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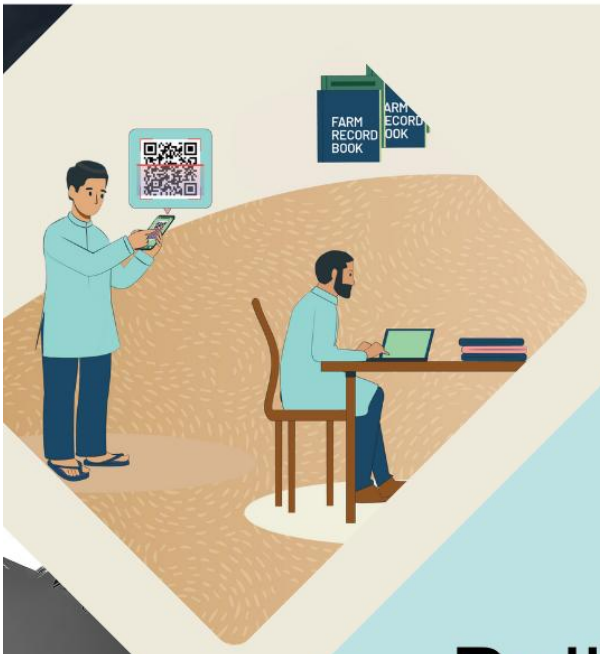
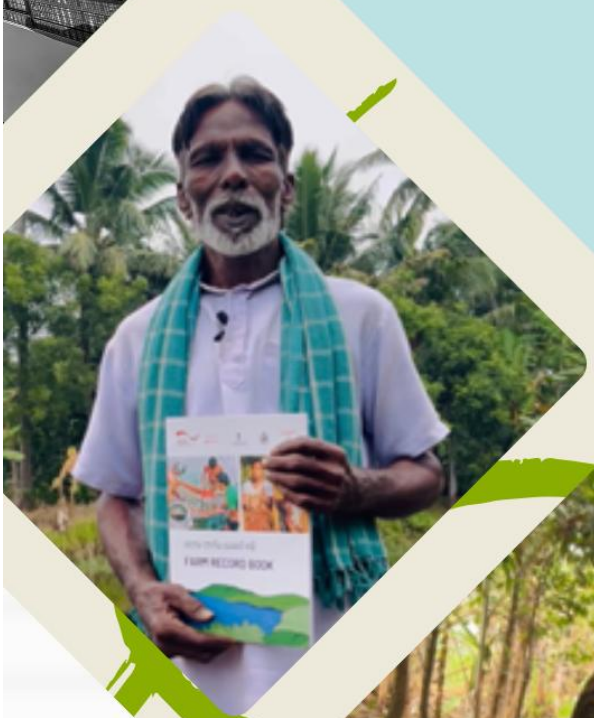
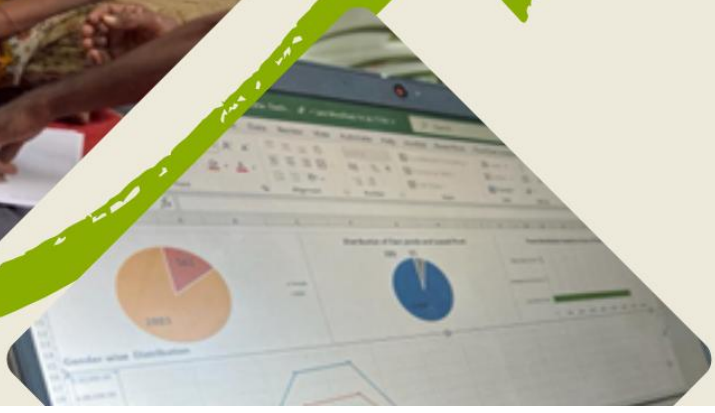


GUIDEBOOK:

Building a Low-Cost Digital Monitoring System for Farmer Institutions

Sustainable Aquaculture for Food and Livelihood (SAFAL)





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On behalf of the
German Federal Ministry for Economic Cooperation and Development (BMZ)

Guwahati, June 2025

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List of Abbreviations

AI	Artificial Intelligence
APP	Application
BMZ	Federal Ministry of Economic Cooperation and Development (Germany) *Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung*
CEO	Chief Executive Officer
CRP	Community Resource Person
CSO	Civil Society Organizations
CSR	Corporate Social Responsibility
DSS	Darbar Sahitya Sansad
EIAA	Food Security through Integrated Aquaculture
FI	Farmer Institution
FIRMS	Farmer Institution Realtime Monitoring System
FPC	Farmer Producer Company
FPO	Farmer Producer Organisations
FRB	Farm Record Book
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GP	Global Programme
GPS	Global Positioning System
ICCSPL	Innovative Change Collaborative Services Private Limited
IEC	Information Education and Communication
KK	Kalong Kapili
MoFAHD	Ministry of Fisheries, Animal Husbandry and Dairying
MS	Microsoft
NGO	Non-Governmental Organization
PG	Producer Group
PMMSY	Pradhan Mantri Matsya Sampada Yojana
QR	Quick Response
SAFAL	Sustainable Aquaculture for Food and Livelihood
SDG	Sustainable Development Goals
SeSTA	Seven Sisters Development Association

Executive Summary

This guidebook provides a practical, step-by-step approach to developing and implementing a low-cost digital monitoring system tailored for Farmer Producer Organisations (FPO), Farmer Producer Companies (FPC), and Producer Groups (PG). It is intended for use by grassroots development organisations, producer collectives, project implementers, and capacity-building experts working in smallholder aquaculture and agriculture.

The guide was developed to address a common challenge: many grassroots institutions continue to rely on paper-based or ad hoc digital record-keeping systems, limiting their ability to make informed, data-driven decisions. By enabling the regular capture and analysis of both static (e.g., pond size, number of units) and dynamic data (e.g., feed usage, input costs, sampling data), the guide supports FPOs, FPCs, PGs and their members in identifying potential risks—such as low fish growth or excessive feed costs—at an early stage. This helps to improve planning, reduce costs, increase productivity, and ultimately strengthen farmer livelihoods and food security outcomes.

Developed through the collaborative efforts of Darbar Sahitya Sansad (DSS), Gram Utthan (GU), Seven Sisters Development Association (SeSTA), Kalong Kapili (KK), and Innovative Change Collaborative Services Private Limited (ICCSPL), the guide builds on field experience and feedback. The system was implemented and field tested through intensive training of leading executives of farmer institutions, district fisheries officer and close handholding of farmers by Community Resource Persons (CRPs).

The digital monitoring system is already in use, with early entries indicating growing adoption. As the system continues to be embedded within FPOs, FPCs and PGs, its long-term value lies in creating a scalable model for low-cost digital transformation in smallholder aquaculture and agriculture.

Ultimately, the guide serves as a reference and practical tool for organisations and professionals supporting rural producer institutions to adopt structured digital tools that can enhance productivity, reduce operational risks, and improve resilience. By aligning with national goals for increasing productivity, reducing risks, and improving resilience among small-scale producers, this guide contributes to broader efforts in strengthening rural institutions and promoting sustainable, inclusive agri-food systems.

1 Approach methodology at a glance

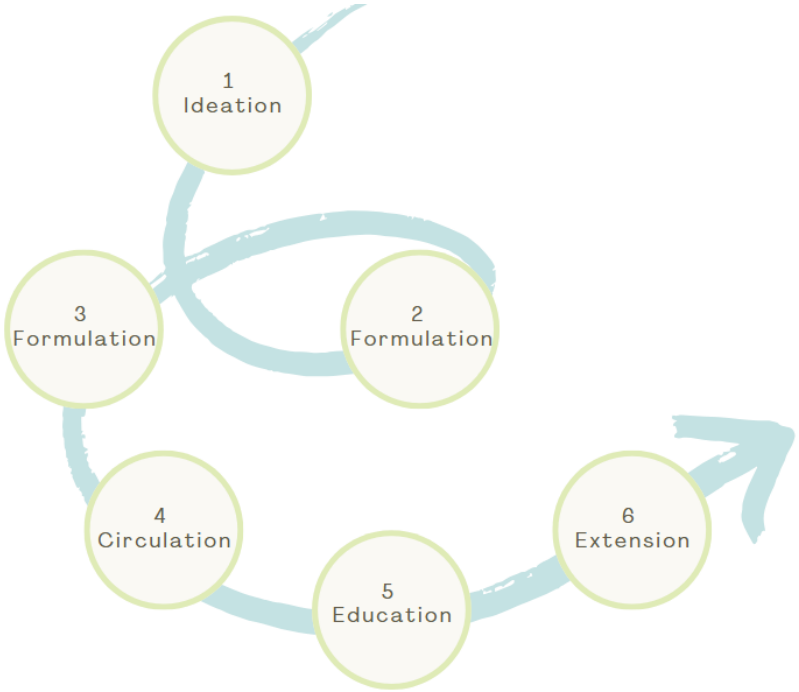


Figure 1 Approach and Methodology at a glance

1. IDEATION	
Situation Analysis (Discussion with FI[1] leaders to understand)	Existing monitoring systems in place.
	Methods for data collection from the field.
	Challenges related to accessing and sharing information with stakeholders.
	Methods used to disseminate information to stakeholders.
	Steps/processes implemented for easier information access.
	General records/information maintained by the FI in addition to mandatory records.
	Feedback on adopting a digital-based monitoring system.
Understanding Digital Capabilities of a FI	Assessing the digital literacy levels of farmers and executive members.
	Evaluating the adaptability of farmers to a digital method.
	Identifying present digital resources available with the FI.
	Upskilling staff and key personnel on digital methods.
	Adoption and effectiveness of training on digital methods.

[1] Collectively FPOs, FPCs and PGs are going to be referred to as Farmer Institutions (FI)

Reviewing Existing Systems	Assessing if farmers/members of the FI have a record-keeping mechanism.	
	Identifying necessary information from existing records for the FI.	
	Evaluating how the FI uses the collected information.	
	Determining benefits for the FI and farmers from the information.	
	Identifying additional information required beyond available records.	
	Understanding how this additional information helps both farmers and the FI.	

2. FORMULATION

Identifying Parameters	Preparing a list of necessary information for the management/business operations of the FI.	
	Listing parameters needed to obtain the required information.	
	Discussing with FI executives, farmers, and other involved personnel to select parameters.	
	Categorising parameters into respective groups based on specific qualities and relevancy.	
Preparing a Questionnaire	Identifying valid information sources based on farmers' personal record-keeping mechanisms.	
	Validating available sources to ensure the quality of information.	
	Creating a list of questions to capture data for obtaining the parameters.	
	Collecting inputs from farmers, FI executives, and other stakeholders on terminology, language, and phrasing of questions.	
	Validating the need for each question, collecting data, and filtering questions based on necessity.	
	Discussing with Non-Government Organisations (NGO), Civil Society Organisation (CSO), implementing agencies, government departments, funding agencies, and other external stakeholders to identify required parameters.	
Review of Questionnaire	Discussing with FI executives, farmers, and other involved personnel to review the questionnaire by:	*Identifying questions that address the immediate needs of the FI to ensure the collection of accurate information.*
		Determining the frequency with which stakeholders can provide information.
	Checking data validations, calculations, cross-checks, and dependencies of relevant information.	
	Reviewing the logic of questions, provided options, and custom information (units of measurement, regional information).	

Utilisation of Data	Discussing with FI executives, farmers, and other involved personnel to understand:	*How the data/information is used after collection.*
		How the information is interpreted.
		How FI executives ensure the security of personal information of fish farmers.
	Initiating discussions with relevant personnel to understand the needs and utilization of data/information by:	*CSOs, NGOs involved with the FI.*
		Supporting government line departments.
		Implementing agencies/supporting agencies.

3. EXECUTION

Setting up Data collection	Setting up the Account (Website)	Create an account, verify details, and complete other nominal requirements.
		Use the "Create Form" option and explore provided options for creating a questionnaire. Explore advanced form-making for more complex options.
		Ensure proper logic, visibility of questions, options, and other relevant information as per the configuration.
	Setting up the Data Collection (Application)	Follow the app setup flowchart provided.
		Test the availability of the form and provide data inputs.
		Create an account access QR Code.
	Data Collection	Test data collection processes.
		Provide demo data for testing.
Setting up Analysis of Data	Preparation	Prepare an Excel file for data analysis.
		Import data from the Kobo server to MS Excel.
	Data Processing	Develop queries for data processing.
		Create a data model.
	Analysis and Visualization	Create pivot tables for analysis.
		Visualize data into relevant concepts and insights.
Prototype	Testing	Conducting prototype testing with a sample of similar stakeholders to identify challenges and gather feedback.

		Organizing workshops and training sessions to demonstrate the prototype and gather real-time inputs.	
	Updating	Analysing feedback from prototype testing and identifying areas of improvement.	
		Updating the system based on feedback to address identified challenges.	
		Validating the updated system with a smaller group of stakeholders to ensure improvements are effective.	
		Incorporating Findings and Learnings and repeating.	

4. CIRCULATION

Communication	Designing informative, educational, and communication (IEC) materials to explain the system.		
	Translating materials into local languages for better comprehension.		
Dissemination Process	Planning the dissemination process to ensure wide and effective reach.		
	Coordinating with CRPs to facilitate the distribution of materials and training to farmers.		
	Establishing a support system for troubleshooting and assistance during the initial rollout.		
	Setting up communication channels for continuous feedback and support.		
	Scheduling regular follow-ups to ensure the system is being used effectively and to address any emerging issues.		
Implementation and Rollout	Gradually rolling out the system to all targeted farmer institutions.		
	Monitoring the initial implementation phase closely to address any issues promptly.		
	Collecting ongoing feedback to continuously improve the system and support provided.		

5. EDUCATION

Capacity building of FI level stakeholders	Identifying Key Areas/Components	Pinpoint essential components in the process, focusing on:	*Managing the entire FIRMS system.*
			Performing data analysis.
			Interpreting information derived from analysis.

	Providing Training to Personnel from FIs	Training on data collection methods.
		Instruction on system maintenance and troubleshooting.
		Guidance on making minor edits and changes within the system.
Capacity building of stakeholder above FI level	Advanced Training for Technical Personnel from CSOs/High-level Agencies	Training on the implementation of the system.
		Instruction on adding, removing, or making major changes to the system.
		Educating on the criticalities behind data analysis.
		Ensuring sustainability of the system.

6. EXTENSION

Addressing Technical Challenges	Identifying potential technical issues.
	Developing solutions and troubleshooting protocols.
	Ensuring ongoing technical support and updates.
Maintenance and Updates	Regular system maintenance schedules.
	Implementing updates based on feedback and technological advancements.
	Ensuring seamless integration of new features and improvements.
Adaptability	Monitoring system performance and user feedback.
	Adapting the system to meet evolving needs and requirements.
	Ensuring the system remains relevant and effective for various contexts and user groups.

2 What does this book provide?

This guidebook serves as step-by-step plan for making a low-cost digital monitoring system for an organisation, farmer institution, or project. This digital monitoring system brings all the benefits of digital monitoring and enable data driven decision making at the organisation level.

This guide explains about the following concepts:

- *What is a digital monitoring system?*
- *How the digital monitoring system works?*
- *How can an organisation setup an own digital monitoring system?*
- *Why should an organisation go with digital monitoring?*

3 Background

Overview of SAFAL

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implements the Indo-German Development Cooperation Project “Food Security through Integrated Aquaculture” (EIAA) in cooperation with the Ministry of Fisheries, Animal Husbandry and Dairying (MoFAHD), Government of India. The project aims to increase the production of fish from sustainable aquaculture along with the associated increase in income and demand for labour. The political and institutional framework conditions for the implementation of sustainable and resource-saving aquaculture shall be improved while complementing various Indian government schemes, especially the Pradhan Mantri Matsya Sampada Yojana (PMMSY).

EIAA is part of the Global Programme on Sustainable Fisheries and Aquaculture (GP Fish) under the Special Initiative "Transformation of Agricultural and Food Systems” by BMZ. The project is locally known as “Sustainable Aquaculture for Food and Livelihood”, hereafter referred to as SAFAL.

The project promotes the availability and access to fish as a nutrient-rich food, contributing to Sustainable Development Goal (SDG) 2 (Zero Hunger) as well as to SDG 1 (No Poverty) through productivity enhancement activities, improved business skills and promotion of income generating activities for small-scale fish producers, FPOs, FPCs and PGs, multipliers and policymakers.

Phase I (December 2021 to May 2022): Focuses on groundwork, planning, and setting the stage for implementation.

Phase II (September 2022 to October 2024): Emphasizes actionable implementation, expansion, and scaling up of initiatives.

SAFAL collaborates closely with local government institutions, including the Departments of Fisheries in Odisha and Assam and the Assam State Rural Livelihood Mission (ASRLM) to facilitate technical knowledge exchange, capacity building, and policy advisory support. By partnering with local institutions, SAFAL aims to enhance the effectiveness and sustainability of its interventions, ultimately fostering inclusive growth and development in the aquaculture sector.

4 What is Digital Monitoring?

Digital monitoring means to understand the status and progress of a certain activity or intervention with the help of digital tools. Digital monitoring is a critical tool used across various sectors to effectively manage operations at all levels. It utilizes digital tools to collect, process, analyse, and visualize data collected from the field. This data provides valuable insights, allowing for a deeper comprehension of the status and progress of projects and interventions. By monitoring measurable parameters, digital monitoring empowers better planning, enables dynamic adjustments, and ultimately ensures the achievement of objectives.

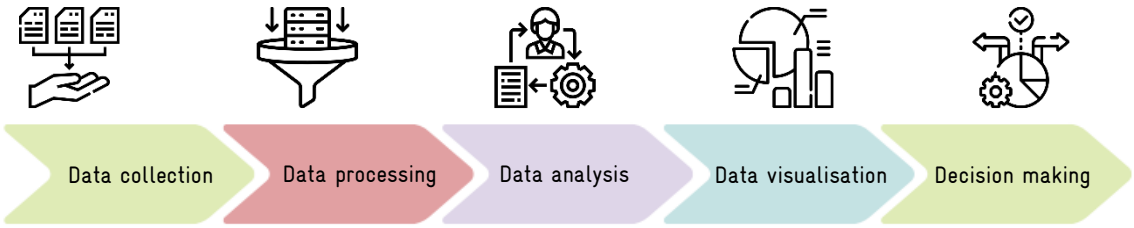


Figure 2: Digital Monitoring Process

5 Benefits of Digital Monitoring

Benefits of Digital Monitoring

Data-Driven Decision making: Replace guesswork with concrete data to analyse trends, identify areas for improvement, and support in making strategic choices and dynamic decisions for the intervention, activity, or project.

Real-Time Insights: Gain immediate visibility into key metrics for proactive problem-solving and swift adjustments.

Optimized Resource Allocation: Streamline resource allocation by identifying areas of under/over utilization. Ensuring the vital resources and budget are directed towards their most impactful uses.

Fostering Transparency & Accountability: Create a culture of trust with clear data visibility, promoting collaboration and a shared sense of responsibility.

Critical Information for Development: Identify strengths and weaknesses to develop strategic plans for growth and implement data-driven initiatives.

Indirect Benefits: Improved communication/collaboration among stakeholders, enhanced transparency/accountability within the sector, increased access to financing/insurance based on data.

Digital Transformation: Empowers stakeholders with new technologies and digital literacy, contributes to industry modernisation, lays the foundation for advanced technologies.

Business Development: Enables data-driven decisions for improved efficiency and profitability, facilitates market access/traceability.

Figure 3: Benefits of Digital monitoring system.

6 Digital monitoring system and stakeholders

The digital monitoring system provides curated benefits to the stakeholders involved in the intervention. A social development project has the following set of stakeholders at different levels.

Figure 4: Stakeholder Ecosystem for Digital Monitoring

The target stakeholders, from whom the activities of intervention are developed, and impact of intervention is measured.

The Stakeholder organisations/ institutions are formed by the target stakeholders coming together and forming group with common interests. These organisations facilitate better approachability of any intervention, program, or project to the target stakeholders.

The NGOs and CSOs are the organisations which work for facilitating the development of fore mentioned target stakeholders through the project/program and are mainly the supporting partners for any government, funding agency, implementation agency.

The Government, funding agencies, implementing agencies are the organisations which aim for the development of target stakeholders through a project/ program.

6.1 First level stakeholder (Farmers/Labourers/Livelihood)

Figure 5: Benefits of First level stake holders.

6.2 Farmer Institutions

Figure 6: Benefits of Farmer Institutions

6.3 Supporting agency (NGO/CSO)

Figure 7: Benefits of Supporting Agency (NGO/CSO)

6.4 Government Agency / Funding or financing agencies

Figure 8: Benefits of government agency / funding or financing agency.

7 Ideation

7.1 Situation Analysis

This step is crucial for understanding the status of a particular FI monitoring techniques.

The following steps will help in comprehending:

- *The existing understanding of monitoring within the farmer institution.*
- *The current level of digital literacy.*
- *The need for a digital monitoring system and its potential usage if installed.*

1 **Existing monitoring systems in place.** In these discussions, we inquire about the current systems or mechanisms the farmer institution uses to understand its operations and interventions. This can be achieved by asking executive members or farmers how they keep track of activities at the field level. Their responses help identify all existing monitoring systems and formulating the next steps.

2 **Methods for data collection from the field.** Once existing systems are identified, we ask how data is collected. This data could be anything from photographs to status reports on farmers. Understanding the current data collection methods enables a smoother transition to a digital monitoring system.

3 **Challenges related to accessing and sharing information with stakeholders.** Identifying the basic challenges faced by farmer institutions in running their monitoring systems helps us design a system that addresses these issues. Listing these challenges and requesting potential solutions from involved individuals provides valuable insights for planning and strategizing.

4 **Methods used to disseminate information to stakeholders.** After understanding the data collection process and its challenges, we also need to understand how information is disseminated to stakeholders. This knowledge can help in creating awareness about our system.

5 **Steps/processes implemented for easier information access.** Reviewing the information dissemination processes implemented by farmer institutions or support organisations helps create opportunities for potential system awareness.

6 **Mandatory records by FI.** Farmer institutions must maintain a set of mandatory records. Identifying additional specific records that are maintained can help in motivating the institution to collect relevant data and information.

7 **Feedback on adopting.** Understanding the experiences and opinions of farmers and farmer institutions on integrating digital approaches provides helpful insights for implementing a digital monitoring system.

7.2 Digital Capabilities of a FI

1 **Assessing the digital literacy levels of farmers and executive members.** As farmers and FI members are key stakeholders in the successful implementation of this system, it is necessary to understand their digital literacy levels. This includes evaluating their access to smartphones, internet, and their ability to input data digitally and operate a computer.

2 **Evaluating the adaptability of farmers to a digital method.** Conduct a simple study to gauge the willingness of farmers to adopt a digital system. Assess their comfort with providing information, the frequency of information updates, and other factors that contribute to the adoption of digital methods.

3 **Identifying present digital resources available with the FI.** Since the system relies on digital resources such as smartphones and computers, it is important to understand the availability of these resources and the personnel capable of operating them.

4 **Upskilling staff and key personnel on digital methods.** As the FI plays a major role in both implementing and utilizing the received information, it is crucial to develop or upskill personnel with relevant technical skills for optimised use of the system. Understanding the adaptability of these personnel is vital.

5 **Adoption and effectiveness of training on digital methods.** People often prefer conventional approaches, so it may take time for them to adopt new methods. It is essential to discuss with farmers and other stakeholders the execution of the system and provide training to the involved personnel.

7.3 Reviewing Existing Systems:

Reviewing Existing Systems:

Assess Record-Keeping Mechanism: Determine if farmers and FI members have an existing method for record-keeping.

Identify Necessary Information: Pinpoint crucial information from existing records that the FI requires for its operations.

Evaluate Usage of Collected Information: Understand how the FI utilises the collected data in its daily activities and decision-making processes.

Determine Benefits: Assess the advantages that both the FI and farmers gain from the current information, such as improved efficiency or productivity.

Identify Additional Information Needs: Recognise what additional data is needed beyond the existing records to fill gaps and provide comprehensive insights.

Understand Additional Information's Impact: Evaluate how this extra information can further support both the farmers and the FI, enhancing their operations and outcomes.

8 Formulation

8.1 Identifying Parameters

Prepare Necessary Information List: Compile a list of essential information for the management and business operations of the FI.

List Required Parameters: Identify parameters needed to obtain the necessary information.

Discuss Parameter Selection: Engage with FI executives, farmers, and other involved personnel to select relevant parameters.

Categorize Parameters: Group parameters into respective categories based on specific qualities and relevancy.

8.2 Preparing a Questionnaire

Identify Immediate Needs: Determine valid sources based on farmers' personal record-keeping mechanisms.

Validate Information Sources: Ensure the quality of information from available sources.

Create a Question List: Develop questions to capture data for obtaining the required parameters.

Collect Stakeholder Input: Gather inputs from farmers, FI executives, and other stakeholders on terminology, language, and phrasing of questions.

Validate Questions: Ensure the necessity of each question, filter questions based on necessity and validate the data collection process.

Discuss with External Stakeholders: Engage with NGOs, CSOs, implementing agencies, government departments, funding agencies, and other external stakeholders to identify required parameters.

8.3 Review of Questionnaire

Review with Stakeholders: Discuss with FI executives, farmers, and other involved personnel to review the questionnaire.

Identify Immediate Needs: Determine questions that address the immediate needs of the FI for accurate information collection.

Determine Frequency: Establish how often stakeholders can provide information.

Check Data Validations: Verify data validations, calculations, cross-checks, and dependencies of relevant information.

Review Question Logic: Assess the logic of questions, provided options, and custom information (units of measurement, regional information).

8.4 Utilization of Data

Discuss Data Usage: Engage with FI executives, farmers, and other involved personnel to understand how data/information is used after collection.

Interpretation of Information: Determine how the information is interpreted.

Data Security: FI executives secure the personal information of fish farmers.

Engage with Relevant Personnel: Initiate discussions to understand the needs and utilization of data/information by:

- CSOs and NGOs involved with the FI.
- Supporting government departments
- Implementing and supporting agencies

9 Execution

The structured table format provided below gives an overview of the key steps which are required for setting up the digital monitoring system. The support articles from Internet guide the interested personnel with step-by-step approach.

Key steps for setting up			Supporting articles from Internet
Setting up Data collection	Setting up the Account (Website)	Create an account, verify details, and complete other nominal requirements.	Visit www.eu.kobotoolbox.org
		Use the "Create Form" option and explore provided options for creating a questionnaire. Explore advanced form-making for more complex options.	Click here: Creating Forms – KoboToolbox documentation Or copy this: https://support.kobotoolbox.org/creating-forms.html
		Ensure proper logic, visibility of questions, options, and other relevant information as per the configuration.	Click here: Using the Question Options – KoboToolbox documentation Or copy this: https://support.kobotoolbox.org/question_options.html
	Setting up the Data Collection (Application)	Follow the app setup flowchart provided.	Setting up of Kobo Collect (Android Application)
		Test the availability of the form and provide data inputs.	Click here: Data Collection on KoboCollect App (Latest Version) – KoboToolbox documentation Or copy this: https://support.kobotoolbox.org/kobocollect_on_android_latest.html
		Create an account access QR Code.	
	Data Collection	Test data collection processes.	
		Provide demo data for testing.	
Setting up	Preparation	Prepare an Excel file for data analysis.	Setting up Analysis in Excel
		Import data from the Kobo server to MS Excel.	KOBO COLLECT APP

	Key steps for setting up		Supporting articles from Internet

Analysis of Data			
			KoBo Collect
			Kobo Collect: Mobile Data Collection
			• **Free offline data collection in android**
			  ◦ Capture data in remote areas without internet.
			  ◦ Easy-to-use forms for efficient field work.
			  ◦ Analyse & export data for seamless reporting.
			• **Streamline Fieldwork on android.**
			  ◦ make data collection forms effortlessly.
			  ◦ Centralised management.
			Kobo Collect is a mobile app that turns your phone or tablet into a data collection tool. It lets you create surveys (questionnaires) for any purpose. The information needs to be collected is framed as questions, and the questions are formulated as forms, the Kobo Toolbox (website) lets user build the survey on your computer, download it to your device, and then interview people offline. Even without internet access, you can fill out the surveys and upload the data later. This gives you a central place to see all your collected information.

9.1.1 Setting up of Kobo Collect (Android Application)

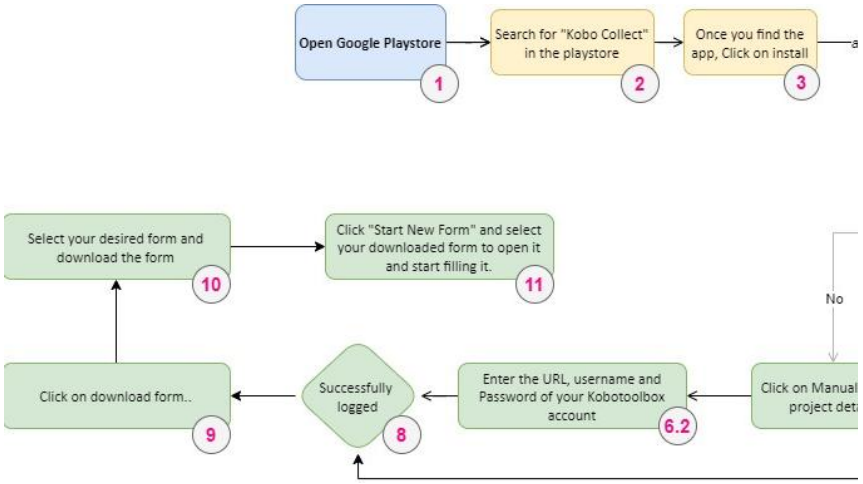
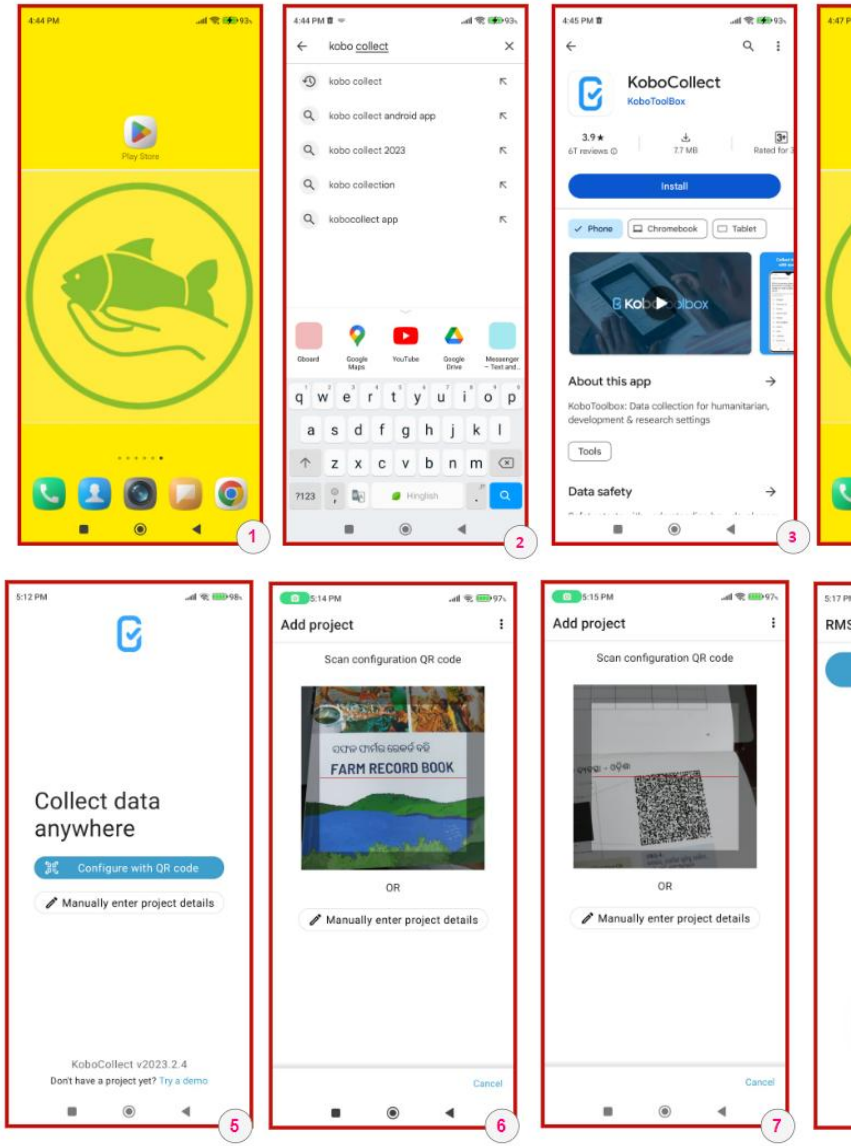


Figure 18: KoBo Collect Setup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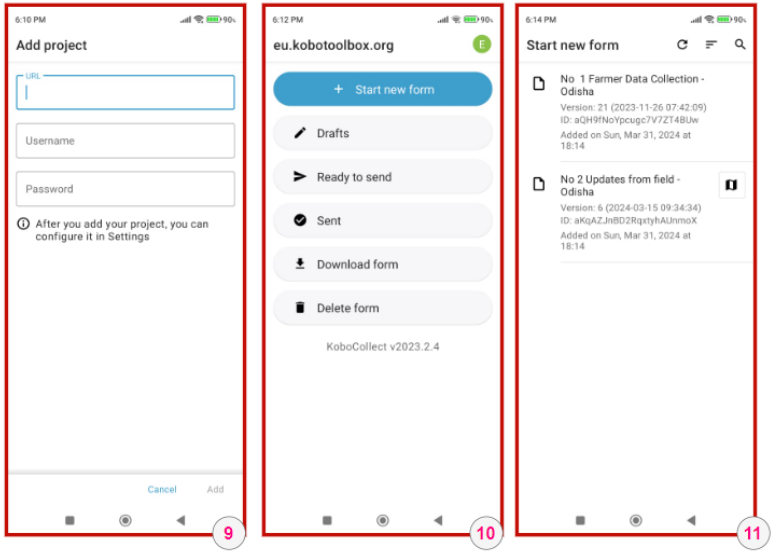
KoboToolBox
Install
Phone
Chromebook
Tablet
About this app
KoboToolbox: Data collection for humanitarian, development & research settings
Tools
Data safety
3
Collect data anywhere
Configure with QR code
Manually enter project details
KoboCollect v2023.2.4
Don't have a project yet? Try a demo
5
Add project
Scan configuration QR code
FARM RECORD BOOK
OR
Manually enter project details
Cancel
6
Add project
Scan configuration QR code
OR
Manually enter project details
Cancel
7

Key steps for setting up	Supporting articles from Internet
	 *Figure 19: how to download KoBo Collect* Now you're ready to start using Kobo collect app to collect data and streamline your real time monitoring and evaluation processes. Data collection through Questionnaire.

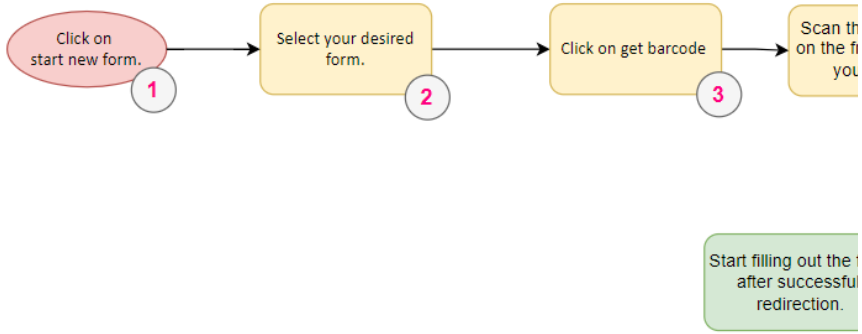


Figure 20: Data Collection via Questionnaire

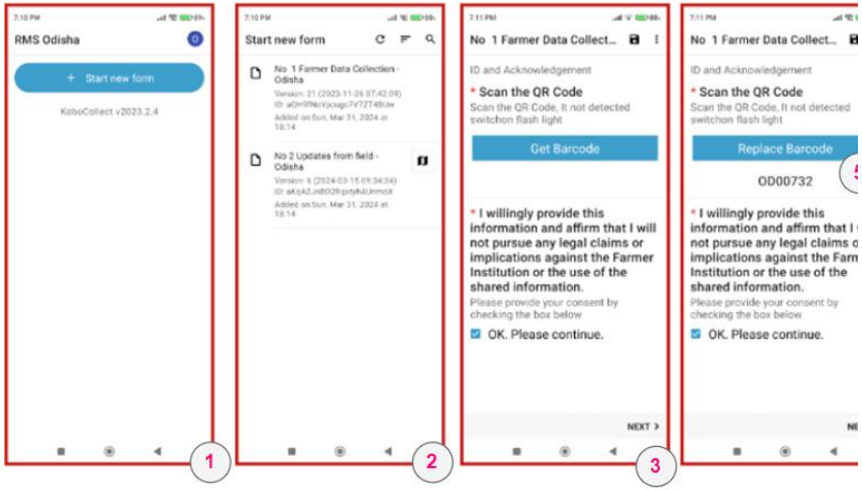


Figure 21: Scanning the QR code to answer the Questionnaire.

Key steps for setting up			Supporting articles from Internet
			Accessing the collected data Click here: Connecting KoboToolbox to Microsoft Excel – KoboToolbox documentation Or copy this: https://support.kobotoolbox.org/pulling_data_into_excelquery.html
	Data Processing	Develop queries for data processing.	Click here: Master Excel Power Query: A Step-by-Step Tutorial [2024] | Simplilearn Or copy this: https://www.simplilearn.com/tutorials/excel-tutorial/power-query-in-excel
		Create a data model.	Click here: Creating a Data Model in Excel GeeksforGeeks https://www.geeksforgeeks.org/creating-a-data-model-in-excel/
	Analysis and Visualization	Create pivot tables for analysis.	Click here: How to Create a Pivot Table in Excel: A Step-by-Step Guide GeeksforGeeks Or copy this: https://www.geeksforgeeks.org/pivot-tables-in-excel/?ref=ml_lbp
		Visualize data into relevant concepts and insights	
Prototype	Testing	Conducting prototype testing with a sample of similar stakeholders to identify challenges and gather feedback.	Testing among the various personnel with varying digital literacy
		Organizing workshops and training sessions to demonstrate the prototype and gather real-time inputs.	Demonstrate the system for feedback and enhancement
	Updating	Analysing feedback from prototype testing and identifying areas of improvement.	
		Updating the system based on feedback to address identified challenges.	

Key steps for setting up		Supporting articles from Internet
		Validating the updated system with a smaller group of stakeholders to ensure improvements are effective.
		Incorporating Findings and Learnings and repeating.

10 Circulation

10.1 Communication

To effectively explain the Farmer Institution Real-Time Monitoring System (FIRMS) system, informative, educational, and communication (IEC) materials need to be designed. These materials should be comprehensive and clear to ensure understanding by all stakeholders. Additionally, translating these materials into local languages is essential for better comprehension and accessibility.

10.2 Dissemination Process

A well-planned dissemination process is crucial for ensuring the wide and effective reach of the system. Coordination with Community Resource Persons (CRPs) will facilitate the distribution of materials and the training of farmers. Establishing a support system for troubleshooting and assistance during the initial rollout will help address any immediate concerns. Communication channels should be set up to allow for continuous feedback and support. Regular follow-ups are necessary to ensure the system is being used effectively and to address any emerging issues.

10.3 Implementation and Rollout

The system should be gradually rolled out to all targeted farmer institutions. Close monitoring of the initial implementation phase is essential to promptly address any issues that arise. Collecting ongoing feedback will help to continuously improve the system and the support provided to users.

11 Education

Capacity building of Ground level Stakeholders: The ground level stakeholders such as Farmers, Farmer Institution executives and other relevant stakeholders involved with the FI are to be provided with skillset in data collection and troubleshooting any possible errors during data collection.

- Managing the entire FIRMS system.
- Performing data analysis.
- Interpreting information derived from analysis.

Identifying Key Areas/Components: The key areas in the data collection mechanism, and essential components in the process are identified and knowledge material is developed on focus areas:

- Training on data collection methods.
- Instruction on system maintenance and troubleshooting.
- Guidance on making minor edits and changes within the system.

Advanced Training for Technical Personnel:

- Training on the implementation of the system.
- Instruction on adding, removing, or making major changes to the system.
- Educating on the criticalities behind data analysis.
- Ensuring sustainability of the system.

12 Extension

As the digital monitoring system becomes embedded in organisational processes, long-term sustainability relies on a proactive approach to addressing technical challenges, maintaining system performance, and adapting to evolving user needs.

12.1 Addressing Technical Challenges

Implementing a digital monitoring system at the grassroots level often brings unforeseen technical issues—from data syncing errors to user interface difficulties. It is essential to identify potential bottlenecks early through regular engagement with end-users such as Community Resource Persons (CRPs) and FI staff. A structured troubleshooting protocol should be established, including clear escalation pathways and dedicated personnel or service providers for resolving issues. Ongoing technical support, whether through remote assistance or in-person visits, helps maintain user trust and system functionality.

12.2 Maintenance and Updates

Regular system maintenance is critical for ensuring stable performance and data security. This includes routine backups, software version checks, and bug fixes. Updates should be rolled out based on both ground-level feedback and broader technological advancements. Importantly, new features must be integrated in a way that ensures continuity—avoiding disruption to users already familiar with the existing workflow. Clear communication, user manuals, and training on updates play a vital role in this transition.

12.3 Adaptability

One of the system's core strengths lies in its customizability. However, maintaining relevance requires ongoing monitoring of system performance and responsiveness to user feedback. Over time, organisations may need to revise data entry forms, incorporate new parameters, or simplify interfaces. Ensuring the system remains user-friendly, especially for digitally less-literate users, is essential for sustained engagement. The system should also be adaptable across sectors and geographies, allowing for broader application in agriculture, allied sectors, and beyond.

By embedding mechanisms for technical support, continuous improvement, and adaptability, the system can evolve into a long-term, scalable solution that supports efficient data-driven decision-making across multiple levels of rural development initiatives.

13 Case Study: Farmer Institution Real-Time Monitoring System

13.1 Genesis

The genesis of FIRMS traces back to February 2023, during a workshop organised by GIZ SAFAL on Monitoring and Evaluation with partner supporting agencies in Guwahati. The representatives of FIs in the aquaculture sector have asked for the advisory support in having a dashboard or information hub to know what is happening in their institution.

Followed by the workshop, several individual discussions with stakeholders of Farmer Institutions (BoDs, Executive members, CEOs, staff, CRPs etc.) it was concluded to come with a mechanism to get information from individuals Farm Record Books. This will help the FIs in effectively managing their business, operations, and members.

The above approach is provided in a strategical approach as below.

13.2 Catering the stakeholder wise needs

In the ideation and formulation of FIRMS, the vision extended beyond individual farmers and FPO, FPCs and PGs to encompass the entire aquaculture ecosystem, recognising the pivotal role of supporting agency, funding or financing agency, and government organisations.

- **For Farmers:**
    - Empowerment through access to critical data and insights.
    - Informed decision-making for improved resource management.
    - Better planning, risk mitigation, and increased profitability.
- **For FPO, FPC and PGs:**
    - Equipped with tools for data-driven decision-making.
    - Enhanced capacity to manage resources and access market opportunities.
    - Strengthened bargaining power and enhanced value chain participation.
- **For supporting agency:**
    - Invaluable access to real-time data and insights for tailored support programs.
    - Facilitated targeted interventions and impactful capacity-building initiatives.
- **For Funding or Financing Agency:**
    - Enhanced operational efficiency through streamlined data processes.
    - Evidence-based decision-making for improved program monitoring and evaluation.
- **For Government Organisations:**
    - Access to comprehensive data for evidence-based policy formulation.
    - Empowered resource allocation and program planning for impactful interventions.

FIRMS serves as a catalyst for positive changes, empowering stakeholders across the aquaculture sector with real-time data and insights.

13.3 Key Components of FIRMS

FIRMS, the Farmer Institution Real-time Monitoring System, is a combined system works by employs digital tools like Kobo Toolbox, Microsoft excel and manual tools like Farm Record Books. These tools facilitate real-time data collection and analysis.

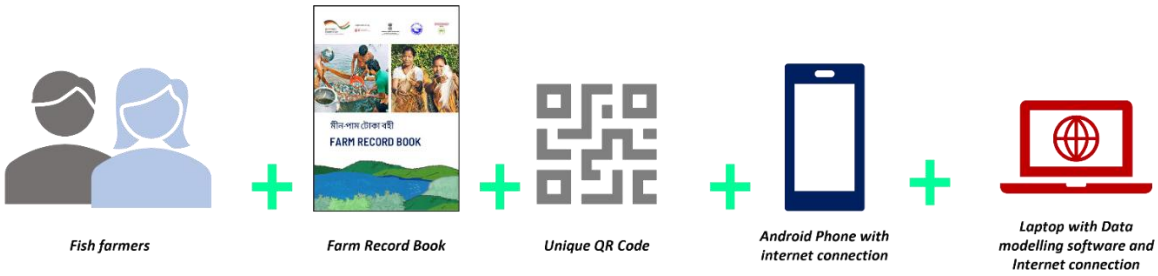


Figure 9: Key components of FIRMS.

13.3.1 Primary Stakeholders Fish Farmers

Figure 10: Fish famers as the first level stakeholders.

This project addressed the needs of the aquaculture industry, specifically targeting fish farmers that are associated with established organisations FIs and Cooperatives. A digital monitoring system was formally developed with a focus on these fish farmers and their respective institutions. The underlying principles of this system can be readily adapted and implemented for other sectors, encompassing a wider range of stakeholders engaged in diverse livelihoods with distinct objectives.

13.3.2 Farm Record Book

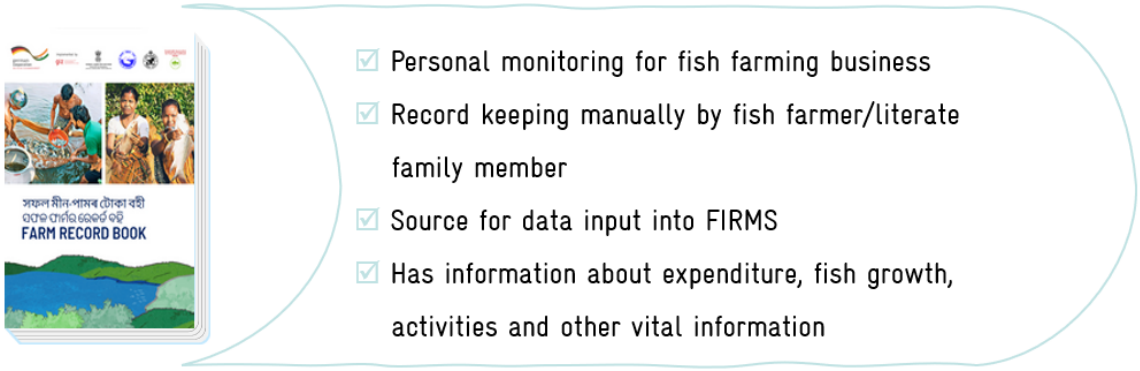


Figure 11: Farm Record Book: A book for improved management

The farm record book empowers farmers by letting them track finances, daily tasks, fish growth, and harvests. This data is key to managing their business effectively. In the digital monitoring system, this book acts as the data source.

Figure 12: Farmer recording data in Farm record book and then digitalising it in the kobo collect app.

The farmer will manually record data using a pen in the farm record book, with the help of a smartphone either the farmer or any technologically literate person can update relevant information using the Kobo collect app.

13.3.3 Unique QR code

QR code is provided to every individual farmer. This QR code is specific to each farmer and acts as a unique identification number for referring that farmer in future. As per the design of

data collection system info the user will be able to provide their data or information once they have verified their identity by scanning this QR code using their smartphones.

In the current scenario, as the farmers of the implementation area under SAFAL were receiving farm record books, QR code was pasted on each of the farm record book.

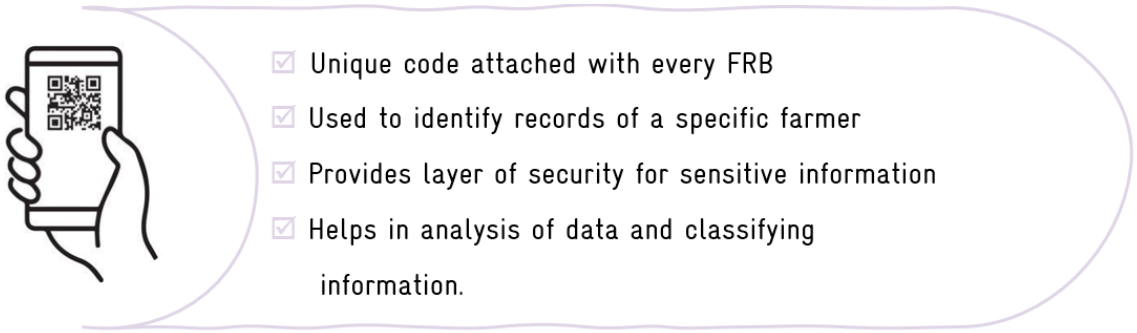


Figure 13: The unique QR code and its uses.

13.3.4 Android Phone

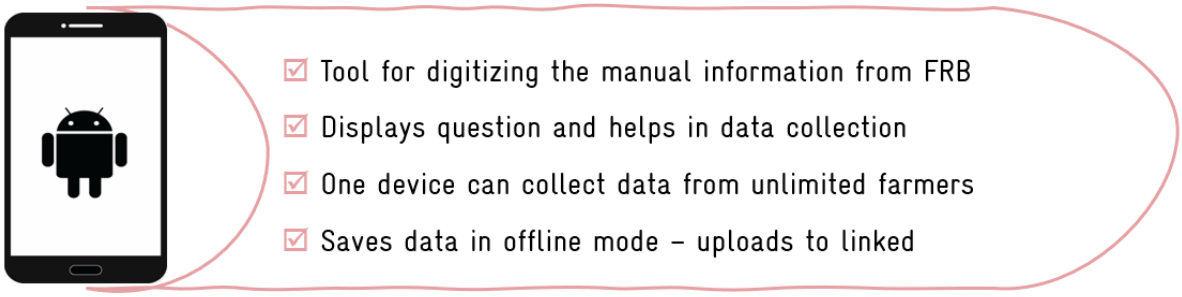


Figure 14: Android phone with internet connection.

An Android phone is used for data collection, specifically digitising the data from the farmer's manual farm record book. Given the widespread accessibility of smartphones and internet connectivity in India, this approach has been successful. A freely available Android app, Kobo Collect, is downloaded from the Play Store, and installed on the smartphone. This app serves as a medium for collecting necessary data from farmers. Being free of charge and offering options for customisation and offline data collection, Kobo Collect reduces the overall cost of the system. The offline data collection feature is particularly noteworthy as it allows data to be collected offline and transferred to the server once connected to the Internet. This capability enables data collection in remote locations where connectivity is a challenge. Kobo Collect is compatible solely with Android devices and is not available on iOS platforms. It functions with Android versions 4.1 and above, ensuring compatibility with a wide range of Android smartphones.

13.3.5 Computer + Internet

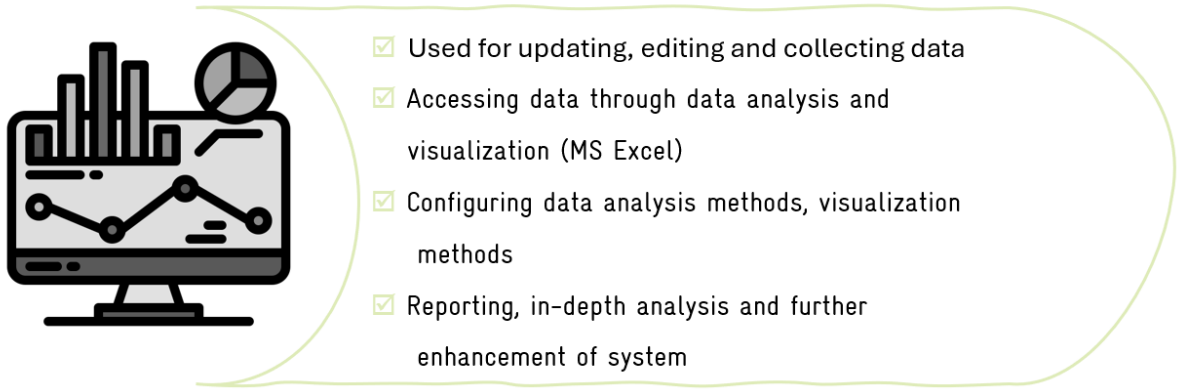


Figure 15: Computer with internet connection.

The last component of this system is a computer and internet connection. Previous components help in collection of data while the computer helps in analysing the data. There are various tools available for analysis of data the tools are both free and have very varying price ranges. One of such common tools which is available is Microsoft Excel. The various features which are part of Microsoft Excel from 2016 version providers with an opportunity to import the data directly from the server perform query operations and provide us with results our desired outputs as pivot tables and pivot charts.

Excel is not only the tool there are many other free alternatives such as Metabase, google data studio, Apache superset etc. The choice of an analytical software is completely depending on the personal who is working with.

13.4 Benefits and limitations of FIRMS:

The following table represents the benefits, description, and the limitations of FIRMS:

Benefit	Description	Limitations of the benefit
Data-Driven Decision making	Replace guesswork with concrete data to analyse trends, identify areas for improvement, and support in making strategic choices.	Relies on data quality and user input.
		The decision-making capability is dependent on conditions specific to person, region, produce and other factors.
Real-Time Insights	Gain immediate visibility into key metrics for proactive problem-solving and swift adjustments.	The source (farmer's mobile) and end user (FI personnel) must be connected to internet for real-time update.
		15-20 minutes of delay in data can be observed.
Optimised Resource Allocation	Streamline resource allocation by identifying areas of under/over	Captures the data as per the limitations in questionnaire.

Benefit	Description	Limitations of the benefit
	utilisation. Ensure your team and budget are directed towards their most impactful uses.	May require historical data collection for meaningful analysis and outputs.
Fostering Transparency & Accountability	Create a culture of trust with clear data visibility, promoting collaboration and a shared sense of responsibility.	Requires training and communication to avoid misinterpretations.
		Eliminates privacy concerns.
Offline Data Collection	Capture and store data even without internet connectivity. Synchronise data later when a connection is available.	Data can be collected offline; it will be transferred to the server when connected to internet.
Indirect Benefits	Improved communication/collaboration among stakeholders, enhanced transparency/accountability within the FI, increased access to financing/insurance based on data.	Depends on the questionnaire, reciprocation to information and other vivid factors.
Digital Transformation	Empowers fish farmers with new technologies and digital literacy, contributes to industry modernization, lays the foundation for advanced technologies (IoT sensors, AI).	Requires phased approach and capacity building.
Business Deployment	Enables data-driven decisions for improved efficiency and profitability, facilitates market access/traceability of fish products, creates opportunities for innovation and new business models.	Digital monitoring does not guarantee business success (Success depends on various factors).
		Only large-scale operations benefit (Provides valuable insights for both small and large businesses).

13.5 Setting up the mechanism behind the system.

13.5.1 Kobo Toolbox

Figure 16: KoBo Toolbox and KoBo Collect app.

Kobo Toolbox (https://www.kobotoolbox.org/): Browser based Powerful Data Management

- **Streamlined form management**
  - Drag & Drop Design
  - Easy Data Management
  - Live Data Insights
- **Simplified Data Collection**
  - Effortless Form Creation
  - Accessible Data Collection
  - User Friendly Interface

Similar to filling out a digital form, Kobo Collect guides users through questions relevant to their Farm Record Books (FRB). The Kobo Collect app facilitates asking questions to the farmers for collecting the data which is recorded into the FRB. With a user-friendly interface and multiple language options, Kobo Collect empowers farmers to easily record and submit vital aquaculture data, even in areas with limited internet access. https://www.kobotoolbox.org/

13.5.2 Setting up Kobo Toolbox (Browser edition)

Setting up Kobo Toolbox starts with creating an account. Please follow the flowchart below for creating and accessing the account. You are required to have a working email id for verification purposes.

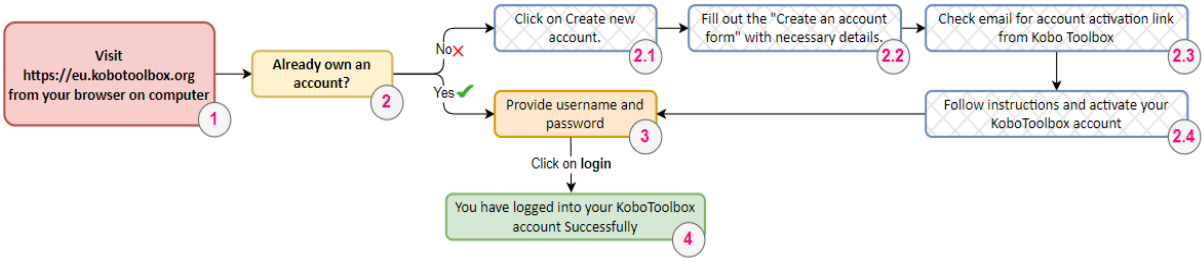
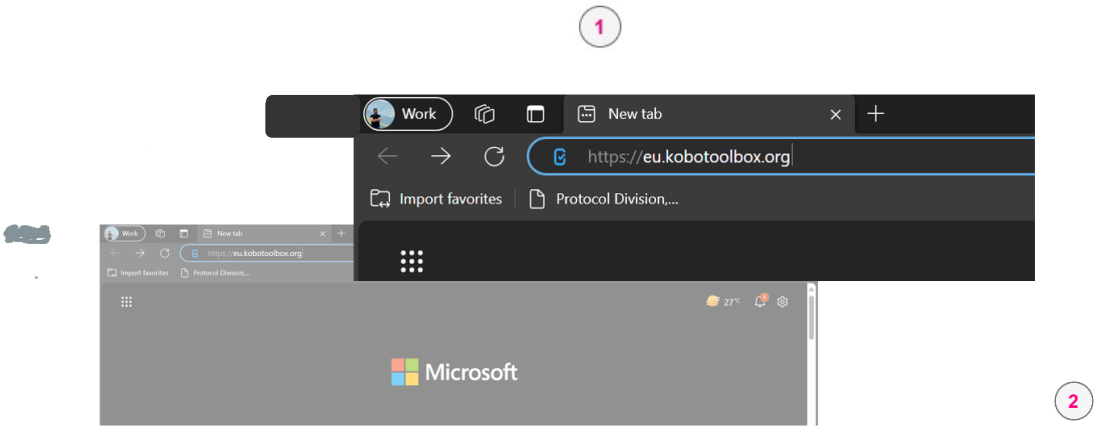


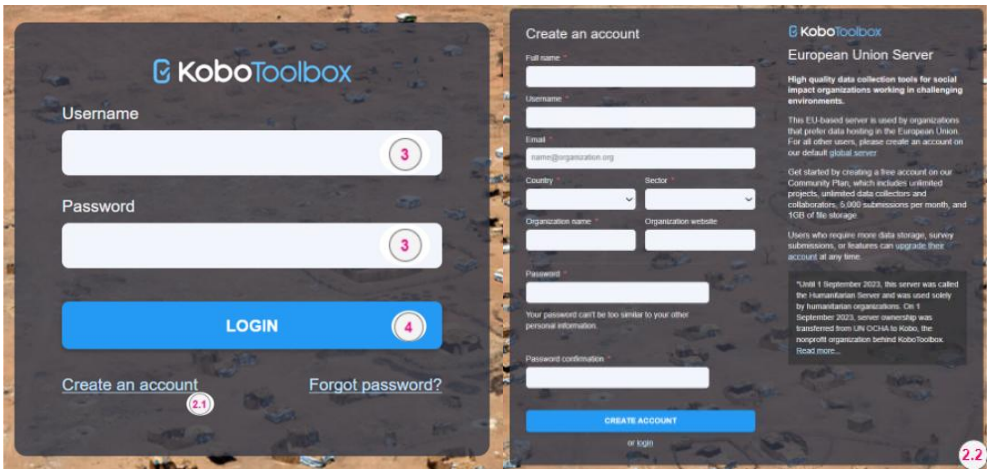
Figure 17: KoBo toolbox setup.

Step 1: Open your preferred Browser

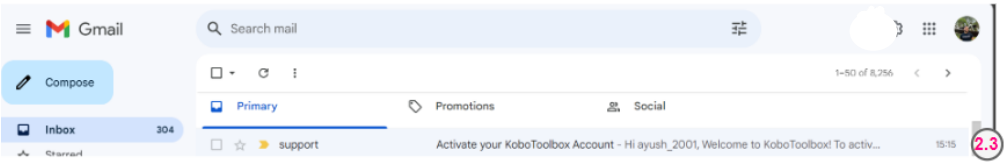
Step 2: Go to https://eu.kobotoolbox.org



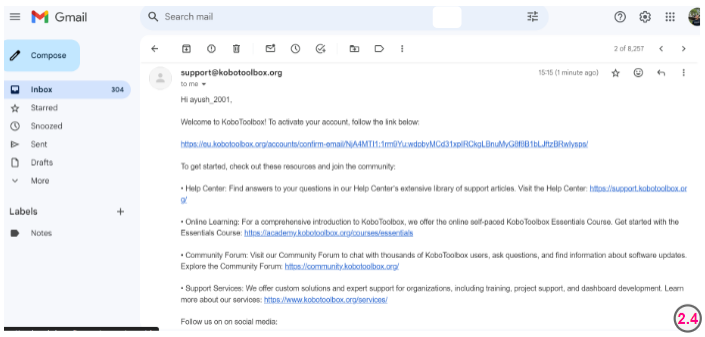
Step 3: click on create account or click on login if u already have an account by filling out your login details.



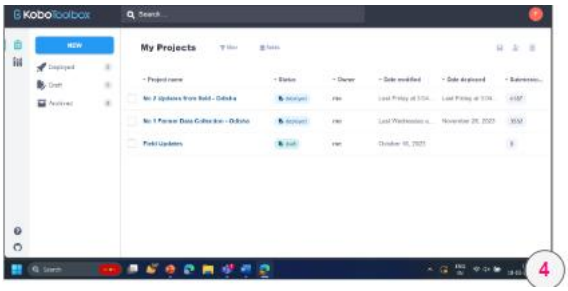
Step 4: Check your email account for the confirmation link.



Step 5: Follow the steps indicated in the email and successfully login into your account.



Step 6: you have successfully logged into your account.



13.5.3 KOBO COLLECT APP

KoBo Collect

Kobo Collect: Mobile Data Collection

- **Free offline data collection in android**
  - Capture data in remote areas without internet.
  - Easy-to-use forms for efficient field work.
  - Analyse & export data for seamless reporting.
- **Streamline Fieldwork on android.**
  - make data collection forms effortlessly.
  - Centralised management.

Kobo Collect is a mobile app that turns your phone or tablet into a data collection tool. It lets you create surveys (questionnaires) for any purpose. The information needs to be collected is framed as questions, and the questions are formulated as forms, the Kobo Toolbox (website) lets user build the survey on your computer, download it to your device, and then interview people offline. Even without internet access, you can fill out the surveys and upload the data later. This gives you a central place to see all your collected information.

13.5.4 Setting up of Kobo Collect (Android Application)

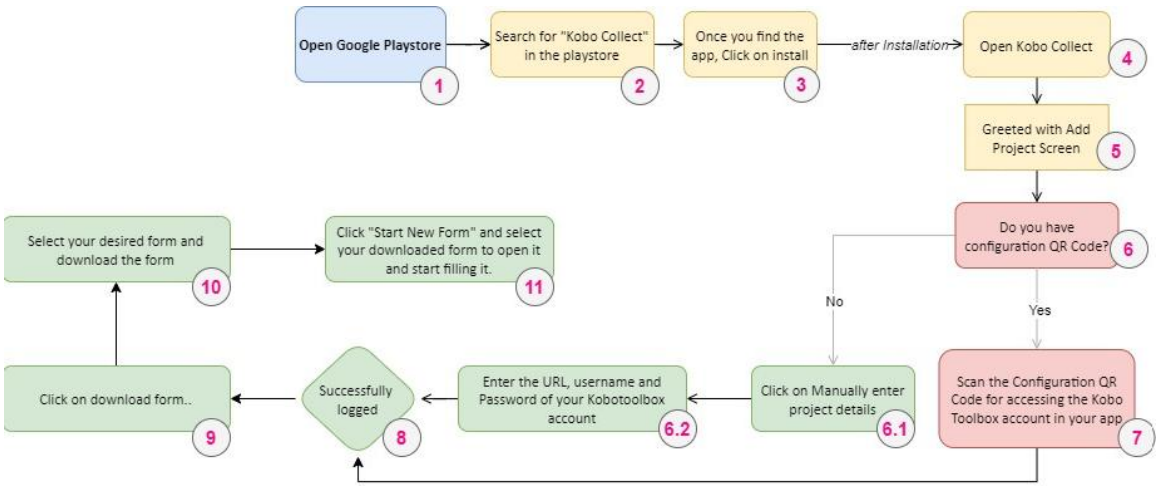
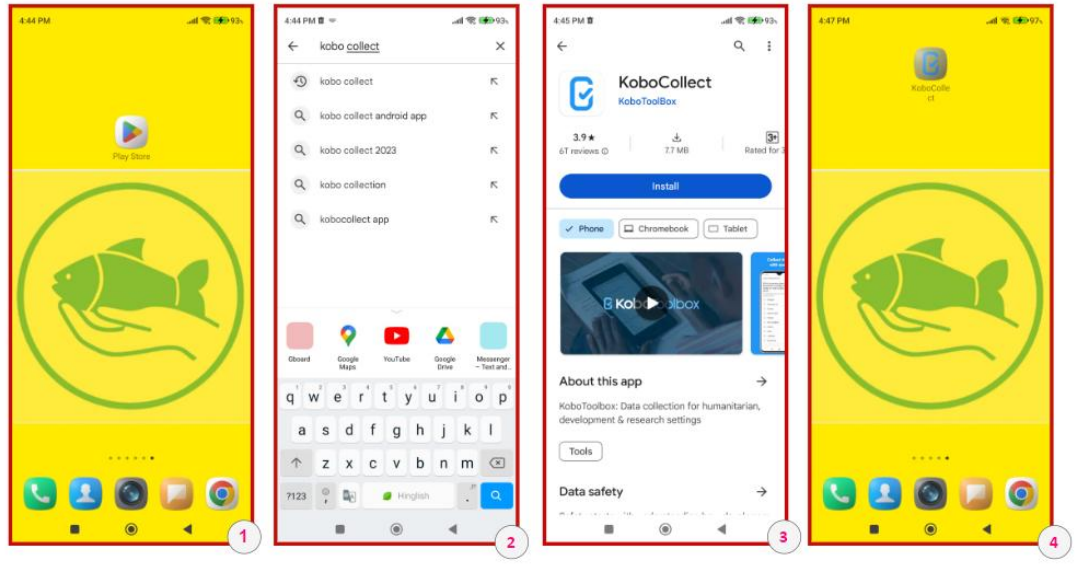


Figure 18: KoBo Collect Setup



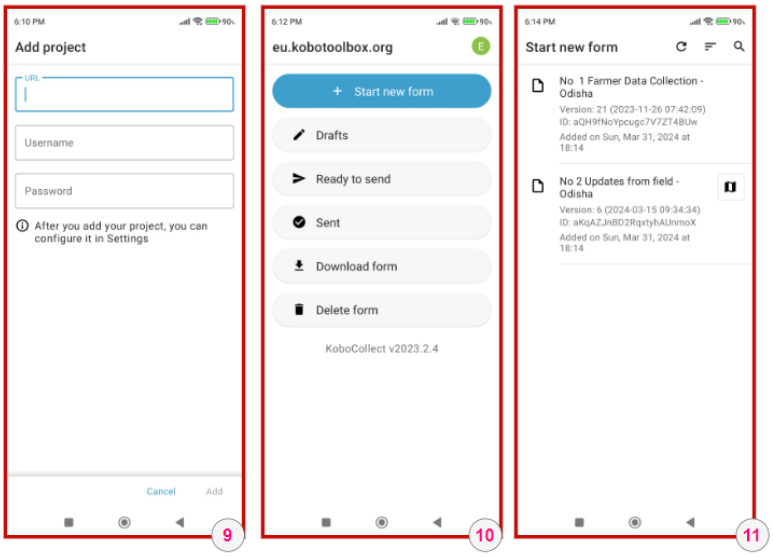


Figure 19: how to download KoBo Collect

Now you're ready to start using Kobo collect app to collect data and streamline your real time monitoring and evaluation processes. Data collection through Questionnaire.

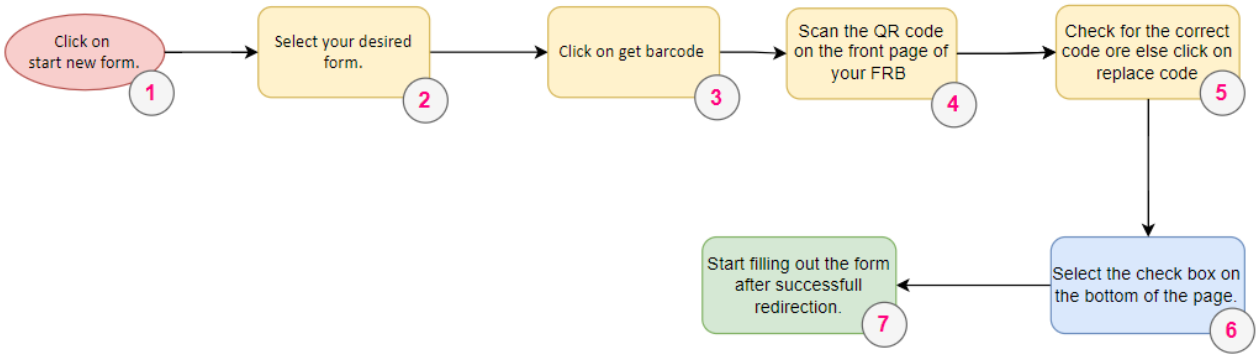


Figure 20: Data Collection via Questionnaire

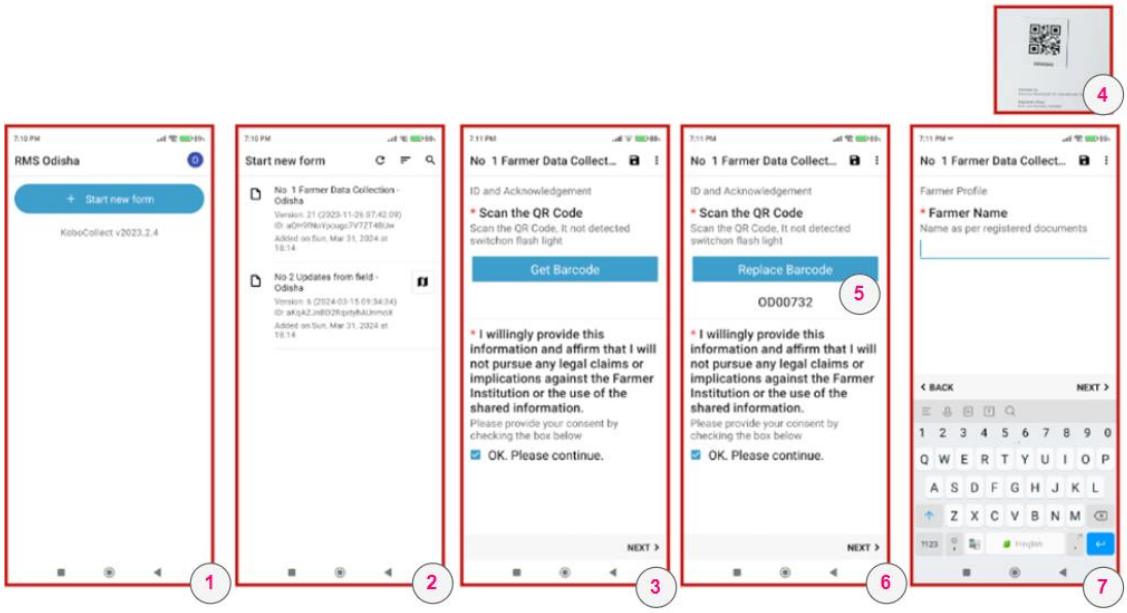


Figure 21: Scanning the QR code to answer the Questionnaire.

13.6 Accessing the collected data

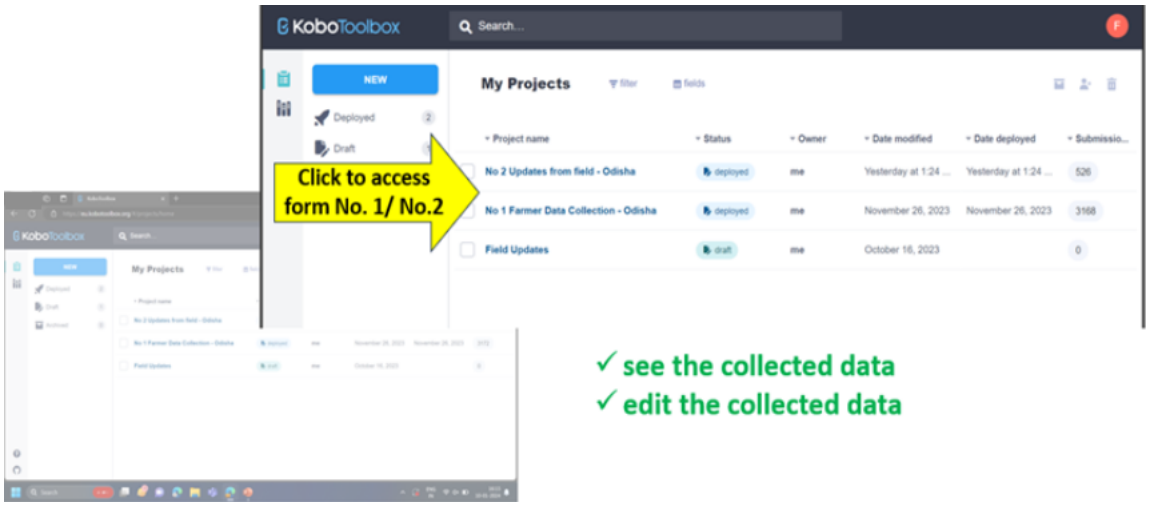
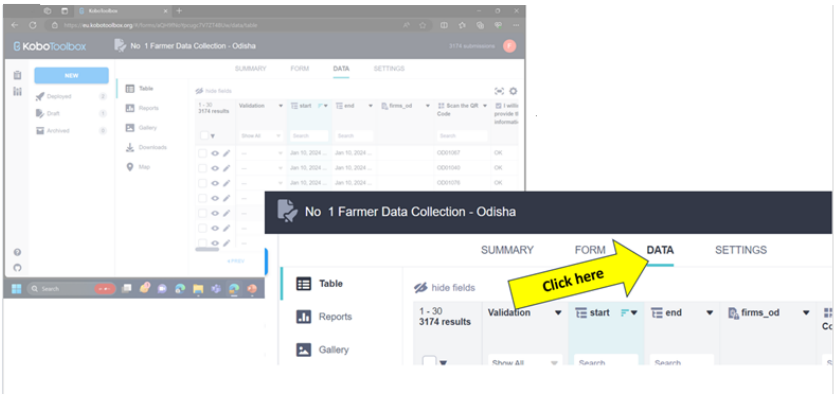


Figure 22: KoBo Toolbox dashboard

After signing in you will be redirected to the main screen from where you can have an overview of the collected data and can also edit the data.



Click on data tab and you will be redirected to all the summited data.

13.6.1 Data management

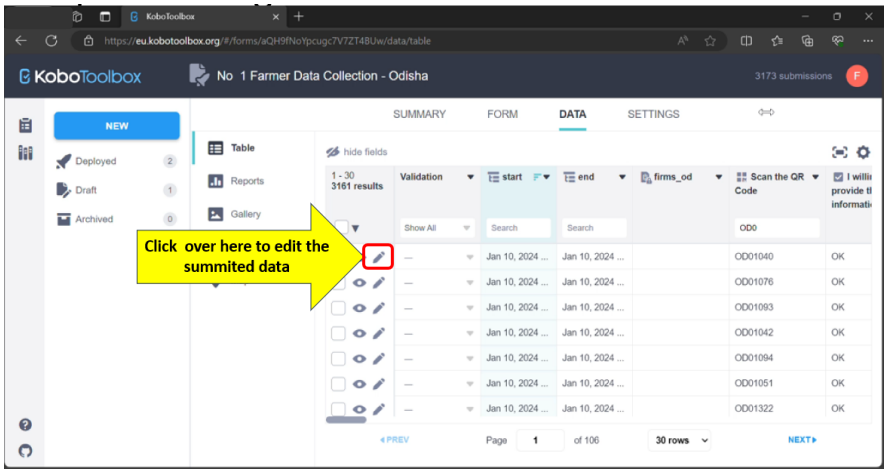


Figure 23: KoBo Toolbox data tab

Data editing, addition, and deletion in Kobo Collect are managed through the Kobo toolbox web interface. Users can access submitted forms and navigate to specific data entries needing modifications. An edit icon, represented by a pencil symbol, is prominently highlighted for easy access. Clicking on the edit icon directs users to the submitted form for adjustments or deletions.

13.6.2 Editing the data

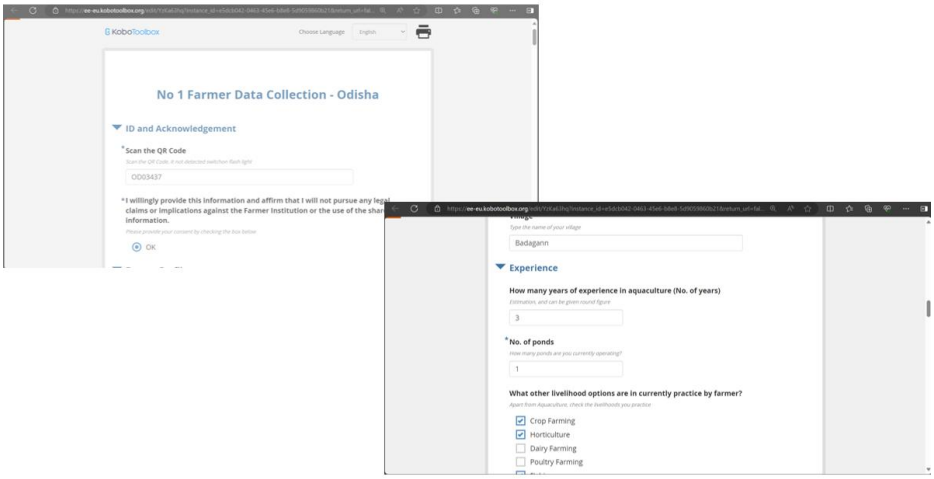


Figure 24: Questionnaire form.

Once the submitted form is open, users can seamlessly edit form entries by selecting the desired fields and making necessary changes. Additionally, the option to delete erroneous or outdated entries ensures data accuracy. This streamlined process simplifies data management, allowing users to maintain up-to-date records effortlessly.

13.7 Setting up Analysis in Excel

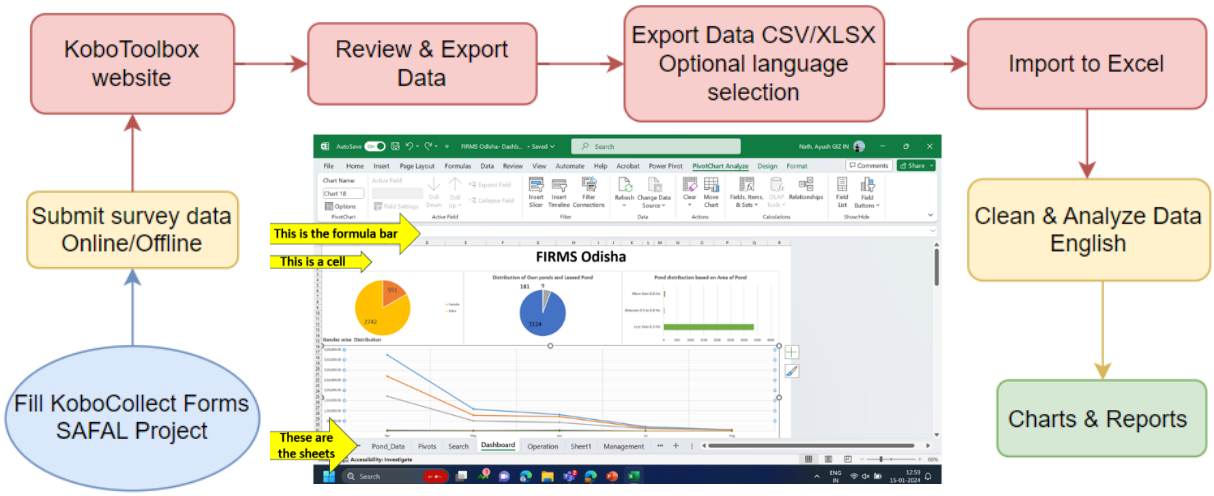


Figure 25: Excel-Based Analysis Workflow

13.8 Excel's Analytical Capabilities

Feature	Benefit
Data Analysis	Use formulas, functions, and pivot tables to summarize and understand your data. Explore relationships between variables to find deeper meaning.
Data Visualization	Transform raw data into clear and colourful charts & graphs (bar charts, line graphs, pie charts). Customize for better understanding.
Data-Driven Decisions	Use data insights to make informed choices. Identify opportunities, anticipate challenges, and optimize processes.

14 Scalability of Digital Monitoring System

All these monitoring system has three major components one being data collection, second being the data analysing and third being the effective utilization of data for decision making any other organisations which is looking for establishing such a system can either get inspiration from the current existing system and to customise it according to their needs or can use this booklet to completely build up their own system from the ground level.

Since this system is in the initial stages, it can be helpful in establishing an additional source of verification for corporate social responsibility (CSR) evidence. It also provides a deeper understanding of the status and progress of any intervention. The system can be integrated with already existing monitoring systems or Monitoring and Data systems of respective organisations and can be used as a complementary tool.

An organisation and institution or a specific agency who are looking into adopting the system can set up the system from the scratch and investigate the way possible for collecting information. FRB in this case is the main component of the system where the data is being collected hence the organisation must investigate one such document or one such in tool urban such method to prove to get accurate data as much as accurate data possible.

Once the mechanism for data collection has been identified, the next critical factor is determining who will be responsible for collecting the data. In this case, Community Resource Persons (CRPs) play a key role in gathering data from farmers, particularly those who are digitally illiterate. Farmers with higher levels of digital literacy were often able to enter their own data after receiving initial handholding support during training sessions. Similarly, targeted training should be provided to all individuals involved in data collection to ensure accuracy, consistency, and confidence in using the digital tools.

At the organisational level, this setup is beneficial as it relies on commonly available and user-friendly tools. However, if the approach is to be scaled up, a more robust software solution for managing databases will be required to optimise processes and reduce system strain. For larger-scale implementation, advanced tools such as R programming, Metabase, or Google Data Studio can be explored to ensure efficient data handling, visualization, and analysis.

This system is highly customizable and adaptable, making it suitable for implementation across various agriculture, allied, and other sectors seeking a low-cost, efficient solution for data collection and streamlined monitoring.

Due to the system's wide range of customisation options, organisations can tailor it to their specific needs while maintaining consistency across processes. Based on field-level feedback, one of the key lessons from the project experience is the importance of designing the system in a way that minimizes the effort required from those providing data inputs. The less time it takes to enter data, the more likely users are to do so regularly and accurately. Regular feedback loops—through discussions, workshops, or meetings—are also essential for identifying challenges and continuously improving the system's usability and effectiveness.

14.1 Costs and budget planning:

Setting up FIRMS requires a cost assessment. Initial investment varies based on factors like scale and customisation. Budgeting considers hardware, software, training, and future expansion. Cost mitigation strategies like open-source software can help. Ongoing costs include maintenance and user training. Comprehensive planning ensures efficient resource allocation and project sustainability.

Cost Category	Description	Total Cost / year
Fixed Costs break-up		
Laptop / computer	Acquisition of laptops/computers for data collection and analysis (Fixed cost)	₹ 1,00,000
Mobile 3-4	Purchase of 3-4 mobile devices (smartphones/tablets) for data collection (Fixed cost)	₹ 80,000
Printing IEC materials	Training materials (printing) for farmers and other stakeholders on FIRMS usage (Fixed cost)	₹ 50,000
Recurring Cost Break-up		
MS-excel	Integrating FIRMS with existing data systems (Recurring Cost)	₹ 8,000
Digital Monitoring System Expert	Salary of Digital Monitoring System Expert to manage internal FIRMS operations, maintenance, and staff training (Recurring Cost)	₹ 7,20,000
Data Collection	Ongoing maintenance of hardware, software, and data storage/security (Recurring Cost)	₹ 1,00,000
Training of enumerator	Training programs for data collectors on using FIRMS for data collection (Recurring Cost)	₹ 60,000
Total cost of implementing **FIRMS**		Total ₹ 11,18,000

14.2 Challenges and Solutions:

Implementing a new data collection system in any field, not just aquaculture, can be a complex process. It's crucial to be aware of potential challenges that might hinder successful deployment and adoption.

The following table outlines common challenges associated with implementing a new data collection system and corresponding solutions that can help mitigate them:

Challenge	Solution
Lack of Technical Expertise	Hire or train staff on the new system's functionalities, data collection protocols, and maintenance procedures. Consider outsourcing initial setup and training to experienced consultants.
Resource Constraints	Explore cost-effective solutions for software and hardware. Investigate potential grants or funding opportunities to support implementation. Consider phased implementation to spread costs over time.
Resistance to Change	Establish clear communication channels with stakeholders (e.g., staff, users) to address concerns and build trust in the new system. Highlight the benefits of the new system, such as improved efficiency and data quality. Offer training and support to ensure a smooth transition.
Offline Data Collection Needs (if applicable)	Choose a system with offline functionality or integrate with offline data collection tools. Ensure data synchronization capabilities for seamless transfer when connectivity is restored.
Data Security and Privacy	Implement robust data security measures to protect sensitive information. Clearly communicate data privacy policies to all stakeholders.

By acknowledging these challenges and implementing the proposed solutions, organisations can pave the way for a successful data collection system implementation. This will ultimately lead to improved data management and informed decision-making.

15 Concluding Remarks: Empowerment through Digital monitoring

The successful deployment of a digital monitoring system like FIRMS in aquaculture demonstrates the transformative potential of this approach. This document serves as a blueprint for organisations in any sector considering implementing a similar system to revolutionize their field.

The challenges outlined here – lack of technical expertise, resource constraints, and resistance to change – are common hurdles encountered during implementation. However,

the solutions discussed, such as training programs, strategic partnerships, and addressing data security concerns, provide a roadmap for overcoming them.

Digital monitoring holds immense potential for various industries. From environmental resource management to healthcare delivery, these systems can empower stakeholders with actionable data, leading to improved practices and better outcomes. This guidebook equips you with the knowledge and strategies to navigate the challenges and unlock the power of data-driven decision-making in your specific field.

By embracing digital monitoring and fostering a collaborative approach, organisations across all sectors can achieve significant progress. Let's leverage the lessons learned from FIRMS and similar successful implementations to usher in a new era of data-driven management and create a more sustainable and efficient future.

Annexure

The Excel dashboard shows important information that are collected from Kobo Toolbox about aquaculture. It includes graphs to see things like how many men and women are involved, production trends, and resource use. This helps farmers, supporting organisations, and governments make better decisions for sustainable aquaculture.

15.1 Gender wise distribution:

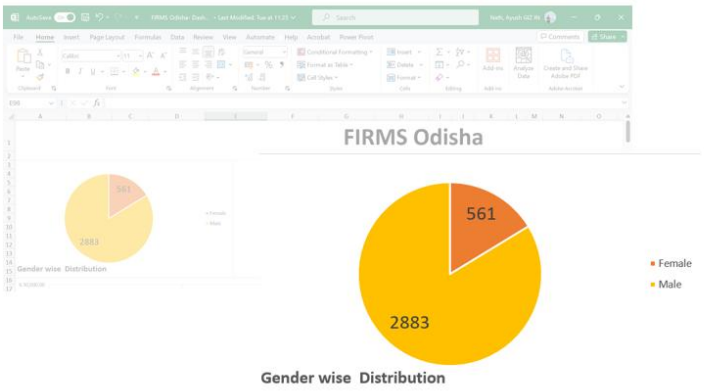


Figure 26: Excel graph representing gender wise distribution of farmers

The table below represents the stake holders and their benefit from the gender distribution graph:

Stakeholder	Description	Benefit
Farmers	Shows gender distribution (men vs women).	Tailor support programs for a more inclusive aquaculture community (increased participation, collaboration).
Farmer institution	Shows gender distribution (men vs women).	Target services effectively, allocate resources based on needs (women vs men), improve farmer engagement and satisfaction.
Supporting agency (NGO/CSO)	Shows gender distribution (men vs women).	Identify gaps in participation, develop initiatives for inclusivity and equality, fostering a more empowered aquaculture sector.
Funding or financing agencies & government bodies	Shows gender distribution (men vs women).	Tailor policies for gender equality, leading to enhanced socio-economic development and sustainable aquaculture growth.

15.2 Distribution of own pond and lease pond

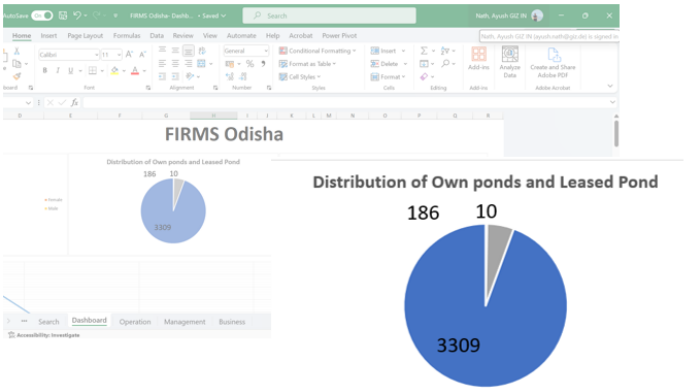


Figure 27: Excel graph of Pond distribution.

The below table represents the various stakeholders and the benefit they get from the distribution graph of own or leased pond:

Stakeholder	Description	Benefit
Farmers	Shows pond ownership (own vs lease).	Access support services tailored to their needs (own/lease) for fairer resource access and sustainable practices.
Farmer institution	Clarifies pond ownership (own vs lease).	Plan resource allocation and tailor services for equitable support and aquaculture growth.
Supporting agency (NGO/CSO)	Analyses pond ownership (own vs lease).	Informs interventions for equitable access, sustainable management, and environmental stewardship.
Funding or financing agencies & Government Bodies	Reveals pond ownership (own vs lease).	Enables improved monitoring, stakeholder collaboration, risk mitigation, and informed decisions for sustainable aquaculture development.

15.3 Pond distribution based on area of the pond

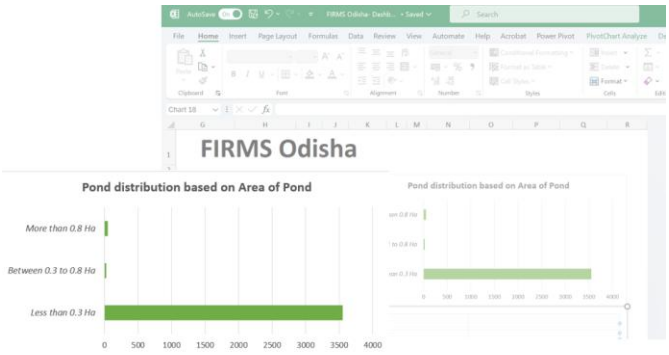


Figure 28: Pond area distribution graph.

The below table represents the various stakeholders and the benefits from the pond area distribution graph:

Stakeholder	Description	Benefit
Farmers	Shows pond size distribution (large, medium, small).	Optimize production (stocking, resources) for better yields and sustainability.
Farmer institution	Clarifies pond size distribution (large, medium, small).	Strategize resource allocation, collaboration, and capacity building for members' productivity and economic viability.
Supporting agency (NGO/CSO)	Analyse pond size distribution (large, medium, small).	Inform interventions for equitable access, sustainable practices, and environmental stewardship in aquaculture.
Funding or financing agencies & Government Bodies	Reveals pond size distribution (large, medium, small).	Formulate targeted policies, optimize resource allocation, and plan infrastructure/capacity building for sustainable aquaculture development.

15.4 Month wise expected harvest timeline distributed by species.

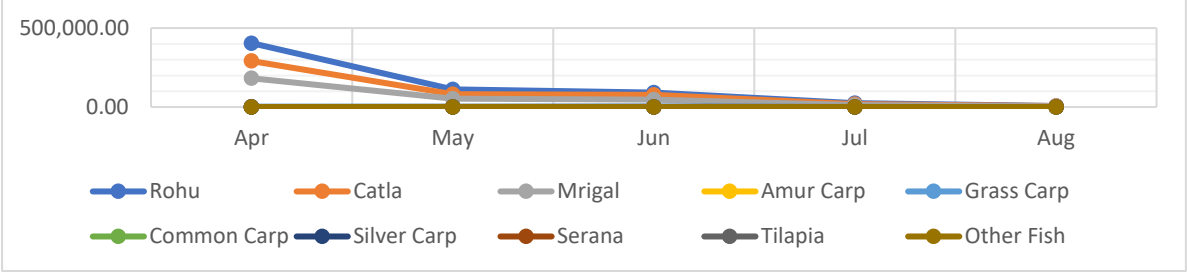


Figure 29: Month wise expected harvest timeline distributed by species.

The below table represents the various stakeholders and the benefits from the data of month wise expected harvest timeline graph:

Stakeholder	Description	Benefit
Farmers	Plan harvesting & marketing for optimal yield & market alignment.	Maximise profits & farm productivity.
Farmer institution	Coordinate production, logistics, & marketing for efficient resource use & market opportunities.	Enhance profitability & venture sustainability.
Supporting agency (NGO/CSO)	Tailor support programs to critical production phases for maximum impact.	Foster sustainable development in aquaculture communities.
Funding or financing agencies & Government Bodies	Plan regulations, services, & infrastructure based on seasonal harvest patterns.	Promote economic growth & sustainable aquaculture governance.

Component	Specification	Contribution
Android Phone	Smartphones running Android OS (various versions depending on compatibility) Internet connectivity preferred for data syncing.	Enables data collection through Kobo Collect app.
Computer/Laptop	Personal computer or laptop with internet access Operating system compatibility may vary (Windows, macOS, Linux) Web browser for accessing Kobo Toolbox online platform.	Facilitates data management, analysis, and export using Kobo Toolbox.
Kobo Toolbox (Online Version)	Cloud-based platform for designing, deploying, and managing data collection forms Accessible through a web browser.	Provides user-friendly interface for form creation, data collection setup, and data management Enables collaboration and data sharing among authorized users.

Kobo Collect (Android App)	Free, open-source mobile app for data collection Installs on Android phones.	Allows offline data collection using pre-loaded forms Offers features like GPS location capture, photo integration, and barcode scanning.
FRB (Farm Record Book)	Physical record book provided to farmers Contains pre-defined sections for recording aquaculture data.	Serves as a primary data collection tool for farmers who may not have smartphones Provides a backup record of data in case of digital system issues.
QR Code	Unique identifier code linked to a specific fish farm Printed on a label or displayed on a mobile device.	Facilitates rapid farm identification and data association within the system Enhances data accuracy by minimizing manual farm selection errors.
CRP (Community Resource Person)	Individuals from the local community trained in aquaculture and data collection May utilize Kobo Collect app, FRB, or assist with data collection logistics.	Provides valuable local knowledge and facilitates communication with farmers Plays a crucial role in capacity building and farmer engagement.
Data Collector	Individual responsible for collecting data from fish farms May utilize Kobo Collect app, FRB, or both.	Plays a crucial role in ensuring data quality and completeness Can provide valuable insights through observations and interactions with farmers.