



EMPOWERING SUSTAINABLE AQUACULTURE: THE ROLE OF GREEN FINANCE IN FISH FARMING

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Abstract: Green finance has emerged as a transformative force in promoting sustainable development across several sectors, including aquaculture. It enables individuals and businesses to make environmentally friendly purchasing and investment decisions. Additionally, green finance can help address global challenges, including climate change and other environmental risks. It can adopt a transformative approach, promoting sustainable and profitable aquaculture practices by integrating green finance into fish farming. The study's objectives are to understand the awareness level of fish farmers about green finance and to identify the expectations of fish farmers about green finance schemes. The study relies on both primary and secondary data. A total of 50 fish farmers were selected for the study. The study reveals that the awareness of fish farmers about green finance is low. Most of the fish farmers expect low interest rates and longer repayment periods.

Keywords: Green finance, Fish farming, Sustainable development, Aquaculture, Climate change

I. INTRODUCTION

Fish farming is one of Kerala's most valuable and dynamic sectors, significantly contributing to food production, nutrition, income, livelihoods, employment, and foreign exchange earnings in the Indian economy. Kerala has numerous water bodies, including lakes, rivers, canals, backwaters, ponds, and paddies, providing tremendous potential for aquaculture development. Fish farming offers a valuable solution for supplying seafood to a growing market, contributing fish protein to consumers. These operations have significantly improved the socioeconomic conditions for many individuals, promoting food self-sufficiency and helping to alleviate poverty. (Kumar, 2019). However, the rapid growth of aquaculture has raised concerns about its environmental impact, including habitat destruction, water pollution, and loss of biodiversity. To address these issues while meeting the increasing demand for sustainable fish farming, Green finance has emerged as a transformative tool to address the challenges of achieving sustainable fish farming. Green finance is a broad term that refers to financial investments directed towards sustainable development projects and initiatives, as well as environmental products and policies that promote the establishment of a more sustainable economy. While green finance encompasses climate finance, it is not limited to it. (Höhne et al., 2012). Green financing refers to any structured financial activity, such as products or services, designed to achieve better environmental outcomes. It encompasses various types of loans, debt mechanisms, and investment options that encourage customers and investors to engage in green projects, ultimately aiming to minimize the environmental impact of these initiatives. (Mathur & Chaturvedi, 2022).

Fish farmers encounter significant financial challenges that impact their success, including limited access to funds, barriers to obtaining credit, a lack of financial resources, reluctance to utilize available resources, unfamiliarity with lenders, and high initial costs associated with new ponds. (Phukan & Barman, 2016). To address financial challenges, fish farmers need innovative tools like green finance. Green finance can potentially enhance fish production through sustainable practices in fish farming. This study explores the potential scope of green finance on fish farming that leads to profitable and sustainable fish farming.

II. REVIEW OF LITERATURE

Ahmed et al. (2009) State that fish farming is a sustainable livelihood option for rural communities. It has provided significant social and economic benefits to farmers, leading to improvements in their standard of living and purchasing power. The study suggests that fish farming has led to increased food consumption, improved social status, and better access to housing, education, and healthcare facilities. Additionally, fish farming has led to greater fish and food consumption, while farmers have experienced an increase in cash income. Surendran & Alex (2023) Highlight several challenges faced by fish farmers, including low product demand and prices, limited access to quality seeds, competition from sea fish, poor water quality, high initial costs, inadequate training, and a lack of credit facilities. Green financing refers to any structured financial activity, such as products or services, aimed at achieving better environmental outcomes. It includes various types of loans, debt mechanisms, and investment options that encourage customers and investors to participate in green projects. The ultimate goal is to minimize the environmental impact of these initiatives. (Mathur & Chaturvedi, 2022) Green finance as a tool for sustainable development, climate action, and energy transition. The study assessed various green finance tools used to fund projects. (Bhattacharyya, 2022) Green Banking, Bonds, and Insurance are important components of Green Finance. These elements can have both positive and negative impacts on developing countries, especially in India. Establishing an effective regulatory framework and raising public awareness about these emerging concepts to promote sustainable development is crucial. (S, 2021).

Keerthi (2013) Identified the barriers and obstacles to green financing while highlighting recent practices and the future potential of green finance in India. They listed several green projects, including finance initiatives that address conservation issues, such as prawn hatcheries, fish seed preparation, and ornamental fisheries. They recommended creating effective policies to ensure the smooth functioning of the green finance system. Additionally, they noted that the current policies and procedures are inadequate. Mohamed & Orabi (2020) Investigated the level of awareness regarding Green Financing among Jordanian commercial banks from the perspective of investment department managers and found a high level of awareness and understanding of Green Finance. Agarwal et al. (2023) Aimed to assess the scope of Green Finance in India by examining various projects and initiatives, including the Equator Principles, the UN Global Compact, and the Carbon Disclosure Project. It analysed the functioning of Green Finance and concluded that establishing a Green Infrastructure is essential for effectively implementing Green Finance in India. Unnikrishnan et al. (2019) Examined the awareness of green financing among youth in Bangalore, particularly among students. It revealed that most students are unfamiliar with the concept of green financing, but they show a strong interest in using such financial instruments in the future.

III. STATEMENT OF THE PROBLEM

Fishing has long been a traditional activity for humans. Early communities that settled in coastal areas, along riverbanks, and near lakes began fishing to secure food for their survival. Fish became a staple in their diet, and fishing evolved into an important occupation for these groups. Fish farmers face several financial challenges that hinder their operations. These include limited funds, difficulties in securing institutional credit, and a lack of knowledge about available financial tools. Many farmers are also reluctant to utilize these resources and may be unfamiliar with lenders. Additionally, high initial costs for digging ponds and the expense of fishing nets further complicate the financial landscape, making it difficult for fish farming operations to thrive. (Phukan & Barman, 2016). To address these financial challenges, green finance is a more effective option. However, the availability of green finance schemes to the fish farmers. There were limited studies undertaken in the field of green finance, and no studies were undertaken in the field of fish farming. This study aimed to assess the scope of green finance in fish farming and its role in profitable and sustainable fish farming.

IV. SIGNIFICANCE AND SCOPE OF THE STUDY

Green finance in fish farming is important because it tackles essential environmental, economic, and social challenges within the industry. It promotes the adoption of sustainable practices, such as waste management, the use of renewable energy, and water recycling, all of which help to minimize the industry's environmental impact. Additionally, green finance supports innovation by funding the development of sustainable feed, disease management solutions, and efficient production technologies. This funding facilitates the transition to eco-friendly systems, including recirculating aquaculture and offshore farming. This study attempts to assess the awareness level of fish farmers about green finance and their expectations towards fish farming. The study provides a comprehensive understanding of green finance and its scope on fish farming and contributes to the existing literature on aquaculture in India. The scope of the study is limited to potential fish farmers with less than three years of experience.

V. OBJECTIVES OF THE STUDY

- To study the awareness level of fish farmers about green finance
- To study the fish farmers' expectations towards green finance.

VI. RESEARCH METHODOLOGY

The present study is descriptive cum analytical in nature. Both primary and secondary data were used for the study. Primary data is collected from fifty (50) fish farmers in the Thiruvananthapuram and Kollam districts with a structured interview schedule. The purposive sampling method was used for the study. Secondary data for the study was gathered through an extensive and intensive literature survey.

VII. ANALYSIS OF DATA

Level of Awareness of Fish Farmers about Green Financing Schemes

Hypothesis 1

H_0 : There is no significant difference in the level of awareness of fish farmers about green financing schemes between the two districts.

H_1 : There is a significant difference among the fish farmers in the two districts about the level of awareness of fish farmers about green financing schemes.

Table 1.1: Descriptive statistics on Level of Awareness about Green Financing Schemes

	Thiruvananthapuram		Kollam		Total	
	Mean	SD	Mean	SD	Mean	Std. Deviation
Green Deposits	1.63	1.821	1.82	1.932	1.49	1.802
Green Bonds	1.72	1.791	1.54	1.769	1.62	1.747
Green Vehicles	1.83	1.726	1.06	1.804	1.79	0.670
Green Insurance	1.52	1.873	.959	1.773	1.46	1.802

Source: Primary Data

Table 1.1 indicates the level of awareness of fish farmers about green financing schemes. Since the mean value of the majority of variables is below the neutral value of 2.5, the respondents seem to be unaware of the above variables. The opinion on awareness was examined in two dimensions, and the ALSCAL model of MDS was applied to identify the level of awareness. The results are presented as under:

Table 1.1: Stimulus Co-ordinates of the Awareness of Green Financing

Stimulus Number	Stimulus Name	Dimension	
		1	2
1	Green Deposits	-1.8671	-.9275
2	Green Bonds	-1.4845	-.9142
3	Green Vehicles	-1.7361	-.9365
4	Green Insurance	-.5381	-1.093

Source: Primary Data

For matrix

$$\text{Stress} = .12493 \text{ RSQ} = .93235$$

Configuration derived in 2 dimensions

From Table 1.1, the model explains 93 percent of the variability (RSQ=.93235) and the stress is also small (.12493). All four variables are (stimulus no. 1 to 4 with negative coefficient in both dimensions) unaware or have less awareness.

Here, there is no significant difference between the level of opinion on the level of awareness among the fish farmers of the two districts, as the stress is too small and the RSQ Value is above 90 percent, and the stimulus values are negative. So H₀ stands accepted.

Challenges faced by Fish Farmers in accessing finance

K-related Friedman Test is used to locate the most challenging factor faced by fish farmers to access finance products.

Table 1.3: Mean Rank on Challenges Faced by Fish Farmers

	Mean Rank
High Interest Rate	2.39
Collateral Requirement	2.62
Lack of Awareness	2.29
Complex Application Procedure	2.46

Source: Primary Data

Table 1.3 indicates the extent of challenges faced by Fish Farmers. The variable lack of awareness having the lowest mean rank is the most challenging factor.

Level of Expectation on Green Financing Schemes

Hypothesis 2

H₀: There is no significant difference among the fish farmers in the two districts regarding the Level of Expectation on Green Financing Schemes.

H₁: There is a significant difference between the fish farmers in the two districts about the Level of Expectation on Green Financing Schemes

Table 1.2: Descriptive Statistics on Level of Expectation on Green Financing Schemes

	Thiruvananthapuram		Kollam		Total	
	Mean	SD	Mean	SD	Mean	Std. Deviation
High Interest Rate	2.52	1.831	2.71	1.932	2.71	1.741
Collateral Requirement	2.81	1.709	2.67	1.769	2.62	1.871
Lack of Awareness	2.73	1.802	2.78	1.804	2.83	1.647
Complex Application Procedure	2.58	1.784	2.64	1.773	2.51	1.813

Source: Primary Data

Table 1.2 indicates the level of expectation of Fish Farmers on green financing schemes. Since the mean value of the majority of variables is above the neutral value of 2.5, the respondents seem to be highly expectant of the above variables. The opinion on challenges was examined in two dimensions, and the ALSCAL model of MDS was applied to identify more expected variables. The results are presented as under:

Table 1.2: Stimulus Co-ordinates of Expectation Variables

Stimulus Number	Stimulus Name	Dimension	
		1	2
1	Low Interest Rate	1.7742	.8995
2	Longer Repayment Period	1.8322	.9035
3	Grants and Subsidies	1.8632	.9234
4	Technical Support and Training	1.6571	.9123

Source: Primary data

For matrix

$$\text{Stress} = .10391 \text{ RSQ} = .92221$$

Configuration derived in 2 dimensions

From Table 1.1, the model explains 92 percent of the variability ($\text{RSQ}=.92221$) and the stress is also small (.10391). All four factors (stimulus no. 1 to 4 with positive coefficients in both dimensions) are more expected.

Here, there is no significant difference between the level of opinion on the effect of challenges among the fish farmers of the two districts, as the stress is too small and the R-squared value is above 90 percent, and the stimulus values are positive. So H_0 stands accepted.

CONCLUSION

Green finance has a wide scope in fish farming. Integrating green finance into fish farming represents a transformative approach to creating a more sustainable aquaculture industry. By redirecting investments toward environmentally friendly practices, the sector can reduce its ecological footprint while addressing global food security needs. Additionally, green finance supports broader goals such as combating climate change, preserving ecosystems, and ensuring long-term economic resilience for fish farmers. The study finds that most fish farmers have limited awareness of green finance and its associated schemes. They have higher expectations for the green finance scheme integrated into green finance. Most of the fish farmers expect low interest rates and longer repayment periods. Enhancing these initiatives requires collaboration between policymakers, financial institutions, industry stakeholders, and consumers, creating a pathway for a sustainable economy.

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