



IBM – IORF



SUSTAINABILITY ACCELERATOR PROJECT

Adoption of a Cluster of Villages for Agricultural Sustainability and Food Security through Clean Food Program

PROJECT SITE :

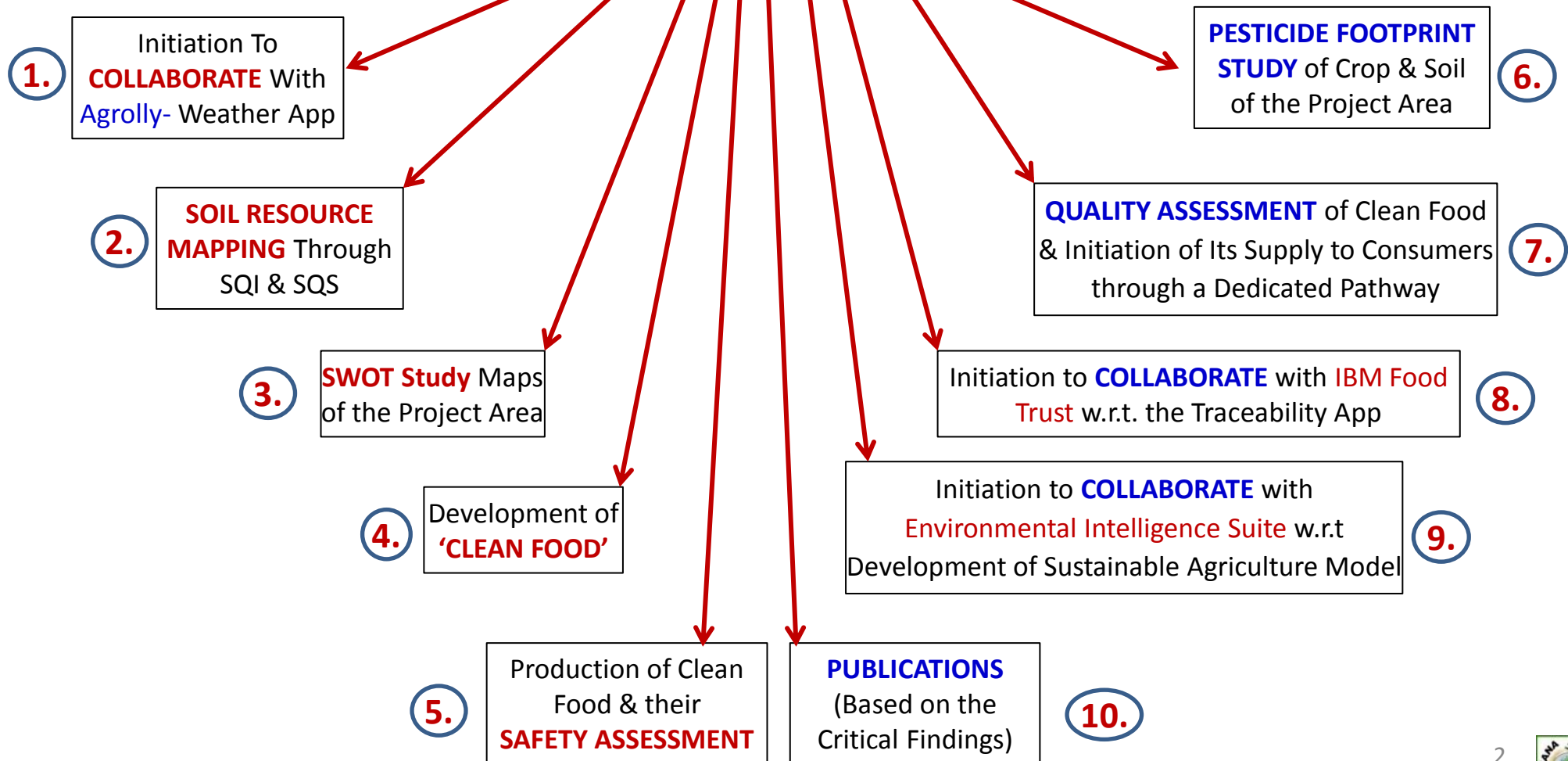
Block– Haringhata, **District-** Nadia , **State-** West Bengal, India

PHASE 1 PROJECT

Highlights of MILESTONES Achieved



MILESTONES



The objective was to utilize the Weather updates provided by Agrolly App especially for any sudden weather aberrations like thunderstorms, heavy downpour etc.; towards formulation of customized recommendations for Soil & Plant Health Management and for undertaking weather safety measures for the crops.

Target Achievement – Over Compliance

IORF did not just restrict to utilizing the weather updates but also introduced the Project Farmers to the Agrolly App to provide solution to one of the major problems of lack of access to Technology Support w.r.t. Crop Production, especially in respect of the small and marginal farmers.

MIILESTONE HIGHLIGHTS

- 400 Project Farmers have been registered under Agrolly App.
- The App insights like Weather Updates, forecasts, etc. have been utilized by IORF for providing climate smart field management guidelines – **A 1st Ever Initiative Pan India towards Sustainable Agriculture**
- IORF also utilized Crop Specific stress period forecast; to provide time specific prescription for **Plant Stress Management** - *A 1st Ever Initiative in Indian Agriculture for the small and marginal farmers (hardest hit by the climate change impact).*

Further Scope of Work

- IORF wishes to utilize **Agrolly as the Dissemination Platform** for Land Specific Soil Health Card (with 26 parameters study) to the Project farmers (300 SHC's are Ready).
- Once Soil Health Proximity Model becomes fully functional, IORF wishes to **utilize Agrolly App as the Platform that can provide access to** Soil Specific, Crop Specific, Season Specific- Sustainable Soil Health Management Guidelines for the farmers.

Soil Health is a critical factor for Sustainable Agriculture and assessment of Soil Quality Status is 1st step in this direction, especially **critical for the Project Site considering the very high land fragmentation**. Actual field evaluation revealed that the land holding size in the Project area was even <0.26 ha; moreover the land holdings are not contiguous but scattered in two or more locations. **Hence for appraisal of land specific Soil Quality Status (SQS); IORF needed to go upto a micro grid of 0.16 hec.**

MILESTONE HIGHLIGHTS

- IORF took up an exhaustive Soil Analysis Program, considering four different Sampling Grids : 10 hec., 2.5 hec., 0.6 hec. & 0.16 hec. – which led to **about 1200 Soil Samples**.
- The **Soil Analysis was done as per 26 Quality Parameters** comprising *Physical, Physicochemical, Fertility-Macro/ Micronutrients & most importantly BIOLOGICAL STUDY* which is a **1st Ever Approach in the Indian Agricultural Scenario**.
- The soil health status as per each individual soil sample were quantified in terms of 5 different Soil Indices viz., **Physical Index (PI), Fertility Index (FI), Microbial Activity Potential (MAP), Micronutrient Index (MI) & Soil Quality Index (SQI)**- again a **1st Ever Approach in the Indian Agricultural Scenario**.

FINALLY SOIL RESOURCE MAPS WERE DEVELOPED

Initially it was decided that 4-5 Resource Maps will meet the requirements,
but with escalation in mandate, we developed Resource Maps in a phase wise manner &
Finally Submitted 96 Maps

Target Achievement – Over Compliance

SWOT study was undertaken to adjudge the sustainability status of the Project farm lands. Moreover **such detailed assessment is presently lacking in the Indian agricultural scenario**, especially in the context of small & marginal land holdings.

In the Project area, the small and marginal farmers comprise 96% of the Total Farmers with average land holding size <0.26 ha and critical land fragmentation. But in stark contrast, **the cropping intensity is very high (about 2.5 to 3.0), meaning extreme dependence on land, leading to very high dependence on unsustainable inputs like chemical fertilizers and pesticides.**

Hence, IORF first undertook the Soil Health Status of the entire project area, going up to the micro level grid size of 0.16 hec., and then developed the various **SWOT INTERACTIVE MAPS** encompassing all the aspects of the soil as a resource base; to devise a customized Sustainability Plan for Soil & and Plant Health Management.

Initially it was decided that 1-2 SWOT Maps will justify the objective.

However, as the data started coming in, it was revealed that the Criticality is far more than that considered during Project formulation towards disseminating Sustainability to the majority Agri- Producers i.e., the small and marginal farmers.

WE FINALLY PROVIDED 10 SWOT MAPS.

Target Achievement – Over Compliance

MILESTONE 4

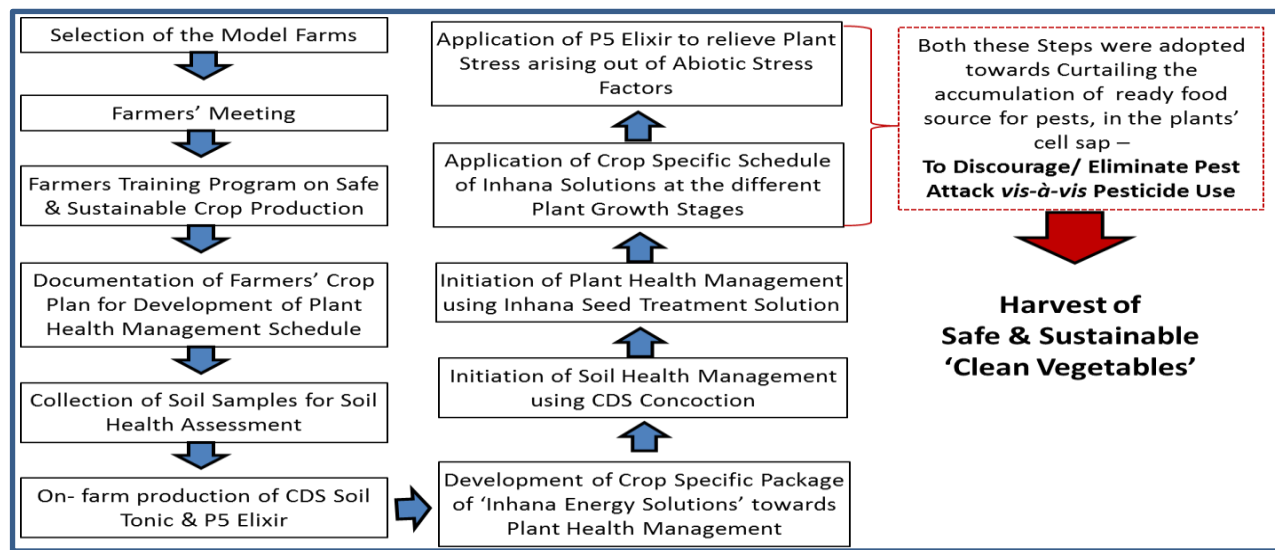
DEVELOPMENT OF 'CLEAN FOOD'

- 'Clean Food' is a first endeavor to **comply the requirement for SDG-2** of the United Nations, **more meaningfully SDG- Target 2.4** (*Sustainable food production and resilient agricultural practices*).
- 'Clean food' development is an exclusive outcome of a truly Economically and Ecologically Sustainable Agriculture and extremely relevant in the pretext of the **statement of the UN**, "It is currently not clear or well defined what constitutes productive and sustainable agricultural practice".

UNIQUENESS OF THE CONCEPT ?

Clean Food is the First & Only Tangible Demonstration of 'Safe & Sustainable' Food – **developed under Inhana Rational Farming (IRF) Technology**

Activity Flow Chart towards Clean Food Production



What is Clean Food?

NO Carcinogenic Chemicals
Heavy Metals
Growth Hormones

Achieved a Milestone of Global Appeal

The **World Health Organization (WHO)** states that “**If it is not safe, it is not food**”, as it does not serve its purpose to provide proper & safe nutrition. Hence, analysis of pesticide residues in food has become the governing criteria for ensuring food safety.

However; the **chromatographic techniques are hugely expensive, complex, time-consuming and require specific resources and infrastructure**. Especially in respect of **Vegetables the short time gap between field harvest and their consumption, limits the scope for safety analysis even if infrastructure and economics is not considered**.

To authenticate the Safety aspect of ‘Clean Food’ and considering that the Clean Food Producers were small and marginal farmers, IORF had to ensure a **SUSTAINABLE PATHWAY FOR SAFETY ASSESSMENT**.

IORF identified the ‘**COLORIMETRIC PESTICIDE ASSAY TEST**’– a **Scientific yet an Economical Solution** that can mitigate both Cost & Time Constraints associated with Food Safety Assessment.

The newly standardized Colorimetric Pesticide Assay Test Protocol can enable detection of :

- **Collective presence/ absence of Pesticides up to group specific- lowest permissible limit for > 90% of permitted pesticides, most of banned chemicals, and residual presence for chemicals like DDT/ isomers.**
- **Presence/ absence of heavy metals and wide range of toxic substances of known/unknown origin.**

COLORIMETRIC PESTICIDE ASSAY TEST - Authenticating Safety In Real Time & Most Economic Manner due to Affordable Cost (1/10th to 1/15th of the Conventional Cost of Residue Analysis) & significant Reduction in Analysis Time (1/10th of time required for Residue Analysis using HPLC).

UNIQUE DEVELOPMENT OF GLOBAL APPEAL

The Indian average consumption of pesticide is lower than many other developed economies, but **the problem of pesticide residue is very high in India**. This is due to the critical land fragmentation of Indian Farms with contrasting High Cropping intensity, leading to High Dependence on land and therefore an extreme reliance on unsustainable inputs like fertilizers and pesticides. Over a period of time the ecological footprint of pesticides have increased due to increased dosage or injudicious mixing of formulations or because formulations that are less toxic to humans may be more toxic to other biodiversity.

In this context RELIABLE PESTICIDE RISK INDICATORS are pivotal to assess the potential risk associated with pesticide use, & **are particularly useful under conditions of limited data availability & resources, especially applicable for countries like India.**

The objective of the IBM-IORF Sustainability Accelerator Project was Safe & Sustainable 'Clean Food' Production and it provided the opportunity to IORF to **Standardize its PESTICIDE FOOTPRINT ASSESSMENT TOOL** (*originally developed and used in Plantation crops*) **in respect of the Field Crops (Vegetables) as no such evaluation Pathway is presently available in this sector.**

Two Pesticide Pollution Indices : i) CROP PESTICIDE POLLUTION INDEX (CPPI) ii) SOIL PESTICIDE POLLUTION INDEX (SPPI); were used to assess the Risk Potential related to Crop Sustainability, Soil Quality Degradation, Pesticide Residue in the End Product and Future vulnerability of crop under climate change impact.

Among the different vegetable families evaluated, a higher SPPI Value was documented in case of solanaceae, and cucurbitaceae, indicating a high toxicity load on soil, especially in relation to the microbial population and their functional dynamics. Besides **lack of sustainable soil managements, raises a big question mark on the future sustainability of these vegetable farm lands.**

UNIQUE DEVELOPMENT OF GLOBAL APPEAL

QUALITY ASSESSMENT OF CLEAN FOOD & INITIATION OF ITS SUPPLY TO THE CONSUMERS THROUGH A DEDICATED PATHWAY

The World Food Safety Day 2022 theme highlights the role that Safe, Nutritional Food Plays in Ensuring Human Health. That means **Vegetables can actually serve as the source of Nutrition for Human Health, only when they are produced from a Safe Source. And Only Safe & Sustainable Agriculture can Produce Safe Vegetables.**

The **CLEAN FOOD CONCEPT** was developed by IORF to fulfill the need of **SAFE FOOD that is Also SUSTAINABLE**. That means the Safety Aspect of Clean Food should influence its Nutritional aspects i.e., the health giving properties. Hence, Quality Assessment of 'Clean Food' in terms of **Vitamin – C Content, Protein Richness and Antioxidant Richness (which have crucial relevance towards human health)** was undertaken **to Quantify the Nutritional aspects of 'Clean Food'**

Quality Assessment of a Wide Diversity of Winter Vegetables (12 vegetable crops) at a Time is a 1st Time Approach & Unique to this Project

Analysis indicated an improvement in the expression of Vitamin- C, at Par/ Slightly Higher Protein Content & Higher Polyphenol Content in the 'Clean Vegetables' as compared to their conventional counterparts.

IORF has established Two Platforms for Delivering Sustainability at Two Levels - The Farmers & The Consumers.

- Through a dedicated FPC **Manobjomin Agro Producers Company Limited (MAPCL)** being DEDICATED SOLELY TOWARDS SAFE AND SUSTAINABLE AGRICULTURE
- **SafeU** is the dissemination wing of IORF, designed to deliver ECONOMIC SUSTAINABILITY to both the PRODUCERS (procuring Clean Food at competitive market prices, or even slightly higher at times) and the CONSUMERS (retailing Clean Food at competitive market prices of chemical-laden conventional produce, at no premium whatsoever).

INITIATION TO COLLABORATE WITH IBM FOOD TRUST w.r.t. THE TRACEABILITY APP

IORF believes that **Building up Consumer Trust on 'CLEAN FOOD'** is critical towards dissemination of Sustainability from the Food Producers to the Consumers, which is again **mandatory for Sustainability of the Clean Food Program beyond the Project Period and its Expansion across different agro- ecological regions.**

IORF is now ready with 'Clean Food', Food Safety Monitoring Standard, Soil Health Tools, Execution Team for Safe & Sustainable Projects, Clean Food Dissemination Wing and all other Project Deliverables that will be required to **Reach the Safe & Sustainable Story of 'Clean Food' Development at the Consumer Level.**

Although set on a global tone this IBM Platform can assess how to best utilize the 'Clean Food' Project Deliverables towards development of a Traceability App that can provide a true End-To-End Digital Traceability & Visibility in Real Time of the Safety & Sustainability Aspects of 'Clean Food' produced by IORF.

THE TRACEABILITY APP CAN BE OF IMMENSE RELEVANCE . . .

- In respect of all the future 'Sustainable Food Projects'
- In Engaging Consumer Interest into the aspects of Safe & Sustainable Agriculture especially considering the **Statement of the UN, "It is currently not clear or well defined what constitutes productive and sustainable agricultural practice".**
- In Building up Consumer Trust, and Finally in the expansion of Safe & Sustainable 'Clean Food' Projects across the different agro- ecological zones.

INITIATION TO COLLABORATE WITH ENVIRONMENTAL INTELLIGENCE SUITE w.r.t THE DEVELOPMENT OF SUSTAINABLE AGRICULTURE MODEL

IORF introduced IRF Technology in the project Area to demonstrate the pathway towards development of 'HEALTHY PLANTS'. However, under the **existential Climate Change Impacts causing weather adversities, Crop Failure and or Yield Decline is fairly common** – and the Resource Poor Farmers who have least Risk Taking Capabilities are the Worst Hit

The Need for Accurate Weather Predictability led to IORF – AGROLLY Collaboration. IORF utilized **The Real Time Weather Data provided by AGROLLY App** towards development of Customized Plan for **Crop Stress Management, Prophylactic Disease Management and Integrated Management in Soil** towards Reduction of Nitrate Fertilizers

Now the final objective is to develop an Adoptable 'Sustainable Agriculture Model' for large scale dissemination of Sustainability; especially in respect of the Small and Marginal farmers

And the IBM Environmental Intelligence Suite can take an important role in this respect by providing the most advanced weather alerts in terms of disruptive weather conditions.

AI-powered Software Solutions in this Suite can also help in digital transformation of the **Agricultural Data**, which is especially relevant considering the **critical land fragmentation and the small and marginal farmers who have very limited access to such advanced but easily adoptable technologies - can help not only in sustenance of the food supply chain but also increase the Sustainable Product Supply Line from the Producer to the Consumers.**

IORF had more than 75 publications based on its IRF Technology and Novcom Composting Method. The IBM Sustainability Accelerator Project provided the Opportunity for practical generation of exclusive research findings in the way of Safe & Sustainable 'Clean Food' Production.

We have taken up the objective of developing 7-8 Research Articles in a year's time, all directed towards the Sustainability Component be it in respect of Crop Production, Environment or the Livelihood of the Resource Poor Farmers as well as Safety Imprints for the Consumers.

This is again one of the first for any Sustainability project when most of the time not a single scientific publication is done, 9 publications in National and International Journals have been published (2021 – 2024)one is awaiting. Out of these 10 publications, five publications are on the models and tools those are developed in this project, 2021 – 2024.