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Climate-Resilient Financing: Cooperative Banks Supporting Green Agriculture in Pune Rural

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Abstract

Climate change is increasingly affecting agricultural production through irregular rainfall, drought conditions, rising temperatures, water scarcity and extreme weather events. These challenges are particularly important for rural economies where agriculture remains a major source of livelihood and where small and marginal farmers often have limited financial capacity to invest in climate-resilient technologies. In this context, cooperative banks can play an important role by directing affordable agricultural finance towards sustainable and climate-smart farming practices. The present research paper examines the role of cooperative banking institutions in supporting climate-resilient and environmentally sustainable agriculture in Pune Rural. The study focuses particularly on the financing potential of the Pune District Central Cooperative Bank (PDCC Bank), which operates through the cooperative credit structure and provides agricultural finance to farmers and rural institutions. Pune district contains substantially different agro-climatic zones, ranging from the relatively high-rainfall western areas to the comparatively hot and dry eastern region comprising areas such as Baramati, Daund, Shirur and Indapur.

Climate change is increasingly affecting agricultural production through abnormal rainfall, drought, rising temperatures, water scarcity and extreme weather events. These challenges are particularly important for rural economies where agriculture remains a major livelihood and where small marginal farmers regularly have limited financial capacity to invest in climate resilient technologies |. In this context, cooperative banks play an important role by directing cheap agricultural finance towards sustainable, climate-smart agricultural practices The gift study paper examines the status of cooperative banks in supporting climate resilient and environmentally sustainable agriculture in rural Pune The overview focuses specifically on the financing capacity of Pune District Central Cooperative Bank (PDCC Bank), which operates through cooperative credit structure and provides farm finance to farmers and rural firms. The Pune district has a wide range of exclusive agro-climatic zones ranging from the exceptionally high rainfall western regions to the comparatively hot and dry eastern regions The paper adopts a descriptive and analytical methodology based entirely and exclusively on secondary statistics acquired from PDCC Bank, NABARD, RBI, Government of Maharashtra, FAO and World Bank assets. The evaluation considers agricultural lending, medium- and long-term finance, irrigation-related loans,

solar pumps, inexperienced/multi-household activities, soil and land improvement, and various activities that can provide agricultural resilience. The take a look at unearths that cooperative banks already own several financing channels that can support weather-smart agriculture, but there is scope for developing a more clearly identifiable green-finance portfolio, climate-risk assessment mechanisms, concessional products and measurable sustainability indicators. The paper concludes that cooperative banks can become important local institutions for climate-resilient rural development by integrating agricultural credit with climate information, crop diversification, water conservation, renewable energy, insurance, farmer education and sustainable production practices.

Keywords: *Climate-resilient finance, cooperative banks, green agriculture, sustainable agriculture, agricultural credit, PDCC Bank, climate-smart agriculture, Pune Rural, green finance, rural development.*

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Introduction

Agriculture depends heavily on climatic conditions, making farmers especially susceptible to adjustments to rainfall, temperature, and frequency of extreme weather events Climate variability can affect crop yields, input needs, irrigation desires, agricultural income, and farmers' ability to repay agricultural loans. Therefore, climate-smart farming seeks to mix productivity improvement, weather processing and, where possible, reduction of greenhouse fuel emissions FAO describes climate-smart farming as integrating food security, processing and mitigation objectives to suit local conditions The Pune district provides an important stand to examine their difficulties because of its good-sized agro-climatic diversity.

There are 4 extensive agro-climatic zones in the district. Its Japanese south-eastern regions, which include Baramati, Daund, Shirur and Indapur, have been identified as the deficit quadrant of kharif-cum-rabi cultivation, while at the same time western regions receive extensively higher rainfall this geographical version creates exclusive financing needs for farmers. Within the heavily arid Japanese belt, irrigation, water conservation and drought-resistant agriculture are particularly big. Co-operative banks play an essential role in the rural credit form of India because of their close institutional linkages with the number one agricultural credit unions, farmers and rural communities.

In Pune division, PDCC Bank functions as an important cooperative economic group, providing short-, medium- and long-term agricultural finance the bank's agricultural division gives finance to farmers through No. 1 agricultural cooperatives and supports exceptional agriculture-related activities

The transition from traditional agricultural finance to climate-resilient finance requires exchanges within the way agricultural credit is designed. Traditional crop loans typically finance seasonal investments and agricultural fees.

Climate resilient financing, in comparison, consists of a growing number of aid investments that reduce farmers' vulnerability to climate shocks.

Examples include drip and sprinkler irrigation, solar pumps, water harvesting, land reclamation, preserved agriculture, renewable energy, soil development, crop diversification, agroforestry, green farming equipment, and climate resistant animal game As a result, the position of economic institutions is obviously broader than lending. Banks can influence adoption of sustainable technologies through hobby fee incentives, mortgage products, repayment systems, technical operations and partnerships with government agencies NABARD particularly emphasizes weather resilient agriculture, herbicide support management, farmer collectives and innovative agricultural technologies as critical areas for rural development It is given The Reserve Bank of India has additionally developed a comprehensive coverage framework for green finance. Its 2023 Green Deposit Framework defines inexperienced finance as financing activities contributing to weather-hazard mitigation, variation, resilience and other environmental goals provides.

Against this history, the ongoing study examines how cooperative banks can support the transition closer to green weather resilient agriculture in rural Pune.

Objectives of the Study

1. To examine the role of cooperative banks in financing agriculture in Pune Rural.
2. To understand the importance of climate-resilient financing for rural agricultural development.
3. To examine selected agricultural financing activities of PDCC Bank that can support sustainable agriculture.
4. To analyse the growth of selected financial indicators of PDCC Bank.
5. To identify opportunities for expanding green and climate-smart agricultural finance.
6. To suggest measures for improving climate-resilient financing in Pune Rural.

Research Methodology

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

Sources of Data

The study uses information from:

- PDCC Bank annual reports and official website.
- NABARD publications and policy information.
- Reserve Bank of India publications and regulatory frameworks.
- Government of Maharashtra economic and climate-related documents.
- FAO and World Bank publications.
- Relevant academic literature and research reports.

Study Area

The geographical focus is Pune district, with particular relevance to rural and agricultural areas. Special attention is given to the relatively dry eastern belt, including Indapur, Baramati, Daund and Shirur, where water availability and climate variability are particularly relevant to agricultural finance.

Analytical Tools

Descriptive statistics, percentage analysis, comparative analysis and tabular presentation are used. Financial indicators are compared for selected years to identify broad trends.

Conceptual Framework: Climate-Resilient Financing

Climate-resilient financing refers to financial resources designed to help households, enterprises and institutions prepare for, withstand and recover from climate-related risks. In agriculture, such financing can support both adaptation and mitigation.

A climate-resilient agricultural loan portfolio may include:

Financing Area	Climate/Sustainability Contribution
Drip and sprinkler irrigation	Reduces water consumption
Solar agricultural pumps	Supports renewable-energy use
Water conservation	Improves drought resilience
Green/poly-house cultivation	Protects crops from climatic fluctuations
Soil and land development	Improves productivity and resilience
Agroforestry/plantation	Supports soil and ecological sustainability
Crop diversification	Reduces dependence on one crop
Livestock and allied activities	Diversifies farmer income
Climate-resilient farm machinery	Improves resource efficiency
Renewable-energy equipment	Reduces dependence on conventional energy

The objective should not simply be to increase agricultural lending but to increase the proportion of lending that creates long-term resilience and sustainable productive assets.

Cooperative Banking and Agricultural Finance in Pune Rural

PDCC Bank has an established position in the agricultural cooperative finance sector in Pune district. The financial institution reported that its agricultural division provides short-, medium- and long-term finance to farmers with a guide to primary agricultural societies.

The lending division of the financial institution has a number of activities that have the potential to benefit from climate resilience. Its agricultural mortgage data includes financing for drip and sprinkler irrigation, inexperienced/poly-houses, solar pumps/equipment, land development, plantations, nurseries, dairies, birds, fishing and other agricultural games

This is huge because weather-resistant agriculture requires investing in effective assets instead of the simplest season crop investments. For example, a drip irrigation device can help a farmer manage water shortages over several farming seasons, while at the same time a solar pump can reduce reliance on conventional energy or diesel and protected agriculture can reduce some of the construction risks associated with climate variations.

However, the officially measured “green finance portfolio” of such debt commodities should not be interpreted robotically. A stronger inexperienced-finance framework could require the financial institution to classify eligible loans in step with environmental goals and file their economic fees and measurable impact.

Descriptive Data Analysis

Table 1: Selected Financial Indicators of PDCC Bank Rs. crore

Indicator	31 March 2024	31 March 2025	31 March 2026
Deposits	12,966.22	14,766.84	17,189.13
Loans & Advances	10,785.99	12,059.03	13,578.61
Investments	7,867.22	9,054.72	10,228.08
Working Capital	20,614.52	23,926.33	27,097.34
Net Worth	2,658.10	2,989.98	3,408.84
Net Profit	72.73	75.75	78.78

The data indicate a broad expansion of the bank's financial scale between 2024 and 2026. Deposits increased from ₹12,966.22 crore to ₹17,189.13 crore, while loans and advances increased from ₹10,785.99 crore to ₹13,578.61 crore. Working capital also increased substantially.

This expansion is relevant to climate-resilient finance because a financially larger cooperative institution potentially has greater capacity to develop specialized agricultural products. However, financial growth by itself does not establish that climate or green finance has increased. Separate classification and reporting would be necessary.

Figure 1: Growth in Deposits and Loans & Advances

The following chart uses PDCC Bank's reported figures.

Table 2: PDCC Bank Loan Composition, 31 March 2026

Loan Category	Amount (₹ crore)	Share
Agriculture	3,965.37	29.29%
Sugar Factory	6,196.11	45.63%
Individual	2,633.22	19.39%
Other	783.92	5.77%
Total	**13,578.61**	**100%**

Agriculture accounted for 29.29% of the reported loan portfolio in March 2026. This demonstrates the continuing importance of agricultural finance within the bank's overall lending structure.

However, agriculture finance and green finance should not be treated as identical concepts. Some conventional agricultural loans may have limited environmental benefits, while certain investments within agriculture—such as water-efficient irrigation or renewable energy—may generate stronger climate-resilience outcomes.

Opportunities for Green Agricultural Finance

Pune Rural has considerable potential for developing specialized climate-resilient financial products.

First, **water-efficient agriculture finance** can be expanded. Drip and sprinkler irrigation, farm ponds, water harvesting and efficient pumping systems can help farmers respond to water scarcity.

Second, **renewable-energy finance** can be promoted. Solar agricultural pumps and other renewable-energy applications can reduce dependence on conventional energy and improve the long-term economics of farm operations.

Third, **crop diversification finance** can reduce farmers' dependence on a single crop and potentially stabilize income. Financing can be linked to horticulture, pulses, millets, livestock and other suitable activities based on local agro-climatic conditions.

Fourth, **protected and precision agriculture** can be supported through financing for greenhouses, poly-houses, precision irrigation, sensors and other technologies.

Fifth, cooperative banks can strengthen **climate-risk assessment**. Loan appraisal can incorporate information about water availability, crop vulnerability, historical climate risks and the resilience of proposed investments.

Sixth, **farmer collectives and FPOs** can receive financing for shared infrastructure such as cold storage, solar-powered facilities, processing, water management and sustainable supply chains.

Major Challenges

Several challenges may restrict the development of climate-resilient agricultural finance.

The first is limited awareness among farmers regarding the financial and long-term benefits of climate-smart technologies. The second is the initial capital requirement for technologies such as solar pumps, protected cultivation and precision farming. The third is uncertainty regarding returns from new technologies. The fourth is the difficulty of assessing climate risk at the individual borrower level.

Cooperative banks may also require specialized climate-risk expertise, data systems and monitoring mechanisms. There is additionally a need to coordinate credit with crop insurance, agricultural extension, government subsidies and technical institutions.

Another challenge is the absence of standardized local-level indicators for measuring the environmental impact of agricultural lending. A bank may finance irrigation or renewable-energy equipment without systematically measuring the amount of water saved, energy generated, emissions avoided or farmers made more resilient.

Suggestions

1. PDCC Bank and other cooperative institutions should establish a clearly defined **Climate-Resilient Agriculture Finance Portfolio**.
2. Eligible loans for solar pumps, drip irrigation, water conservation, protected cultivation and sustainable land management should be separately classified.
3. Banks should consider **preferential financing or incentives** for verified climate-smart investments, subject to applicable regulations.
4. Climate-risk assessment should be incorporated into agricultural credit appraisal.
5. Cooperative banks should collaborate with NABARD, agricultural universities, government departments and FPOs.
6. Farmer awareness programmes should explain the financial benefits of water-saving and renewable-energy technologies.
7. Crop insurance and climate-resilient credit should be integrated wherever possible.
8. Banks should develop digital monitoring systems for tracking green-finance disbursement and outcomes.
9. Annual reports should disclose the value and number of loans supporting climate-resilient agricultural activities.
10. Special financing windows may be developed for small and marginal farmers so that climate technologies do not remain accessible only to larger farmers.

Limitations of the Study

The have a look at is based primarily on secondary statistics and consequently does not directly degree the study of individual farmers. Available PDCC data do not provide a separate audited category headed “inexperienced agricultural finance”;

Consequently, agricultural lending and diagnosis climate-friendly credit products are used as indicators of financing capacity instead of measured green finance The study additionally does not survey the No. 1 discipline of farmers, department managers or cooperative societies. Moreover, the climatic conditions in Pune district vary greatly, which means that findings from one taluk may not be directly relevant to each other. Future studies consequently need to combine bank-phase data with farmer surveys, taluka-level rainfall data, crop yield, water availability and reimbursement overall performance

Conclusion

Climate trade creates every agricultural and monetary threat for rural communities. In rural Pune, in which agriculture unveils to large spatial variations in rainfall and water availability, improving climate-resilient agri-finance is increasingly important

Co-operative banks are well positioned to contribute due to their local presence, dating No. 1 agricultural societies and agricultural lending experience PDCC Bank’s current financing games cover several areas that can help weather resilience, including irrigation, solar pumps, green/multi-habitat farming, land development and agro-related games

The evaluation shows that PDCC Bank has a large agricultural loan portfolio within its growing core balance sheet. However, traditional agricultural finance no longer needs to be mechanically classified as green finance. The subsequent degree must involve the systematic identification, classification, and inspection of weather-resistant investments.

A dedicated inexperienced-farm financing framework should connect cooperative banking with sustainable agriculture through affordable credit scores, weather-hazard assessment, farmer education, crop coverage, renewable energy, water conservation, and farmer

collectives. Such a framework could allow rural finance to transport past short-term agricultural credit scores towards long-term resilience and sustainable monetary reform.

The transition to weather-resilient financing for Pune Rural could consequently be an important avenue for farmer income, protective natural assets and the development of an additional sustainable rural financial system

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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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