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

MILESTONES ACHIEVED IN 3 YEARS
IBM-IORF SUSTAINABILITY PROJECT 2021- 2024

MILESTONES

Summary of Project Achievements



PHASE I

10 Milestones

Project Site:

**District- Nadia ,
State- West
Bengal, India**

2021-22

PHASE II

19 Milestones

Project Sites:

**District- Nadia ,
State- West
Bengal, India &
District- Mandya,
State- Karnataka,
India**

2022-23

PHASE III

8 Milestones

Project Sites:

**District- Nadia ,
State- West
Bengal, India &
District- Mandya,
State- Karnataka,
India**

2023-24

MILESTONES

Milestone set and accomplished during the IBM-IORF Sustainability Project is actually a journey and evolution of Sustainable Agriculture, Action against Climate Change & Global Warming.

All together thirty-seven (37) Milestones, were designed and accomplished during three years and in three phases of IBM-IORF Sustainability Project.

While **three (3) Milestones** refer about the different **Sustainable Crop Production Models**, **Seven (7) Milestones** about the **Climate Resilient Seeds and Planting Material development models**. One milestone speaks about ten publications in the international journals and **Two (2) Milestones** explains about the two extremely important **Sustainability Tools**. And above all, one milestone explains about the development of India's **first Agri-Net Zero Model** with a huge negative Carbon Footprint & more than **250 MT CO₂e/ha**.

These milestones are the dossiers of Sustainability in a area where it need highest intervention. Finally **CFNZ Model, ACFA Version 1. and SACFA Toolkit** are the **360° solution to Global Food Production issues and that too for the Small & Marginal Farmers**.

Soil Proximity and **Crop Safety Assessment** Prototypes are awaiting for the right partners to develop as a tool to bring technology & science to the small holding farming community for sustained ever sustainable livelihood.



1. Initiation To **COLLABORATE** With **Agrolly**- Weather App

It would have been the first Actual weather forecasting with assessment and guidance for prevention and aftershock measures.

2. **SOIL RESOURCE MAPPING** Through SQI & SQS

Extremely important tool for understanding the Soil Health Status and interventional impact – 1st time for marginal and small farming community.

3. **SWOT Study** Maps of the Project Area

First of its kind being the micro land holding study for each individual farmers with a large outline of area comprising potentials and threats towards right crop selection, soil management and policy making for any large scale sustainability initiative.

4. Development of '**CLEAN FOOD**'

Safe food production in a sustainable manner by and for the marginal and small resource poor farmers, is perhaps the first endeavor in this respect, where utmost safety was assured for human consumption, without any crop loss or cost hike through IRF Technology.

5. Production of Clean Food & their **SAFETY ASSESSMENT**

Authentication of Safety in Clean food was also important to prove the sustainability. Suitable method of Safety analysis are huge cost intensive, time consuming and above all not effective for vegetable crops for their multiple harvesting. Thus colorimetric Assay Test Method was developed , standardized as most scientific, comprehensive and conclusive safety assessment tool available at 1/20th Cost and 1/10th time.

6. **PESTICIDE FOOTPRINT STUDY** of Crop & Soil of the Project Area

Pesticide Footprint Study is another milestone in the Sustainability initiation in agriculture. The Protocol, standard and Index were developed by IORF to



study and assess the impact of the Synthetic Crop Protectants in terms of their bioavailability, permeability, half-life, water solubility etc. which are different in each agro-chemicals. Finally there should be an index to represent the harmfulness potential of chemicals used the crop and their effect on soil. This first time study through Pesticide Load on Crop (PLc) or Pesticide Load on Soil (PLs), Crop Pesticide Pollution Index (CPPI) and Soil Pesticide pollution Index. (SPPI).

6) QUALITY ASSESSMENT of Clean Food & Initiation of Its Supply to Consumers through a Dedicated Pathway

Sustainability infused at the source (crop production) need to reach to the consumers with minimum intervention. So that the Safe & Sustainable Food become affordable to all, which can be ensured only by a dedicated pathway, which was experimentally organized.

8) Initiation to COLLABORATE with IBM Food Trust w.r.t. the Traceability App

A Programme was chalked out for the collaboration with IBM Food trust to take the advantage Traceability App for sharing the message of Clean Food – its journey of development from beginning to each and every step of the final produce.

9) Initiation to COLLABORATE with Environmental Intelligence Suite w.r.t Development of Sustainable Agriculture Model

This collaboration with IBM environmental Intelligence Suite would showcase the environment protective and environment friendly crop production model, to learn about the nature harnessed pathway of crop production.

10) PUBLICATIONS (Based on the Critical Findings)

This is again one of the first for any Sustainability project when most of the time not a single scientific publication is done, nine publications in national and international journals have been published one is awaiting. Out of these 10 publications, five publications are on the models and tools those are developed in this project.



1. Demonstration of Large Scale ‘Waste to Wealth’ Program through bioconversion of Coir Pith and Press Mud- High GHG Emitters and highly soil and water polluting materials; utilizing Novcom Composting Technology.

Enormously significant milestone , first and only endeavor towards Agri Industry landfill waste, extremely higher GWP values of 6 ton CO₂e and 4.2 ton CO₂e respectively for mitigation, savings and C- sequestration together through Novcom Composting Technology. More than 1000MT Novcom Coirpith compost was made.

2. Demonstration of Sustainable Management Practice in Sugarcane Cultivation

Sugarcane being the second largest crop of Karnataka, as well as Mandya District – which once used to be referred as the Sugar Bowl of the state, lost its glory and sugarcane production & productivity both have come down drastically. IRF Technology along with Novcom Coirpith compost successfully demonstrated both the enhancement of productivity and production and that too with a huge carbon negative footprint.

3. Demonstration of Sustainable Management Practice in Vegetable Cultivation (Model Plots).

While the crop diversity is very poor in the state and further less in project district. Vegetable production is low in most of the districts of the states but it is practically nil in the Mandya district. Strongest reason behind that is perhaps very poor soils for vegetable production.

4. Development of Clean Food ‘NET ZERO’ encompassing THREE LAYERS OF SAFETY- Safe for Human Health, Safe for Soil Life & Safe for the Environment.

Development of Clean Food – Net Zero is the best offer from the IBM-IORF Sustainability Project to the world as many first in one model- first agri- net zero model, Carbon negative farming, only safe net zero model, methane mitigation, carbon sequestration and N₂O abatement in a single model, while ensuring more than -240 MT CO₂e/ha. carbon credit potential, Clean food Net Zero model

Ensures 360° or 3 layers of safety to human health for no presence of chemical pesticides, soil life due to avoidance of synthetic fertilizers (especially urea N fertilizers) and environment for the mitigation of methane and abatement of nitrous oxides.

5. Safety Authentication of the Clean Food 'NET ZERO' using the Food Safety Assessment Tool.

Colorimetric Assay test the safety assessment tool which was developed in Phase-I of the project was successfully utilized for the safety analysis of the crop grown under Clean Food 'Net Zero' Programme. It most comprehensively validated the absence of all harmful chemicals.

6. Soil Quality Appraisal of the Project Area & Soil Health Card for the farmers.

Any sustainable interventions in Agriculture must have a comprehensive knowledge and information about the soil quality in terms of physicochemical, fertility and most importantly Biological Health. The study was carried out in all the farms of Project Farmers through Inhana Soil Health Tool and Inhana soil quality Index., Soil Health Cards.

7. Development 'Reclamation Model' for converting Degraded Land to Agriculturally Suitable Land through adoption of IRF Technology.

Degraded land area of the total agricultural land is more than 50% and this is a huge issue in the pretext of food security and nutritional security. A reclamation model was taken under IRF technology and NOVCOM Coirpith compost in a degraded land.

Comprehensive soil analysis confirmed the poor status of soil and about 40 MT of NOVCOM compost was given, which essentially infused 40 trillion billion self generated diversified microbial population into the soil. Inhana plant health management under IRF Technology, Specially customized with the need successfully ensured diversified crop productivity most significantly without any time lag.

PHASE II: 9 Milestones

Project Site: Mandya, Karnataka.

8. Developing a GHG Mitigation Model with added Social and Environmental Impact and a potential for mitigating 30 – 40 lakh metric ton CO₂ equivalent/ year, in India.

Clean food Net Zero proved to be an unique GHG Mitigation Model with Social and Environmental Impact that clearly emphasized the relevance of this de-carbonization model on social and environmental cost.

9. Development of Resource Maps of the Project Area.

Resource mapping was done in the project area covering 20 times more number of farmers over project farmers with small grids for all individual farmland with the Soil Quality Index of IORF. This Resource Map revealed a thorough insight on the Soil Health at large-scale. Which gives clear direction for any sustainable intervention towards Crop Optimization, Soil Development and Land Use Planning.

PHASE II: 10 Milestones

Project Site: Nadia, WB,, India

1. Soil Health Card of individual farm lands for about 400 project farmers.

This is perhaps the largest endeavor towards bringing the Technology & Science to the Marginal and Small Resource Poor Farmers for their individual farmland. When their per capita land holding is as small as 0.14 hectare, and that too fragmented in 2 to 3. Moreover, these Soil Health Card contains the colour code for every Soil Quality Indices for the easy and convenient for understanding the farmers.



2. SOIL- SITE SUITABILITY evaluation of major crops

This is another significant sustainability tool and seldom available to the small and marginal farmers. Most often the farmers are unaware of soil site suitability towards optimization and maximization of the crops, which crops to be adopted or abandoned, crop sequence and above all, where this would provide higher efficiency.

3. Model demonstration OF SAFE & SUSTAINABLE 'CLEAN VEGETABLE SEED' PRODUCTION.

Seed is the foundation of any sustainable crop initiative as quality seed alone can hugely influence crop productivity. At the same time for any sustainable interventions, where synthetic crop nutrients are removed or reduced, the existing varieties those have been developed for higher fertilizer response does not function in the desired manner. Clean Food successfully demonstrated Safe And Sustainable Model in all tests Crops, it was thought that **Clean vegetable seeds** would provide further resilience, an higher economic efficiency.

4. Development of SUSTAINABLE IMPACT STORIES Related to IBM sustainability project.

Several sustainable impact stories were developed during the IBM- IORF Sustainability Projects with wide relevance in multiple sector from Safe And Sustainable Models, Agri-Net Zero Model, Safety Assessment Tool, Clean Seed Development, reclamation of Agricultural Degraded Land, Soil Health Card for every farmland, landfill waste recycling etc..

5. Research Publications Based on Specific Scientific Outcomes.

It was dedicated to document the most relevant and scientific outcomes to provide insights on the various impact of any Sustainable Initiative on human. environment and soil & water. Several research publications have been published in the internal Journals of repute, perhaps fast for the Sustainable practice.

6. Model demonstration of SAFE & SUSTAINABLE 'CLEAN PADDY SEED' PRODUCTION.

Paddy being the largest consumed cereals in India as well as the largest land share under paddy is one of the most important crops. At the same time being C3 plant, it is its vulnerability against climate change is huge, simultaneously being methane emitter, Paddy causes largest GHG emission among all crops. Therefore, it's relevance, impact on a global warming and climate change etc. demands A sustainable approach while sustainable paddy cultivation was demonstrated by IORF farmers, clean paddy seeds holds Paramount importance for any sustainable approach and sustainable paddy cultivation is indeed imperative. This clean paddy seeds and clean paddy net zero seed were developed. The Productivity was higher and different quality parameters were found to be superior and finally these Climate Resilient Paddy seeds are available at lower than conventional cost. This model clearly confirmed the potential of Clean Paddy or Clean Paddy Net Zero at large scale, with a visible impact on soil ,environment and human.

7. ESTIMATION OF ENERGY USE EFFICIENCY

Agriculture, being the second largest energy consuming sector after power, it is not included in the energy transition programme buy Energy Transition Commission. At the same time there is close relationship between unsustainable inputs- GHG Emitting components and non-renewable energy components of agriculture. So in any sustainable initiative, Energy use efficiency is A strong this indicator an energy transition can be the yardstick of sustainable agriculture. A protocol and standard was developed for the first time in in agriculture, and these can be used as an important Sustainability Tool.



8. ESTIMATION OF **CARBON SAVING AND GHG MITIGATION**

Estimation of carbon footprint of different components of agriculture is of Paramount importance towards understanding about the sustainability status of the farm and crop. To document and asses the impact of clean food Net zero programme. For the first time, all major and minor components were taken for their individual footprint assessment.

9. ANALYSIS OF **SAFETY, QUALITY & SEED RESILIENCE OF CLEAN PADDY & VEGETABLE SEEDS**

The objectivity of clean paddy and vegetable seeds development was to bring higher resiliency and quality potential. Therefore, all the vegetable and paddy seeds were evaluated to our detailed protocol for analysis, all the clean seeds performed superior under stress test along with other quality parameters.

10. **SAFETY AUTHENTICATION OF 'CLEAN FOOD' THROUGH 'FOOD SAFETY ASSESSMENT TOOL'**

All the clean food grows under Clean Food Programme were judged/ analyzed through Colorimetric Assay Test- The food safety assessment tool developed by IORF during the project and found to be safe.



PHASE III: 8 Milestones

Project Site: Mandya, Karnataka & Nadia, West Bengal, India

1. Validation of Quality Potentials of the Second Generation 'NET ZERO' Clean Paddy Seeds developed under Phase-II Project in Mandya District of Karnataka, in respect of Yield Improvement and Climate Resilience - in West Bengal Project Area.

This is often said that a quality seeds sustainably developed perform well in different ago climate. Therefore, Clean Paddy seeds developed in West Bengal - Gangetic alluvial zone was tasted in Karnataka zone, and it was found that yielded higher& with higher qualities. Thereafter, the 'NET ZERO' Clean Paddy Seeds grown over there again experimented as the second generation seed and found its good performance in the adverse weather condition where many conventional paddy seeds considerably under performed.

2. Development of 'NET ZERO' Clean Ginger Planting Material, in the Project area at Mandya District of Karnataka

It is again a landmark sustainable model primarily towards the higher income potential of the farmers, apart from its ecological impact. Clean ginger production in Phase II provided the need of quality ginger seeds. Due to non availability of quality seeds, the productivity is compromised up to 40% . Seed born disease is a major reason behind that. At the same time because of non quality seed more seed is required for the same unit area which incurs huge Cost hike. The project was taken for Ginger seedling development, thereby shortening the cropping period By 3 months, disease resistance, higher agronomic efficiency and at even lower cost. The project was highly successful for its higher productivity, quality and lower cost.

3. Development of 'NET ZERO' Clean Millet Seeds; for Food Security and Farmers' Welfare, aligning with the 'Indian Millet Initiative', in the Project area at Mandya District of Karnataka

Importance of miles are well discussed, which has been recognized by UN as the Millet Year. Though millet is widely grown and important dietary is supplement of project area quality millet seed is a huge limiting factor. Therefore, a programme on net zero clean millet seed with three prime varieties towards higher yield potential and qualities.

4. Development of **Coconut based Circular Economy (CE) Model**, in the Project area at Mandya District of Karnataka

Coconut is a major crop in Karnataka and at the same time, the productivity is lower than neighboring state as well as Indian average. The project was aimed at vegetable-based Circular Bio-economy in coconut plantations. The project successfully exhibited the increased income potential and reduced carbon foot print towards effective VCM Project.

5. Development of **'Clean Millet'** encompassing different important varieties for improvement of Crop Productivity and Quality, in the Project area at Mandya District of Karnataka

Productivity of Millets hugely vary from 30 quintal to 50 quintal per hectare. This is Primarily due to agro climatic influence and management impacts. The experiment was carried out to improve the agronomic efficiency and plant functioning resulting into higher yield and quality through IRF Technology and Novcom Coirpith compost. The experiment Exhibited superiority and improvement towards optimization.

6. Development of **'NET ZERO' Clean Coconut Planting Material**, in the Project area at Mandya District of Karnataka

Similar to other main crops, planting material plays a major role in the performance of coconut in terms of productivity Potential. Quality planting material has more relevance than coconut seed from its establishment Potential that has to sustain for next few decades. 'NET ZERO' Clean Coconut Planting Material successfully exhibited growth and other potentials. The sustainability model has a huge potential and scope in sustainable coconut cultivation Net Zero, When they will be bought under any effective sustainable technology.



7. Development of 'NET ZERO' Clean Sugarcane Planting Material, in the Project area at Mandya District of Karnataka

Once used to be considered as sugar bowl of Karnataka state, the project district Mandya has been now struggling. Sustainable sugarcane cultivation under clean sugarcane net zero program emphasized the need for quality sugarcane Planting material towards better adaptability, and higher crop performance. 'NET ZERO' Clean Sugarcane Planting Material proved its success and ushered multiple impacts on realization, quality, sustainability etc.

8. Assessment of Quality Potentials of the First generation 'NET ZERO' Clean Vegetable Seeds produced under Phase-II Continuation Project in West Bengal, in respect of Yield Improvement and Climate resilience - in West Bengal Project Area.

The relevance, importance, and objectivity of quality, vegetable seeds are well-known and well defined. 'NET ZERO' Clean Vegetable Seeds were produced with higher productivity and better quality. This experiment was laid down to exhibit, evaluate and establish their crop performance- potential to Actual. The threat of productivity loss under any sustainable initiative was thoroughly ruled out as well as this model has showed further higher productivity due to incorporation 'NET ZERO' Clean Vegetable Seeds and crop management under IRF Technology.

