Food and Agriculture Organization of the United Nations

GAFSP global agriculture & food security program

Green House Gas Accounting Analysis of GAFSP Public Sector Window:

Executive Summary

March 2021

The Food and Agriculture Organization of the United Nations (FAO) has conducted an analysis of the Global Agriculture and Food Security Program's (GAFSP) Public Sector Window portfolio[1] in the Agriculture, Forestry and Other Land Use (AFOLU) sector, for its climate change mitigation potential. Although the GAFSP portfolio has not been designed with a climate change mitigation focus, GAFSP countries have demonstrated a large interest in prioritizing and implementing climate-sensitive approaches in the food and agriculture sector. The GAFSP Coordination Unit (CU) determined that it would be useful to capture the overall trends and trajectory of the program in terms of its impact on addressing climate change over time, identify best practices, and benchmark where possible the achievements with the current emissions and/or country commitments. The objective of the task "GHG accounting analyses for the Global Agriculture and Food Security Program" was to examine the climate change mitigation potential of 44 GAFSP investments[2] in the public sector window and Missing Middle Initiative (MMI) pilot projects using the most up-to-date version of the EX-Ante Carbon-balance Tool (EX-ACT-v8)[3]. The task was carried out from August 2020 to March 2021 in four major steps and associated component outputs: i) brief inception report; ii) data collection phase, consultations, analysis and drafting of the report; iii) draft final report and draft Prezi presentations; and iv) final report, final Prezi presentations. The present report represents the Executive Summary of the final analytical report.

The GAFSP projects were analysed individually using the Ex-Ante Carbon Balance Tool (EX-ACT) for GHG emissions[4]. The analysis was conducted in all projects in implementation or those of which have closed (ex-post). The projects were clustered

[1] This study was undertaken under the task "GHG accounting analyses for the Global Agriculture and Food Security Program" financed by GAFSP.

[2] Initially, GAFSP identified 45 investment projects in its portfolio for analysis. As there was no data available the GAFSP Coordination Unit (CU) and the EX-ACT team decided to exclude the "*Sustainable Agriculture Intensification for Food and Nutrition Security (PAPSA)*" project in Burkina Faso.

[3] EX-ACT reports a carbon-balance in tCO_2e. A positive carbon-balance means an increase in GHG emissions, while a negative carbon-balance indicates that there are carbon-sequestrations or GHG emission reductions.

[4] EX-ACT tool that was used to perform the analyses to estimate the climate change mitigation potential of the GAFSP portfolio, specifically on the types of greenhouse gases (GHGs) and the sub-sectors within the AFOLU sector estimated.

around geographic regions to better understand the GHG emissions scenarios irrespective of the project supervising and implementing entities. The results are driven by the size of the investments, type of implemented activities as well as the specific geographical conditions prevailing in the projects' areas (notably, climate, moisture and soil type). As such, no objective benchmarking of the overall performance of the portfolio was possible while the benchmarking was limited to establishing the contribution of the portfolio to countries' national determined contributions (NDCs) and comparing projects' emission reductions with current emissions levels.

The study has established that the current GAFSP portfolio of 44 projects is a net reducer of GHG emissions, with an overall carbon-balance of -7.58 million tCO_2e over 20 years of analysis[5]. Given the overall yearly emissions from agriculture from all the GAFSP countries combined (632 million tCO_2e in 2018 according to FAOSTAT), the GAFSP contribution to emission reductions is rather small. Still, this overall result is generally appreciable, particularly because of the portfolio's objectives not being related to climate change mitigation. Notably, the GAFSP portfolio's GHG emission removals and carbon sequestrations of -15.4 million tCO_2e largely offset the portfolio's overall GHG emissions of 7.8 million tCO_2e. The climate change mitigation benefits are not distributed equally across the six operating regions of GAFSP driven by the number of projects and different range of activities implemented in each region. While five regions had a net negative carbon-balance (East Asia and the Pacific with seven projects, Africa with 25 projects, Latin America and the Caribbean with five projects, Europe and Central Asia with two projects and South Asia with four projects), one region was identified as a net emitter of GHGs (Middle East and North Africa with a single project in Yemen). Specifically, the GAFSP portfolio within the East Asia and the Pacific region showed the highest climate change mitigation potential with over -3.3 million tCO2e, followed by approximately -3 million tCO2e in Africa, -1.7 million tCO2e in Latin America and the Caribbean, and -1.5 and -0.8 million tCO2e in Europe and Central Asia, and South Asia, respectively. The emissions from the Middle East and North Africa region (2.8 million tCO_2e) are an exception due to the fact that there is only a single project, namely *Smallholder Agricultural Production Restoration and Enhancement Program (SAPREP)*, within the portfolio in Yemen and that this project had a strong focus on maintaining a stable livestock population in a conflict zone (without the project the livestock population would decrease by 20 percent based on the observed trends).

The projects of the GAFSP portfolio covered a wide range of activities from avoiding deforestation to afforestation, other land use change (e.g., from set-aside to cropland or annual to perennial cropland), annual croplands, perennial croplands, grasslands, livestock, forest management, inputs (such as fertilisers and pesticides) and

[5] Following the IPCC methodology, EX-ACT considers that benefits of a project in terms of CO_2 emissions occur during 20 years since the beginning of project implementation.

investments (such as on-farm buildings or irrigation)[6], and fisheries and aquaculture. While some of these activities removed carbon-dioxide from the atmosphere or reduced GHG emissions, others were key emitters of GHG.

The analysis revealed several "best and worst practices" that indicate the investments that brought most benefits in terms of carbon sequestration and avoided GHG emissions, as well as the investments that led to increased emissions [7]. Approximately 90 percent of all net GHG emission removals and carbon sequestrations of GAFSP-financed projects can be attributed to the following three activities:

- The improved management and restoration of annual croplands by means of Climate Smart Agriculture (CSA) practices (including improved agronomic practices, nutrient management, no tillage and residue retention, water management and/or manure application) increase carbon sequestration in the soil and hence remove carbon-dioxide (CO_2) from the atmosphere. Considering GAFSP's focus on agriculture and food security, most of the portfolio's investments were spent on annual cropland improvements. As a result, annual croplands also represent the activity with most carbon-sequestrations, representing approximately 45 percent of all net carbon sequestrations and GHG emission removals of the GAFSP portfolio. Carbon sequestrations from annual croplands are distributed across all continents and are of particular importance in Africa, East Asia and the Pacific, and Europe and Central Asia.

- The development and improved management of agroforestry sustainably increase the smallholders' productivity, while at the same time offering better protection against climatic hazards such as droughts, floods, or strong winds, and providing an ever more efficient way to increase carbon sequestration. Indeed, in perennial croplands, carbon sequestration is not limited to soils. The above- and below-ground biomass also stores significant amounts of carbon. Perennial croplands represent approximately 35 percent of all net carbon sequestrations and GHG emission removals of the GAFSP portfolio. Africa, East Asia and the Pacific, and Latin America and the Caribbean were the regions with the highest carbon sequestrations from agroforestry systems.

- Afforestation is one of the most efficient ways to sequester carbon within the above- and belowground biomass, soil, litter and deadwood. Furthermore, forests provide other ecosystem services that are not purely related to climate change mitigation, such as food provisions, water regulation and erosion prevention. With roughly 10 percent of all net carbon sequestrations and GHG emission removals, afforestation makes an important contribution to the

[6] "Inputs and investments" emissions were accounted from use of synthetic fertilizers and pesticides; the increased energy consumption and construction of new infrastructure are sources of nitrous oxide (N_2O) and/or CO_2

[7] In very general terms, best practices involve avoided deforestation, afforestation and improved forest management, while worst practices involve livestock expansion and intensification of flooded rice systems. Yet, the size of their impacts of each of these activities on the carbon balance will be determined by the size, type and location of the investment. As a result, it is more appropriate to analyse the best and worst practices within the portfolio at hand rather than in general terms.

overall positive environmental performance of the GAFSP portfolio. The highest carbon sequestrations from afforestation can be attributed to East Asia and the Pacific, Africa, and Latin America and the Caribbean, in chronological order. The remaining three regions did not have any afforestation activities.

Yet, some GAFSP activities were net GHG emitters. Approximately 97 percent of all net GHG emissions in the GAFSP portfolio can be attributed to the following three activities:

- The increase in livestock herds involves the production of methane (CH_4) due to the enteric fermentation process of livestock. Livestock methane emissions represent approximately 70 percent of all net emissions in the GAFSP portfolio and are particularly notable in the Middle East and North Africa, East Asia and Pacific, and Africa regions (and less so in Latin America and the Caribbean, and South Asia).
- The intensification of flooded rice systems involves the production of methane due to the anaerobic decomposition of organic material in flooded rice fields. The introduction of multiple cropping seasons increases in the cultivation period, the pre-season and peri-season flooding period, and the incorporation of organic amendments are all possible explanations for increases in CH_4 emissions in Africa, East Asia and the Pacific, and South Asia. Methane emissions from flooded rice represent roughly 18 percent of all emissions in the portfolio.
- The increased use of synthetic fertilizers and pesticides, the increased energy consumption and construction of new infrastructure are sources of nitrous oxide (N_2O) and/or CO_2. These emissions accounted for as "inputs and investments" only represent roughly 9 percent of all GHG emissions in the portfolio and are particularly notable in Africa and East Asia and the Pacific (and less so in Europe and Central Asia, and the Middle East and North Africa). In two regions, better input management led to decreases in emissions from inputs and investments, notably South Asia and Latin America and the Caribbean.

Figures 1 and 2 below summarize the contribution of various activities to the overall carbon balance of the GAFSP portfolio and of the regional interventions.

Figure 1. Net carbon-balance by activity

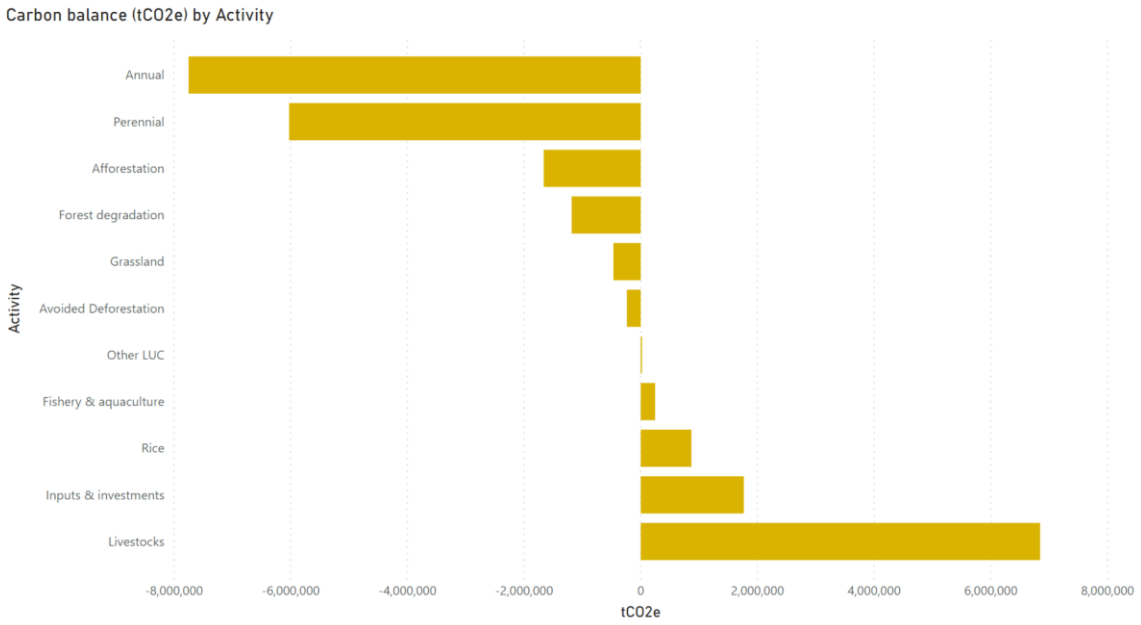
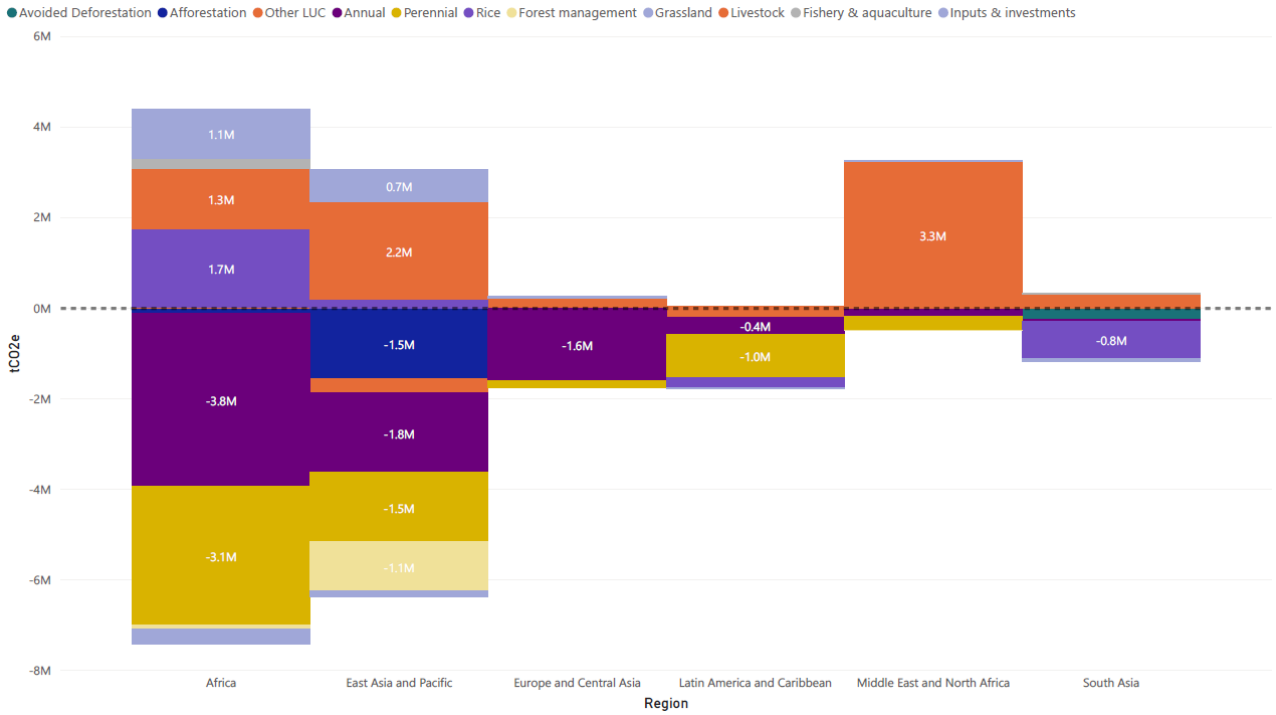


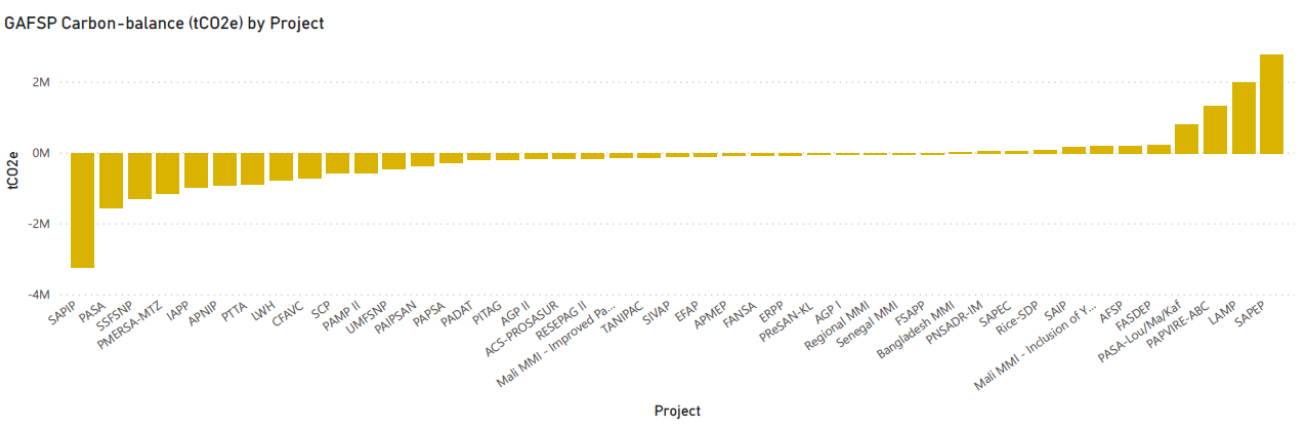
Figure 2. Net carbon-balance by activity and region



Among the 44 projects within the GAFSP portfolio, the following three projects were revealed to have the highest mitigation potential based on the total carbon-balance over 20 years (Figure 3): the *Sustainable Agriculture Productivity Improvement Project*

(SAPIP) in Timor-Leste was found to display the highest mitigation potential based on the total carbon-balance in terms of tCO_2e over 20 years (-3,237,145 tCO_2e), when solely considering the proportional GAFSP contribution to the projects; the *Agriculture Sector Support Project (PASA)* in Togo had the second highest climate change mitigation potential with a carbon-balance of -1,532,275 tCO_2e; followed by the *Strategic Support for Food Security and Nutrition Project (SSFSNP)* in the Lao People's Democratic Republic with a carbon-balance of -1,282,254 tCO_2e. The magnitude of the carbon sequestrations and emission reductions of the SAPIP project can be explained by its strong focus on forestry activities. Indeed, the SAPIP project in Timor-Leste is the only forestry-dominant project within the GAFSP portfolio, with afforestation and forest management making up over 80 percent of its carbon-balance. The SAPIP project alone contributes approximately 93 percent and 92 percent to the GAFSP overall carbon-sequestrations from afforestation and forest management activities. The strong carbon sequestrations of the PASA project in Togo are associated with a strong perennial crop (or agroforestry) component, representing approximately 56 percent of the project. The SSFSNP project in Lao People's Democratic Republic (PDR) had a strong focus on annual cropland improvements, which explain over 85 percent of all carbon-sequestrations and emission reductions of this project.

Figure 3. Carbon-balance expressed in tCO_2e per project, all activities.



Several GAFSP projects were found to be net emitters of GHGs. These projects are notably the SAPEP in Yemen with a carbon-balance of 2,762,553 tCO_2e, followed by *Livestock and Agricultural Marketing Project (LAMP)* in Mongolia with a carbon-balance of 1,991,536 tCO_2e and the Project to *Support Food Production and Build Resilience in Alibori, Borgou, and Collines Departments (PAPVIRE-ABC)* in Benin with a carbon-balance of 1,329,843 tCO_2e. While the former two projects' emission increases can be attributed to livestock activities, the latter one's increased emissions can mainly be attributed to increased methane emissions from flooded rice activities. The livestock activities associated with these projects are an important contributor to

livelihoods in either a conflict zone (SAPEP) or a region where the animals are a significant source of income (LAMP).

From the project-specific carbon emissions reduction and carbon sequestration perspectives, future GAFSP investments could take into consideration the sequestration potential of forestry-related activities, perennial crops and agroforestry systems. Similarly, future investments on potential livestock [8] and flooded rice activities may need to take in to account the net GHG emissions.

By calculating project-related marginal abatement cost curves (MACCs) on the GAFSP portfolio, FAO experts found that the cost-effectiveness in terms of climate change mitigation was the highest for the SAPIP in Timor-Leste with marginal abatement costs of only USD 6.49 per tCO_2e, PASA in Togo with marginal abatement costs of USD 11.90 per tCO_2e, and the *Improved Rice Paddy Quality and Quality Niébé Processing for Improved Nutrition and Increased Farmer Development* (MMI) pilot project in Mali with marginal abatement costs of USD 21.82 per tCO_2e. On the other hand, the projects with the lowest cost-effectiveness in terms of climate change mitigation were the *Agricultural Growth Project (AGP-I)* in Ethiopia with marginal abatement costs of USD 1,008.49 per tCO_2e, *Small-Scale Irrigation and Value Addition Project (SIVAP)* in Kenya with marginal abatement costs of USD 914.94 per tCO_2e and the *Food and Nutrition Security Enhancement project (PReSAN-KL)* in Mali with marginal abatement costs of USD 690.01 per tCO_2e.

As there was no possibility to disaggregate the project activities by financing entity for projects with multiple sources of co-financing, the GAFSP management team and the EX-ACT team decided to first calculate the overall carbon-balance of each project in order to then compute the GAFSP portion of the projects' carbon-balance via its budget contribution to each project. This approach results however in a rough estimate of GAFSP contributions to the carbon balance.

Benchmarking the GHG analysis to countries' NDC targets and total agricultural emission levels for a portfolio of this size relative to overall country investments in the AFOLU sector is bound to show very small benefits. The overall GAFSP portfolio contributions were about 0.08 percent of the combined countries' NDC targets of emission reduction to be achieved until 2030. It may be more useful to note that all 45 countries in which the GAFSP Public Sector Window is operating are party to the UN Framework Convention on Climate Change (UNFCCC) and have included climate resilient agriculture as a priority sector in their NDCs, as have most of the current GAFSP-eligible countries, demonstrating GAFSP countries' large interest in prioritizing climate resilient agriculture and implementing climate sensitive approaches. Objective benchmarking of project contributions in the AFOLU sector is also extremely difficult, as those are heavily influenced by the size of the investment, specific activities selected and, most importantly, the geographical conditions, including climate, moisture and soil type, prevailing in the specific project area, which can be

[8] EX-ACT v.8 includes a simplified way of accounting for emissions from the livestock sector. It provides a reasonable estimate of overall emissions from livestock keeping but does not allow for detailed disaggregation of the emissions.

very different even within the same country or region. Instead, it might be useful to concentrate on decomposing project analysis by specific activities in the specific locations, to understand under which circumstances the activities lead to better carbon balance and lead to greater climate change mitigation contributions. The cost-effective analysis would be most informative at such a disaggregated level with site specificities taken into account.

Refining the conclusions and elaborating a set of robust recommendations on how future GAFSP investments should be shaped requires a more in-depth analysis (beyond the scope of the present report due to time constraints and the approach taken in the study). In particular, to determine the most climate-mitigation friendly investment options, the future analyses could focus on: (i) deriving the activity-specific marginal abatement cost curves, which would show which activities perform best and where it is most useful to invest future resources to achieve best mitigation outcomes; (ii) breaking down the activity marginal abatement cost curves (MACCs) by region, climate, moisture and soil type as those are key in determining the performance of each of the activities and may significantly vary from one area to another; and (iii) conducting additional assessments to include emissions beyond farm gate, down the value chains for projects that include activities downstream of the value chains to allow for a comprehensive coverage of all sources of emissions (or their reductions) of the project in question.

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