Food and Agriculture Organization of the United Nations

Annex 22

Assessment of GHG emission reductions and their monitoring and reporting

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For the GCF-FAO Project "Ecosystems-based Adaptation for resilient Watersheds and Communities in Malawi (EbAM)"

Preamble

1. The Ex-Ante Carbon Balance Tool (Ex-ACT) has been developed by the Food and Agriculture Organization of the United Nations (FAO) to evaluate impacts of the interventions in the Agriculture, Forestry and Other Land Use (AFOLU) sector on greenhouse gas (GHG) emissions. Ex-ACT provides estimates of the mitigation potential of public or private investment projects, policies and national level programs. It helps the decision makers to understand whether the planned agricultural interventions contribute to meeting climate change mitigation objectives. The Ex-ACT appraisals, initially designed for *ex-ante* analysis, can be also conducted during the project implementation as well as ex-post for comprehensive monitoring and evaluation, both at a project and at a country level. Ex-ACT calculations are based on land use data.

2. The current version of Ex-ACT (V9.3) is primarily based on the IPCC 2019 Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories (IPCC 2019) and IPCC 2013, 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (IPCC 2014), complemented by other scientific research. GHG emissions for farm operations, inputs, transport and irrigation systems implementation are based on Lal (2004). Emissions factors for the fishery sector are derived from Parker & Tyedmers (2014), Sciortino (2010), Winther et al. (2009) and Irribaren et al. (2010 & 2011). Soil carbon stock in mangroves is complemented by the review from Atwood et al. (2017). These references provide Ex-ACT with recognized default values for emission factors and carbon values, the so-called Tier 1 level of precision.

3. The tool consists of seven topic modules that allow to analyze a range of agricultural and forestry activities including crop production, land rehabilitation, forest management, livestock and grassland production systems among others. The tool calculates changes in carbon stocks and GHG emissions including carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), which once converted to CO2 equivalent are used to derive the carbon balance that indicates the impact of the project: positive carbon balance indicates that the project leads to greater emissions, while negative carbon balance indicates that project contributes to emissions reduction.

4. The evaluation assesses how the impacts of an intervention compared to the business as usual (BAU) scenario. The calculator requires data for 3 specific points in time: initial situation, with project scenario, without project or BAU. Once all this information is gathered, a plan based on technical expertise is generated on how to best model the intervention in the tool along with the assumptions made. This is a crucial step as this is what really determines the measurement of the impact. All these aspects are discussed below to ensure a clear and transparent understanding of the assessment done for this project.

Project boundaries, data source and assumptions

5. EbAM will directly benefit 270,820 people and target about 83,237 hectares (within the total micro-catchment area of 88,800 hectares) over 6 years and generate mitigation benefits – EbA promoting better land and water use, with improved soil quality and water conservation. This objective will be achieved through the implementation of three interlinked components: (i) Integrated landscape management, (ii) Resilient livelihoods and food systems, and (iii) Enabling institutional and financial environment.

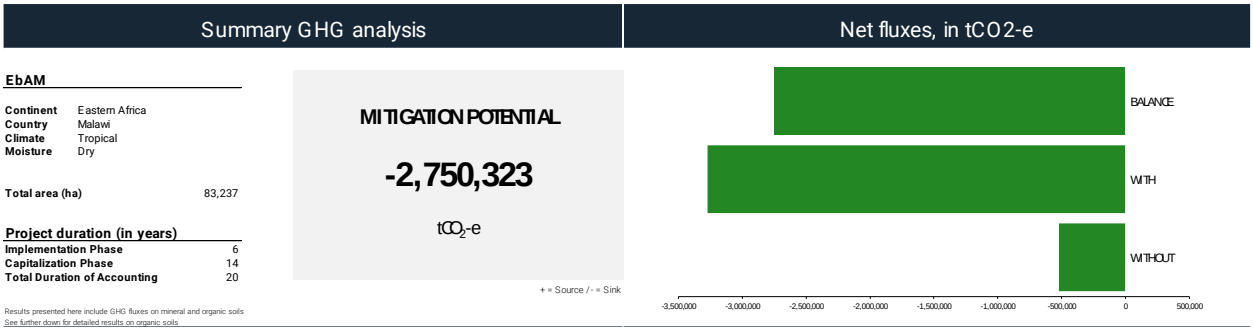
6. The estimation of emissions for this project considers the sequestration, reduction and or avoidance that result from the implementation of project activities. Ex-ACT differentiates between two time periods: project implementation phase and capitalization phase. The implementation phase is the period during which the project activities are carried out. Yet, the period covered by the analysis does not necessarily end with the termination of the active project intervention. Further changes may occur as the result of the interventions (project activities) such as changes in soil carbon content or biomass. This period defines the capitalization phase. In this analysis, following recommendations of the IPCC1, the analysis considered an overall 20-year period for implementation and capitalization phase. As in the current analysis the physical implementation of the project consists of 6 years, the benefits generated by the project will continue to capitalize for 14 more years to reach the 20-year period. The analysis further assumes the dynamics of change (from "without" to "with project") to be *dynamic* over the duration of the project.

7. The main data, assumptions and Ex-ACT modules used are presented below. Assumptions and detailed calculations behind the targeted hectares are also presented in the Excel file of the Economic and Financial Analysis (EFA, see Annex 3, "Ex-ACT assumptions" sheet).

Ex-ACT module	Hectares	Changes in land use & management	Project component
CROPLAND MANAGEMENT			
Cropland remaining cropland	23,376	From full tillage and low carbon input to reduced tillage and high carbon input with manure	Components 1 & 2
Agroforestry	3,654		
GRASSLAND AND LIVESTOCK			
Grassland	3,654	Pastureland, from severely degraded to improved	Component 1
FOREST MANAGEMENT			
Tropical dry forest	45,377	From largely degraded to moderately degraded	Component 1
Tropical shrubland	7,176		
TOTAL HECTARES	**83,237**		

Results

8. Results suggest a mitigation potential in the range of -2,750,323.tCO2eq and -137,516 tCO2eq/ year. Detailed results are presented below, and detailed Ex-ACT calculations were attached to the file.



DETAILED RESULTS

Project name EbAM
Continent Eastern Africa
Country Malawi
Climate Tropical
Moisture Dry

Project duration (in years)	
Implementation Phase	6
Capitalization Phase	14
Total Duration of Accounting	20

Total area (ha)	83,237
Mineral soil	83,237
Organic soil	0
Waterbodies	0

Global warming potential	
CO_2	1
CH_4	34
N_2O	298

Tier 2 Annual emissions

GROSS FLUXES

In tCO2-e over the whole period analysis

PROJECT COMPONENTS		WITHOUT	WITH	BALANCE
Land use changes	Deforestation	0	0	0
	Afforestation	0	0	0
	Other land-use	0	0	0
Cropland	Annual	79,696	-412,442	-492,138
	Perennial	-719,609	-808,870	-89,262
	Flooded rice	0	0	0
Grasslands & Livestock	Grasslands	0	-101,698	-101,698
	Livestock	0	0	0
	Forest mngt.	0	-1,996,879	-1,996,879
	Inland wetlands	0	0	0
	Coastal wetlands	0	0	0
	Fisheries and aquaculture	0	0	0
	Inputs & Invest.	118,863	48,516	-70,347
Total emissions, tCO2-e		**-521,050**	**-3,271,373**	**-2,750,323**
Total emissions, tCO2-e/ha		**-6.3**	**-39.3**	**-33.0**
Total emissions, tCO2-e/ha/yr		**-0.3**	**-2.0**	**-1.7**

+ = Source /- = Sink
Results presented here include GHG fluxes on mineral and organic soils
See further down for detailed results on organic soils
* Includes fisheries, acquaculture and inputs & investments that are not included in the AFOLU definition.

SHARE PER GHG OF THE BALANCE

In tCO2-e over the whole period analysis

CO2 BIOMASS	CO2 SOIL	N_2O	CH_4	ALL NON-AFOLU EMISSIONS*
0	0	0	0	
0	0	0	0	
0	0	0	0	
0	-517,427	25,289	0	
0	-88,793	-468	0	
0	0	0	0	
0	-101,698	0	0	
		0	0	
-1,996,879	0	0	0	
0	0	0	0	
0	0	0	0	
0	0	0	0	0
	0	-19,595		-50,752
-1,996,879	**-707,918**	**5,225**	**0**	**-50,752**
-24.0	**-8.5**	**0.1**	**0.0**	**-0.6**
-1.2	**-0.4**	**0.0**	**0.0**	**0.0**

AVERAGE ANNUAL EMISSIONS

In tCO2-e/yr

WITHOUT	WITH	BALANCE
0	0	0
0	0	0
0	0	0
3,985	-20,622	-24,607
-35,980	-40,444	-4,463
0	0	0
0	-5,085	-5,085
0	0	0
0	-99,844	-99,844
0	0	0
0	0	0
0	0	0
5,943	2,426	-3,517
-26,052	**-163,569**	**-137,516**

Uncertainty level	tCO2-e/yr	Percent
WITHOUT	-26,052	35%
WITH	-163,569	39%
BALANCE	-137,516	39%

Monitoring and evaluation using Ex ACT

9. Monitoring can be carried out using Ex-ACT tool. This is realized at different stages of the project implementation. In collaboration with the implementation and monitoring teams, the Ex-ACT analyst will identify all the activities that are already undertaken and the actual areas that have been improved or restored by the project. The assessment uses this information to quantify the effective carbon sequestered or emitted by the project so far compared to the planned sequestration potential estimated at the beginning of the project. If substantial difference persists, corrective actions could be taken to put the project in the planned path.