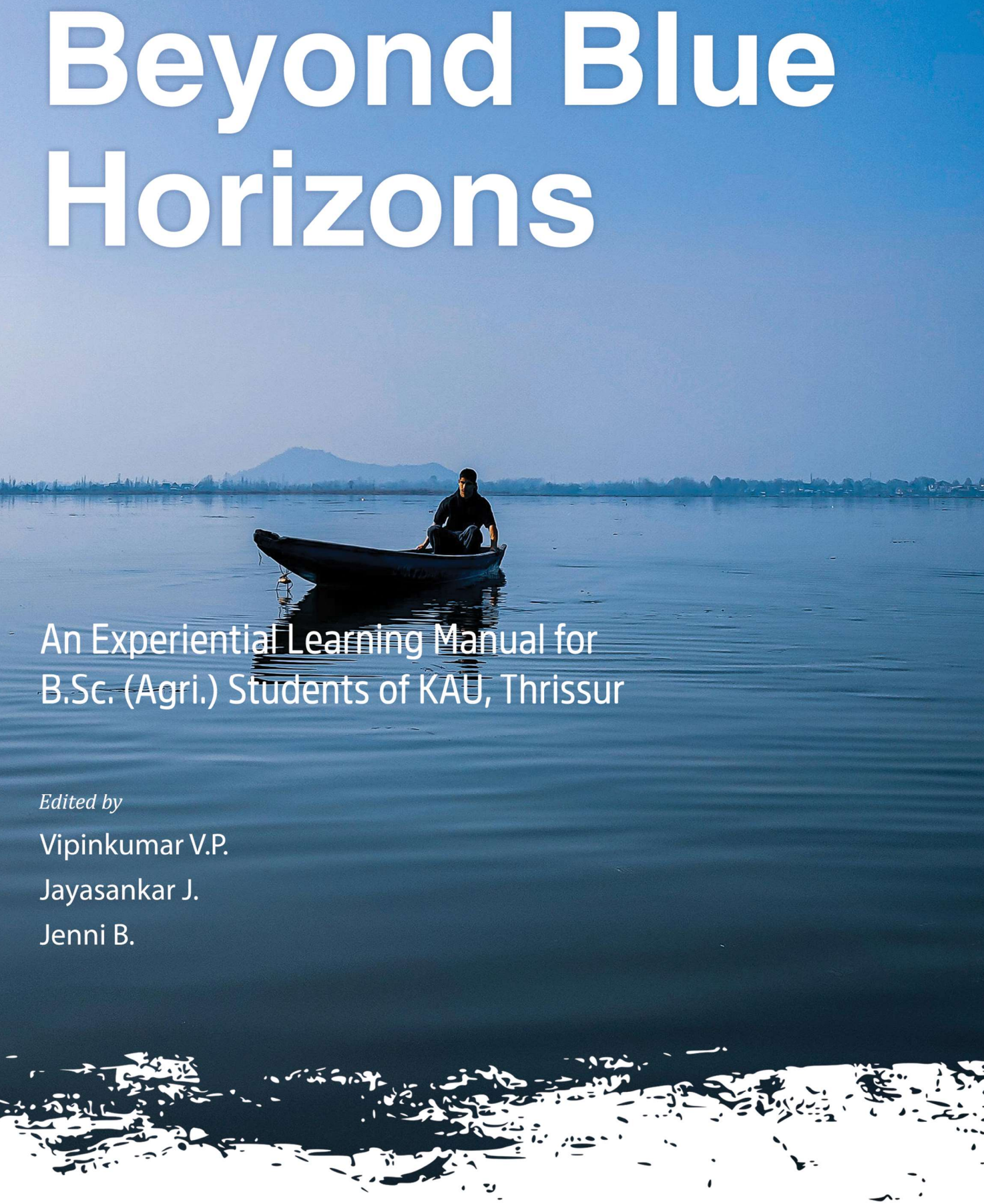
Beyond Blue Horizons



An Experiential Learning Manual for
B.Sc. (Agri.) Students of KAU, Thrissur

Edited by

Vipinkumar V.P.

Jayasankar J.

Jenni B.

ICAR-Central Marine Fisheries Research Institute
(Department of Agricultural Research and Education, Government of India)
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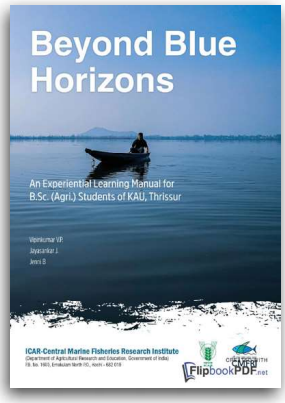

Beyond Blue Horizons
Training Manual for BSc (Agri) students of Kerala Agricultural University

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FOREWORD

It is with great pleasure and deep satisfaction that I present this foreword to the Training Manual of the Science Camp titled "Beyond Blue Horizons: An Experiential Training Manual for B.Sc. Agriculture Students." Conducted from July 14 to 18, 2025, at the STI Hub Digital Training Hall, ATIC, ICAR-CMFRI, Kochi, this programme exemplifies our continued commitment to innovative, experiential, and interdisciplinary learning in agriculture and allied sectors.

Organized by ICAR-Central Marine Fisheries Research Institute through its Agricultural Technology Information Centre (ATIC), the training served as a dynamic platform for B.Sc. Agriculture students from the College of Agriculture, Vellanikkara, Thrissur. The thematic focus on integrating field-based experiences with advanced laboratory analyses reflects a progressive approach to education—one that fosters a seamless continuum between knowledge generation, validation, and application. Such initiatives are vital in equipping students with the skills and perspectives required to address emerging challenges in agriculture and fisheries.

I place on record my sincere appreciation to Dr. Vipinkumar V.P., Principal Scientist and ATIC Manager, ICAR-CMFRI, for his exemplary leadership, meticulous planning, and unwavering dedication in organizing this programme. His efforts, along with those of the entire team, have ensured the successful conduct of this Science Camp, setting a high standard for future capacity-building initiatives.

The programme was thoughtfully designed to bridge the gap between theoretical understanding and practical application. It offered participants a rich blend of innovative lectures on emerging topics, hands-on training sessions, field exposure visits, and institutional interactions. The opportunity to access advanced laboratories, aquarium facilities, and the museum at CMFRI significantly enriched the learning experience. Equally important were the interactive sessions with farmers, which fostered meaningful exchanges between academia and practitioners, grounding scientific knowledge in real-world contexts.

Such experiential learning opportunities are invaluable in enabling students to appreciate the dynamic flow of information from field observations to laboratory insights, ultimately supporting informed decision-making and innovation in production systems. I am confident that the knowledge and exposure gained through this Science Camp will contribute significantly to the academic growth and professional development of the participants.

I extend my warm congratulations to all the students and faculty members who actively engaged in this programme. Your enthusiasm, curiosity, and commitment to learning are truly commendable. May this experience inspire you to strive for excellence and contribute meaningfully to the advancement of agriculture and fisheries.

I am confident that this training manual will serve as a lasting resource, capturing the essence of the programme and reflecting the collective efforts that made this initiative both impactful and memorable.

Dr. Grinson George
Director, ICAR-CMFRI
Kochi

PREFACE

It is with immense pleasure and a deep sense of fulfilment that I present this compendium, "Beyond Blue Horizons: A Training Manual for B.Sc. Agriculture Students of Kerala Agricultural University." This volume encapsulates a unique and inspiring journey of experiential learning, meticulously designed and conducted at the STI Hub Digital Training Hall, ATIC, ICAR-CMFRI, Kochi, from July 14 to 18, 2025.

Envisioned as a transformative academic engagement, this Science Camp brought together bright and inquisitive B.Sc. Agriculture students from Kerala Agricultural University, Thrissur, and guided them through a rich continuum of learning—from field-level realities to the precision of laboratory analytics. At a time when agriculture is rapidly transitioning into a data-driven and innovation-led enterprise, the programme provided a vibrant platform for students to explore the convergence of traditional knowledge systems with modern scientific advancements, with a special emphasis on the fisheries sector.

The training was thoughtfully structured to deliver an immersive and practice-oriented learning experience. Through a dynamic blend of expert lectures, hands-on sessions, field exposure visits, institutional interactions, and meaningful dialogues with farmers, participants were encouraged not only to learn but to question, analyse, and innovate. The focus was on nurturing scientific curiosity, strengthening practical competencies, and inspiring a forward-looking approach to sustainable agriculture and fisheries development.

This manual, comprising ten thoughtfully curated chapters, reflects the thematic depth and diversity of the programme. It covers a wide spectrum of subjects including integrative analytics, digital interventions, field diagnostics, and emerging marine agri-technologies. What makes this volume particularly engaging is its strong practical orientation—each chapter offers insights, methodologies, and experiences that readers can readily connect with and apply. The concluding chapter, featuring the comprehensive report prepared by the students, stands as a testament to their active engagement and the effectiveness of the experiential learning model adopted during the camp.

I place on record my sincere gratitude to Dr. J. Jayasankar, Head of the FRAEE Division, and Dr. B. Jenni, ACTO, ATIC, for their scholarly contributions, editorial excellence, and steadfast support as co-editors of this compendium. Their efforts have been instrumental in shaping this manual into a valuable and enduring academic resource.

As the Course Director and Chief Editor, I consider this compendium not merely as a documentation of an event, but as a celebration of collaborative learning and an invitation to explore the vast and promising interface between agriculture and fisheries sciences. While this endeavour represents only a beginning—a glimpse into a much larger horizon—it is my earnest hope that this volume will inspire readers to delve deeper, think innovatively, and contribute meaningfully to this evolving domain.

I warmly invite students, researchers, academicians, and practitioners to engage with the chapters that follow—rich in practical insights, field-based observations, and scientific perspectives—and to draw inspiration for future learning and innovation.

Dr. Vipinkumar V. P.
Principal Scientist & ATIC Manager
ICAR-CMFRI, Kochi

CONTENTS

STI Hub in Fisheries: Igniting Innovation for a Sustainable Future

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Vipinkumar V.P[1]., Reshma Gills[2]., Ramachandran C[1]., Boby Ignatius.[1], Aswathy N[1]., Anuja A.R[1]., Rajesh N[1]., Jayasankar J[1]., Swathilekshmi P.S[3]., Vidya R[1]., Sanal Ebeneezar[1]., Saju George[1]., Jenni B[1]., Athira P.V[1]., Sary P.S[1]., Binitha K.V[1]., Smitha R.X[1] and Ambrose T.V[1].

1. *ICAR-Central Marine Fisheries Research Institute, Kochi*
2.*ICAR-National Academy of Agricultural Research Management, Hyderabad*
3. *ICAR-Central Marine Fisheries Research Institute, Veraval*

The 'Science Technology and Innovation (STI) Hub in the Fisheries Sector' at Kochi Corporation, Ernakulam district, Kerala, is an externally funded initiative granted to the ICAR-Central Marine Fisheries Research Institute (CMFRI) by the Department of Science & Technology (DST), New Delhi, for the duration of 2022–2025, with a budget of ₹3.2 crores.

Through the mobilization and strengthening of Self-Help Groups (SHGs) and individual businesses in the marine fisheries sector in central Kerala, the project seeks to empower Scheduled Caste (SC) fishermen. Finding location-specific, fishery-based microenterprises that support Entrepreneurial Capacity Building (ECB) and meet the demands of SC stakeholders is a major goal of this effort. This is accomplished by implementing focused training initiatives and embracing sustainable and profitable microbusinesses. In order to support the STI Hub, the initiative also aims to clarify and record successful ECB cases among SHGs and individual SC entrepreneurs by utilizing information and communication technology (ICT) interventions. In order to ensure long-term empowerment and sustainability in the sector, a key element of this project is fostering connections between SHGs/entrepreneurs and technical, institutional, and financial entities.

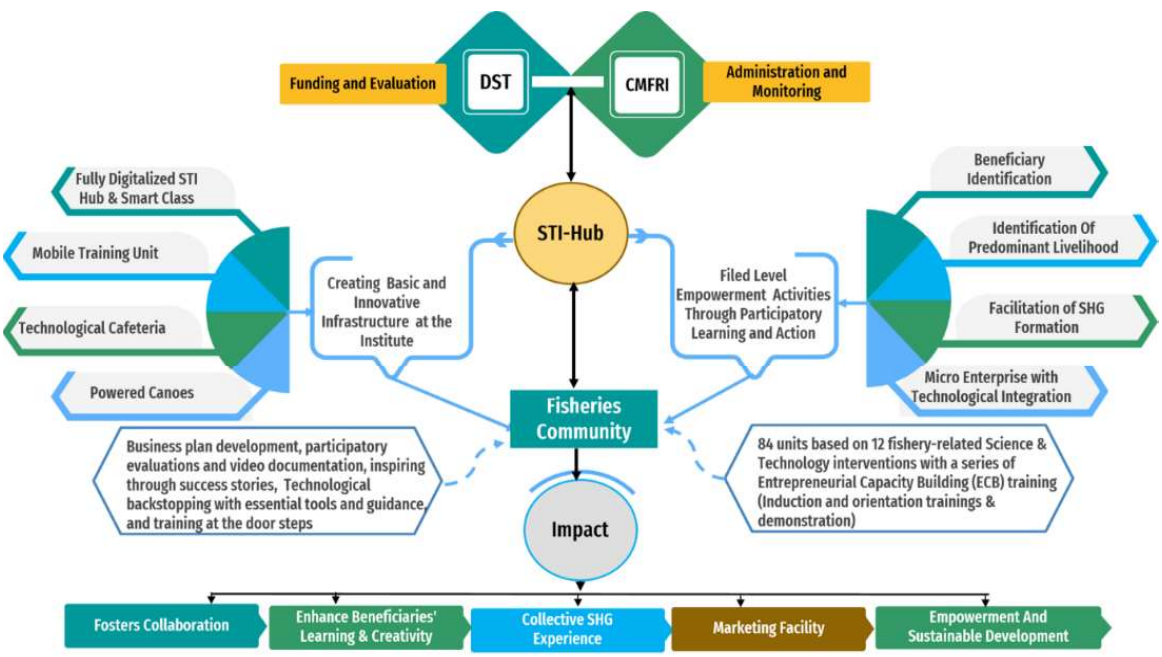
Strategic Implementation Plan

Self-Help Groups (SHGs) and individual businesses in the marine fisheries sector in central Kerala are to be strengthened and mobilized by the Science, Technology, and Innovation (STI) Hub in the Fisheries Sector in order to empower Scheduled Caste (SC) fishermen. This initiative's primary goal is to find fishery-based microenterprises that are location-specific and serve the interests of SC stakeholders while fostering entrepreneurial capacity building (ECB). This is accomplished through the adoption of sustainable and profitable microbusinesses and focused training initiatives. Additionally, the initiative

uses information and communication technology (ICT) interventions to support the STI Hub by elucidating and documenting successful ECB cases among SHGs and individual SC entrepreneurs. Facilitating connections between technical, institutional, and financial entities and SHGs/entrepreneurs is an essential part of this project.

Conceptual Framework of the STI Hub

The Science, Technology, and Innovation (STI) Hub Project is designed to empower Self-Help Groups (SHGs) and individual entrepreneurs by establishing and strengthening their linkages with government agencies and financial institutions, enabling improved access to financial credit, livelihood entitlements, and resources through targeted Human Resource Development (HRD) interventions. Focused on promoting self-sustainability, the project ensures that SHGs can independently manage income-generating enterprises by applying the experiential knowledge gained through participation. Functioning under the Central Marine Fisheries Research Institute (CMFRI), the STI Hub operates collaboratively with institutional units such as the Agricultural Technology Information Centre (ATIC), Fishery Resource Assessment, Economics and Extension Division, Programme Monitoring and Evaluation Cell, and Krishi Vigyan Kendra (KVK). To further ensure market sustainability and economic viability, the initiative leverages the ATIC sales counter as a dedicated outlet for SHG products, thereby facilitating effective marketing and long-term success of the interventions.



Implementation area

The STI Hub Project is strategically implemented in the central zone of Kerala, primarily focusing on the Ernakulam district to build a strong Science, Technology, and Innovation (STI) ecosystem within the fisheries sector. The initiative targets coastal regions with a significant presence of Scheduled Caste (SC) households, such as Vypin, Narakkal, Elamkunnappuzha, Cherai, Vallarpadam, Chellanam, and Paravoor, while also extending its reach to border areas of Thrissur, Alappuzha, and Kottayam districts to ensure wider coverage and inclusivity. The project directly engages 500 SC fisherfolk, including men, women, and transgender individuals, representing an equal number of households. Through this focused intervention, it aims to create a multiplier effect, indirectly benefiting around 2,500 individuals, thereby contributing to enhanced livelihood opportunities, economic resilience, and social empowerment among SC fisherfolk communities.

Practical Implementations of the STI Hub: Empowering SC Fisherfolk through Entrepreneurial Capacity Building

The STI Hub aims to enhance Entrepreneurial Capacity Building (ECB) for Self-Help Groups (SHGs) of Scheduled Caste (SC) beneficiaries and individual entrepreneurs through practical training in advanced fisheries-based technologies. Main areas of emphasis encompass cage culture, pearl spot seed generation, fish sales, fish fertilizer manufacturing, value enhancement, integrated fish farming, fish rearing, mussel farming, oyster farming, clam harvesting, fish drying, and sophisticated fish value addition methods.

Training will be carried out methodically in three stages: awareness initiatives, orientation sessions, and practical demonstration workshops. To guarantee lasting effects, every piece of data, success stories, and technological advancements in fisheries will be carefully digitized and recorded in the advanced Data Documentation Centre at the STI Hub of CMFRI. This facility will house an Entrepreneur Consultancy Cell, an Entrepreneur Technology Park, and a Digital Training Hall, functioning as a knowledge hub and practical guide for maintaining and expanding fisheries-related business initiatives.

To broaden its presence in possible areas, the STI Hub's field efforts will utilize a Mobile Training Unit containing necessary laboratory equipment, canoes with safety equipment, and advanced digital tools like high-resolution cameras and drones for immediate documentation and evaluation of interventions. This proactive method guarantees efficient spread of technology-based fisheries innovations, promoting self-sufficiency and financial empowerment within SC fisherfolk communities.

Progress and Impact: Advancing Fisheries-Based Microenterprises under the STI Hub

The STI Hub Project has made significant strides in promoting fisheries-based microenterprises across eight districts of Kerala, including Ernakulam, Thrissur, Kottayam, Alappuzha, Kozhikode, Kannur, Pathanamthitta, and Kollam. A total of 84 microenterprises have been successfully initiated in various parts of the state.

These microenterprises cover a diverse range of fisheries-related activities, including cage culture, pearl spot seed production, fish vending, fish culture, ornamental fish culture, integrated fish farming, fish fertilizer production, value-added fish products, mussel culture, oyster culture, clam processing, and dry fish production units.

To date, the initiative has directly benefited 469 beneficiaries, comprising 249 males (53%) and 220 females (47%) and 6 transgender beneficiaries, empowering them with sustainable livelihood opportunities and enhancing their economic resilience through technology-driven fisheries entrepreneurship.

Transforming Livelihoods: The Impact of the STI Hub on SC Fisherfolk Communities

The Science, Technology, and Innovation (STI) Hub Project is an innovative effort designed to improve the livelihoods of Scheduled Caste (SC) fisherfolk by implementing 12 different fisheries-based microenterprises, replicated across 84 targeted initiatives.

Among these initiatives, cage culture has proven to be a promising approach for enhancing livelihoods and nutritional security. It holds considerable potential to create more job opportunities, elevate the socioeconomic conditions of fisherfolk, and increase aquaculture production on a global level. The pearl spot seed production project tackles ongoing issues such as seed shortages, low survival rates, and poor-quality stock, ensuring a steady supply of high-quality fish seeds for sustainable aquaculture.

The creation of value-added fish product units has enabled continuous production and availability of processed fish products throughout the year, improving economic sustainability. Fish vending units, featuring transparent display cases, allow customers to choose fresh fish while extending the product's shelf life by 4 to 5 days, thereby increasing profits for sellers. Fish drying, mainly performed by fisherwomen in coastal areas, has been transformed through the use of modern drying technologies, enhancing hygiene, ensuring food safety, conserving fishery resources, and increasing income opportunities.

The STI Hub promotes strong linkages among Self-Help Groups (SHGs), individual entrepreneurs, government bodies, and financial institutions to enhance access to credit, livelihood opportunities, and resource mobilization through focused Human Resource Development (HRD) initiatives. Its sustainability is further strengthened through strategic partnerships with the Agricultural Technology Information Centre (ATIC) of CMFRI and the Krishi Vigyan Kendra (KVK). The ATIC sales outlet functions as a dedicated platform for marketing SHG-produced goods, ensuring the long-term viability of these initiatives even after the project's funding phase concludes.

Furthermore, the fully digitized STI Hub at CMFRI operates within a broad network of institutional and community partnerships that include Knowledge Institutions (KIs), local NGOs, voluntary organizations (VOs), and last-mile delivery systems. The project fosters backward linkages with scientific organizations and agricultural/fisheries universities to promote technology transfer and innovation, while simultaneously developing forward linkages with SHGs, Farmer Producer Organizations (FPOs), and Farmer Producer Companies (FPCs). This integrated approach ensures the sustainability and scalability of fisheries-based entrepreneurial ventures.

The project has thus not only enhanced livelihoods but also promoted inclusivity, skill development, and self-reliance among SC fisherfolk. To ensure wider adoption, horizontal technology transfer through videos, pamphlets, and demonstrations can be effectively leveraged. Overall, the initiative stands as a replicable model of integrating technology dissemination, entrepreneurship, and social empowerment for sustainable community development.