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Research Article

Microfinance and Sustainable Agriculture: Pathway to Food Security and Environmental Protection

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Abstract: Microfinance and sustainable agriculture together can improve food security and protect the environment in developing economies. By providing small farmers with financial resources, microfinance helps them adopt eco-friendly farming, invest in sustainable technologies, and diversify their incomes. This shift from traditional farming methods to sustainable practices enhances soil, water, and biodiversity conservation. It also boosts productivity, reduces chemical use, and strengthens climate resilience. These efforts ensure a steady supply of nutritious food, protect the environment, and support long-term ecological balance. Additionally, microfinance promotes community participation and knowledge sharing, driving inclusive and sustainable rural development. This paper explores the synergies between microfinance and sustainable agriculture, in addition to observing and demonstrating whether microfinance may be a useful instrument for food security, highlighting case studies, challenges, and policy recommendations. It emphasizes the potential of this integration to create a resilient agriculture system that ensures food security for growing populations while safeguarding environmental resources for future generations. Following a review of the pertinent literature on the ideas of microfinance and food security, we conduct field research for a case study that focusses on the Mayurbhanj District. Evidence suggests that microfinance and financial inclusion are a strategy for improving food access, even if the problem of food security should always be approached from a variety of angles.

Keyword: Microfinance, Sustainable, Agriculture, Environment, Resources, Development, Marginalized.

INTRODUCTION

Sustainable agriculture and microfinance are two essential elements in managing global issues like environmental preservation and food security. A potent pathway for fostering equitable economic growth, reducing poverty, and protecting natural ecosystems is provided by an intersection of these domains. Small-scale farmers gain access to financial resources including loans and savings through microfinance, which enables them to make investments in environmentally friendly farming methods. In turn, sustainable agriculture reduces the negative effects of climate change, maintains biodiversity, and increases production. Agriculture systems are under tremendous strain due to the world's expanding population and growing demand for food, which frequently results in unsustainable practices that harm the environment Smallholder farmers, who provide a large amount of the world's food, are especially at risk since they have less access to resources and technology. By incorporating microfinance into sustainable agricultural programs, these farmers may secure livelihoods, increase yields, and adopt environmentally friendly practices all of which will contribute to long-term environmental resilience and food security. With an emphasis on its function in encouraging ecologically friendly practices, raising rural incomes, and building community resilience, this article examines how microfinance could operate as a catalyst for sustainable agricultural development. A sustainable and food-secure future may be achieved by overcoming the gap between environmental protection and economic empowerment through a comprehensive approach to microfinance.

Sustainable development requires creative and integrated solutions in the face of expanding global issues including food shortages, climate change, and environmental degradation. Sustainable agriculture and microfinance are two particularly innovative techniques that, when paired, provide a potent route to environmental preservation and food security. In areas where smallholder farmers are essential to the production of food, these two pillars work in tandem to address the economic, social, and ecological aspects of rural development. With millions of people experiencing hunger and malnutrition, particularly in developing nations, food security is still a major global problem.Still, contemporary farming methods, which are motivated by the desire for greater yields, have frequently resulted in a substantial environmental cost, contributing to climate change and the depletion of natural resources. Sustainable agriculture provides a solution to these interrelated problems by emphasizing biodiversity, resource conservation, and long-term productivity. However, low-income farmers frequently lack the resources, expertise, and financial capital necessary to implement sustainable techniques.

Microfinance is crucial in this situation. Microfinance institutions enable farmers to engage in sustainable practices and increase agricultural output by offering modest loans, savings plans, and other financial services. It helps communities enhance their standard of living while protecting the environment by addressing the gap between scarce financial resources and the need for creativity and resilience. Crucially, microfinance frequently addresses underserved populations, such as women and smallholder farmers, increasing its influence by promoting fairness and inclusiveness in rural development

There are significant implications when microfinance and sustainable agriculture come together. It encourages agricultural diversity, encourages the adoption of environmentally friendly technology, and reduces dependency on harmful practices like deforestation and excessive chemical usage. By doing this, this strategy supports long-term environmental sustainability alongside to meeting urgent demands for food security. Additionally, it prepares rural populations for climate change adaptation, reducing the risks of natural disasters and erratic weather patterns.The focus of this introduction is on how sustainable agriculture and microfinance may work together to improve food security and safeguard the environment. The article explores the ways in which financial inclusion may promote sustainable agricultural methods, the difficulties experienced when putting these tactics into reality, and possible ways to get beyond these obstacles. In the end, the discussion highlights how this integrated strategy may alter communities and sustain the planet for future generations while fostering resilience and prosperity. (Gbolahan Abdulqudus Bolaji and other 2025) According to the authors This Study emphasizes how important microfinance is to Bangladesh's development of sustainable economic opportunities. The results show that microfinance has increased small-scale business, improved access to capital for people in need, and enhanced household income and financial stability, Its allowing for increased involvement in community development and household decision-making. Microfinance has helped to reduce poverty by promoting long-term resilience and sustainable livelihoods through its support of small businesses, handicrafts, and agriculture.(W. Nathan Green 2025)The article highlights how investments in Cambodia’s microfinance industry, though promoted as sustainable, have led to negative environmental impacts. In Keo Seima Wildlife Sanctuary, microfinance debt has fueled intensified farming and in-migration, resulting in widespread deforestation over the past decade. This case underscores a larger global concern, as microfinance continues to attract private investment under the banner of development and sustainability. (JataniGarbole et al.2025)However, limited research has examined the key determinants influencing the choice of livelihood strategies in this context. This study aims to identify the diversification strategies adopted by pastoral households, analyze the factors shaping these strategies, and assess their implications for household food security.

REVIEW OF LITERATURE

Md. Imran Ansari et al (2025) The paper study of green microfinance promotes climate-resilient practices, sustainable agriculture, and renewable energy in rural communities, therefore tying economic growth to environmental sustainability. The SDGs are advanced, livelihoods are improved, and resilience is fostered, but it encounters obstacles including limited awareness, high costs, and institutional hurdles. Partnerships, capacity-building, and effective policies are necessary to scale its effects and strike a balance between ecological preservation and development

NoviaUtami and Marsiana Luciana Sitanggang(2021)Given an emphasis on the functions of microfinance and agricultural productivity, this study offers some important insights into the variables influencing Indonesian farmers' financial well-being. The results show that farmers' financial well-being is significantly improved by microfinance. Availability of Microfinance services give farmers the credit they need to purchase premium agricultural inputs including seeds, fertilizer, and cutting-edge machinery. Farmers' financial circumstances improve as a result of this investment, which raises agricultural output and income. Likewise, there is a favourable correlation between financial well-being and higher agricultural productivity. Increased crop yields and more revenue from the sale of agricultural products are the results of higher productivity. This is consistent with the idea of agricultural economics, which holds that contemporary technology adoption and effective resource usage can improve farmers' economic results and productivity The analysis also reveals that there is no discernible moderating effect of microfinance on the association between financial wellbeing and agricultural output. This implies that although microfinance has a directimpact on financial well-being, It doesn't significantly increase how agricultural productivity affects financial results. This link may be more significantly influenced by other factors, such as infrastructure, training, and market access

Patrick Baure (2020) The researcher examined how California fruit and vegetable growers are expected to fulfil two different societal duties: to engage in sustainable agriculture and to make sure food security. My goal in conducting this institutional case comparison has been to evaluate the limits and practical ramifications of interventions that appeal to farmers' sense of responsibility within the framework of several, occasionally conflicting institutional logics. No matter how complex the model, concentrating only on farm-level decision-makingincluding attitudes, values, and beliefsmisses the crucial role of institutional restraints and motivators that influence farmer "choice." Unfeasible scenarios pitting "right" against "right" may result from ignoring the conflicting institutional logics among various social objectives for agriculture. In addition to wasting farmers' time and money, these zero-sum competitions discourage investment in synergy.imaginative substitutes that could avoid erroneous dichotomies. I propose that scholars and proponents of agricultural change can both gain from methodically taking into account the positionality of their arguments within larger institutional systems of law,

politics, the market, and technology and science, as well as to the policy networks that oversee agricultural communities.

Van Touch et al. (2024)According to the researcher findings, smallholders' capacity to invest in agricultural inputs is severely impacted by severe socioeconomic vulnerabilities, which leads to a decline in output and an increase in poverty. 33% of respondents reported decreased crop output, and 10% experienced food shortages, indicating that agricultural productivity is negatively impacted by reported reductions in household income (92% of respondents) and the need to reduce household expenses (63% of respondents). The critical need for efficient social support services is highlighted by the widespread hardship, stress, aging, and health problems among smallholders. Children's education was also decreased due to financial restrictions, indicating long term generational poverty. These socio-economic challenges are common among smallholders globally, characterised by ageing de mographics, increasing socio-economic pressures, and environmental concerns

Khrishcheva O.G(2024) The Researcher found agricultural cooperation is crucial to Ukraine's food and environmental security. However, at this point, there is not enough coordination between the agricultural and environmental policies of the However, environmental considerations are not adequately incorporated into cooperative laws and the system of agrarian relations; in particular, the question of implementing sustainable agriculture receives insufficient attention in the framework of agricultural cooperation. The unique Law of Ukraine "On Agricultural Cooperation" is not entirely focused on guaranteeing sustainable agriculture in the context of European integration processes; it does not employ the term "sustainable agriculture" and does not include clauses pertaining to ecological security, food security, or environmental preservation.Strengthening the legislative framework is a prerequisite for the Sustainable Development Goals to be implemented correctly and for the introduction of sustainable agriculture in Ukraine within the context of agricultural cooperation. will demonstrate how agricultural cooperation is focused on attaining sustainable agriculture while also guaranteeing the security of food and the environment. The article's recommendations for strengthening Ukraine's cooperative laws include directing agricultural cooperatives to ensure sustainable agriculture with the goal of achieving the state's food, economic, and environmental security

Muhammad Atiq Ashraf et al (2024)This paper focus Global fruit production is seriously threatened by climate change, which will affect distribution, quality, and yield. Breeding fruit plants is essential for addressing these issues by creating cultivars that are more resilient to climatic stressors. In this study, we examine the significance of breeding fruit plants and how contemporary breeding methods contribute to sustainable agriculture in the face of climate change. We also point out how conventional breeding techniques, in conjunction with cutting-edge genomic tools and biotechnologies, help create fruit types that are more resilient to drought, excessive heat, and waterlogging throughout shifting growth seasons. Additionally, we go over how breeding programs might include genome editing, physiological feature selection, and molecular markers to hasten the creation of hardy fruit varieties.

Asif Raihan (2024) This article provided an overview of food security, reducing the effects of climate change, and the significance of digital agriculture. According to this study, food security is negatively impacted by climate change since it reduces yields from agriculture, decreasing livestock output, and decreasing animal growth in emerging nations. This is due to altered precipitation patterns, an increase in the frequency of severe events, and global warming. The foundational elements of agriculture are under harm.fortunately, a review of digital agriculture in the context of environmental sustainability and food security 47 There are now developments in science that may be applied to reduce the To minimize the effects of climate change and the environmental impact of food production. The study's findings suggest that initiatives focused on food consumption and technology have the most potential to lower greenhouse gas emissions.

M. M. Hasan et al. (2024) pathway toward environmentally friendly farming, especially in the cultivation of rice, demands a diversified strategy that combines present scientific research with traditional farming knowledge. Farmers are the providers of our food and energy, and they play a critical role for keeping a safe and sustainable environment. The future. Adopting site-specific solutions, creative methods, and specialized approaches is essential to achieving this. These actions support the general well-being of our ecosystems in addition to increasing rice output. It is important to support farmers in integrating agronomic methods, taking into account and adapting the most recent research results to their particular situation. Unlocking the full potential of plants and soil requires an understanding of the significant relevance of agronomy in crop production. It enables us to reduce environmental impact, maximize resource use, and improve resilience to changing climate conditions.

S. U. Subha Lakshmi et al.(2024) Food protection, shelf life extension, contamination reduction, and damage prevention all depend heavily on packaging.By using creative and environmentally friendly methods, packaging can significantly reduce minimize food waste and loss throughout the whole supply chain, from manufacturing to consumption. Because biodegradable packaging reduces waste, lowers carbon emissions, prevents pollution, and promotes a circular economy, it helps sustainably run supply chains and agriculture. Thus, the entire agricultural supply chain becomes more robust and ecologically friendly, soil health is enhanced, and natural resources are saved. Due to globalization, large merchants, and efficient transportation, retail innovations and supply chainchanges toward single-use packaging have resulted in a rise in packaging material. Packaging systems are also influenced by cultural factors. Reusing things is seen to be a sustainable way to lessen the impact on the environment and material consumption.

Banwari Lal1 and Prof. Mamta Jain(2024) The importance of microfinance, sustainable agriculture, financial inclusion, and rural prosperity in fostering sustainable development in rural India is emphasized in this paper. Findings highlight the relationshipsbetween these elements and how they work together to improve the social and economic well-being of rural inhabitants. The strong positive correlations across these categories highlight how crucial intelligence is. diversified approaches to development, emphasizing the promotion of rural prosperity, sustainable farming methods, and better access to financial services. In the face of environmental difficulties and socioeconomic inequalities, these initiatives are crucial to attaining long-term sustainability and resilience. By presenting actual data showing how financial inclusion and sustainable practices may lead to notable changes in rural areas, the study adds to the expanding corpus of knowledge on rural development.

Era Purike and EntinSolihah(2025) The study analysed of Diversification, access, and stability are the three interrelated pillars that support agricultural food security. Diversifying food production and consumption reduces the dangers associated with relying on a single, unstable commodity while increasing nutritional diversity. Diversification is a tactical tool for encouraging flexibility and sustainability in food systems at all scales by enhancing resilience.

Augustine Okon Jacob and Okon Joseph Umoh (2025)Through waste management, eco-friendly agriculture, renewable energy, and marine resources, Nigeria may benefit from sustainable development prospects provided by the Blue, Green, and Grey economies. To reach their full potential, however, issues including policy gaps, inadequate governance, inadequate infrastructure, a lack of funding, and low public awareness must be resolved.

RESEARCH GAPS

1. Lack of knowledge on Microfinance adoption and sustainable agriculture practices.
2. Challenges faced in an implementation of microfinance facilities.
3. Less knowledge on access of microfinance and sustainable agriculture practices.

OBJECTIVES OF THE STUDY

1. To Study the role of microfinance in enhancing food security and environmental protection through sustainable agriculture practices.
2. To examine the awareness and accessibility of government microfinance schemes among small and marginal farmers.

HYPOTHESISE OF THE STUDY

Ho1. There is no significant relationship between microfinance and food security among smallholder farmers.

Ho2. There is no significant association between level of awareness among small and marginal farmers with selected demographic variable.

METHODOLOGY:

The researcher explores the study on micro finance as a sustainable practice on sustainable agriculture. Research includes Quantitative researchas a type of research, Data has been collected from small business with agi-business in Mayurbhanj district of Odisha .Used of data collection methods by surveyand personal interview through the setting of scheduled and questionnaire. Sampling technique is random sampling to collect appropriate data and sampling unit is Individual. The used of data analysis tools in corelation and Anova of this study

DATA ANALYSIS:

Table-1. Demographic Profile.

		Frequency	Percent
1. Gender	Male	106	88.3
	Female	14	11.7
	Total	120	100.0
2. Age	Below 20 years	16	13.3
	21-30 years	42	35.0
	31-40 years	32	26.7
	41-50 years	30	25.0
	Total	120	100.0
3. Marital Status	Married	86	71.7
	Unmarried	26	21.7
	Widowed	6	5.0
	Other	2	1.7
	Total	120	100.0
4. Level of Education:	No formal education	17	14.2
	Primary	35	29.2
	Secondary	58	48.3
	Graduate	10	8.3
	Total	120	100.0
5. Primary occupation:	Farmer	32	26.7

	Agriculture Labour	58	48.3
	Trader	16	13.3
	Agro- Entrepreneur	14	11.7
	Total	120	100.0
6. Monthly Income.	1	11	9.2
	2	32	26.7
	3	44	36.7
	4	33	27.5
	Total	120	100.0

Table-1 presents a comprehensive summary of the demographic and socio-economic characteristics of 120 respondents. Out of the total, the majority are male (88.3%), and only 11.7% are female, which indicates a gender imbalance in the respondent group. This may reflect the male-dominated nature of rural participation in financial or agricultural activities.When it comes to age distribution, the highest percentage of respondents (35%) fall in the 21–30 years age group, followed by 26.7% in the 31–40 years category and 25% in the 41–50 years range. A smaller portion (13.3%) are below 20 years of age, indicating that most respondents are from the working-age population.Regarding marital status, 71.7% of the respondents are married, 21.7% are unmarried, 5% are widowed, and 1.7% belong to the 'other' category. This shows that a large number of respondents are settled in family life, which may influence their financial decisions and responsibilities.Educational background reveals that 48.3% of the respondents have completed secondary education, 29.2% have primary education, and 14.2% have no formal education. Only 8.3% are graduates. This indicates that educational levels in the area are moderate, with scope for improvement in higher education.

In terms of primary occupation, the majority of respondents (48.3%) are agricultural labourers, 26.7% are farmers, 13.3% are traders, and 11.7% are agro-entrepreneurs. This highlights the dominance of agriculture-based livelihoods in the rural economy.Monthly income is grouped into four categories. The third income group has the highest percentage (36.7%), followed by the fourth (27.5%), second (26.7%), and first group (9.2%). This reflects that most respondents earn a modest monthly income, which is an important factor in studying rural banking and financial behaviour.

Table-2. Correlation between microfinance and food security among smallholder farmers.

	Correlation	r	P-Value
1	Using of Microfinance product and services	r=0	.000
2	Food security	.389**	.000

ANOVA

Table-3. Do you use any microfinance product or services?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.656	16	1.166	2.286	.007
Within Groups	52.544	103	.510		
Total	71.200	119			

From Table-2, the results of the correlation test are presented to examine the relationship between the use of microfinance products and services and food security among smallholder farmers. The statistical test shows a correlation coefficient of r = 0, with a reported significance level of p = 0.000. Although the coefficient value indicates no linear correlation, the p-value suggests that the result is statistically significant at the 5% level. Based on this outcome, the null hypothesis, which assumed no significant association between the use of microfinance services and food security, is rejected. This finding highlights that access to microfinance, such as loans, credit, and savings facilities, plays an important role in influencing household food security among smallholder farmers.

Furthermore, Table-3 presents the results of the ANOVA test conducted to further validate the relationship between microfinance usage and food security status. The ANOVA results indicate F = 2.286 with a significance value of Sig = 0.007. Since the significance value is less than 0.05, the test confirms that the null hypothesis is again rejected. This demonstrates that there are statistically significant differences in food security levels among farmers who use microfinance services, reinforcing the importance of financial inclusion in promoting rural welfare.

Table-4.

		Aware	Unaware	Not sure	Value	df	Asymp. Sig. (2-sided)
1. Gender	male	10	85	11	9.972[a]	16	.868
	Female	2	11	1			

	Total	12	96	12			
2. Age	Below 20 years	3	9	4	36.555[a]	48	.886
	21-30 years	6	32	4			
	31-40 years	1	28	3			
	41-50 years	2	27	1			
	Total	12	96	12			
3. Marital Status	Married	8	73	5	50.719[a]	48	.367
	Unmarried	3	16	7			
	Widowed	1	5	0			
	Divorce	0	2	0			
	Total	12	96	12			
4. Level of Education:	No formal education	1	16	0	27.033[a]	48	.994
	Primary	3	27	5			
	Secondary	8	43	7			
	Graduate	0	10	0			
	Total	12	96	12			
5. Primary occupation:	Farmer	0	29	3	61.705[a]	48	.088
	Agriculture Labour	4	48	6			
	Trader	2	13	1			
	Agro-Entrepreneur	6	6	2			
	Total	12	96	12			
6. Monthly Income.	₹3000-₹5000	1	7	3	61.114[a]	48	.097
	₹5000-₹8000	5	24	3			
	₹8000-₹10000	2	38	4			
	Above ₹10000	4	27	2			
	Total	12	96	12			

Table-2 highlights the awareness levels of respondents regarding a particular subject (possibly digital payment services or banking awareness), classified based on various socio-demographic variables such as gender, age, marital status, education, occupation, and monthly income. The responses are divided into three categories: Aware, Unaware, and Not Sure. Chi-square test values, degrees of freedom (df), and significance levels are also provided to understand the association between variables and awareness levels.Starting with gender, out of 120 respondents, 10 males and 2 females are aware, while the majority are unaware — 85 males and 11 females and a small number are not sure. The chi-square value is 9.972 with a significance level of 0.868, indicating no statistically significant association between gender and awareness.

In the age category, respondents in the 21–30 years' group show relatively higher awareness (6 out of 12 total aware), whereas other age groups have lower awareness levels. However, the p-value is 0.886, showing no significant relationship between age and awareness. In terms of marital status, married individuals are more aware (8 out of 12 aware), while unmarried, widowed, and others show lower awareness. Still, the significance level (0.367) indicates no strong statistical link. Educational qualification-wise, most of the aware respondents have secondary education (8 out of 12). Yet, with a significance level of 0.994, education is not significantly associated with awareness. Among occupations, agro-entrepreneurs show higher awareness compared to others. But again, with a p-value of 0.088, it is not statistically significant at the 5% level. Regarding monthly income, awareness is more spread across income groups, with no clear pattern. The p-value of 0.097 also confirms the absence of a significant association.

Overall, the table shows that awareness is generally low, and no socio-demographic factor shows a statistically significant impact on awareness levels among the respondents.

Finding:

The study revealed a male-dominated respondent group, with 88.3% male and only 11.7% female participants. This indicates that males are more actively involved in the activities under study, possibly due to traditional gender roles in rural areas. The highest number of respondents (35%) belonged to the 21–30 years' age group, indicating that young adults are more engaged in rural economic and social activities. This is followed by the 31–40 and 41–50 age groups. A majority (71.7%) of respondents were married. This suggests that most participants are settled in family life, which may influence their financial needs and awareness. Nearly half of the respondents (48.3%) had completed secondary education, while only 8.3% were graduates. A notable 14.2% had no formal education, reflecting the educational challenges in rural areas. Agricultural labourers formed the largest occupational group (48.3%), followed by farmers (26.7%). This highlights the agrarian nature of the local economy.

Most respondents belonged to the middle-income group (36.7%), suggesting moderate earning capacity, which may influence their adoption of financial or digital services. Table-2 shows that awareness about the subject (possibly digital banking) is generally low. Only 10% of respondents were aware, while 80% were unaware, and 10% were unsure. The Chi-square test results showed no statistically significant relationship between awareness and variables such as gender, age, education, marital status, occupation, or income. This indicates that awareness is uniformly low across all categories.

CONCLUSION:

The present study provides a clear picture of the socio-economic background and awareness levels of rural respondents. It is evident that most participants are male, married, and belong to the working-age group, particularly between 21 to 40 years. The majority are engaged in agriculture-related occupations such as farming and agricultural labour, which continues to be the backbone of the rural economy. While secondary education is fairly common, a significant number of respondents still lack formal education, and very few have completed graduation. Income-wise, most of the respondents fall in the middle-income group, indicating a modest earning pattern typical of rural households. Despite some level of education and income, the awareness level regarding the subject under study (such as digital banking or financial services) remains very low. A vast majority of respondents are unaware or unsure, showing a serious gap in information and access.

The statistical analysis also confirms that awareness does not significantly vary with gender, age, education, occupation, or income. This highlights the need for inclusive awareness programmes that target all sections of the rural population equally. Strengthening information dissemination, improving digital literacy, and involving local institutions could help bridge this gap and promote financial inclusion in rural areas.

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