A Short Synopsis

IBM- IORF SUSTAINABILITY ACCELERATOR PROJECT 2021-24

Sustainable Agricultural Models & Sustainability Tools /Indices developed under IBM-IORF Sustainability Project (2021 -24)

Prepared by

Inhana Organic Research Foundation (IORF)

PHASE- I PROJECT

Demonstration of **'CLEAN FOOD' Model**

100% elimination of Synthetic Pesticide

Safe and Sustainable 'Clean Food' Production towards empowerment of Small and Marginal Farmers and preservation of our environment in the back drop of climate change.

- **NO CARCINOGENIC CHEMICALS, HEAVY METALS, GROWTH HORMONES.**
- **PURE & SAFE FOOD AT NO EXTRA COST**
- **NO CROP LOSS/ IMPROVEMENT OF CROP YIELD DESPITE ELIMINATING AGROCHEMICALS (SYNTHETIC PESTICIDES).**

SAFETY @ SAME COST means SUSTAINABLE FOR ALL

Inhana Rational Farming (IRF) Technology Plays the Pivotal Role in driving the Project Objective through A Unique Concept Inhana Plant Health Management

PHASE- I PROJECT

Ensured the FIRST TIER of Food Safety

REMOVES ONE ARM OF UNSUSTAINABILITY i.e., 100% elimination of CHEMICAL PESTICIDES

NO CROP LOSS – NO HIKE IN CoP

'CLEAN FOOD'

SAFE for HUMAN HEALTH

PURE & SAFE FOOD AT NO EXTRA COST

NO CROP LOSS/ IMPROVEMENT OF CROP YIELD.

SAFETY @ SAME COST means SUSTAINABLE FOR ALL

A Unique Concept brought to Reality through the Intervention of IRF TECHNOLOGY, especially Inhana Plant Health Management

Impact of 1st Ever 'Clean Food Model'

Developed under IBM-IORF Sustainability Project Phase I (2021-22)

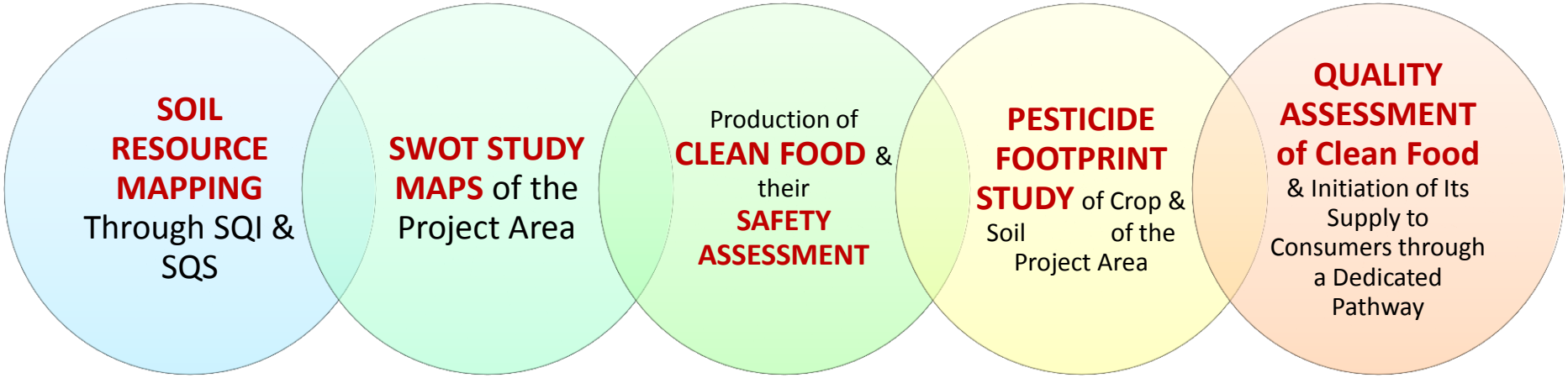
- **1600-2000 Ton Safe & Sustainable 'CLEAN FOOD' with** > 20 different variety of vegetable crops **with increased Crop Productivity**.
- **400 Beneficiary Farmers** receiving access to Sustainable Crop Technology (IRF Technology) from Seed Sowing to Crop Harvest.
- **Comprehensive SOIL HEALTH CARD for Project Farmers.**
- For the 1st time in Indian Agriculture, **COLORIMETRIC ASSAY TEST (CAT)** of Pesticide Groups for authenticating the purity of Clean Food: **Batch Wise, sample analysis** in **1/10th-1/15th of the Conventional Cost** & **1/10th of the time** needed for HPLC Residue Analysis.

Development of Safe & Sustainable Agriculture Model under Phase-I IBM Sustainability Project

OUT OF 10 MILESTONES

SOME SIGNIFICANT MILESTONES ACHIEVED

During IBM - IORF Sustainability Accelerator Project: PHASE I (2021 -22)



KEY OUTCOMES

- **SAFE FOOD – Safety for Human Health**, authenticated by Actual Residue Analysis
- **SOIL HEALTH CARD (25 Parameters & 5 Soil Quality indices)** for Every Farmer
- **CROP SUSTAINABILITY**
- **Farmers' ACCESS** to Crop Technology for Safe and Sustainable Crop Production
- **IMPROVEMENT** in Farmers' Income Potentials.
- Impact Areas w.r.t **THREE Crucial SDGs – 1, 2 and 13**
- Progression towards **ENERGY EFFICIENT** Crop production.

IBM - IORF Sustainability Accelerator Project: PHASE I

A Couple of FIRST's - At the National Level

MICRO GRID SOIL HEALTH ANALYSIS
specially considering the Critical Land Fragmentation of Small & Marginal Farmers

25 PARAMETER SOIL HEALTH STUDY
Focus on SOIL BIOLOGICAL PARAMETERS

5 SOIL INDICES
1. Physical Index (PI)
2. Fertility Index
3. Microbial Activity Potential (MAP)
4. Micronutrient Index (MI)
5. Soil Quality index (SQI)

Development of Village Level SWOT INTERACTIVE MAPS

UNIQUE SOIL HEALTH CARD

- Actual Report Card for Individual Farm Land
- 25 Parameter Study Report
- Soil Biological Study
- 5 Soil Health Indicators with Colour Coding for easy understanding at the Farmers' level

COLORIMETRIC PESTICIDE ASSAY TEST

Revolution in Food Safety Authentication

1. Detection of **>90% of the Pesticides**.
2. Detection of **Banned Chemicals.**
3. Detection of **DDT & its Isomers**
4. Detection of **Toxic Heavy Metals** .
5. **Scope for Batch wise Food Safety Analysis due to:**

a. **LOW COST** (1/10th-1/15thof the Conventional Cost of Residue Analysis)

b. **LESS TIME CONSUMING** (1/10th of the time needed Residue Analysis using HPLC).

Clean Food Program : Global Significance

The phase-1 IBM-IORF Sustainability Project has etched out a concrete Road Map & practically demonstrated **Safe Food Production, with Higher Crop Yield & Without Increasing Cost of Production**

Its Relevance and Global Significance can be understood from statement of the UN,

"It is currently not clear or well defined what constitutes productive and sustainable agricultural practice".

The impact of Clean Food Program can be better understood from the FACT that with a single program we brought out **Significant Impact Areas w.r.t. multiple Sustainability Development Goals (SDG's)**

Most Importantly . . .
The Phase-1 IBM-IORF Sustainability Accelerator Project gave the insights for

- Development of a Prototype of **SOIL HEALTH PROXIMITY MODEL**
- Development of **SAFEST 'Clean Food' NET ZERO MODEL*.**

Model Farm Project: Model farm exhibited a net negative carbon footprint (-20.57 MT CO2e/ha). *Demonstrated potential for Carbon-neutral and Net Zero Agriculture.*

IBM - IORF Sustainability Accelerator Project

PHASE- II PROJECT

Demonstration of CLEAN FOOD 'NET ZERO' MODEL

In the Phase-I Project, apart from Safety towards Human Health, IORF also wanted showcase a Pathway to ensure **SAFETY** towards **SOIL & ENVIRONMENT**

Soil Health Management towards ELIMINATION of N- FERTILIZERS was NECESSARY for this, but RESOURCE SCARCITY for Compost production was the PRIMARY BOTTLENECK

Moreover to enable Soil Health Management at SCALE, the raw material source has to be abundant and economic.

WASTE of any kind is the best solution, and the quest led IORF to **COIR PITH –** a **High METHANE EMITTER,** Toxic, **WASTE** from Coir Industry – **with no effective technology for its safe bioconversion**

Innovative Waste to Wealth Program : Methane Mitigation from Source

Coir pith, a byproduct of coir industry can take decades to decompose when left untreated. Due to absence of effective and viable composting technology/ies for its effective bioconversion, dumping of coir pith in open lands leads to environmental pollution specially METHANE emission.

Under IBM-IORF Sustainability project at Mandya, Karnataka, Novcom Composting Technology was utilized towards effective bioconversion of coir pith into safe and mature compost for sustainable soil management.

Thus adoption of **Waste to Wealth Program with adoption of** Novcom Composting Technology can transform not only a potential pollutant to a safe and effective organic soil amendment, the process attends the objective of SDG 13, especially in terms of Source Point Methane Abatement; SDG 15, SDG-3 and most importantly SDG-2. **At the same time, it can facilitate to develop an effective model towards attainment of Net Zero commitment with significant social and environmental impacts.**

Clean Food Net Zero : Most Unique Model for Crop Sustainability to Livelihood Support and Climate Change Mitigation to attainment of SDGs/1

Clean Food 'Net Zero' Program is probably a 1st such Science based Comprehensive Farmers' Participatory Agri- 'NET ZERO' Program that Delivers Economically Viable - SAFEST FOOD with profound impact on Human Health, Soil and Environment ; while Empowering Farmers' Livelihood.

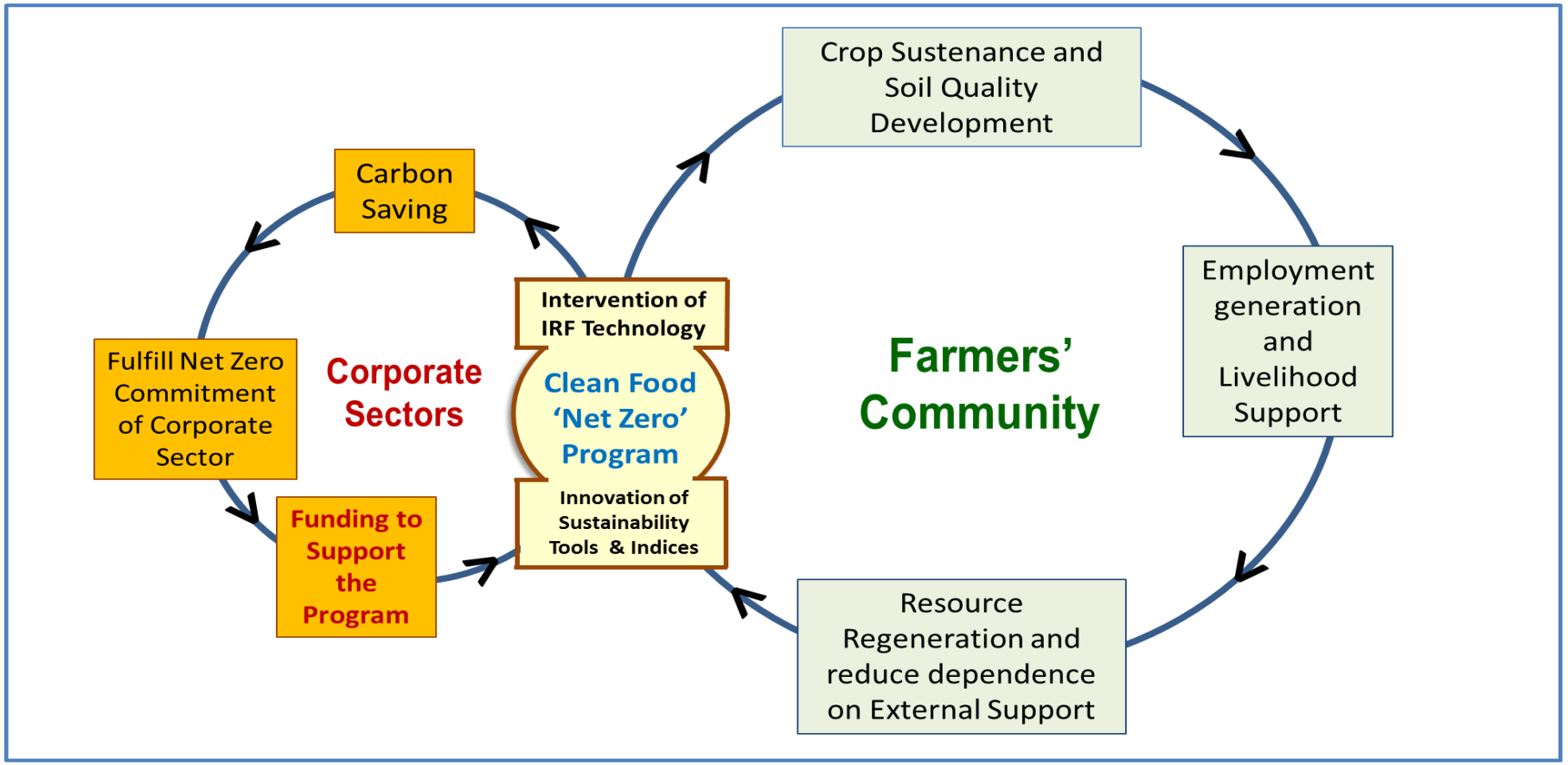
It is also the 1st ever Sustainable Agricultural model which has meaningful contribution towards 7 Crucial SDGs viz SDG1, 2, 3, 11,12,13 and 15

This is the ONLY Model that has Specific Impact Area w.r.t. **Both** the **CAUSE** (**Climate Change**) as well as the **EFFECT** (**Food Insecurity**)

1st Climate Action Program that ensures Food Safety, Food Security and Livelihood Sustenance through both Climate Mitigation & Adoption Initiatives.

Clean Food Net Zero : Most Unique Model for Crop Sustainability to Livelihood Support and Climate Change Mitigation to attainment of SDGs/2

How the Symbiotic Relationship attains long-term viability of the Sustainability Initiative



A model of Symbiotic Relationship for the betterment of our people & environment and benefit goes to everyone in terms of Clean (safe) Food and Clean Climate

PHASE- II PROJECT

Clean Food 'NET ZERO' Model

- **SAFEST** FOOD Production - Safe for **HUMAN HEALTH, SOIL & ENVIRONMENT**
- **ENERGY TRANSITION,** 57% SHIFT to **RENEWABLE ENERGY SOURCES**
- **GHG ABATEMENT-** about **250 MT CO_2 eq.**/ hectare Food Production
- **Best Model for METHANE MITIGATION from Source Point**
- **Best Model for RECLAMATION of Degraded Land**

The First Ever Model in Agriculture for

NET ZERO Attainment

That Also Attends SEVEN CRUCIAL SDGs

Single Model Multi-Dimension IMPACTS

Only Model that can attend the objectives of

'Clean Food' (NET ZERO) Model

- **SAFEST Food** → Development of Pesticide Residue Free (as per FAO-WHO-Codex Alimentarius Std.) '**Clean Food**'
- **Human Health, Soil, Environment** → **Soil & Environment Friendly Agriculture** that can provide SAFEST food for >20,000 consumers from a mere 100 ha .
- **Crop Sustainability** → About 15–25% **Increase Crop Productivity** as compared to conventional farmers' practice.
- **Land Fill Material Bioconversion** → **Bioconversion of any type of waste material** (within 21 days) towards soil productivity regeneration and GHG offsetting upto 36 – 40 ton / ha
- **MAJOR GHG Mitigation** → Potential for **GHG mitigation upto 10,000 ton CO_2 equivalent**- ready to serve the NET ZERO OBJECTIVE -A model that can equally benefit the Farmers, Consumers & Corporates as per their specific objectives
- **Carbon Sink** → **Initiative towards regeneration of Soil Carbon Sink,** through enhanced Soil-C sequestration (upto 300 kg/ha/year)
- **Soil Reclamation** → **Low Cost, Time Bound** reclamation program for degraded agricultural soil
- **Seed Development** → Initiative towards development of climate resilient organic paddy & vegetable seeds for self sustenance of the farmers
- **Ecological Sustenance** → Significant Impact on Ecological Sustenance with **increased Soil microflora & earthworm activity**
- **Energy Saving** → Upto **32% lesser Energy Input** with **>60% Higher Energy Productivity** & upto **183 % higher Nutrient Energy Efficiency**
- **Livelihood Support** → Livelihood support to Farmers through **Transfer of Sustainable Crop Technology** & knowledge support.

Driven By

IRF Technology

Ecologically Sustainable, Economically Viable and designed for Convenient Adoption especially by the marginal and small farmers

IBM - IORF Sustainability Accelerator Project

PHASE- III PROJECT

Climate Resilient Net Zero Clean Seed & Planting Materials Development – Foundation for any Sustainable Initiatives

- **Development of Net Zero Clean Paddy seeds**
- **Development of Net Zero Clean Millet seeds**
- **Development of Net Zero Clean Vegetable seeds**
- **Development of 'NET ZERO' Clean Coconut Planting Material**
- **Development of 'NET ZERO' Clean Sugarcane Planting Material**
- **Development of 'NET ZERO' Clean Ginger Planting Material**

*These seeds demonstrated significantly higher resilience under abiotic stress, with the **Climate Resilience Index (CRI) showing up to 35.5% higher** values compared to conventional seeds.*

Climate Resilient Net Zero Clean Seed Development – Foundation for any Sustainable Initiatives

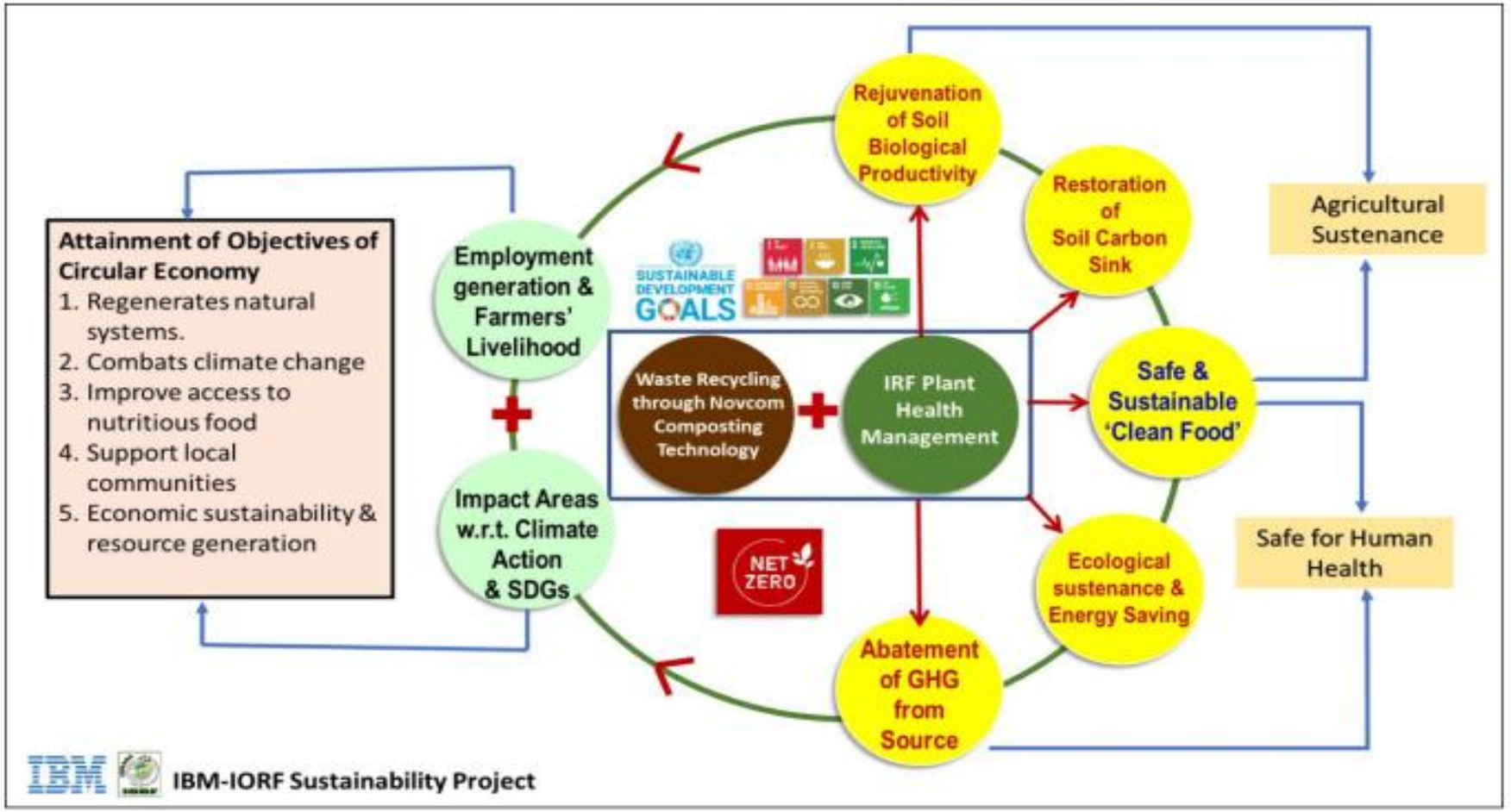
Climate-resilient crops and crop varieties have been recommended as a way for farmers to cope with or adapt to climate change, but availability of climate resilient vegetable seeds are rare in India if not totally unavailable.

In the present study under IBM-IORF Sustainable project, we initiated a program towards development of climate resilient seeds of paddy, vegetables and plantation crops in farmers' field with adoption of Inhana Rational Farming (IRF) Technology.

Climate resilience of the seeds was evaluated through study of germination under water stress (G_{WS} %), salt stress (G_{SS} %), accelerated ageing (G_{AA}%) and Electrolyte leakage (EC) and significantly higher value was obtained for **'NET ZERO' Clean Seed.** Climate Resilience Index (CRI)" which was developed majorly as a function of seed germination under abiotic stress, showed upto 35.5 % higher value as compared to conventional seeds.

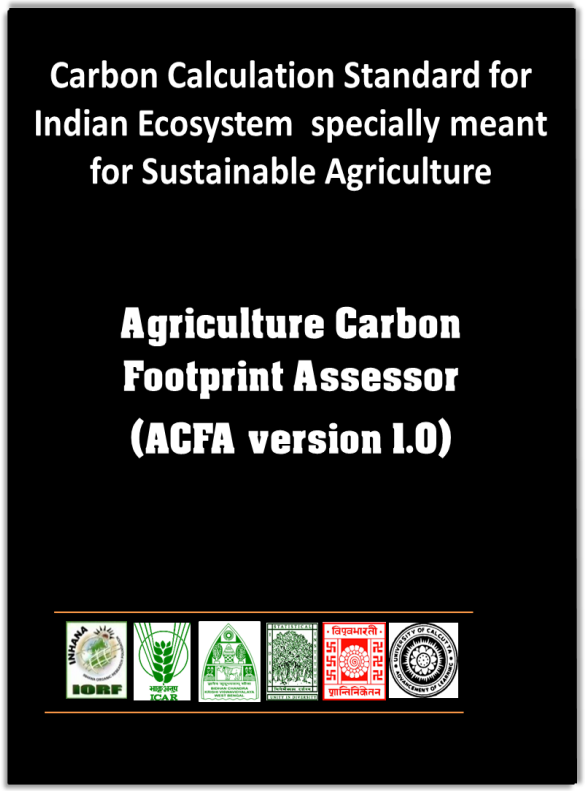
Thus Development of Net Zero Clean Seed Development protocol under IBM-IORF Project can help any agricultural sustainable initiatives with adoption of the Seed Development Model

DEVELOPMENT OF COCONUT BASED CIRCULAR BIO-ECONOMY MODEL



Potential for offset more than 500 MT CO2 eq/ha, increase Coconut Equivalent Yield (CEY), and improve farm income. Soil health assessments indicated positive impacts on carbon levels, fertility, and microbial activity.

Development of India's 1st Carbon Computing Tool for Sustainable Agriculture



Agriculture Carbon Footprint Assessor (ACFA ver 1.0) is a carbon computing standard for evaluating carbon footprint in Agriculture specially sustainable agriculture considering variability under Indian Agro ecosystem.

This is probably the 1st comprehensive carbon computing tool for sustainable agriculture developed by Indian Scientists considering conditions in Indian Ecosystem viz. diversity in agro-ecosystem, variation in cultivation practice, on-farm and off-farm input usage pattern, energy usage, residue management and transport.

IBM-IORF Sustainable project facilitates the development of "ACFA -ver 1.0" and provided key database for standardization process of ACFA -ver 1.0

Clean Food 'NET ZERO' PERHAPS THE FIRST AGRI NET ZERO MODEL

The most **Sustainable Agricultural Model**

VALIDATION & CERTIFICATION OF CFNZ MODEL , BY I-NO CARBON, UK.

i-NoCarbon Limited

Change Today for a Better Tomorrow

59, Harfield Road, Sunbury on Thames, TW16 5PT, The UK

Ref: SACFA/0923/004

Period Certified: 01 April 2022 To: 31 March 2023

AGRI - NET ZERO

SUSTAINABLE AGRICULTURE CARBON FOOTPRINT CERTIFICATE

This document certifies that the agricultural GHG emissions of the project were calculated using the **Sustainable Agriculture Carbon Footprint Assessment (SACFA) Toolkit developed by i-NoCarbon Limited**.

Farm/Project Name & Location: IBM-IORF Sustainability Project at Mandya District, Karnataka, India

Project Details: Clean Food – Net Zero (CFNZ) Project in 25.2 ha area using NOVCOM Coir Pith compost under INHANA Soil Health Management (ISHM) & Inhana Plant Health Management (IPHM), through Inhana Rational Farming (IRF) Technology of Inhana Organic Research Foundation (IORF), Kolkata, India (Phase II : 2022 - 2023).

Chemical-Intensive Agriculture was practised in the above project area wherein Sustainable Agriculture under IRF Technology was introduced and the Carbon Footprint from on-farm activities were calculated using the **SACFA Toolkit** for both the practices:

Erstwhile Agricultural practice followed:	**Conventional (Chemical Fertilizers & Pesticides)**
Erstwhile Carbon Footprint:	**(+) 1.470 mt CO2e/ha**
Present Agricultural practice followed:	**Inhana Rational Farming (IRF) Technology**
Present Carbon Footprint:	**(-) (250.080) mt CO2e/ha**

NET Carbon Footprint Achieved from **25.20 ha** **(-) 6,339.060 mt CO2e**

This means that this IBM-IORF Sustainability Project has shown the potential of REDUCING

251.55 mt CO2e/ha

for such De-carbonization Programme towards Net Zero compliance.

Vijay L Narasimhan

Authorised Signature

Date of Issue: 18 September 2023

i-NoCarbon Limited
Change Today for a Better Tomorrow!
Sunbury-on-Thames, United Kingdom

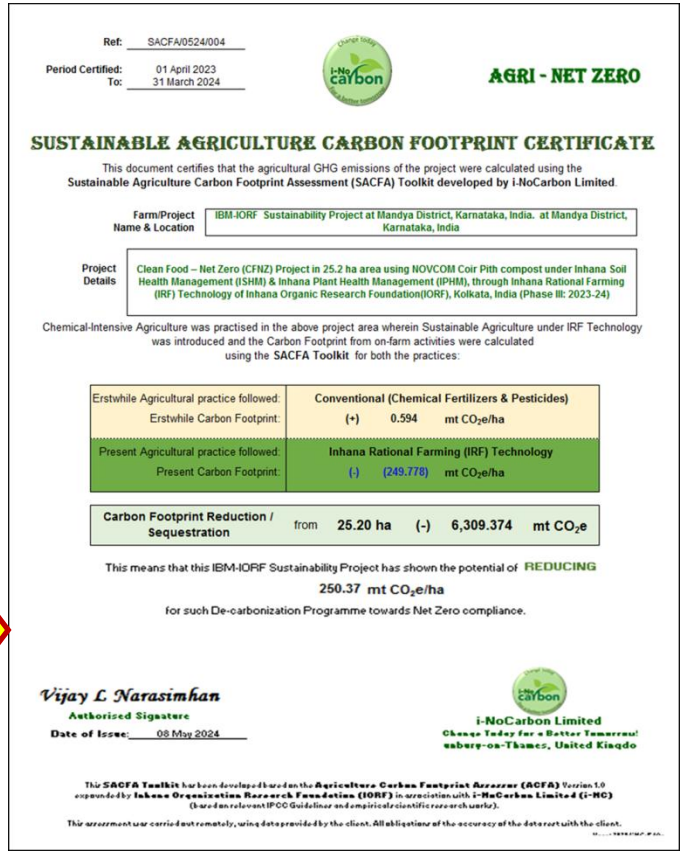
This **SACFA Toolkit** has been developed based on the **Agriculture Carbon Footprint Assessor (ACFA)** Version 1.0 expounded by **Inhana Organization Research Foundation (IORF)** in association with **i-NoCarbon Limited (i-NC)** (based on relevant IPCC Guidelines and empirical scientific research works).

This assessment was carried out remotely, using data provided by the client. All obligations of the accuracy of the data rest with the client.

IBM-IORF Sustainability Accelerator Project

1st Year: Net Carbon Footprint (-) 250 MT CO2e/ha. and total Net Carbon Footprint (-) 6340 MT CO2e generated from 25.2 ha. Agri Net Zero Model.

2nd Year : Certification from with a net carbon footprint of **(-)6309.73 MT CO2e** for 25.2 ha. with a net carbon footprint of (-) **250.39 MT CO2e/ha.**



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AGRI - NET ZERO

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Erstwhile Agricultural practice followed:	**Conventional (Chemical Fertilizers & Pesticides)**
Erstwhile Carbon Footprint:	**(+) 0.594 mt CO_2e/ha**
Present Agricultural practice followed:	**Inhana Rational Farming (IRF) Technology**
Present Carbon Footprint:	**(-) (249.778) mt CO_2e/ha**

Carbon Footprint Reduction / Sequestration from **25.20 ha** **(-) 6,309.374 mt CO_2e**

This means that this IBM-IORF Sustainability Project has shown the potential of REDUCING

250.37 mt CO_2e/ha

for such De-carbonization Programme towards Net Zero compliance.

Vijay L Narasimhan

Authorised Signatore

Date of Issue: 08 May 2024

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sunbury-on-Thames, United Kingdo

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AWARDS & RECOGNITION for innovation & impacts on food production, livelihood development and climate change mitigation.

IBM-IORF Sustainability Accelerator Project

- **WINNER** - Category **ENVIRONMENT** - 8th CSR Impact Awards – CSR Box & Dalmia Bharat Foundation.
- **WINNER – Excellence in Climate Change Mitigation** under CSR & Sustainability Summit & Awards – ASSOCHAM Southern Region.
- **BRONZE** in Category **LIVELIHOOD** under National CSR & Summit Awards – Vision India Forum & CMAI.
- **WINNER** in the Category **'Best Innovative CSR Project'** under Corporate Responsibility Summit & Awards – UBS Forums.

1st time in any SUSTAINABILITY PROJECT

9 Research Articles has already been published in different National/International Journal and Conference proceedings (Perhaps the only of its kind for any Sustainability project)

39 Milestones has been achieved in 3 years of project time period covering wide aspect of Sustainable Food Production, Livelihood Sustenance and Climate Change Mitigation & Adaptation

15 Sharing of Success Stories in Social media platform and in different forum and in farmers meet

Thank You

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