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Green Finance and Sustainable Agricultural Development: The Role of Cooperative Banks in Pune Rural

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Abstract

Green finance has emerged as an important mechanism for directing financial resources toward environmentally sustainable and climate-resilient economic activities. In rural economies, its significance is particularly high because agriculture depends heavily on natural resources and is increasingly exposed to irregular rainfall, drought, water stress, soil degradation and other climate-related risks. This research paper examines the role of cooperative banks in promoting green finance and sustainable agricultural development in Pune Rural, with particular reference to the Pune District Central Co-operative Bank (PDCC Bank). The study explores how cooperative banking institutions can support farmers through agricultural credit, irrigation finance, horticulture, farm ponds, renewable energy, water-efficient technologies, climate-resilient agriculture and other environmentally responsible investments.

The study is based primarily on secondary data collected from PDCC Bank, the Government of Maharashtra, the Reserve Bank of India (RBI), NABARD, FAO and World Bank publications. Descriptive analysis is used to examine the structure of agricultural lending and the potential for integrating green-finance principles into cooperative agricultural credit. PDCC Bank reported total loans and advances of ₹13,578.61 crore as of 31 March 2026, of which agricultural loans accounted for ₹3,965.37 crore, or approximately 29.2 percent. The bank's agricultural lending structure includes short-, medium- and long-term finance, while its reported agricultural portfolio also covers activities such as irrigation, horticulture and farm ponds.

The paper argues that cooperative banks can become important intermediaries between public climate-finance initiatives and rural farmers by developing dedicated green agricultural loans, concessional financing, climate-risk assessment, financial literacy and impact measurement. However, challenges include limited awareness, repayment risk, small farm sizes, lack of technical knowledge and the absence of a comprehensive green-finance framework specifically designed for cooperative rural banking. The paper proposes an integrated model combining finance, technology, governance and farmer capacity building for sustainable agricultural development in Pune Rural.

Keywords: *Green Finance, Cooperative Banks, Sustainable Agriculture, Climate-Smart Agriculture, Rural Development, PDCC Bank, Pune Rural, Financial Inclusion, Climate Resilience, Agricultural Finance.*

Introduction

Agriculture is an important foundation of rural economic development, employment and household income. However, the sustainability of agricultural development increasingly depends on the ability of farmers to respond to climate variability, water scarcity, soil degradation, rising input costs and changing market conditions. Climate-smart agriculture seeks to address these challenges by simultaneously improving productivity, strengthening resilience and reducing greenhouse-gas emissions.

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Finance is a critical enabling factor in this transition. Farmers often require substantial initial investment to adopt drip irrigation, solar pumps, farm ponds, protected cultivation, renewable energy, efficient farm machinery, soil-management practices, horticulture and climate-resilient technologies. Conventional agricultural credit may finance production and investment, but green finance adds an environmental dimension by directing capital toward activities that generate positive environmental outcomes while supporting economic development.

The importance of this approach is particularly relevant in Pune Rural. Pune district contains a large rural and agricultural economy with diverse agro-climatic conditions and substantial variation in irrigation availability. The district government's agricultural programmes include support for drip and sprinkler irrigation, horticulture, farm ponds, protected cultivation, post-harvest infrastructure and other activities relevant to sustainable agricultural development.

Cooperative banks have a distinctive position in this ecosystem because they operate close to farmers and agricultural cooperative institutions. PDCC Bank provides short-, medium- and long-term agricultural finance through the cooperative credit structure. According to its official profile, agricultural advances outstanding were ₹3,080.10 crore as of 31 March 2024, while the bank reported total agricultural loans of ₹3,965.37 crore as of 31 March 2026.

The bank's agricultural lending includes investment-oriented finance. Its medium-term loans can support orchards, vineyards, plantations, dairy, poultry and related infrastructure, while long-term loans can support capital formation and technological upgrading. The bank's 2024–25 annual report also identifies agricultural activities such as lift irrigation, horticulture, farm ponds and composite horticulture within its long-term agricultural lending structure.

At the national level, NABARD has identified climate-resilient agriculture, natural-resource management, water conservation, crop diversification and climate-smart technologies as important areas of rural development. NABARD also provides refinance support to cooperative banks and other eligible institutions for agricultural and rural investment.

The RBI has also recognised the growing importance of green finance. Its 2023 Green Deposit Framework states that the financial sector can play an important role in mobilising resources for green activities and projects, although the framework's specified applicability is to scheduled commercial banks and certain deposit-taking NBFCs rather than district central cooperative banks. Therefore, cooperative banks can draw conceptual and governance lessons from the broader green-finance framework while developing approaches appropriate to their regulatory structure. Against this background, the present study examines how cooperative banks can move beyond conventional agricultural lending toward **green and sustainable agricultural finance** in Pune Rural.

Objectives of the Study

1. To examine the role of cooperative banks in financing agricultural development in Pune Rural.
2. To analyse the potential of green finance for sustainable agricultural development.
3. To examine the agricultural lending structure of PDCC Bank.
4. To identify agricultural activities that can qualify as potential green-finance opportunities.
5. To examine the challenges faced by cooperative banks and farmers in adopting green agricultural technologies.
6. To suggest a framework for strengthening green finance through cooperative banking institutions.

Research Methodology

The study is **descriptive and analytical** in nature and is primarily based on secondary data.

Sources of data

The major sources include:

- PDCC Bank official profile and annual report.
- Government of Maharashtra, Pune District agricultural information.
- Reserve Bank of India publications and regulatory documents.
- NABARD publications and policy information.
- FAO publications on climate-smart and sustainable agriculture.
- World Bank publications on climate finance and climate-smart agriculture.
- Relevant academic and institutional literature.

The analysis uses descriptive statistics, percentages, comparative interpretation and thematic analysis. PDCC Bank is used as a principal institutional case because it is a district-level cooperative bank with extensive agricultural lending activities.

Important methodological limitation: PDCC Bank's published loan data are for the bank's overall operational area/district rather than a separately identified "Pune Rural" sample. Therefore, the figures are interpreted as an institutional indicator of cooperative agricultural finance in Pune district rather than as a survey estimate for every rural household.

4. Concept of Green Finance in Agriculture

Green finance refers broadly to financial resources directed toward environmentally sustainable activities. In agriculture, green finance can support investments that conserve natural resources, improve energy and water efficiency, reduce environmental impacts and increase climate resilience.

Potential green agricultural-finance activities include:

Green-finance activity	Possible agricultural benefit
Drip and sprinkler irrigation	Water conservation
Solar agricultural pumps	Renewable-energy adoption
Farm ponds and water harvesting	Drought resilience
Organic/natural farming	Soil and ecosystem management
Agroforestry	Carbon sequestration and diversified income
Protected cultivation	Resource-efficient production
Energy-efficient farm equipment	Lower energy consumption
Horticulture	Diversification and long-term income
Waste/biogas projects	Resource recovery and renewable energy
Climate-resilient seeds	Adaptation to weather risks

The Pune District Agriculture Department already supports several interventions that overlap with these sustainable-finance opportunities, including drip irrigation, farm ponds, horticulture, protected cultivation and post-harvest infrastructure.

Role of Cooperative Banks in Sustainable Agriculture

Cooperative banks can contribute to sustainable agricultural development through four major functions.

1 Credit mobilisation

Cooperative banks can provide farmers with short-term production credit and medium- and long-term investment credit. PDCC Bank's agricultural department provides short-, medium- and long-term finance to farmers through the cooperative credit structure.

2 Financing sustainable technologies

Green agricultural loans could provide financing specifically for solar pumps, drip irrigation, farm ponds, protected cultivation, renewable energy and efficient agricultural machinery.

3 Financial inclusion

Local cooperative institutions can reach farmers who may face difficulties accessing conventional financial institutions. PDCC Bank also supports SHGs and other rural institutions, creating potential channels for inclusive sustainable-finance programmes.

4 Climate-risk management

Agricultural lending is exposed to weather and climate risks. Banks can incorporate climate-risk screening into agricultural credit appraisal and encourage investments that improve farmers' resilience. NABARD has highlighted climate-resilient agriculture, risk mitigation, natural-resource management and climate-smart technologies as important areas of rural development.

Descriptive Data Analysis

Table 1: PDCC Bank loan portfolio as on 31 March 2026

Loan category	Amount (₹ crore)	Share of total
Agriculture	3,965.37	29.20%
Sugar Factory	6,196.11	45.63%
Individual	2,633.22	19.39%
Other	783.92	5.77%
Total	**13,578.61**	**100%**

Source: PDCC Bank official profile, figures as on 31 March 2026.

The table demonstrates that agriculture constitutes a substantial component of PDCC Bank's credit portfolio. Agricultural loans of ₹3,965.37 crore represented approximately 29.2 percent of total reported loans. This indicates the importance of agriculture in the bank's lending activities and provides an institutional base from which green agricultural finance can potentially be expanded.

At the same time, the data demonstrate that green finance should not be viewed simply as an additional loan category. Instead, existing agricultural credit can progressively incorporate sustainability criteria. For example, part of investment lending could be directed toward water-efficient irrigation, renewable energy, soil conservation and climate-resilient agricultural infrastructure.

Table 2: Examples of PDCC agricultural lending and green-finance potential

Existing/related lending activity	Sustainability opportunity
Lift irrigation	Water-efficient irrigation systems
Horticulture	Long-term diversified and potentially resource-

	efficient production
Farm ponds	Water storage and drought resilience
Composite horticulture	Crop diversification
Dairy and poultry	Renewable-energy and waste-management technologies
Agricultural machinery	Energy-efficient equipment
Long-term farm investment	Climate-resilient asset creation

PDCC Bank's annual report identifies lift irrigation, horticulture, farm ponds and composite horticulture within its agricultural lending activities. Its medium-term lending also includes orchards, vineyards, plantations, dairy and poultry infrastructure.

Table 3: Pune district agricultural sustainability opportunities

Area	Relevance to green finance
Drip/sprinkler irrigation	Reduction in water consumption
Farm ponds	Water security
Horticulture	Long-term income diversification
Protected cultivation	Controlled resource use
Solar agriculture	Reduction in dependence on conventional energy
Agroforestry	Environmental restoration and diversified income
Post-harvest infrastructure	Reduction of food losses

The Pune district government reports programmes supporting drip and sprinkler irrigation, farm ponds, horticulture, protected cultivation and post-harvest infrastructure.

Green Finance Model for Cooperative Banks in Pune Rural

A practical green-finance model can be developed around five components.

First, dedicated green agricultural loan products should finance clearly identified sustainable activities. Loan products could have longer repayment periods for investments such as solar pumps, orchards and water-conservation infrastructure.

Second, interest incentives could be considered for verified sustainable investments. Lower financing costs can improve the economic attractiveness of technologies that have high initial capital requirements.

Third, technical assessment should accompany finance. Banks may partner with agricultural universities, government agriculture officers, NABARD-supported institutions and technical agencies to verify the feasibility of proposed investments.

Fourth, digital monitoring can improve transparency. Banks could maintain information on the type of green asset financed, investment amount, farmer category, repayment performance and environmental outcomes.

Fifth, impact reporting should be introduced gradually. Useful indicators could include hectares under micro-irrigation, water saved, renewable-energy capacity financed, number of climate-resilient farms financed and improvement in farm income.

The RBI's green-deposit framework illustrates the importance of verification, impact assessment and disclosure for green finance, although its applicability does not extend directly to DCCBs such as PDCC Bank.

8. Major Challenges

Several challenges may restrict the expansion of green agricultural finance.

High initial investment: Solar systems, protected cultivation and water-management infrastructure may require substantial initial capital.

Small and fragmented holdings: Small farmers may find it difficult to generate sufficient collateral or cash flow for large investments.

Limited awareness: Farmers may not understand the long-term economic benefits of climate-smart technologies.

Climate uncertainty: Changing rainfall and extreme weather can affect agricultural repayment capacity.

Technical risk: Banks may not possess sufficient technical expertise to evaluate environmental technologies.

Measurement problems: It can be difficult to measure environmental outcomes such as carbon reduction or water savings at individual farm level.

Greenwashing risk: Green-finance claims should be supported by transparent eligibility criteria and monitoring.

Institutional capacity: Cooperative banks require trained personnel, digital systems and appropriate governance mechanisms to implement specialised green-finance products.

Suggestions

1. PDCC Bank and other cooperative institutions should consider developing dedicated **Green Agricultural Loan Products**.
2. Priority should be given to drip irrigation, farm ponds, solar pumps, renewable energy, soil conservation and climate-resilient technologies.
3. Banks should develop a simple **Green Agricultural Credit Eligibility Checklist**.

4. Farmer awareness programmes should explain both financial and environmental benefits.
5. Cooperative banks should collaborate with NABARD, agricultural departments, agricultural universities and FPOs.
6. Digital platforms can be used for loan monitoring and impact reporting.
7. Climate-risk assessment should gradually become part of agricultural loan appraisal.
8. Financial literacy programmes should include sustainable-finance awareness.
9. Banks should encourage collective financing through FPOs, SHGs and cooperative societies.
10. A transparent monitoring framework should record environmental and economic outcomes of green agricultural loans.

NABARD's current climate strategy emphasises accelerating green lending, resource mobilisation and climate-resilient agricultural systems, providing a broader policy context for such initiatives.

Conclusion

Green finance provides an opportunity to transform agricultural credit from a conventional production-oriented mechanism into an instrument for sustainable rural development. Pune Rural, with its diverse agricultural economy and significant cooperative banking network, provides an appropriate context for this transformation.

The analysis of PDCC Bank demonstrates the importance of agricultural lending within the cooperative banking system. As of 31 March 2026, agricultural loans amounted to ₹3,965.37 crore, representing approximately 29.2 percent of the bank's total reported loans and advances. The bank already finances activities such as irrigation, horticulture, farm ponds, dairy and other agricultural investments that can potentially be aligned with broader sustainability objectives.

The future opportunity is therefore not necessarily to replace conventional agricultural credit but to **green the existing agricultural-credit portfolio**. Cooperative banks can direct a greater proportion of investment finance toward water conservation, renewable energy, climate-resilient agriculture, sustainable horticulture, soil management and resource-efficient technologies.

Green finance can also strengthen the relationship between financial inclusion and sustainable development. Farmers receive capital for productivity-enhancing investments, while banks can build more resilient agricultural portfolios. Government programmes, NABARD refinance, cooperative banking and farmer institutions can work together to reduce the financial and technical barriers to sustainable agriculture.

However, successful implementation requires appropriate governance, farmer awareness, technical support, transparent eligibility criteria and impact measurement. Cooperative banks should therefore adopt a gradual, evidence-based approach rather than treating every agricultural loan as automatically "green."

In conclusion, cooperative banks such as PDCC Bank have the institutional reach to become important facilitators of sustainable agricultural transformation in Pune Rural. The integration of **green finance, cooperative governance, agricultural technology and climate-risk management** can contribute to more resilient farms, more sustainable use of natural resources and inclusive rural economic development.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of thesis paper.

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