

# Greenhouse Gas Mitigation Co-Benefits across the Global Agricultural Development Programs

Bardot Cassidy\*

Department of Agriculture, College of Colchester, United Kingdom

## Abstract

The goal of global agricultural development initiatives is to support smallholder farmers and farming communities by building resilient and sustainable food production systems, which can also have the added benefit of promoting the mitigation of climate change (GHG). In this report, the International Fund for Agriculture Development (IFAD), the USAID-Feed the Future (FTF) Initiative, and the Foreign, Commonwealth and Development Office estimate GHG emissions reductions from almost 100 agricultural development projects across 51 low- and middle-income countries (FCDO, previously DfID). These initiatives supported a net annual reduction in GHG emissions of 6.5 MtCO<sub>2</sub>e. The project areas' enhanced agroforestry practises and forest management programmes made the largest contributions to the investment portfolios' overall mitigation cobenefits (3.9 MtCO<sub>2</sub>e/y). The reduction in GHG emissions (1.5 MtCO<sub>2</sub>e/y) was also significantly aided by improved crop management using minimum tillage techniques, residue integration, water management in paddy rice, and the use of organic fertilisers. The chosen projects' management of grass and grazing lands results in a 0.2 MtCO<sub>2</sub>e/y net reduction in emissions.

**Keywords:** Global agricultural development; Greenhouse gas; Grass and pasture

## Introduction

In the previous few decades, non-CO<sub>2</sub> agricultural greenhouse gas (GHG) emissions have greatly increased globally, and they are expected to continue to do so in the. This estimate is mostly driven by changes in dietary habits in developing nations and population increase in those economies. To accomplish the world's climate ambitions, agricultural emissions reduction will be essential as other sectors move toward more rapid decarbonisation. So, in order to prevent global warming from rising 2 °C above pre-industrial levels by 2100, agriculture, like other industries, must slow down its current GHG emission rise. This calls for a quick and significant change in food systems [1, 2].

## Materials and Method

### Programs for global agricultural development that have been chosen

Enhancing agricultural growth and food security in underdeveloped nations is the goal of the global agricultural development initiatives supported by IFAD, USAID, and FCDO. Through the development of resilient and sustainable food production systems, the programmes aid smallholder farmers and farming communities. 59 agricultural development projects were chosen from the diverse spectrum of IFAD's investment portfolio to evaluate the potential decrease in emissions from the projects' implementation. The selection criteria included information about the agricultural methods (single or combined) supported, the number of farmers targeted by the project, and the geographic area. The most prevalent agricultural methods included in the IFAD's investment portfolio were irrigation and water collection, soil management, enhanced crop diversity, improved agroforestry, and use of organic fertilisers [3].

### GHG emissions are projected to be affected

Three techniques were used to conduct an ex-ante analysis of project portfolio activities for IFAD, USAID, and FCDO: i) emission coefficients calculated using meta-data of greenhouse gas (GHG) emissions and soil organic carbon (SOC) stocks extracted from peer-reviewed journal publications ii) SOC sequestration rate (World

Bank, 2012); and iii) FAO EX-Ante Carbon Balance Tool. The Intergovernmental Panel on Climate Change (IPCC) methodology for GHG emissions inventories serves as the foundation for the EX-ACT. The carbon stock changes and GHG emissions per unit of land under various interventions are estimated using this tool, which uses a land-based GHG emission accounting approach. Based on the information in the project documents (such as project design documents, monitoring and evaluation documents.

The total mitigation potential of improved agricultural practises in the IFAD's investment portfolio was computed using the worldwide mean mitigation potentials derived from the meta-data. Data from 108 studies of SOC stock changes as a result of altered agricultural methods, 51 studies of methane (CH<sub>4</sub>) emissions from paddy rice, and 38 studies of nitrous oxide (N<sub>2</sub>O) emissions from fertiliser application were used to calculate the world mean GHG mitigation potential. Since there were few research on pasture management in the dataset, Conant et al. used their global analysis to estimate the practice's potential for mitigating climate change (2017). In the chosen studies, the difference between the control treatment and better agricultural practises was used to calculate the impacts of agricultural practises on SOC, N<sub>2</sub>O, and CH<sub>4</sub>.

Methods used in a specific agricultural production system. The database also contains information on how individual and combined agricultural techniques may reduce emissions. For example, due to a significantly smaller dataset of N<sub>2</sub>O measurements, the use of compost, manure, and synthetic nitrogen fertilisers were combined to analyse the impact on N<sub>2</sub>O emissions [4, 5, and 6].

\*Corresponding author: Bardot Cassidy, Department of Agriculture, College of Colchester, United Kingdom, E-mail: Bardot33@gmail.com

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## Transitions in landscape scale

Improved agroforestry systems in poor nations can have significant GHG reduction co-benefits and prevent deforestation and forest degradation. These interventions are crucial for forest dependent populations who rely on revenue production, fuelwood, timber, and non-timber forest products in some way, as well as for improving ecosystem services by minimising soil erosion and nutrient loss (e.g. medicinal plants and fruits). Total interventions with landscape consequences in the IFAD, FTF, and FCDO financed initiatives helped to sequester atmospheric carbon. The landscape transition of around 100,000 ha to afforestation, avoided deforestation and degradation, and better agroforestry systems is expected to reduce emissions by 68 MtCO<sub>2</sub>e in 20 years. Landscape transition projects are mostly associated with initiatives to conserve natural resources, and benefits related to emission reduction [7, 8].

## Conclusion

This assessment of the IFAD, FCDO, and FTF programmes' support for agricultural development projects has revealed enormous potential for reducing net greenhouse gas emissions or emission intensity in agriculture and related sectors, including improved agricultural growth and food security in low- and middle-income countries (LMIC). The global agriculture development programmes must increase support for scaling up/out of agricultural best practises and better integrate agriculture and forestry efforts to prevent land use change in order to advance toward achieving the net-zero emissions and 1.5 °C goals, including food security. To further satisfy national emissions reduction goals, many new and updated NDCs of LMICs additionally focus on agricultural and related sectors (such as crop, livestock, soil, forestry/agroforestry, etc.). They also mention financial and technological assistance from international communities [9, 10].

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## Potential Conflict of Interest

No conflict or competing interests in the publication of this paper.

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