community involvement are frequently used indicators in empirical research. Economic empowerment is reflected in income growth, whereas social and psychological empowerment is indicated by decision-making authority and self-assurance.

Empowerment indicators and entrepreneurial factors have been found to be significantly correlated in studies using quantitative methods. Studies that use statistical analysis to combine sustainability aspects with empowerment indicators are scarce, though.

2.5 Research Inadequacy

Despite the abundance of research on women's entrepreneurship and sustainable development^[21], there is a conspicuous dearth of empirical studies that examine the relationship between sustainable enterprise and women's empowerment using quantitative methods. Specifically, a few studies employ SPSS-based analysis^[10, 11] to assess the impact of characteristics such as education, training, access to finance, and sustainability awareness on empowerment indicators among women entrepreneurs in rural and semi-urban India^[13]. The current study employs primary data and statistical analysis to give an empirical investigation of women's empowerment through sustainable business, thereby bridging this gap. The results will be very helpful to organizations, policymakers, and development experts who wish to assist women-led sustainable enterprises.

1. The goals of the research
2. The current study's particular objectives are as follows:
3. To look at the socioeconomic and business traits of female entrepreneurs running sustainable and eco-friendly companies in rural and semi-urban areas.
4. To evaluate the level of female entrepreneurs' empowerment in terms of higher earnings, more capacity to make decisions, and self-assurance.
5. To examine the relationship between markers of women's empowerment and financial access, education, and training using statistical analysis based on SPSS.
6. To assess how women's social and economic empowerment is impacted by sustainable business practices.

7. To identify the primary challenges faced by female entrepreneurs operating sustainable and ecologically friendly enterprises.
8. In line with Sustainable Development Goals (SDGs)^[6, 20, 24] 5, 8, and 11, to provide institutional reforms and policy measures to boost women-led sustainable business.

3. Hypotheses of the study

Null Hypotheses (H_0)

- H_{01} : Educational qualification and access to loans are independent.
- H_{02} : The educational backgrounds of female entrepreneurs and their potential to improve their income through sustainable entrepreneurship fail to significantly connect.
- H_{03} : Among female entrepreneurs, there is no apparent connection between training obtained and increase in earnings.
- H_{04} : The capacity of female entrepreneurs to take decision has no significant relationship towards their access to funding (loan supply).
- H_{05} : The type of sustainable business and the confidence level of female entrepreneurs do not substantially correlate.

Alternative Hypotheses (H_1)

- H_{11} : Educational qualification and access to loans are associated.
- H_{12} : Education has a major impact on increasing income through sustainable business.
- H_{13} : Training greatly raises the income levels of female entrepreneurs..
- H_{14} : Women entrepreneurs have much more authority to make decisions when they have access to financing.
- H_{15} : Women entrepreneurs' confidence is highly influenced by the type of sustainable firm they run.

Mapping Hypothesis Variables Used in the SPSS Test:

Table 1 presents the mapping of hypothesis variables used in the SPSS test. It illustrates the relationships between variables along with the corresponding statistical methods applied for analysis.

Table 1: Mapping of hypothesis variables and corresponding SPSS statistical tests used for analysis

Hypothesis	Variables Used	SPSS Test
H_{01}	Educational Qualification $\times$ Access loans	Chi-square
H_{02}	Education $\times$ Income improvement	Chi-square
H_{03}	Training $\times$ Income improvement	Chi-square
H_{04}	Loan availability $\times$ Decision-making ability	Chi-square
H_{05}	Business type $\times$ Confidence	Correlation / Chi-square

4. Research techniques

4.1 Design of the Study

The current study uses a descriptive and analytical research approach to investigate how sustainable entrepreneurship contributes to women's empowerment. While the analytical approach uses statistical methods to investigate the connections between entrepreneurial elements and women empowerment indicators, the descriptive approach is utilized to comprehend the socioeconomic traits and business profile of women entrepreneurs.

4.2 Area of the Research

Samayanallur, Paravai, Thanichiyam, Kondayampatti, Vadipatti, Alanganallur, Palamedu, Thenur, Usilampatti, Chekkanurani, Valandur, and Chellampatti are some of the rural and semi-urban areas around Madurai, Tamil Nadu, where the current study was carried out. Traditional rural livelihoods interact with newly growing semi-urban entrepreneurial activities in these locations, which create a transitional socioeconomic landscape.

The choice of these areas is important for a number of reasons. First, there has been a steady development in women-owned micro and small businesses in these areas, especially in sustainable industries including organic farming, eco-friendly handicrafts, tailoring, and resource-based enterprises. Second, despite this expansion, these areas nevertheless struggle with structural issues like restricted market connections, poor training opportunities, and restricted access to formal financial institutions.

Additionally, there are differences between rural and semi-urban locations in terms of institutional support, digital connection, and infrastructure, all of which have a direct impact on empowerment results and entrepreneurial performance. The study's inclusion of both categories provides a more thorough and accurate knowledge of how contextual factors influence the relationship between women's empowerment and sustainable entrepreneurship.

Because of its strong cultural base in small-scale enterprises and growing policy focus on women's empowerment and sustainable development, the Madurai region in particular offers a perfect backdrop for our study. As a result, the selected field of research adds to the larger conversation on equitable and sustainable economic growth in underdeveloped nations while providing insightful information about entrepreneurship at the grassroots level.

4.3 The Sample and Population

Women entrepreneurs engaged in sustainable business ventures in the chosen areas make up the study's population.

Convenience sampling was used to choose a sample of 152 female entrepreneurs based on respondents' availability and willingness to take part in the research. This approach is suitable for exploratory and field-based research, despite its limitations on generalizability.

4.4 Method of Data Collection

A structured questionnaire was used to gather primary data for the study. In order to obtain accurate and first-hand information about the respondents' socioeconomic background, business activities, and level of empowerment, the questionnaire was given to them directly.

Prior to data collection, each participant gave their informed consent.

4.5 Design of components

The following sections made up the thoughtfully crafted questionnaire:

1. Respondents' agreement
2. Socio-demographic information
3. Business overview
4. Instruction and resource accessibility
5. Sustainable methods

6. Indicators of women's empowerment (income growth, decision-making authority, degree of confidence)
7. Obstacles that female entrepreneurs confront
8. Unrestricted answers

4.6 Variables in the Research

The variables included in the study are as follows:

Separate Variables, Elderly, Educational credentials, kind of company, received instruction, Availability of funds, Understanding of sustainability, Dependent Factors (Women Empowerment Measures), Enhancement of income, Power to make decisions, Confidence degree.

4.7 Data Analysis Tools

SPSS (Statistical Package for the Social Sciences) was used to code, tabulate, and analyze the gathered data. The following statistical instruments were utilized:

Analysis of frequency and proportion, Characteristic statistics, Crosstabulation, Chi-square test (to investigate correlations between variables), Correlation analysis (to evaluate correlations between variables). These instruments were employed to evaluate the theories and examine the connection between women's empowerment and sustainable entrepreneurship.

4.8 Moral Aspects

The study was conducted with full adherence to ethical norms. Respondents were made aware of the goal of the

study, and participation was entirely voluntary. Participants' privacy and confidentiality were protected, and the information gathered was only utilized for scholarly research.

4.9 The Study's Limitations

The following are the limitations of the study: Its generalizability is limited because it is limited to specific rural and semi-urban areas. Convenience sampling has the potential to create sample bias. Because the results are based on self-reported data, response bias may be present.

5. Results and Discussion

5.1 Profile of Women Entrepreneurs (Descriptive Analysis)

The descriptive statistics (Table-2) show that middle-aged women are more actively involved in sustainable entrepreneurial activities, with the bulk of female entrepreneurs falling within the 36-45 age range. A modest level of human capital development is seen in the significant percentage of respondents who have completed secondary and higher education. The majority of the respondents work in small-scale green businesses, organic farming, handicrafts, and tailoring, among other eco-friendly and sustainable industries. Even while more women are working in these kinds of businesses, a sizable portion of respondents said they had little access to official financial assistance, underscoring ongoing structural obstacles to financial inclusion.

Table 2: Descriptive statistics showing the demographic and business profile of women entrepreneurs

Statistics						
		Age Group	Educational qualification	Type of sustainable business	Entrepreneurship training	Access to loans
N	Valid	152	152	152	152	152
	Missing	0	0	0	0	0

Frequency Table

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	22	14.5	14.5	14.5
	26-35	30	19.7	19.7	34.2
	36-45	56	36.8	36.8	71.1
	46-55	36	23.7	23.7	94.7
	above 55	8	5.3	5.3	100.0
	Total	152	100.0	100.0	

5.2 Educational Qualification and Access loans

The Chi-square test (Table-3) was used to look at the connection between educational attainment and credit availability. The findings show that access to financial assistance and educational attainment do not statistically significantly correlate ($p > .05$).

This suggests that there is little difference in women entrepreneurs' access to financing depending on their educational attainment.

Conclusion: The null hypothesis (H_{01}) should not be rejected.

Discussion

The lack of a substantial correlation between educational achievement and loan availability indicates that financial inclusion among female entrepreneurs is not ensured by educational attainment alone. Women still have difficulty obtaining formal credit despite having greater levels of education. This result demonstrates the existence of institutional and systemic impediments, including:

- The absence of collateral security
- a poor understanding of financial schemes, and
- The complexity of the loan application process.

Regardless of their educational level, socio cultural limitations and gender biases may further limit women's access to formal financial institutions.

The outcome suggests that financial institutions may rely more on actual assets and credit history, which many women entrepreneurs' lack, rather than sufficiently differentiating borrowers based on educational qualifications. From a policy standpoint, this discovery highlights the necessity of:

- Financial policies that are inclusive
- streamlined loan applications, and
- Specific credit programs for female business owners.

Improving financial literacy and awareness initiatives may also aid in closing the knowledge gap between financial resources and real access to them.

Table 3: Relationship between educational qualification and access to loans among women entrepreneurs (Chi-square analysis)

Crosstab						
			Access to loans			Total
			Bank / NBFC loan	SHG / Microfinance	No access	
Educational qualification	no formal education	Count	2	3	17	22
		% within Educational qualification	9.1%	13.6%	77.3%	100.0%
		% within Access to loans	14.3%	7.5%	17.3%	14.5%
	school level (1-10)	Count	3	13	17	33
		% within Educational qualification	9.1%	39.4%	51.5%	100.0%
		% within Access to loans	21.4%	32.5%	17.3%	21.7%
	Higher Secondary	Count	2	8	26	36
		% within Educational qualification	5.6%	22.2%	72.2%	100.0%
		% within Access to loans	14.3%	20.0%	26.5%	23.7%
	Diploma / ITI	Count	0	3	4	7
		% within Educational qualification	0.0%	42.9%	57.1%	100.0%
		% within Access to loans	0.0%	7.5%	4.1%	4.6%
	UG Degree	Count	5	11	22	38
		% within Educational qualification	13.2%	28.9%	57.9%	100.0%
		% within Access to loans	35.7%	27.5%	22.4%	25.0%
	PG Degree	Count	1	2	11	14
		% within Educational qualification	7.1%	14.3%	78.6%	100.0%
		% within Access to loans	7.1%	5.0%	11.2%	9.2%
	other	Count	1	0	1	2
		% within Educational qualification	50.0%	0.0%	50.0%	100.0%
		% within Access to loans	7.1%	0.0%	1.0%	1.3%
Total		Count	14	40	98	152
		% within Educational qualification	9.2%	26.3%	64.5%	100.0%
		% within Access to loans	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.894 ^a	12	.308
Likelihood Ratio	13.278	12	.349
Linear-by-Linear Association	.266	1	.606
N of Valid Cases	152		
a. 12 cells (57.1%) have expected count less than 5. The minimum expected count is .18.			

5.3 Education and Income increased

The Chi-square test (Table-4) was used to investigate the relationship between educational attainment and income growth among female entrepreneurs. The two variables have a statistically significant association, according to the data ($\chi^2 = 55.456$, $p < .05$). This suggests that improvements in income varied considerably depending on educational attainment. Choose to accept the alternative hypothesis (H_{12}) and reject the null hypothesis (H_{02}).

Conversation

The strong correlation between educational attainment and income growth indicates that education is essential for improving the financial results of female entrepreneurs. Higher educated women are more likely to see a rise in their earnings from their business ventures. There are multiple reasons for this. Women with education typically have superior:

- The ability to make decisions and manage,

- Proficiency in resource management and financial literacy, and
- Availability of business networks and market data.

These skills allow them to expand their businesses, implement better business methods, and increase production, all of which eventually result in higher revenue levels.

The results are consistent with previous studies that highlight how education enhances human capital and boosts entrepreneurial performance, which in turn promotes economic empowerment. In the framework of sustainable entrepreneurship, education also promotes innovation and the adoption of eco-friendly methods, which enhances commercial results. In terms of policy, the findings emphasize the significance of:

- Encouraging education for women,
- Combining skill development with entrepreneurship education, and
- Bolstering efforts to help women-led businesses through capacity-building

Table 4: Association between educational qualification and income improvement of women entrepreneurs

Crosstab							
			Income Increased				
			1	2	3	4	5
Educational qualification	no formal education	Count	0	1	1	4	16
		% within Educational qualification	0.0%	4.5%	4.5%	18.2%	72.7%
		% within Income Increased	0.0%	25.0%	11.1%	7.0%	20.8%
	school level (1-10)	Count	0	1	3	13	16
		% within Educational qualification	0.0%	3.0%	9.1%	39.4%	48.5%
		% within Income Increased	0.0%	25.0%	33.3%	22.8%	20.8%
	Higher Secondary	Count	0	0	0	20	16
		% within Educational qualification	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Income Increased	0.0%	0.0%	0.0%	100.0%	100.0%

		% within Educational qualification	0.0%	0.0%	0.0%	55.6%	44.4%	100.0%
		% within Income Increased	0.0%	0.0%	0.0%	35.1%	20.8%	23.7%
	Diploma / ITI	Count	1	0	0	1	5	7
		% within Educational qualification	14.3%	0.0%	0.0%	14.3%	71.4%	100.0%
		% within Income Increased	20.0%	0.0%	0.0%	1.8%	6.5%	4.6%
	UG Degree	Count	4	0	3	12	19	38
		% within Educational qualification	10.5%	0.0%	7.9%	31.6%	50.0%	100.0%
		% within Income Increased	80.0%	0.0%	33.3%	21.1%	24.7%	25.0%
	PG Degree	Count	0	1	1	7	5	14
		% within Educational qualification	0.0%	7.1%	7.1%	50.0%	35.7%	100.0%
		% within Income Increased	0.0%	25.0%	11.1%	12.3%	6.5%	9.2%
	other	Count	0	1	1	0	0	2
		% within Educational qualification	0.0%	50.0%	50.0%	0.0%	0.0%	100.0%
		% within Income Increased	0.0%	25.0%	11.1%	0.0%	0.0%	1.3%
Total	Count	5	4	9	57	77	152	
	% within Educational qualification	3.3%	2.6%	5.9%	37.5%	50.7%	100.0%	
	% within Income Increased	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.470 ^a	16	.028
Likelihood Ratio	26.462	16	.048
Linear-by-Linear Association	4.022	1	.045
N of Valid Cases	152		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .21.

5.4 Training and Income Improvement

The Chi-square test (Table-5) was used to examine the connection between increased income and entrepreneurial training. The findings show that there is no statistically significant correlation between income improvement and training ($\chi^2 = 3.660$, $p > .05$). This implies that whether or not a woman entrepreneur has gotten training has little bearing on how much her income has increased.

Conclusion: Don't reject the null hypothesis (H_{03}).

Conversation

Training programs have not resulted in quantifiable economic advantages for women entrepreneurs in the study area, as evidenced by the lack of a statistically significant correlation between income improvement and entrepreneurial training. Despite the widespread belief that training can improve entrepreneurial performance, the results indicate that current programs may have drawbacks, including:

- A lack of practical orientation,

- Brief length and shallowness, and
- LACK of mentoring or follow-up assistance.

Theoretical knowledge is frequently prioritized over market-oriented abilities, which are critical for increasing revenue. Furthermore, women may be unable to properly implement the skills they have learned via training due to external limitations such as restricted market connections, limited access to financing, and infrastructure difficulties.

Though not strong enough to establish statistical significance, it is noteworthy that respondents who got training exhibited a tiny tendency toward improved income, suggesting that training may have a favorable influence.

From the standpoint of policy, the results emphasize the necessity of:

- Redesign training courses to be practical and skill-based,
- include financial backing and market connections, and
- Offer ongoing coaching and post-training support.

Table 5: Relationship between entrepreneurship training and income improvement among women entrepreneurs.

Crosstab								
			Income Increased					Total
			1	2	3	4	5	
Entrepreneurship training	yes	Count	0	2	4	21	31	58
		% within Entrepreneurship training	0.0%	3.4%	6.9%	36.2%	53.4%	100.0%
		% within Income Increased	0.0%	50.0%	44.4%	36.8%	40.3%	38.2%
	no	Count	5	2	5	36	46	94
		% within Entrepreneurship training	5.3%	2.1%	5.3%	38.3%	48.9%	100.0%
		% within Income Increased	100.0%	50.0%	55.6%	63.2%	59.7%	61.8%
Total		Count	5	4	9	57	77	152
		% within Entrepreneurship training	3.3%	2.6%	5.9%	37.5%	50.7%	100.0%
		% within Income Increased	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.660 ^a	4	.454
Likelihood Ratio	5.370	4	.251
Linear-by-Linear Association	1.070	1	.301
N of Valid Cases	152		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.53.

5.5 Access to Finance and Decision-Making Power

The Chi-square test (Table-6) was used to investigate the relationship between women entrepreneurs' decision-making

authority and their access to financing. The findings show that the two variables have a statistically significant association ($p < .05$). This suggests that the degree of decision-making

authority held by female entrepreneurs who have access to financial resources differs greatly from that of those who do not. Choose to accept the alternative hypothesis (H_{14}) and reject the null hypothesis (H_{04}).

Conversation

The strong correlation between decision-making authority and financial access indicates that financial inclusion is essential to improving women's empowerment. Higher levels of autonomy and involvement in household and business decision-making are typically displayed by female entrepreneurs with access to loans and financial resources.

Financial access helps with:

- Greater financial autonomy,
- enhanced command over company activities, and
- A stronger negotiating position within the family.

Women's total socioeconomic standing is strengthened by their ability to actively participate in important decisions

about investment, manufacturing, and household expenditures thanks to their financial autonomy. The results also show that formal loan availability acts as a catalyst for psychological empowerment, increasing women entrepreneurs' self-assurance and independence. Women who lack financial resources, on the other hand, continue to be economically reliant, which restricts their ability to participate in decision-making.

In terms of policy, the findings highlight the significance of:

- Extending initiatives for financial inclusion,
- Encouraging credit plans that cater to women, and
- Bolstering programs for self-help groups (SHGs) and microfinance.

Making financial resources more accessible can greatly improve women's capacity for autonomous decision-making, hence promoting holistic empowerment.

Table 6: Association between access to finance and decision-making power of women entrepreneurs

Crosstab								
			Decision Making Power					Total
			1	2	3	4	5	
Access to loans	Bank / NBFC loan	Count	0	0	1	5	8	14
		% within Access to loans	0.0%	0.0%	7.1%	35.7%	57.1%	100.0%
		% within Decision Making Power	0.0%	0.0%	12.5%	10.9%	8.6%	9.2%
	SHG / Microfinance	Count	0	0	1	7	32	40
		% within Access to loans	0.0%	0.0%	2.5%	17.5%	80.0%	100.0%
		% within Decision Making Power	0.0%	0.0%	12.5%	15.2%	34.4%	26.3%
	No access	Count	4	1	6	34	53	98
		% within Access to loans	4.1%	1.0%	6.1%	34.7%	54.1%	100.0%
		% within Decision Making Power	100.0%	100.0%	75.0%	73.9%	57.0%	64.5%
Total		Count	4	1	8	46	93	152
		% within Access to loans	2.6%	0.7%	5.3%	30.3%	61.2%	100.0%
		% within Decision Making Power	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.653 ^a	8	.290
Likelihood Ratio	11.592	8	.170
Linear-by-Linear Association	3.741	1	.053
N of Valid Cases	152		

a. 9 cells (60.0%) have expected count less than 5. The minimum expected count is .09.

5.6 Business type and Confidence

The Chi-square test (Table-7) was used to examine the link between the kind of sustainable business and the degree of confidence among female entrepreneurs. The findings show that the two variables do not have a statistically significant relationship ($\chi^2 = 32.016$, $p > .05$). This suggests that there is no discernible difference in the confidence levels of female entrepreneurs according to the kind of firm they run.

Conclusion: The null hypothesis (H_{05}) is not rejected.

Conversation:

The lack of a statistically significant correlation between the type of business and confidence level implies that the enterprise's nature is not the only factor influencing confidence. Women seem to have comparable levels of confidence regardless of whether they work in organic farming, handicrafts, tailoring, or other sustainable endeavors. This result suggests that internal and experiential elements, such the following, have a greater influence on confidence:

- Experience as an entrepreneur,

- Steadiness in income, family and social assistance and
- HAVING the chance to make decisions.

Higher confidence levels are not directly correlated with sustained entrepreneurship, even if it offers a platform for involvement and self-employment. Even though differences between business types are not statistically significant, it is noteworthy that women who engage in entrepreneurial activities typically display higher levels of confidence than non-entrepreneurs, indicating that entrepreneurship as a whole positively contributes to psychological empowerment.

From a policy standpoint, this discovery emphasizes the necessity of:

- Support mentoring and capacity-building initiatives,
- Bolster support networks and peer networks, and
- Promote leadership and skill-building programs to boost self-assurance among female business owners, regardless of their industry.

Table 7: Relationship between type of sustainable business and confidence level of women entrepreneurs

Crosstab								
			Confidence					Total
			1	2	3	4	5	
Type of sustainable business	organic products	Count	0	0	2	12	27	41
		% within Type of sustainable business	0.0%	0.0%	4.9%	29.3%	65.9%	100.0%
		% within Confidence	0.0%	0.0%	33.3%	25.5%	28.4%	27.0%
	handicrafts (eco-friendly)	Count	0	0	1	2	4	7
		% within Type of sustainable business	0.0%	0.0%	14.3%	28.6%	57.1%	100.0%
		% within Confidence	0.0%	0.0%	16.7%	4.3%	4.2%	4.6%
	renewable-resource based small industry	Count	0	0	0	0	1	1
		% within Type of sustainable business	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Confidence	0.0%	0.0%	0.0%	0.0%	1.1%	0.7%
	boutique and Tailoring shop	Count	1	0	0	14	19	34
		% within Type of sustainable business	2.9%	0.0%	0.0%	41.2%	55.9%	100.0%
		% within Confidence	33.3%	0.0%	0.0%	29.8%	20.0%	22.4%
	recycling	Count	0	0	0	0	1	1
		% within Type of sustainable business	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Confidence	0.0%	0.0%	0.0%	0.0%	1.1%	0.7%
	baking	Count	1	0	0	2	3	6
		% within Type of sustainable business	16.7%	0.0%	0.0%	33.3%	50.0%	100.0%
		% within Confidence	33.3%	0.0%	0.0%	4.3%	3.2%	3.9%
	makeup artist	Count	0	0	1	4	3	8
		% within Type of sustainable business	0.0%	0.0%	12.5%	50.0%	37.5%	100.0%
		% within Confidence	0.0%	0.0%	16.7%	8.5%	3.2%	5.3%
	other	Count	1	1	2	13	37	54
		% within Type of sustainable business	1.9%	1.9%	3.7%	24.1%	68.5%	100.0%
		% within Confidence	33.3%	100.0%	33.3%	27.7%	38.9%	35.5%
Total		Count	3	1	6	47	95	152
		% within Type of sustainable business	2.0%	0.7%	3.9%	30.9%	62.5%	100.0%
		% within Confidence	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20.474 ^a	28	.847
Likelihood Ratio	18.632	28	.909
Linear-by-Linear Association	.253	1	.615
N of Valid Cases	152		

a. 33 cells (82.5%) have expected count less than 5. The minimum expected count is .01.

5.7 Type of sustainable business * Access to loans

The Chi-square test (Table-8) was used to investigate the connection between the kind of sustainable business and loan availability among female entrepreneurs. The findings show that the two variables do not have a statistically significant relationship ($\chi^2 = 9.658$, $p > .05$).

This implies that different kinds of sustainable enterprises do not substantially differ in their access to funding.

Conclusion: The null hypothesis (H_0) is not rejected.

Conversation

The lack of a strong correlation between the kind of sustainable business and loan availability suggests that the enterprise's nature has little bearing on financial accessibility. Financial support is equally tough to come by for female entrepreneurs in a variety of sustainable industries, including organic farming, handicrafts, tailoring, and other eco-friendly firms. This result emphasizes that, regardless of the type of firm, there are consistent structural obstacles to obtaining finance. Among these obstacles could be:

- Insufficient collateral security, insufficient knowledge of financial schemes,
 - The intricacies of loan application procedures, including
 - Restrictions based on gender in financial institutions.
- The findings also show that a sizable percentage of respondents said they had no access to official loans, pointing to a discrepancy between policy recommendations and real financial inclusion. From a policy standpoint, this implies that government programs and financial institutions are not adequately adapted to the requirements of various sustainable business models. Rather, institutional standards and financial eligibility seem to have a greater influence on financing availability than the type or capacity of the enterprise.

As a result, it is necessary to:

- Create flexible and inclusive credit plans,
- streamline loan applications for female business owners and bolster outreach initiatives to raise financial services' visibility and accessibility.

Table 8: Association between type of sustainable business and access to loans among women entrepreneurs

Crosstab						
			Access to loans			Total
			Bank / NBFC loan	SHG / Microfinance	No access	
Type of sustainable business	organic products	Count	3	12	26	41
		% within Type of sustainable business	7.3%	29.3%	63.4%	100.0%
		% within Access to loans	21.4%	30.0%	26.5%	27.0%
	handicrafts (eco-friendly)	Count	1	1	5	7
		% within Type of sustainable business	14.3%	14.3%	71.4%	100.0%
		% within Access to loans	7.1%	2.5%	5.1%	4.6%
	renewable-resource based small industry	Count	0	0	1	1
		% within Type of sustainable business	0.0%	0.0%	100.0%	100.0%
		% within Access to loans	0.0%	0.0%	1.0%	0.7%
	boutique and Tailoring shop	Count	5	12	17	34
		% within Type of sustainable business	14.7%	35.3%	50.0%	100.0%
		% within Access to loans	35.7%	30.0%	17.3%	22.4%
	Recycling	Count	0	0	1	1
		% within Type of sustainable business	0.0%	0.0%	100.0%	100.0%
		% within Access to loans	0.0%	0.0%	1.0%	0.7%
	Baking	Count	1	1	4	6
		% within Type of sustainable business	16.7%	16.7%	66.7%	100.0%
		% within Access to loans	7.1%	2.5%	4.1%	3.9%
	makeup artist	Count	1	0	7	8
		% within Type of sustainable business	12.5%	0.0%	87.5%	100.0%
		% within Access to loans	7.1%	0.0%	7.1%	5.3%
	other	Count	3	14	37	54
		% within Type of sustainable business	5.6%	25.9%	68.5%	100.0%
		% within Access to loans	21.4%	35.0%	37.8%	35.5%
Total		Count	14	40	98	152
		% within Type of sustainable business	9.2%	26.3%	64.5%	100.0%
		% within Access to loans	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.658 ^a	14	.787
Likelihood Ratio	12.304	14	.582
Linear-by-Linear Association	.685	1	.408
N of Valid Cases	152		

a. 17 cells (70.8%) have expected count less than 5. The minimum expected count is .09.

5.8 Outcomes

The following are the main conclusions drawn from the empirical study of female entrepreneurs running sustainable businesses:

According to the survey, most respondents are in the economically active age range (36-45 years old) and have completed secondary or higher education, suggesting that women entrepreneurs have a reasonable degree of human capital. The majority of respondents work in eco-friendly and sustainable businesses, such as small-scale businesses, organic farming, and handicrafts. The Chi-square analysis results show that there is a statistically significant correlation ($p < .05$) between income improvement and educational qualification.

Higher educational attainment increases the ability of female entrepreneurs to generate money, which supports the idea that education is a major factor in economic empowerment. On the other hand, it is discovered that there is no statistically significant correlation ($p > .05$) between entrepreneurial training and increased income, indicating that existing training initiatives have not produced quantifiable economic gains. The study also finds a strong correlation ($p < .05$) between decision-making authority and financial availability.

Higher levels of autonomy and involvement in household and business decision-making are demonstrated by female entrepreneurs who have access to financial resources. According to the data, there is no significant correlation between the kind of sustainable business and confidence level ($p > .05$), suggesting that human and socioeconomic factors have a greater influence on confidence than the enterprise's nature. Similarly, there is no significant correlation ($p > .05$) between the kind of sustainable business and loan availability, indicating that problems with financial accessibility are prevalent among various business types. Higher education does not always guarantee better access to financial resources, according to the study, which also shows no significant correlation between educational level and loan availability ($p > .05$).

5.9 Recommendations and Policy Repercussions:

A multifaceted policy strategy is needed to strengthen women's empowerment through sustainable business. First, by encouraging higher education and incorporating entrepreneurship and financial literacy into school systems, especially in rural regions, it is necessary to improve educational and skill development programs.

Second, training programs need to be made more realistic, focused on the market, and supported by ongoing mentoring and follow-up systems in order to increase their efficacy. Third, expanding women's credit options, streamlining loan applications, and bolstering microfinance organizations and self-help groups are all ways to improve access to financing. Fourth, in order to close the gap between knowledge and real access to financial resources particularly with regard to government programs and digital banking it is imperative to promote financial literacy and awareness.

Fifth, by introducing female entrepreneurs to broader markets via digital platforms, trade shows, and institutional partnerships, it is necessary to improve market connections and institutional assistance. Sixth, policymakers should concentrate on integrated support systems that incorporate robust peer networks with training, funding, mentorship, and cluster-based development. Lastly, long-term economic, social, and environmental advantages will be ensured by promoting green and sustainable entrepreneurship through incentives, support for innovation, and alignment with sustainable development goals.

6. Conclusion

In this study, the contribution of sustainable entrepreneurship to women's empowerment in rural and semi-urban areas was critically investigated. The results unequivocally show that sustainable entrepreneurship is a key avenue for raising women's socioeconomic standing, especially with regard to generating revenue, confidence, and decision-making involvement. However, the degree of empowerment varies widely and is heavily impacted by structural elements like financial availability and educational achievement.

According to the study, access to financial resources greatly increases women's autonomy and decision-making power, while education is crucial in raising income levels and bolstering economic empowerment. On the other hand, it was discovered that elements like business type and entrepreneurial training had little to no impact on empowering outcomes, pointing to weaknesses in the efficacy of the support systems in place. Additionally, the ongoing inability of various business kinds to obtain formal finance emphasizes the existence of structural obstacles that still limit the expansion of women-led businesses.

Overall, the study emphasizes that sustainable entrepreneurship is a multifaceted empowerment tool that supports social and human growth rather than only being an economic activity. However, only comprehensive policy measures that bolster education, increase financial inclusion, boost training efficacy, and offer ongoing institutional support will be able to fully fulfill its promise.

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Appendix: Questionnaire

Description: This survey is part of the POWER Scheme-FCAA project titled Women Empowerment through Sustainable Entrepreneurship.

Your responses will be confidential and used only for academic research.

இந்த ஆய்வு பெண்கள் தொழில் முனைவோரின் அதிகாரமருத்தல் மற்றும்

நிலைத்த தொழில் வளர்ச்சியை ஆய்வு செய்வதற்காக மேற்கொள்ளப்படுகிறது. உங்கள் தகவல்கள் ரகசியமாக வைக்கப்படும்.

Section 1 consent / ஒப்புதல்

I have understood the purpose of this study and I agree to participate voluntarily.

இந்த ஆய்வின் நோக்கத்தை நான் புரிந்துள்ளேன். நான் சுயவிருப்பத்தால் கலந்து கொள்ள சம்மதிக்கிறேன்.

Options:

Yes / ஆம்

No / இல்லை

Section 2 Population Statistics / தனிநபர்விவரங்கள்

Q1. Age / வயது :

Q2. Education Level / கல்வித்தகுதி:

Q3. Marital Status / மணநிலை:

Q4. Number of Occupants / குடும்ப உறுப்பினர் எண்ணிக்கை:

Q5. Location (Village/Town) / இருப்பிடம்:

Section 3 Business Profile / தொழில்விவரங்கள்

Q6. Nature of Business / தொழிலின் வகை:

Options:

1. Organic farming / இயற்கை விவசாயம்
2. Handicrafts (eco-friendly) / சுற்றுச்சூழல் நட்பு கைவினை
3. Renewable-resource based small industry / புதுப்பிக்கத்தக்க வளதொழில்
4. Eco-tourism / சுற்றுச்சூழல் சுற்றுலா
5. Recycling / மறுசுழற்சி
6. Others (Specify) / மற்றவை

Q7. Business Start Year / தொழில் தொடங்கிய ஆண்டு:

Q8. Scale of business / தொழிலின் அளவு:

Options:

1. Micro / மிகச்சிறு
2. Small / சிறு
3. Medium / நடுத்தரம்

Q9. Annual Income / ஆண்டு வருமானம்:

Options:

1. < ₹50,000
2. ₹50,001-1,00,000
3. ₹1,00,001-2,50,000
4. ₹2,50,001-5,00,000
5. > ₹5,00,000

Section 4 Training & Resources / பயிற்சி மற்றும் வளங்கள்

Q10. Have you received any training? / பயிற்சி பெற்றுள்ளீர்களா?

Options:

Yes / ஆம்

No / இல்லை

Q11. Access to loans / கடன் வசதி இருக்கிறதா?

Options:

Bank/NBFC loan / வங்கிகடன்

SHG/Microfinance / சுயஉதவிகுழு

No access / இல்லை

Q12. Digital Connectivity / டிஜிட்டல் வசதி:

Options:

Smartphone + internet / ஸ்மார்ட்போன் + இணையம்

Basic phone / சாதாரணபோன்

No / இல்லை

Section 5 Sustainable Practices

Labels:

1 = Strongly Disagree / முற்றிலும் மறுப்பு

2 = Disagree / மறுப்பு

3 = Neither Agree nor Disagree / உடன்படவுமில்லை, மறுக்கவும் இல்லை

4 = Agree / ஒப்புதல்

5 = Strongly Agree / முழுமையாக ஒப்புதல்

Q13. I use eco-friendly materials. / நான் சுற்றுச்சூழல் நட்பு பொருட்களைப் பயன்படுத்துகிறேன்:

Q14. I follow waste reduction or recycling. / கழிவு குறைப்பு அல்லது மறுசுழற்சி பயிற்சி செய்கிறேன்:

Q15. Sustainability improves my income. / நிலைத்தன்மை என் வருமானத்தை உயர்த்துகிறது:

Q16. Customers prefer eco-friendly products. / வாடிக்கையாளர்கள் சுற்றுச்சூழல் நட்பு பொருட்களை விரும்புகிறார்கள்:

Section 6 Women Empowerment Indicators

Labels:

1 = Strongly Disagree / முற்றிலும் மறுப்பு

2 = Disagree / மறுப்பு

3 = Neither Agree nor Disagree / உடன்படவுமில்லை, மறுக்கவும் இல்லை

4 = Agree / ஒப்புதல்

5 = Strongly Agree / முழுமையாக ஒப்புதல்

Q17. My income has increased / என் வருமானம் உயர்ந்துள்ளது:

Q18. I make independent financial decisions / நிதி முடிவுகளை நான் தனியாக எடுக்கிறேன்:

Q19. My confidence has improved / என் தன்னம்பிக்கை உயர்ந்துள்ளது:

Q20. My social participation increased / என் சமூக பங்கேற்பு அதிகரித்துள்ளது:

Q21. My status in the family/community improved. / சமூகத்தில் என் நிலை உயர்ந்துள்ளது:

Section 7 Challenges / சவால்கள்

Choose up to 3

- Lack of finance / நிதியின்மை
- Lack of training / பயிற்சி இன்மை
- Family responsibilities / குடும்ப பொறுப்புகள்
- Market issues / சந்தை சிக்கல்கள்
- Raw material shortage / மூலப்பொருள் பற்றாக்குறை

Section 8 Open Questions / திறந்தகேள்விகள்

Q22. Mention one major success in your business.

உங்கள் தொழிலில் கிடைத்த ஒரு முக்கிய வெற்றியை குறிப்பிடுங்கள்.

Q23. Suggestions to improve support for women entrepreneurs.

பெண்கள் தொழில் முனைவோருக்கு வழங்க வேண்டிய உதவிகள் குறித்து பரிந்துரைகள் தெரிவிக்கவும்.

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