## ACFA VERSION 1.0 – Sustainable Agriculture Carbon Computing Standard based on IPCC Guidelines

## Adapt or starve: COP27 spotlights agriculture challenges and solutions in the face of climate change

"if the right choices are made, agriculture can be an important part of the solution to fight the climate crisis by sequestering carbon in soil and plants and promoting adaptation and resilience".

UN News - Global perspective Human stories - 12 November 2022 - Climate and Environment

There must be an annual increase in the world's agricultural production by 60% from 2005/2007 to 2050, comprising a rise of 77% in developing and 24% in developed countries, to fulfill the food and nutritional requirements of the population by 2050 (Alexandratos and Bruinsma, 2012). But Ensuring food for the world's population in the face of climate change is not an easy task, owing to its huge impact on agriculture production (Malhi *et al*, 2021; WPR, 2020). Climate change not only can disrupt food availability, but also reduce access to food, and affect food quality (USDA, 2015).

But among all adversities, there lies a way to progress considering that agriculture acts as both source and sink of GHG. The role of soil ecosystem as a potential sink for GHGs is increasingly being recognized with the realization that, agricultural ecosystems have the potential to store a vast amount of soil carbon, up to 1 billion metric tons per year (Sanderman and Baldock, 2010; Abdullahi et al., 2018, Jansson et al, 2021), which would offset around 10% of the annual GHG emissions of 8–10 billion metric tons per year (Jansson et al, 2021). GHG emissions from agriculture originate mainly in the form of CH<sub>4</sub> from rice cultivating systems and cattle rearing and N<sub>2</sub>O from fertilizer management practices.

Hence, the situation demands a TRANSFORMATIVE CHANGE in Agricultural Practices to ensure SUSTAINED production and availability of SAFE FOOD for the rising global population while MITIGATING Climate Change Impact (*The Future of Food and Agriculture- Trends and Challenges, FAO-2017*).

The Clean Food 'NET ZERO' program of Inhana Organic Research Foundation (IORF) is one such Model for Transformation of Conventional Agriculture into a Safe and Sustainable crop production system without any threat of crop loss and

without increasing the cost of production. The highlight of this Program is that while delivering SAFEST FOOD and EMPOWERING FARMERS' LIVELIHOOD, it actually provides IMPACTFUL CLIMATE ACTION in terms of MITIGATING 251.5 MT CO<sub>2</sub>e per hectare. The significant GHG Mitigation under this program spurred the necessity for its comprehensive Carbon Footprint Computation. But, comprehensive GHG quantification under CFNZ initiative became a challenge while using the presently available carbon calculators.

This is because the scientifically available case studies on agriculture carbon footprint assessment generally did not comply with the standard three-tier methodology, leading to non-uniformity among different studies and their comparisons. Moreover, these carbon calculators while being mostly aligned with conventional agriculture, often do not account for all the potential emission sources in agriculture, one such example being embodied GHGs; regional variations in terms of geographical location, climate, and other micro-climatic factors are also not accounted for, GHG mitigation under different organic manure/compost is not properly differentiated, and the assessment protocols mostly do not cater to Indian agricultural ecosystem.

Hence, to accurately quantify and adjudge the impact of sustainable agriculture initiatives in the Climate Action dimension, IORF set out to develop the best fit carbon assessment tool taking into account the effect of farm level sustainable management approaches (Tier 2 /tier 3 level); specially in tandem with the latest IPCC amendments and recent research findings. Scientists from several universities and research units *viz*. Dept. of Agronomy, Visvabharati University, Agricultural & Ecological Research Unit, Indian Statistical Institute (Giridih), Dept. of Soil Science, Tezpur University and Krishi Vigyan Kendra, Nadia (ICAR, BCKV), Institute of Agricultural Science, Calcutta University and i-NoCarbon Limited, UK joined hands for formulating the equations, sourcing of field database under different agro-ecosystems, organizing scientific experiments for related database, review of literature, acquiring relevant resource data base and comparative resource of different standards and guidelines; towards development of a robust, sustainable agriculture carbon computing tool.

## Aspects that ensure 'Agriculture Carbon Footprint Assessor (ACFA)' Version- 1.0 the best fit sustainable agriculture carbon computing tool?

- Specifically developed for assessing the GHG footprints from Sustainable Agricultural Practices and well synchronized with the Indian Conditions.
- It considers ALL THE POSSIBLE alternative Specific Input components and considers all the possible input specific embodied energies.
- The calculations involve more detailed and specific data and specific emission factors of individual inputs that can provide more accurate estimates of GHG Footprint.
- It considers, specific values of process emission for different on-farm composts/organic soil inputs and enlists specific scope for Agricultural Waste Compost and Land fill compost.
- IPCC Tier 3 methods that are the most advanced and precise, involving specific measurements and more sophisticated models, have been taken as the basis in order to quantify the actual contributions of different agricultural activities to climate change and for tracking progress toward emission reduction targets.
- In the calculations of ACFA, the micro-environment factors are considered into the assessment so that it can enhance the accuracy and relevance of the results and facilitate the development of targeted and context-specific climate action plans in a specific region, and also aid in measuring the progress and effectiveness of mitigation efforts within a particular micro-environment over time.
- Most importantly ACFA provides a comprehensive report that outlines the carbon footprint of the agricultural operation: breakdowns of emissions by activity or emission source, identification of hotspots, and potential mitigation strategies.