Ex-Ante Carbon balance Tool (EX-ACT)

1. Background

Agriculture, Forestry and Land Use Change (AFOLU) are major sources of green-house gases (GHG), contributing 24% of global emissions or about 10-12 Gt of CO_2 equivalents per year. The climate change mitigation potential for the sector is high. Many of the technical options are readily available and could be deployed immediately:

- Decreasing the rate of deforestation and forest degradation, adoption of improved cropland management practices (reduced tillage, integrated nutrient and water management) reduces carbon dioxide emissions;
- Reducing emissions of methane and nitrous oxide through improved animal production, improved management of livestock waste, more efficient management of irrigation water on rice paddies, improved nutrient management; and,
- Sequestering carbon through conservation farming practices, improved forest management practices, afforestation and reforestation, agro forestry, improved grasslands management, restoration of degraded land.

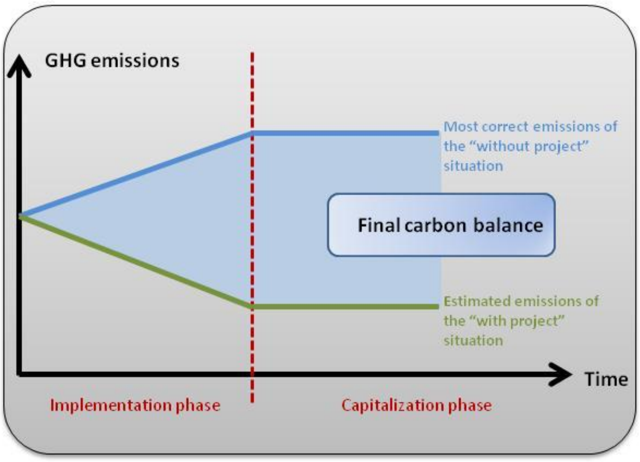
Since 74% of the mitigation potential of agriculture is in developing countries, mitigation options can also contribute to increased food security and reduce rural poverty. Thus, many forestry and agriculture development projects/programmes can play an important role in climate change mitigation, either by reducing emissions or by sequestering carbon.

Nevertheless, there is a lack of methodologies that would help project designers to integrate significant mitigation effects in agriculture and forestry development projects.

2. Objectives of the tool

The EX-ACT (EX-Ante Carbon Balance Tool) is a tool jointly developed from three FAO divisions (TCS, TCI and ESA[1)]) and is aimed at providing ex-ante estimations of the impact of agriculture and forestry development projects on GHG emissions and Carbon (C) sequestration, indicating the effects on the C balance[2.]

The logic behind the EX-ACT tool



EX-ACT is a land-based accounting system, measuring C stocks and stock changes per unit of land, expressed in tCO_2-eq/ha and year. The ex-ante C-balance appraisal guides the project design process and decision-making on funding aspects, complementing the usual ex-ante economic analysis of investment projects. EX-ACT has the potential to support project designers to select project activities with higher benefits both in economic and climate change mitigation terms and the output could be used in financial and economic analysis.

EX-ACT is an easy tool that can be used in the context of ex-ante project/program formulation. Further, it is cost effective, requires a minimum amount of data, and has resources (tables, maps) which can help finding the information required to run the model. Also, EX-ACT works at project level but can easily be up-scaled at programme/sector level.

3. Basic contents of EX-ACT and main outputs

EX-ACT has been developed based on the Guidelines for National Green-house Gas Inventories[3] completed with other existing methodologies. The default values for mitigation options in the agriculture sector are mostly from IPCC (2007)[4.] Other coefficients such as embodied GHG emissions for farm operations, inputs transportation, and irrigation systems implementation are from Lal (2004)[5].

EX-ACT consists of a set of linked Microsoft Excel sheets in which project designers insert basic data on land use and management practices foreseen under projects' activities. EX-ACT adopts a modular approach – each

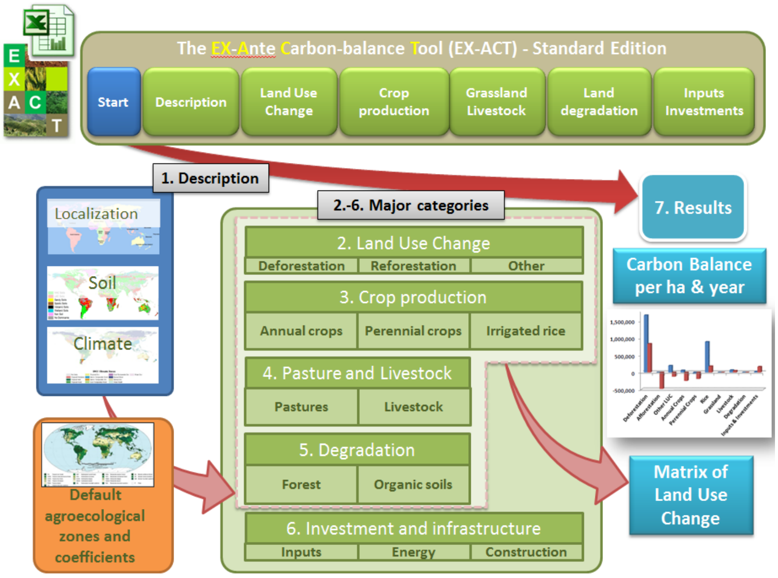
[1] TCS: Policy and Programme Development Support Division TCI: Investment Centre Division ESA: Agricultural Development Economics Division
2 C balance = reduced GHG emissions + C sequestered above and below ground.

[3] IPCC, 2006. IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4.
[4] IPCC, 2007. "Agriculture," in Climate Change 2007: Mitigation.
[5] Lal, R. . 2004. "Carbon emissions from farm operations " Environment International 30, 981-990.

"module" describes a specific land use – and following a three-step logical framework:

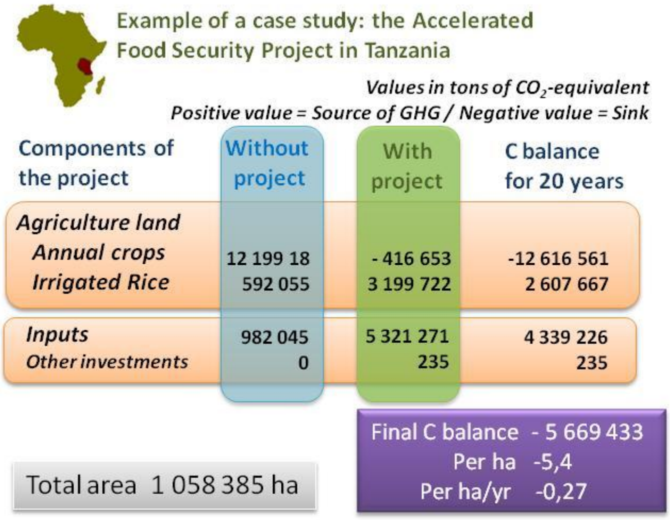
1. A general description of the project (geographic area, climate and soil characteristics, duration of the project);
2. Identification of changes in land use and technologies foreseen by project components using specific "modules" (deforestation, forestation, forest degradation, annual/perennial crops, rice cultivation, grasslands, livestock, inputs, energy); and
3. Computation of C-balance with and without the project using IPCC default values and – when available – ad-hoc coefficients.

The main output of the tool consists of the C-balance resulting from project activities.



As an example, the results of a case study in Tanzania, i.e. the "Accelerated Food Security Project" aimed at increasing maize and rice production in targeted areas through the improved access of farmers to fertilizers and improved seeds, are reported below: they illustrates that although expanded fertilizer use will increase GHG emissions, the adoption of improved land management practices will contribute to soil C sequestration so that the net project effect will be the creation of a C sink, with positive mitigation effects.

The environmental services (Carbon) supplied by the project, estimated through the C-balance, could then be priced, valued and incorporated in the economic analysis of projects, examining how the discounted measures of project worth, e.g. Net Present Value or Internal Rate of Return, will change when taking into account C sequestration benefits. Also, a set of indicators can complement the economic analysis providing useful information about the efficiency of the project in providing environmental services or the potential contribution of such services to farm incomes.



Example of a case study: the Accelerated Food Security Project in Tanzania

Values in tons of CO_2-equivalent
Positive value = Source of GHG / Negative value = Sink

Components of the project	Without project	With project	C balance for 20 years
Agriculture land			
Annual crops	12 199 18	- 416 653	-12 616 561
Irrigated Rice	592 055	3 199 722	2 607 667
Inputs	982 045	5 321 271	4 339 226
Other investments	0	235	235

Total area 1 058 385 ha

Final C balance - 5 669 433
Per ha -5,4
Per ha/yr -0,27

4. The way forward

EX-ACT was created in early 2010 and went through a peer-review process in order to be adopted for project designers in international organizations and donor agencies working on agriculture (and forestry) development and/or involved in agriculture (and forestry) investment projects. The tool is now available for free by donors and technical partners. Appropriate training, software updating and technical quality monitoring framework are currently in place. Initiated for being used at project and program level, the tool is also now used in national sector strategies and policies (e.g. to compute the carbon balance of aggregated agriculture sector strategies and policy options) or for regional initiatives. Initially elaborated in English, EX-ACT has presently been translated into French, Spanish and Portuguese.

5. Materials and documents

The different translations of the tool can be found on the EX-ACT website, as well as detailed user guidelines, technical guidelines, policy briefs and several case studies.

EX-ACT Website

All material and documents are freely available under the following address:

http://www.fao.org/tc/exact

Developed materials are also available on the EASYPol website: www.fao.org/easypol

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