EX-ACT PRACTICAL EXERCISES

Answers Booklet

CORRECTED EXERCISES

Situation 1: Forestry Reserve in Brazil

General description of the project

Firstly, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Brazil, South America, under a tropical wet climate. The dominant type of soil found is the "LAC soils" category.

No indication regarding the timeframe is provided. However the activities are led during a long-term period of 42 years. For the sake of simplicity, a 42-year period of only implementation phase and no capitalization phase is considered.

Finally the description module in EX-ACT should be filled as follows:

Project Name	*Reserve project in Brazil*	
Continent	South America	
Climate	Tropical	
Moisture regime	Wet	
	See "Climate" for Help	
Dominant Regional Soil Type	LAC Soils	
	See "Soil" for Help	
Duration of the Project (Years)	Implementation phase	42
	Capitalisation phase	0
	Duration of accounting	42

Components of the project

The project is composed of two different activities. The first activity treats the issue of deforestation, the second one deals with afforestation/reforestation. The two activities may impact on carbon emissions. Consequently, the following two modules require completion: **deforestation**, **A/R** (Afforestation/Reforestation).

Deforestation module

The type of vegetation the activity is tropical rain forest.
Within EX-ACT there exist two kinds of tropical rain forest: natural or plantation.

Regarding the IPCC classification these two possibilities are described as follows:

- Natural forest: extensive management practices, with reduced or minimum human intervention.

- Plantation: intensive management practices.

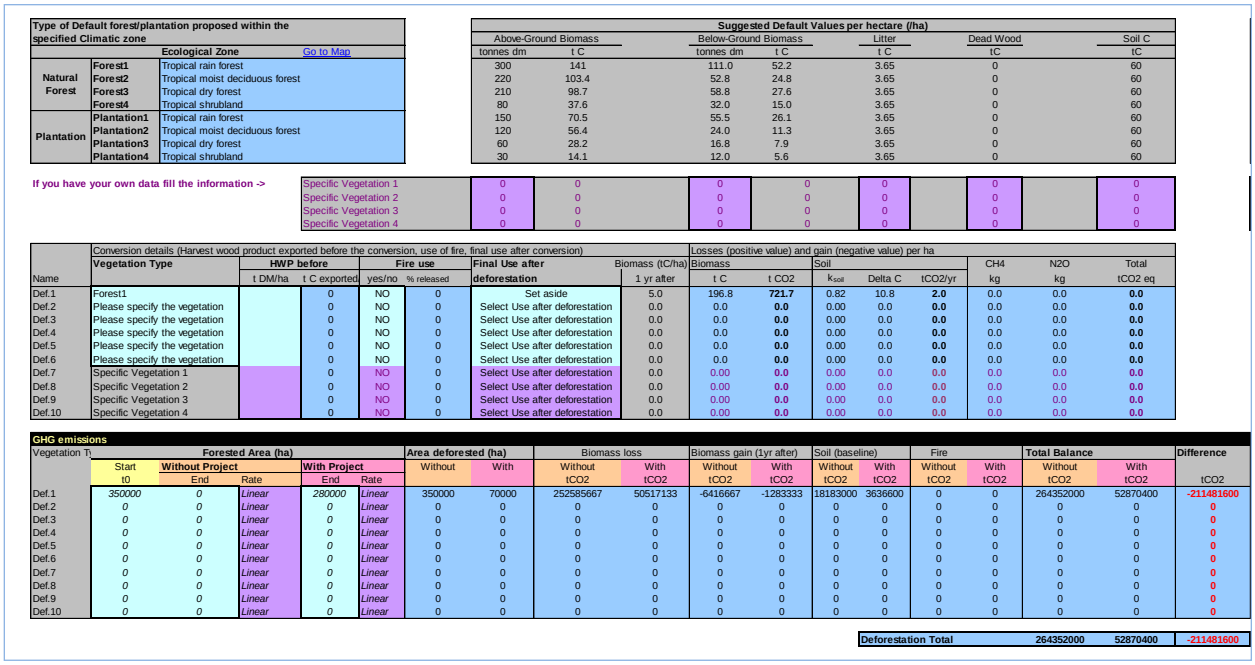
The distinction between the two categories also depends on the definitions fixed by the country of interest.

In the case of the exercise we consider that the deforested tropical forest is a natural forest. Indeed we can think that the reserve is first made for a conservation purpose of primary forest.

No information is provided regarding the usual harvested wood products as well as fire use. For the sake of simplicity, it is not brought up in the exercise.

Without the project intervention, 350 000 ha of forest will be deforested in the future. With the project intervention 80% of the 350 000 ha will stay in place in the future. In both cases the deforested area will be set aside (final use after deforestation).

The deforestation module can be filled as follows:



Type of Default forest/plantation proposed within the specified Climatic zone		Ecological Zone (Go to Map)
Natural Forest	Forest1	Tropical rain forest
	Forest2	Tropical moist deciduous forest
	Forest3	Tropical dry forest
	Forest4	Tropical shrubland
Plantation	Plantation1	Tropical rain forest
	Plantation2	Tropical moist deciduous forest
	Plantation3	Tropical dry forest
	Plantation4	Tropical shrubland

Suggested Default Values per hectare (/ha)						
Above-Ground Biomass		Below-Ground Biomass		Litter	Dead Wood	Soil C
tonnes dm	t C	tonnes dm	t C	t C	tC	tC
300	141	111.0	52.2	3.65	0	60
220	103.4	52.8	24.8	3.65	0	60
210	98.7	58.8	27.6	3.65	0	60
80	37.6	32.0	15.0	3.65	0	60
150	70.5	55.5	26.1	3.65	0	60
120	56.4	24.0	11.3	3.65	0	60
60	28.2	16.8	7.9	3.65	0	60
30	14.1	12.0	5.6	3.65	0	60

If you have your own data fill the information ->

Specific Vegetation 1	0	0	0	0	0	0	0	0
Specific Vegetation 2	0	0	0	0	0	0	0	0
Specific Vegetation 3	0	0	0	0	0	0	0	0
Specific Vegetation 4	0	0	0	0	0	0	0	0

	Conversion details (Harvest wood product exported before the conversion, use of fire, final use after conversion)							Losses (positive value) and gain (negative value) per ha							
	Vegetation Type	HWP before		Fire use		Final Use after	Biomass (tC/ha)	Biomass		Soil			CH4	N2O	Total
Name		t DM/ha	t C exported	yes/no	% released	deforestation	1 yr after	t C	t CO2	k_{soil}	Delta C	tCO2/yr	kg	kg	tCO2 eq
Def.1	Forest1		0	NO	0	Set aside	5.0	196.8	**721.7**	0.82	10.8	**2.0**	0.0	0.0	**0.0**
Def.2	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.3	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.4	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.5	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.6	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.7	Specific Vegetation 1		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.8	Specific Vegetation 2		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.9	Specific Vegetation 3		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.10	Specific Vegetation 4		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**

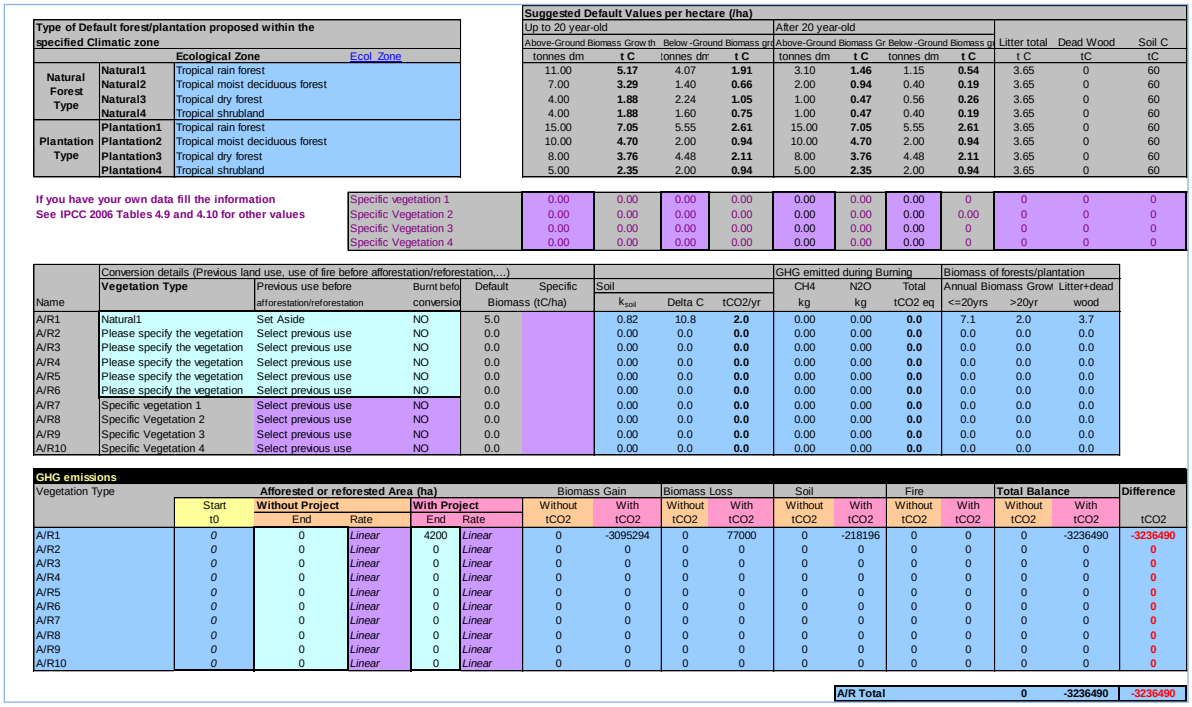
GHG emissions																		
Vegetation Ty	Forested Area (ha)					Area deforested (ha)		Biomass loss		Biomass gain (1yr after)		Soil (baseline)		Fire		Total Balance		Difference
	Start	Without Project		With Project		Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate			tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
Def.1	*350000*	*0*	*Linear*	*280000*	*Linear*	350000	70000	252585667	50517133	-6416667	-1283333	18183000	3636600	0	0	264352000	52870400	**-211481600**
Def.2	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.3	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.4	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.5	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.6	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.7	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.8	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.9	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Def.10	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
															Deforestation Total	**264352000**	**52870400**	**-211481600**

Afforestation module

The exercise treats tropical rain forest, which is going to be planted. We do not know how this plantation is managed. However as the purpose of the implementation of the reserve may have a conservation purpose of primary forest, we can consider that the reforestation will become natural forest.

Without the project intervention, no area will be reforested. With the project 100 ha of forest are going to be planted during a period of 42 years, hence a total area of reforestation reaching 4200 ha.

The afforestation module can be filled in as follows:



Type of Default forest/plantation proposed within the specified Climatic zone		Ecological Zone	Ecol Zone
Natural Forest Type	Natural1	Tropical rain forest	
	Natural2	Tropical moist deciduous forest	
	Natural3	Tropical dry forest	
	Natural4	Tropical shrubland	
Plantation Type	Plantation1	Tropical rain forest	
	Plantation2	Tropical moist deciduous forest	
	Plantation3	Tropical dry forest	
	Plantation4	Tropical shrubland	

Suggested Default Values per hectare (/ha)

	Up to 20 year-old				After 20 year-old						
	Above-Ground Biomass Grow th		Below -Ground Biomass gro		Above-Ground Biomass Gr		Below -Ground Biomass gr		Litter total	Dead Wood	Soil C
	tonnes dm	t C	tonnes dm	t C	tonnes dm	t C	tonnes dm	t C	t C	tC	tC
Natural1	11.00	**5.17**	4.07	**1.91**	3.10	**1.46**	1.15	**0.54**	3.65	0	60
Natural2	7.00	**3.29**	1.40	**0.66**	2.00	**0.94**	0.40	**0.19**	3.65	0	60
Natural3	4.00	**1.88**	2.24	**1.05**	1.00	**0.47**	0.56	**0.26**	3.65	0	60
Natural4	4.00	**1.88**	1.60	**0.75**	1.00	**0.47**	0.40	**0.19**	3.65	0	60
Plantation1	15.00	**7.05**	5.55	**2.61**	15.00	**7.05**	5.55	**2.61**	3.65	0	60
Plantation2	10.00	**4.70**	2.00	**0.94**	10.00	**4.70**	2.00	**0.94**	3.65	0	60
Plantation3	8.00	**3.76**	4.48	**2.11**	8.00	**3.76**	4.48	**2.11**	3.65	0	60
Plantation4	5.00	**2.35**	2.00	**0.94**	5.00	**2.35**	2.00	**0.94**	3.65	0	60

If you have your own data fill the information
See IPCC 2006 Tables 4.9 and 4.10 for other values

Specific vegetation 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Specific Vegetation 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Specific Vegetation 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Specific Vegetation 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0

	Conversion details (Previous land use, use of fire before afforestation/reforestation,...)							GHG emitted during Burning			Biomass of forests/plantation		
	Vegetation Type	Previous use before	Burnt befo	Default	Specific	Soil			CH4	N2O	Total	Annual Biomass Grow	Litter+dead
Name		afforestation/reforestation	conversio	Biomass (tC/ha)		k_{soil}	Delta C	tCO2/yr	kg	kg	tCO2 eq	<=20yrs	>20yr	wood
A/R1	Natural1	Set Aside	NO	5.0		0.82	10.8	**2.0**	0.00	0.00	**0.0**	7.1	2.0	3.7
A/R2	Please specify the vegetation	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R3	Please specify the vegetation	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R4	Please specify the vegetation	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R5	Please specify the vegetation	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R6	Please specify the vegetation	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R7	Specific vegetation 1	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R8	Specific Vegetation 2	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R9	Specific Vegetation 3	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0
A/R10	Specific Vegetation 4	Select previous use	NO	0.0		0.00	0.0	**0.0**	0.00	0.00	**0.0**	0.0	0.0	0.0

GHG emissions

Vegetation Type	Afforested or reforested Area (ha)					Biomass Gain		Biomass Loss		Soil		Fire		Total Balance		Difference
	Start	Without Project		With Project		Without	With	Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
A/R1	*0*	0	*Linear*	4200	*Linear*	0	-3095294	0	77000	0	-218196	0	0	0	-3236490	-3236490
A/R2	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R3	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R4	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R5	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R6	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R7	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R8	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R9	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
A/R10	*0*	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0	0	0	0	**0**
														A/R Total	**0**	**-3236490**

Land use and land use change Matrix

The following matrix is proposed, summing up the area information provided by the user:

Mineral soils
Without Project

		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	**Forest/Plantation**	0	*0*	*0*	*0*	*0*	*0*	*350000*	350000
	Annual	*0*	0	*0*	*0*	*0*	*0*	*0*	0
Cropland	Perennial	*0*	*0*	0	*0*	*0*	*0*	*0*	0
	Rice	*0*	*0*	*0*	0	*0*	*0*	*0*	0
Grassland		*0*	*0*	*0*	*0*	0	*0*	*0*	0
Other Lar	Degraded	*0*	*0*	*0*	*0*	*0*	0	*0*	0
	Other	*0*	*0*	*0*	*0*	*0*	*0*	4200	4200
	Total Final	0	0	0	0	0	0	354200	354200
								Organic soils	0

Mineral soils
With Project

		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	**Forest/Plantation**	280000	*0*	*0*	*0*	*0*	*0*	*70000*	350000
	Annual	*0*	0	*0*	*0*	*0*	*0*	*0*	0
Cropland	Perennial	*0*	*0*	0	*0*	*0*	*0*	*0*	0
	Rice	*0*	*0*	*0*	0	*0*	*0*	*0*	0
Grassland		*0*	*0*	*0*	*0*	0	*0*	*0*	0
Other Lar	Degraded	*0*	*0*	*0*	*0*	*0*	0	*0*	0
	Other	*4200*	*0*	*0*	*0*	*0*	*0*	0	4200
	Total Final	284200	0	0	0	0	0	70000	354200
								Organic soils	0

The total area of interest reaches 354 200 ha.

Without the project 350 000 ha will be converted from forestland to other land (set aside) and 4200 ha stay set aside.

With the project, 280 000 of forest stay in place. 70 000 ha of initial forest becomes set aside land. Finally, 4 200 ha of set aside lands become forestland. The project implies land use changes.

Results provided by the EX-ACT tool

With the assumptions taken into account in this exercise, the EX-ACT tool indicates the following results:

Project Summary		Area (Initial state in ha)			Duration of the Project (years)	
Name	Reserve project in Brazil	Forest/Plantation		350000	Implementatio	42
		Cropland	Annual	0	Capitalisation	0
Continent	South America		Perennial	0	Total	42
			Rice	0	Total Area	
Climate	Tropical Wet	Grassland		0	Mineral soils	354200
		Other Land	Degraded	0	Organic soils	0
Dominante Soil	LAC Soils		Other	4200	Total Area	354200
		Organic soils/peatlands		0		

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Capital.	Mean per year Total	Implement.	Capital.
Deforestation	-211481600	this is a sink	-196935200	-14546400	0	0	-211481600	0	-5035276	-5035276	0
Forest Degradation	0		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	-3236490	this is a sink	-3018294	-218196	0	0	-3236490	0	-77059	-77059	0
Non Forest Land Use Change	0		0	0	0	0	0	0	0	0	0
Agriculture											
Annual Crops	0		0	0	0	0	0	0	0	0	0
Agroforestry/Perennial Crops	0		0	0	0	0	0	0	0	0	0
Irrigated Rice	0		0	0	0	0	0	0	0	0	0
Grassland	0		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	0		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	0		---		0	0	0	0	0	0	0
Inputs	0		0		0	---	0	0	0	0	0
Other Investment	0		0		---	---	0	0	0	0	0
Final Balance	-214718090	It is a sink	-199953494	-14764596	0	0	-214718090	0	-5112335	-5112335	0
In % of Emission without project:	-81.2%										
Result per ha	-606.2		-564.5	-41.7	0.0	0.0	-606.2	0.0	-14.4	-14.4	0.0

The first three blocs indicate the description of the project filled in the description module. It sums up the area of interest as well as the duration of the carbon appraisal.

The mitigation potential of the two activities led is reflected:

- The reduction of deforestation proposed with the project should create a **carbon sink** reaching 211.5 million tons of eq-CO2 during 42 years. The sink is due to the expected reduction of CO2 emissions stored in biomass compared to the without project situation. The project allows avoiding the emission of 5 million tons of eq-CO2 per year.

- The reforestation activity implies a **carbon sink** reaching 3.2 million tons of eq-CO2 during 42 years, hence a sink of 77059 tons of eq-Co2 each year. Once again avoided CO2 emissions are stored in biomass.

Finally the two activities gathered represents a **net GHG sink** of 214.9 million tons of eq-CO2 in 42 years or 14.4 tons of eq-CO2/year/ha. It represents the benefits brought by the implementation of the project in comparison of a situation in which the project will not happen. Most mitigation potential comes from the reduction of the deforestation.

Situation 2: Palm trees in Indonesia

General description of the project

Primarily, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Indonesia, Asia insular, under a tropical wet climate. The dominant type of soil corresponds to LAC soils.

The project will be financed during 3 years, hence an implementation phase of 3 years. The capitalization phase is estimated to have a duration of 17 years.

Finally the description module in EX-ACT should be filled as follows:

Description of the project

Project Name	*Palm trees in Indonesia*	
Continent	Asia (Insular)	
Climate	Tropical	
Moisture regime	Wet	
	See "Climate" for Help	
Dominant Regional Soil Type	LAC Soils	
	See "Soil" for Help	
Duration of the Project (Years)	Implementation phase	3
	Capitalisation phase	17
	Duration of accounting	20

GWP (choose values)	
Official-CDM	
CO2	1
CH4	21
N2O	310

Components of the Project
Deforestation
Afforestation and Reforestation
Non Forest Land Use Change
Agriculture
Annual Crops
Agroforestry/Perennial Crops
Rice
Grassland
Other GHG Emissions
Livestock
Inputs
Other Investment

GO TO RESULTS

Components of the project

Two different activities are realized. The first one concerns deforestation, the second one; implementation of perennial crops. The two activities may impact GHG emissions. Consequently, the following two modules that shall be completed are: **deforestation and perennial crops**.

Deforestation module

Opposite to previous exercise, an activity, with the project, of deforestation is conducted in order to install a palm trees plantation.

The vegetation considered is natural tropical rain forest that is going to be deforested with fire in the situation "with project" to plant palm trees (perennial crops). In the future, without project, 10000 ha of forest will remain.

The deforestation module can be filled as follows:

Type of Default forest/plantation proposed within the specified Climatic zone		
	Ecological Zone	Go to Map
Natural Forest	Forest1	Tropical rain forest
	Forest2	Tropical moist deciduous forest
	Forest3	Tropical dry forest
	Forest4	Tropical shrubland
Plantation	Plantation1	Tropical rain forest
	Plantation2	Tropical moist deciduous forest
	Plantation3	Tropical dry forest
	Plantation4	Tropical shrubland

Suggested Default Values per hectare (/ha)									
Above-Ground Biomass		Below-Ground Biomass		Litter		Dead Wood		Soil C	
tonnes dm	t C	tonnes dm	t C	t C		tC		tC	
350	164,5	129,5	60,9	3,65		0		60	
290	136,3	69,6	32,7	3,65		0		60	
160	75,2	44,8	21,1	3,65		0		60	
70	32,9	28,0	13,2	3,65		0		60	
150	70,5	55,5	26,1	3,65		0		60	
120	56,4	24,0	11,3	3,65		0		60	
60	28,2	16,8	7,9	3,65		0		60	
30	14,1	12,0	5,6	3,65		0		60	

If you have your own data fill the information ->

Specific Vegetation 1	0	0	0	0	0		0		0
Specific Vegetation 2	0	0	0	0	0		0		0
Specific Vegetation 3	0	0	0	0	0		0		0
Specific Vegetation 4	0	0	0	0	0		0		0

	Conversion details (Harvest wood product exported before the conversion, use of fire, final use after conversion)							Looses (positive value) and gain (negative value) per ha							
	Vegetation Type	HWP before		Fire use		Final Use after	Biomass	Biomass		Soil			CH4	N2O	Total
Name		tonne	t C exported	yes/no	% released	deforestation	1 yr after	t C	t CO2	k_{soil}	Delta C	tCO2/yr	kg	kg	tCO2 eq
Defor.1	Forest1	0	0	YES	0,32	Perennial/Tree Crop	10,0	229,0	**839,7**	1,00	0,0	**0,0**	761,6	22,4	**22,9**
Defor.2	Please specify the vegetation	0	0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.3	Please specify the vegetation	0	0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.4	Please specify the vegetation	0	0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.5	Please specify the vegetation	0	0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.6	Please specify the vegetation	0	0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.7	Specific Vegetation 1	0	0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.8	Specific Vegetation 2	0	0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.9	Specific Vegetation 3	0	0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Defor.10	Specific Vegetation 4	0	0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**

GHG emissions

Vegetation Ty	Forested Area (ha)					Area deforested (ha)		Biomass loss		Biomass gain (1yr after)		Soil		Fire		Total Balance		Difference
	Start	Without Project		With Project		Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate			tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
Defor.1	*10000*	*10000*	*Linear*	*0*	*Linear*	0	10000	0	8397217	0	-366667	0	0	0	229376	0	8259926	8259926
Defor.2	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.3	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.4	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.5	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.6	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.7	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.8	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.9	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Defor.10	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
																Deforestation Total	**0**	**8259926**	**8259926**

Perennial module

The user already indicated that the forest will become perennial crops in the situation with project. The indication is automatically accounted for in the perennial module in "reserved system P1" corresponding to perennial coming from deforestation.

No information is provided regarding the residue/biomass burning practice during the palm tree cultivation. For the sake of simplicity, this information is ignored.

The perennial module appears as follows:

	Your description	Residue/Biomass Burning	Interval (yr)	Tons dm/ha	Aboveground Biomass Growth rate (tC/ha) Default	Specific	Belowground Biomass Growth rate (tC/ha) Default	Specific	Soil Effect Default t CO2/ha/yr	User default available	tCO2/ha/yr	CH4 kg	N2O kg	CO2eq t
Reserved system P1	From Deforestation	NO	1	10	10		0		0.7	NO		0	0	0.0
Reserved system P2	Converted to A/R	NO	1	10	0		0		0.7	NO		0	0	0.0
Reserved system P3	OLUC to Perennial	NO	1	10	10		0		0.7	NO		0	0	0.0
Reserved system P4	Perennial to OLUC	NO	1	10	0		0		0.7	NO		0	0	0.0
Perennial Syst 1		NO	1	10	0		0		0.7	NO		0	0	0.0
Perennial Syst 2		NO	1	10	0		0		0.7	NO		0	0	0.0
Perennial Syst 3		NO	1	10	0		0		0.7	NO		0	0	0.0
Perennial Syst 4		NO	1	10	0		0		0.7	NO		0	0	0.0
Perennial Syst 5		NO	1	10	0		0		0.7	NO		0	0	0.0

The default (tiers 1 assumption) is that if the system is in equilibrium therefore default growth rate is 0
Only System P1 and P3 are considered by default not in equilibrium

Positive value= gain for soil

Mitigation potential

Vegetation Type	Areas		Without project		With Project		CO_2 fluxes from Biomass		CO_2 fluxes from Soil		CO_2eq emitted from Burni		Total Balance		Difference
	Start		End	Rate	End	Rate	Without	With	Without	With	Without	With	Without	With	
	t0												tCO_2	tCO_2	tCO2eq
System P1	0		*0*	*Linear*	*10000*	*Linear*	0	-6600000	0	-129500	0	0	0	-6729500	**-6729500**
System P2	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
System P3	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
System P4	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Perennial Syst 1	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Perennial Syst 2	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Perennial Syst 3	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Perennial Syst 4	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Perennial Syst 5	0		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
Total Syst 1-5	0		0		0										
													Agric. Annual Total	**0**	**-6729500**	**-6729500**

Land use and land use change Matrix

The following matrix will be proposed, summing up the area information provided by the user:

Without Project		FINAL							
		Forest/ Plantatio	Cropland			Grasslanc	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	10000	0	0	0	0	0	0	10000
	Cropland Annual	0	0	0	0	0	0	0	0
	Cropland Perennial	0	0	0	0	0	0	0	0
	Cropland Rice	0	0	0	0	0	0	0	0
	Grassland	0	0	0	0	0	0	0	0
	Other Lar Degraded	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total Final	10000	0	0	0	0	0	0	10000

With Project		FINAL							
		Forest/ Plantatio	Cropland			Grasslanc	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	0	10000	0	0	0	0	10000
	Cropland Annual	0	0	0	0	0	0	0	0
	Cropland Perennial	0	0	0	0	0	0	0	0
	Cropland Rice	0	0	0	0	0	0	0	0
	Grassland	0	0	0	0	0	0	0	0
	Other Lar Degraded	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total Final	0	0	10000	0	0	0	0	10000

The total area of interest is 10 000 ha. In the situation “without project”, there is no land use change, the 10 000 ha of forest remain forestlands. With the project, 10 000 ha of forestlands are turned into perennial croplands.

Results provided by the EX-ACT tool

With the assumptions taken into account in this exercise, EX-ACT indicates the following results:

Project Summary		**Area (Initial state in ha)**			**Duration of the Project (years)**	
Name	palm tree in Indonesia	**Forest/Plantation**		10000	Implementatio	3
Continent	Asia (Insular)	**Cropland**	Annual	0	Capitalisation	17
			Perennial	0	Total	20
Climate	Tropical Wet		Rice	0	**Total Area**	
		Grassland		0	Mineral soils	10000
Dominante Soil	'LAC Soils	**Other Land**	Degraded	0	Organic soils	0
			Other	0	**Total Area**	**10000**
		Organic soils/peatlands		0		

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		**CO2** Biomass	**CO2** Soil	**N2O**	**CH4**	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital.
Deforestation	**8259926**	**this is a source**	8030550	0	69440	159936	8259926	0	412996	2753309	0
Forest Degradation	**0**		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	**0**		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	**0**		0	0	0	0	0	0	0	0	0
Agriculture											
Annual Crops	**0**		0	0	0	0	0	0	0	0	0
Agroforestry/Perennial Crops	**-6729500**	**this is a sink**	-6600000	-129500	0	0	-377167	-6352333	-336475	-125722	-373667
Irrigated Rice	**0**		0	0	0	0	0	0	0	0	0
Grassland	**0**		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	**0**		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	**0**		---		0	0	0	0	0	0	0
Inputs	**0**		0		0	---	0	0	0	0	0
Other Investment	**0**		0		---	---	0	0	0	0	0
Final Balance	**1530426**	**It is a source**	**1430550**	**-129500**	**69440**	**159936**	**7882759**	**-6352333**	**76521**	**2627586**	**-373667**
In % of Emission without project:	**0.0%**										
Result per ha	**153.0**		**143.1**	**-13.0**	**6.9**	**16.0**	**788.3**	**-635.2**	**7.7**	**262.8**	**-37.4**

The two activities proposed with the project imply different impacts on climate change mitigation:

- The deforestation activity creates a **source of GHG** reaching 8.3 million tons of eq-CO2 in 20 years. The loss of vegetation leads especially to emissions of CO2 (8 million tons of eq-CO2 in 20 years).

-The implantation of palm trees implies a **sink of GHG** reaching 6.7 million tons of eq-CO2. The sink is essentially due to the growth of the trees storing Carbon in biomass and soil.

The sink realized by the perennial crops is not sufficient enough to compensate the source created by the deforestation activity. Accordingly the project is not contributing to mitigation but will amplify the impacts of climate change. The two activities gathered represent a **net source** of 1.5 million tons of eq-CO2, or 7.7 t eq-CO2/year/ha.

Situation 3: Agricultural project in Benin

General description of the project

First of all, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Benin, Africa. We do not have direct information regarding the dominant climate. However the project deals with cotton crops, therefore we can imagine that the project would happen in North of Benin, which implies a tropical dry climate. The dominant type of soil corresponds to LAC soils.

The project will be financed during 5 years, hence an implementation phase of 5 years. The capitalization phase is estimated to occur over a duration of 15 years.

Finally the description module in EX-ACT should be filled as follows:

Project Name	*Agricultural project in Benin*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Dry	
	See "Climate" for Help	
Dominant Regional Soil Type	LAC Soils	
	See "Soil" for Help	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

GWP (choose values)	
Official-CDM	
CO2	**1**
CH4	**21**
N2O	**310**

Components of the Project
Deforestation
Afforestation and Reforestation
Non Forest Land Use Change
Agriculture
Annual Crops
Agroforestry/Perennial Crops
Rice
Grassland
Other GHG Emissions
Livestock
Inputs
Other Investment

GO TO RESULTS

Four different activities are realized. The first one treats the development of perennial crops implying land use change, the second one with the decrease of cotton crops, the third with the improvement of annual crops (cassava) and the last one with the use of inputs. The activities may have impacts on GHG emissions. Consequently, the following four modules are going to be filled in: **non-forest LUC, perennial crops, annual crops, inputs.**

Non forest land use change module

Perennial crops will be planted on set aside lands. That implies a land use change that has to be indicated first within the non-forest LUC module. This land use change will be achieved with the use of fire.

Consequently the non forest LUC module can be filled as follows:

		Description of LUC			Burnt before	Default C Stocks (tC/ha)				Delta (tCO2)		Emitted during Burning	
Name	Your Name	Initial Land Use	Final Land Use	Alert	conversion	Biom. Ini.	Biom. Fin.	Soil Ini.	Soil Fin.	Biomass	Soil /yr *	CH4 (kg)	N2O (kg)
LUC-1	cashew trees plantatio	Set Aside	Perennial/Tree Crop		YES	5,0	1,8	32,6	35,0	-11,7	0,4	27,0	7,0
LUC-2		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-3		Select Initial Land Use	Select Final Land Use	Fill initial LU	YES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-4		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-5		Select Initial Land Use	Select Final Land Use	Fill initial LU	YES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-6		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-7		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-8		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-9		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-10		Select Initial Land Use	Select Final Land Use	Fill initial LU	YES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-11		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-12		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-13		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-14		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-15		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
LUC-16		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

*Soil effect limited to 20 years

GHG emissions

Vegetation Type		Area concerned by LUC				Biomass Change		Soil Change		Fire		Total Balance		Difference
		Without Project		With Project		Without	With	Without	With	Without	With	Without	With	
		Area	Rate	Area	Rate	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
LUC-1	cashew trees plantatio	0	Linear	1000	Linear	0	11733	0	-7860	0	2737	0	6610	6610
LUC-2		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-3		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-4		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-5		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-6		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-7		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-8		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-9		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-10		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-11		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-12		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-13		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-14		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-15		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
LUC-16		0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
									Other LUC total			0	6610	6610

Perennial crops module

The information provided by the user regarding the land use change from set aside to perennial crops is automatically implemented in the perennial module, in the line “reserved system P3”. As the biomass/residue will not be burnt during the cashew cultivation, the user does not have any other information to fill in the perennial module.

The perennial module appears as follows:

	Your description	Residue/Biomass Burning	Interval (yr)	Tons dm/ha	Aboveground Biomass Growth rate (tC/ha) Default	Specific	Belowground Biomass Growth rate (tC/ha) Default	Specific	Soil Effect Default t CO2/ha/yr	User default available	tCO2/ha/yr	CH4 kg	N2O kg	CO2eq t
Reserved system P1	From Deforestation	NO	1	10	1.8		0		0.33	NO		0	0	0.0
Reserved system P2	Converted to A/R	NO	1	10	0		0		0.33	NO		0	0	0.0
Reserved system P3	OLUC to Perennial	NO	1	10	1.8		0		0.33	NO		0	0	0.0
Reserved system P4	Perennial to OLUC	NO	1	10	0		0		0.33	NO		0	0	0.0
Perennial Syst 1		NO	1	10	0		0		0.33	NO		0	0	0.0
Perennial Syst 2		NO	1	10	0		0		0.33	NO		0	0	0.0
Perennial Syst 3		NO	1	10	0		0		0.33	NO		0	0	0.0
Perennial Syst 4		NO	1	10	0		0		0.33	NO		0	0	0.0
Perennial Syst 5		NO	1	10	0		0		0.33	NO		0	0	0.0

The default (tiers 1 assumption) is that if the system is in equilibrium therefore default growth rate is 0

Positive value= gain for soil

Only System P1 and P3 are considered by default not in equilibrium

Mitigation potential

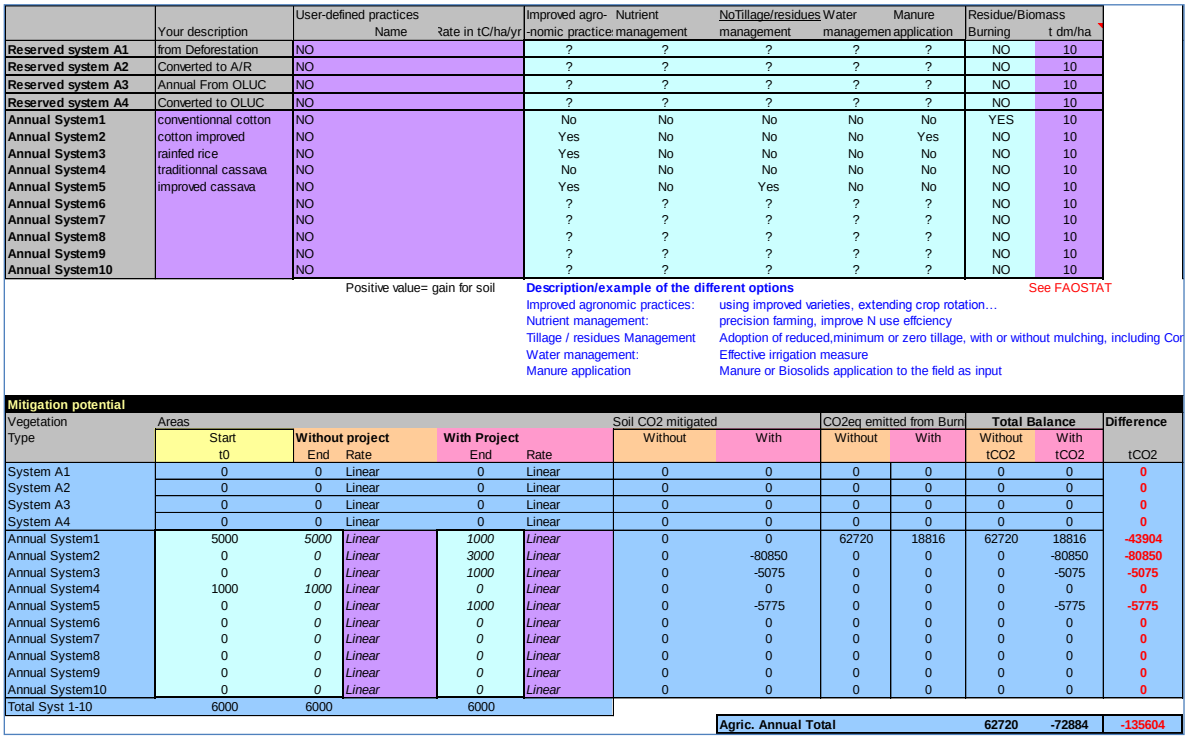
Vegetation Type	Areas					CO_2 fluxes from Biomass		CO_2 fluxes from Soil		CO_2eq emitted from Burni		Total Balance		Difference
	Start	Without project		With Project		Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate							tCO_2	tCO_2	tCO2eq
System P1	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System P2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System P3	0	0	Linear	1000	Linear	0	-112200	0	-5775	0	0	0	-117975	-117975
System P4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Perennial Syst 1	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Perennial Syst 2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Perennial Syst 3	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Perennial Syst 4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Perennial Syst 5	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Total Syst 1-5	0	0		0										
									Agric. Annual Total			0	-117975	-117975

Annual module

It is recommended to build the following table while reading the exercise, since it facilitates the completing procedure within the EX-ACT tool.

Type of annual vegetation system	Start (ha)	Future without project (ha)	Future with project (ha)	Practices
Conventional cotton	5000	5000	1000	Residue/biomass burning
Improved cotton			3000	Manure + crop rotation
Conversion to rainfed rice			1000	Improved seeds and varieties + crop rotation
Traditional cassava	1000	1000		
Cassava improved			1000	No tillage + improved agronomic practices

Finally the annual module can be filled as follows:



	Your description	User-defined practices Name	Rate in tC/ha/yr	Improved agro-nomic practice	Nutrient management	NoTillage/residues management	Water managemen	Manure application	Residue/Biomass Burning	t dm/ha
Reserved system A1	from Deforestation	NO		?	?	?	?	?	NO	10
Reserved system A2	Converted to A/R	NO		?	?	?	?	?	NO	10
Reserved system A3	Annual From OLUC	NO		?	?	?	?	?	NO	10
Reserved system A4	Converted to OLUC	NO		?	?	?	?	?	NO	10
Annual System1	conventionnal cotton	NO		No	No	No	No	No	YES	10
Annual System2	cotton improved	NO		Yes	No	No	No	Yes	NO	10
Annual System3	rainfed rice	NO		Yes	No	No	No	No	NO	10
Annual System4	traditionnal cassava	NO		No	No	No	No	No	NO	10
Annual System5	improved cassava	NO		Yes	No	Yes	No	No	NO	10
Annual System6		NO		?	?	?	?	?	NO	10
Annual System7		NO		?	?	?	?	?	NO	10
Annual System8		NO		?	?	?	?	?	NO	10
Annual System9		NO		?	?	?	?	?	NO	10
Annual System10		NO		?	?	?	?	?	NO	10

Positive value= gain for soil

Description/example of the different options See FAOSTAT

Improved agronomic practices: using improved varieties, extending crop rotation…
Nutrient management: precision farming, improve N use effciency
Tillage / residues Management Adoption of reduced,minimum or zero tillage, with or without mulching, including Cor
Water management: Effective irrigation measure
Manure application Manure or Biosolids application to the field as input

Mitigation potential

Vegetation Type	Areas Start t0	Without project End	Rate	With Project End	Rate	Soil CO2 mitigated Without	With	CO2eq emitted from Burn Without	With	Total Balance Without tCO2	With tCO2	Difference tCO2
System A1	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A2	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A3	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A4	0	0	Linear	0	Linear	0	0	0	0	0	0	0
Annual System1	5000	*5000*	*Linear*	*1000*	*Linear*	0	0	62720	18816	62720	18816	-43904
Annual System2	0	*0*	*Linear*	*3000*	*Linear*	0	-80850	0	0	0	-80850	-80850
Annual System3	0	*0*	*Linear*	*1000*	*Linear*	0	-5075	0	0	0	-5075	-5075
Annual System4	1000	*1000*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Annual System5	0	*0*	*Linear*	*1000*	*Linear*	0	-5775	0	0	0	-5775	-5775
Annual System6	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Annual System7	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Annual System8	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Annual System9	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Annual System10	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0
Total Syst 1-10	6000	6000		6000								
							Agric. Annual Total			62720	-72884	-135604

Inputs module

- Use of urea

Presently, the farmers use 15 kg of urea per hectare per year on cotton crops, consequently a total quantity of 15 kg*5000ha = 75 000 kg of urea per year. Nonetheless, the EX-ACT tool asks the quantity of urea in tons/year. One ton corresponds to 1000 kg. Hence a quantity of 75000/1000= 75 tons/year.

Without the project we can imagine that the farmers will afford the same quantity of urea in the future (75 tons/year).

With the project farmers will bring 50 kg per hectare per year on cotton crops. In the situation with project, there are 4000 ha of cotton crops. Hence the amount of urea in ton/year : 50kg*4000ha/1000= 200 tons/year.

- Use of pesticides

At present time, the farmers use 6l of pesticides including 3l of herbicides and 3l of insecticides per ha per year on cotton crops. For the sake of simplicity we will consider that the previous volume corresponds to the active product and that 1l=1kg. Finally the quantity of herbicides and insecticides used is equivalent to: 3*5000/1000= 15 tons/year.

It is considered that the current application of pesticides will remain in the future without project (therefore a same quantity of 15 tons/year).

Nevertheless, decreasing the consumption of pesticides is recommended, it is expected that farmers will still apply 6 l of pesticides (half herbicides and half insecticides) per hectare per year on cotton crops. However the area of cotton crops changes in the situation with project. Finally the quantity of pesticides used is equivalent to: 3*4000/1000= 12 tons/year.

The inputs module can be filled as follows:

Carbon dioxide emissions from Urea application

				Amount of Urea in tonnes per year						Emission (t CO2eq) per year			Total Emission (tCO2eq)		
	IPCC factor	Specific factor	Default Factor	Start	Without Project		With Project			Start	End				Difference
				t0	End	Rate	End	Rate			Without	With	Without	With	
Urea	0.2		YES	75	75	Linear	200	Linear		15	15	40	300	738	438
								Sub-Total I-2		15	15	40	300	738	438

N_2O emissions from N application on managed soils (except manure management see Livestock Module)

				Amount of N Applied (t per year)						Emission (t CO2eq) per year			Total Emission (tCO2eq)		
Type of input	IPCC factor	Specific factor	Default Factor	Start	Without Project		With Project			Start	End				Difference
				t0	End	Rate	0	Rate			Without	With	Without	With	
Urea	0.01		YES	35	35	Linear	93	Linear		108.5	108.5	289.3	2,170	5,335	3165
N Fertiliser (other than Urea)	0.01		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
N Fertiliser in non-upland Rice*	0.003		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
Sewage	0.01		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
Compost	0.01		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
*N fertilizer from upland rice should be included above (N fertilizer)								Sub-Total I-3		108.5	108.5	289.3	2170	5335	3165

CO_2 equivalent emissions from production, transportation, storage and transfer of agricultural chemicals

				Amount in tonnes of product (active ingrediente for Pesticides)							End		Total Emission		
Type of input**	Default factor*	Specific factor	Default Factor	Start	Without Project		With Project			Start					Difference
				t0	End	Rate	End	Rate			Without	With	Without	With	
Urea	4.8		YES	35	35	Linear	93	Linear		166.8	166.8	444.9	3,337	8,203	4866
N Fertiliser (other than Urea)	4.8		YES	0	0	Linear	0	Linear		0.0	0.0	0.0	0	0	0
N Fertiliser in non-upland Rice*	4.8		YES	0	0	Linear	0	Linear		0.0	0.0	0.0	0	0	0
Phosphorus synthetic fertilizer	0.7		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
Potassium synthetic fertilizer	0.6		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
Limestone (Lime)	0.6		YES	0	0	Linear	0	Linear		0.0	0.0	0.0	0	0	0
Dolomite (Lime)	0.6		YES	0	0	Linear	0	Linear		0.0	0.0	0.0	0	0	0
Generic Lime	0.6		YES	0	0	Linear	0	Linear		0.0	0.0	0.0	0	0	0
Herbicides (Pesticides)	23.1		YES	15	15	Linear	12	Linear		346.5	346.5	277.2	6,930	5,717	-1213
Insecticides (Pesticides)	18.7		YES	15	15	Linear	12	Linear		280.5	280.5	224.4	5,610	4,628	-982
Fungicides (Pesticides)	14.3		YES			Linear		Linear		0.0	0.0	0.0	0	0	0
* from Lal (2004) Table 5 - central value -tCO2/t product								Sub-Total I-4		793.8	793.8	946.5	15877	18548	2671
** tonnes of N, P2O5, K2O and CaCO3															
											Total "Inputs"		18347	24620	6274

Land use and land use change Matrix

In the situation without project, there is no land use change, 6000 ha of annual crops remains as annual crops and 1000 of set aside lands remains as set aside lands. With the implementation of the project, there is no land use change regarding the annual crops despite the management change. There is a land use change reaching 1000 hectares from set aside lands to perennial croplands.

Mineral soils *Without Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	0	0	0	0	0	0	0
	Cropland Annual	0	6000	0	0	0	0	0	6000
	Cropland Perennial	0	0	0	0	0	0	0	0
	Cropland Rice	0	0	0	0	0	0	0	0
	Grassland	0	0	0	0	0	0	0	0
	Other Land Degraded	0	0	0	0	0	0	0	0
	Other Land Other	0	0	0	0	0	0	1000	1000
	Total Final	0	6000	0	0	0	0	1000	7000
							Organic soils		0

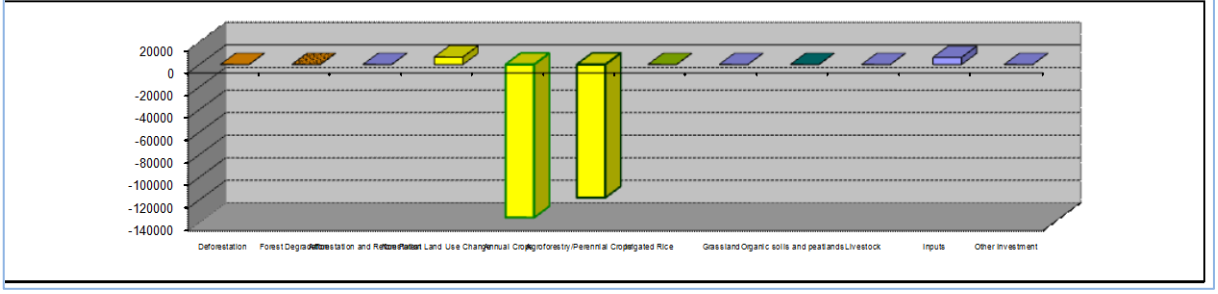
Mineral soils *With Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	0	0	0	0	0	0	0
	Cropland Annual	0	6000	0	0	0	0	0	6000
	Cropland Perennial	0	0	0	0	0	0	0	0
	Cropland Rice	0	0	0	0	0	0	0	0
	Grassland	0	0	0	0	0	0	0	0
	Other Land Degraded	0	0	0	0	0	0	0	0
	Other Land Other	0	0	1000	0	0	0	0	1000
	Total Final	0	6000	1000	0	0	0	0	7000
							Organic soils		0

Results provided by the EX-ACT tool

The improvements proposed in the annual crops lead to a **net sink** of GHG reaching 135 604 tons of eq-CO2 in 20 years. Globally this activity contributes more to mitigation than the activity of planting cashew on 1000 ha, which imply a **net sink** of 117 975 tons of eq-CO2. However, the benefit per hectare is superior for the perennial crops.

The two activities gathered compensate the **source of GHG** due to the operated land use change as well as the consumption of inputs. Finally the implementation of the project allows for contributing to climate change mitigation, with a **benefit** of 240 696 tons of eq-CO2 during 20 years in comparison to a situation in which the project would not happen, or 1.7 tons of eq-CO2 per year per hectare.

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital
Deforestation	0		0	0	0	0	0	0	0	0	0
Forest Degradation	0		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	0		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	6610	this is a source	11733	-7860	2170	567	13347	-6737	330	2669	-449
Agriculture											
Annual Crops	-135604	this is a sink	0	-91700	-12152	-31752	-19372	-116232	-6780	-3874	-7749
Agroforestry/Perennial Crops	-117975	this is a sink	-112200	-5775	0	0	-14025	-103950	-5899	-2805	-6930
Irrigated Rice	0		0	0	0	0	0	0	0	0	0
Grassland	0		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	0		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	0		---		0	0	0	0	0	0	0
Inputs	6274	this is a source	3109		3165	---	896	5377	314	179	358
Other Investment	0		0		---	---	0	0	0	0	0
Final Balance	-240696	It is a sink	-97358	-105335	-6817	-31185	-19153	-221542	-12035	-3831	-14769
In % of Emission without project	-296.9%										
Result per ha	-34.4		-13.9	-15.0	-1.0	-4.5	-2.7	-31.6	-1.7	-0.5	-2.1



Situation 4: Livestock project in Mongolia

General description of the project

Initially, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Mongolia, Continental Asia. We do not have direct information regarding the dominant climate and soil. A cool temperate dry climate and HAC soils is considered.

The project will be financed during 5 years, hence an implementation phase of 5 years. The capitalization phase is estimated to occur during 15 years.

Finally the description module in EX-ACT should be filled as follows:

Project Name	*Livestock project in Mongolia*	
Continent	Asia (Continental)	
Climate	Cool Temperate	
Moisture regime	Dry	
	See "Climate" for Help	
Dominant Regional Soil Type	HAC Soils	
	See "Soil" for Help	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Two different activities are realized: (1) improvement of livestock and (2) improvement of grasslands. One improvement implies the construction of an irrigation system that will be accounted into an additional module. Consequently, the following three modules are completed: **livestock, grasslands, other investments.**

Livestock module

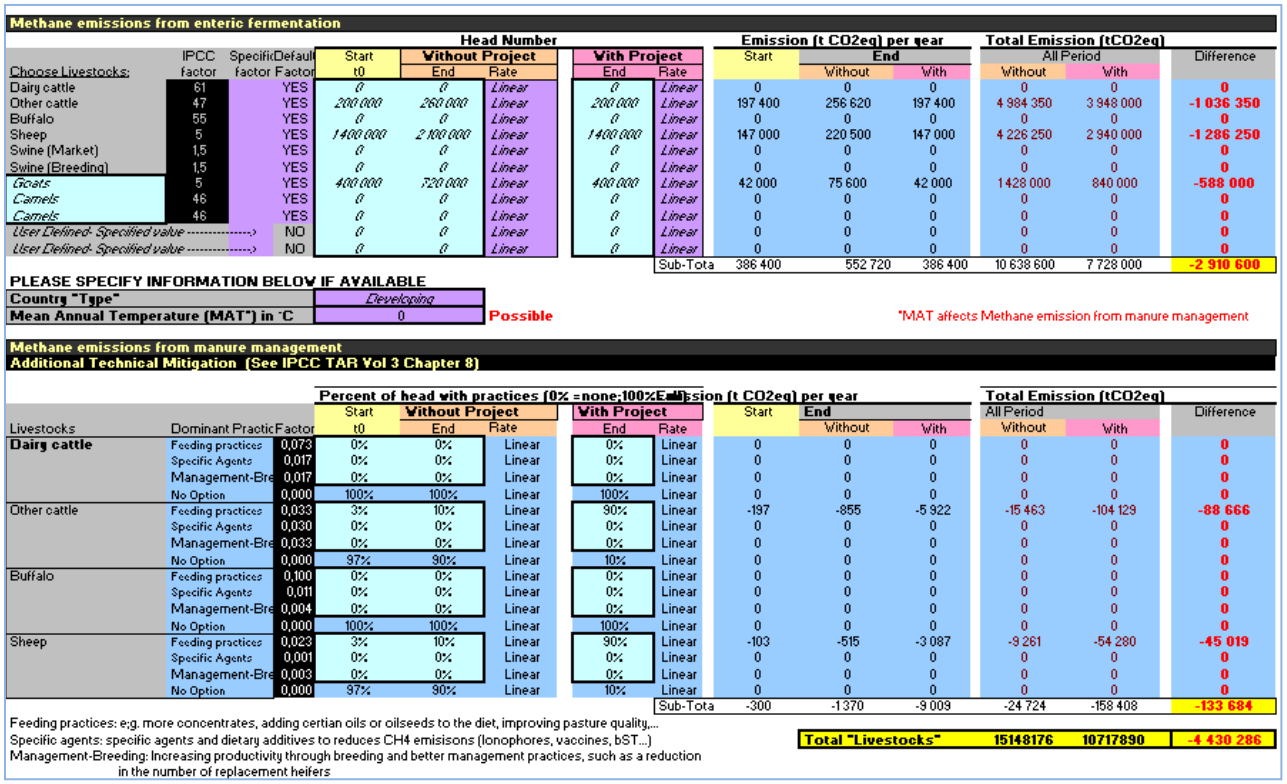
The project focuses on sheep, cattle, and goats. No indication is directly provided about the type of cattle. The category "other cattle" is chosen since the herd will be mixed (dairy, meat). Mongolia is considered as a developing country with a mean average temperature of 0°C.

It is advised to build the following table while reading the exercise before filling in the numbers in EX-ACT:

	Start	Future without project	Future with project
Type of livestock	**Number of heads**		
Sheep	=70%x200x10000=1400000	1400000+(50%x1400000)=2100000	1400000
Cattle (other)	=10%x200x10000=200000	200000+(30%x200000)=260000	200000
Goats	=20%x200x10000=400000	400000+(80%x400000)=720000	400000
	Improvements : feeding practices		

Sheep	3%	10%	90%
Cattle	3%	10%	90%

Finally the livestock module can be filled in as follows:



Methane emissions from enteric fermentation

Choose Livestocks:	IPCC factor	Specific factor	Default Factor	Head Number Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Emission (t CO2eq) per year Start	Emission (t CO2eq) per year End Without	Emission (t CO2eq) per year End With	Total Emission (tCO2eq) All Period Without	Total Emission (tCO2eq) All Period With	Difference
Dairy cattle	61		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
Other cattle	47		YES	200 000	260 000	Linear	200 000	Linear	197 400	256 620	197 400	4 984 350	3 948 000	-1 036 350
Buffalo	55		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
Sheep	5		YES	1 400 000	2 100 000	Linear	1 400 000	Linear	147 000	220 500	147 000	4 226 250	2 940 000	-1 286 250
Swine (Market)	1,5		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
Swine (Breeding)	1,5		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
Goats	5		YES	400 000	720 000	Linear	400 000	Linear	42 000	75 600	42 000	1 428 000	840 000	-588 000
Camels	46		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
Camels	46		YES	0	0	Linear	0	Linear	0	0	0	0	0	0
User Defined- Specified value ---------->			NO	0	0	Linear	0	Linear	0	0	0	0	0	0
User Defined- Specified value ---------->			NO	0	0	Linear	0	Linear	0	0	0	0	0	0
								Sub-Tota	386 400	552 720	386 400	10 638 600	7 728 000	-2 910 600

PLEASE SPECIFY INFORMATION BELOW IF AVAILABLE

Country "Type"	Developing	
Mean Annual Temperature (MAT°) in °C	0	Possible

*MAT affects Methane emission from manure management

Methane emissions from manure management
Additional Technical Mitigation (See IPCC TAR Vol 3 Chapter 8)

Livestocks	Dominant Practic	Factor	Percent of head with practices (0% =none;100%E... Start t0	...ssion (t CO2eq) per year Without Project End	...Without Project Rate	With Project End	With Project Rate	Emission (t CO2eq) per year Start	Emission (t CO2eq) per year End Without	Emission (t CO2eq) per year End With	Total Emission (tCO2eq) All Period Without	Total Emission (tCO2eq) All Period With	Difference
Dairy cattle	Feeding practices	0,073	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Specific Agents	0,017	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Management-Bre	0,017	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	No Option	0,000	100%	100%	Linear	100%	Linear	0	0	0	0	0	0
Other cattle	Feeding practices	0,033	3%	10%	Linear	90%	Linear	-197	-855	-5 922	-15 463	-104 129	-88 666
	Specific Agents	0,030	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Management-Bre	0,033	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	No Option	0,000	97%	90%	Linear	10%	Linear	0	0	0	0	0	0
Buffalo	Feeding practices	0,100	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Specific Agents	0,011	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Management-Bre	0,004	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	No Option	0,000	100%	100%	Linear	100%	Linear	0	0	0	0	0	0
Sheep	Feeding practices	0,023	3%	10%	Linear	90%	Linear	-103	-515	-3 087	-9 261	-54 280	-45 019
	Specific Agents	0,001	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	Management-Bre	0,003	0%	0%	Linear	0%	Linear	0	0	0	0	0	0
	No Option	0,000	97%	90%	Linear	10%	Linear	0	0	0	0	0	0
							Sub-Tota	-300	-1 370	-9 009	-24 724	-158 408	-133 684

Feeding practices: e.g. more concentrates, adding certian oils or oilseeds to the diet, improving pasture quality,...
Specific agents: specific agents and dietary additives to reduces CH4 emisisons (Ionophores, vaccines, bST...)
Management-Breeding: Increasing productivity through breeding and better management practices, such as a reduction in the number of replacement heifers

Total "Livestocks"		**15148176**	**10717890**	**-4 430 286**

Grassland module

The livestock activity is carried out on a total area of 2 000 000 ha of grasslands. The grasslands suffer from grazing pressure. The proposed activity should allow for grassland recover.
The exercise can be translated as follows:

	Start (ha)	**Future without project (ha)**	**Future with project (ha)**
Moderately degraded pasture	2 000 000	505 000	(2 000 000- (500 000 + 5 000)= 1 495 000
Severely degraded pasture		1 495 000	
Improved grassland without inputs, with moderate grazing pressure			(1/4 x 2 000 000)= 500 000
Irrigated and cultivated grassland			5 000

Finally the grassland module can be filled as follows:

Description of Grassland type, their management and areas (ha)

Name of the Systems		Initial state	Final State of the grassland		Fire used to manage			
					Without project		With project	
Default	Your name		Without Project	With Project	Fire*	Interval (yr)	Fire*	Interval (yr)
Reserved system G1	**from Deforestation**	Non degraded	Non degraded	Non degraded	NO	5	NO	5
Reserved system G2	**converted to A/R**	Non degraded	Non degraded	Non degraded	NO	5	NO	5
Reserved system G3	**From OLUC**	Non degraded	Non degraded	Non degraded	NO	5	NO	5
Reserved system G4	**Grassland to OLUC**	Non degraded	Non degraded	Non degraded	NO	5	NO	5
Grass-1	Severely degraded without project	Moderately Degraded	Severely Degraded	Moderately Degraded	NO	5	NO	5
Grass-2	improved	Moderately Degraded	Moderately Degraded	Improved without inputs management	NO	5	NO	5
Grass-3	improved through irrigation and culti	Moderately Degraded	Moderately Degraded	Improved with inputs improvement	NO	5	NO	5
Grass-4		Select state	Select state	Select state	NO	5	NO	5
Grass-5		Select state	Select state	Select state	NO	5	NO	5
Grass-6		Select state	Select state	Select state	NO	5	NO	5
Grass-7		Select state	Select state	Select state	NO	5	NO	5
Grass-8		Select state	Select state	Select state	NO	5	NO	5
Grass-9		Select state	Select state	Select state	NO	5	NO	5
Grass-10		Select state	Select state	Select state	NO	5	NO	5

* is fire occuring?

Default		Start	Without project		With Project		Soil C variations (tCO2eq)		Total CO2 eq from fire		Total CO2eq		Difference
		t0	End	Rate	End	Rate	Without	With	Without	With	Without	With	tCO2eq
System G1	from Deforestation	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
System G2	converted to A/R	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
System G3	From OLUC	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
System G4	Grassland to OLUC	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Grass-1	Severely degraded without project	1495000	*1495000*	*Linear*	*1495000*	*Linear*	59955729	0	0	0	59955729	0	**-59955729**
Grass-2	improved	500000	*500000*	*Linear*	*500000*	*Linear*	0	-15239583	0	0	0	-15239583	**-15239583**
Grass-3	improved through irrigation and culti	5000	*5000*	*Linear*	*5000*	*Linear*	0	-252977	0	0	0	-252977	**-252977**
Grass-4		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-5		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-6		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-7		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-8		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-9		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Grass-10		0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	**0**
Total Syst 1-10		2000000	2000000		2000000								
									Grassland total		59955729	-15492560	**-75448290**

Other investment module

The installation of an irrigation system (5000 ha of solid roll sprinkle irrigation system) to improve a quantity of grassland has to be accounted within the other investment module.

The other investment module can be filled as follows:

Released GHG associated with installation of irrigation systems

Installation of irrigation system	surface (ha)	Type of irrigation system	Associated tCO2eq
Without Project	0	Hand moved sprinkle	0,0
With Project	5000	Solid roll sprinkle	427,2

Difference 427,2

IRSS = Irrigation runoff return system

Released GHG associated with building of infrastructure

Type of construction or infrastructure	Default value t CO2 /m2	Specific Value	Default Factor	surface (m2) Without	surface (m2) With	Emission (t CO2eq) Without	Emission (t CO2eq) With
Industrial Buildings (concrete)	0,825		YES			0,0	0,0
Agricultural Buildings (metal)	0,220		YES			0,0	0,0
Agricultural Buildings (metal)	0,220		YES			0,0	0,0
Agricultural Buildings (metal)	0,220		YES			0,0	0,0
Industrial Buildings (concrete)	0,825		YES			0,0	0,0
Road for medium trafic (concrete)	0,319		YES			0,0	0,0
Road for medium trafic (asphalt)	0,073		YES			0,0	0,0
			Subtotal	0,0	0,0	*Difference*	*0,0*

SUB-TOTAL FOR INVESTMENT Without 0 With 427 Difference 427

Land use and land use change Matrix

The exercise mainly focuses on livestock. Livestock is not reflected inside the matrix of land use change however the project also deals with grasslands. The matrix only represents the area concerned with the implementation of the project. There is no land use change, hence the same numbers are presented in the matrix in the two situations (without and with project). Indeed the project only works on pasture improvements.

Mineral soils *Without Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	0	0	0	0	0	0	0
	Annual	0	0	0	0	0	0	0	0
Cropland	Perennial	0	0	0	0	0	0	0	0
	Rice	0	0	0	0	0	0	0	0
Grassland		0	0	0	0	2000000	0	0	2000000
Other Lar	Degraded	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total Final	0	0	0	0	2000000	0	0	2000000
								Organic soils	0

Mineral soils *With Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	0	0	0	0	0	0	0
	Annual	0	0	0	0	0	0	0	0
Cropland	Perennial	0	0	0	0	0	0	0	0
	Rice	0	0	0	0	0	0	0	0
Grassland		0	0	0	0	2000000	0	0	2000000
Other Lar	Degraded	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total Final	0	0	0	0	2000000	0	0	2000000
								Organic soils	0

Results provided by the EX-ACT tool

The main two activities proposed with the project imply positive impacts on climate change mitigation:

- The livestock improvements create a **sink of GHG** reaching 4,4 million tons of eq-CO2 in 20 years. The sink is due to the reduction of N2O and CH4 emissions.

-The grassland restoration implies a **sink of GHG** reaching 76.4 million tons of eq-CO2 in 20 years. The sink is due to the enhancement of soil carbon content. The installation of an irrigation system creates a insignificant **source of GHG** reaching 427 tons of eq-CO2 in 20 years that is largely compensated by the two previous activities.

Thus the project is contributing to mitigation to climate change. The gathered activities represent a **net sink** of about 79 million tons of eq-CO2, or 2 t eq-CO2/year/ha.

Project Summary	
Name	
Continent	Asia (Continental)
Climate	Cool Temperate Dry
Dominante Soil	HAC Soils

Area (Initial state in ha)		
Forest/Plantation		0
Cropland	Annual	0
	Perennial	0
	Rice	0
Grassland		2000000
Other Land	Degraded	0
	Other	0
Organic soils/peatlands		0

Duration of the Project (years)	
Implementatio	5
Capitalisation	15
Total	20
Total Area	
Mineral soils	2000000
Organic soils	0
Total Area	**2000000**

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital.
Deforestation	0		0	0	0	0	0	0	0	0	0
Forest Degradation	0		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	0		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	0		0	0	0	0	0	0	0	0	0
Agriculture											
Annual Crops	0		0	0	0	0	0	0	0	0	0
Agroforestry/Perennial Crops	0		0	0	0	0	0	0	0	0	0
Irrigated Rice	0		0	0	0	0	0	0	0	0	0
Grassland	-75448290	this is a sink	0	########	0	0	-10778327	-64669963	-3772414	-2155665	-4311331
Organic soils and peatlands	0		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	-4430286	this is a sink	---		-1325291	-3104995	-632898	-3797388	-221514	-126580	-253159
Inputs	0		0		0	---	0	0	0	0	0
Other Investment	427	this is a source	427		---	---	427	0	21	85	0
Final Balance	-79878149	It is a sink	427	########	-1325291	-3104995	-11410798	-68467351	-3993907	-2282160	-4564490
In % of Emission without project:	-106.4%										
Result per ha	-39.9		0.0	-37.7	-0.7	-1.6	-5.7	-34.2	-2.0	-1.1	-2.3

Situation 5: Rice project in Ghana

General description of the project

First of all, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Ghana, Africa. We do not have direct information regarding the dominant climate and soil. A Tropical Wet climate and HAC soils are considered.

The project will be financed during 5 years, hence an implementation phase of 5 years. The capitalization phase is estimated to occur during 15 years.

Finally the description module in EX-ACT should be filled as follow:

Project Name	*Rice project in Ghana*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Wet	
	See "Climate" for Help	
Dominant Regional Soil Type	HAC Soils	
	See "Soil" for Help	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

GWP (choose values)	
Official-CDM	
CO_2	**1**
CH_4	**21**
N_2O	**310**

Components of the project

Three different activities are realized: (1) improvement of flooded rice, (2) improvement of upland rice and (3) the application of fertilizers. Consequently, the following three modules requires completion: **Rice, Annual and input.** It is worth observing in that the upland rice is considered as an annual crops whereas the flooded rice is accounted within the irrigated rice module of EX-ACT. Indeed the flooded rice is responsible of high methane emissions.

Annual module

The total area concerned by project is 8 500x1,25 = 10 625 ha. About 40% of these area is currently under cultivation of upland rice: 1 0625*0,4 = 4 250 ha, whose residue is burnt.
The implementation of the project should lead to improve the current area of upland rice by using better agronomic practices and applying manure.
Without the implementation of the project, it is expected that in the future 70% (4 250*0,7 = 2 975) of this rice crop area should remain traditional upland rice, whereas 30% (4 250x0,3 = 1 275) of this area will be given up to other annual crop (called other annual in the following screenshot).

It is advised to build the following table while reading the exercise to fill in the EX-ACT tables:

	Start	Future without project	Future with roject
Traditional upland rice	8 500x1,25x0,4 = 4250	8 500x1,25x0,4x0,7 = 2975	0
Improved upland rice	0	0	8 500x1,25x0,4 = 4250
Other annual	0	8 500x1,25x0,4x0,3 = 1275	0

Finally the annual module can be filled as follows:

	Your description	User-defined practices Name	Rate in tC/ha/yr	Improved agro-nomic practice	Nutrient management	NoTillage/residues management	Water management	Manure application	Residue/Biomass Burning	t dm/ha
Reserved system A1	from Deforestation	NO		?	?	?	?	?	NO	10
Reserved system A2	Converted to A/R	NO		?	?	?	?	?	NO	10
Reserved system A3	Annual From OLUC	NO		?	?	?	?	?	NO	10
Reserved system A4	Converted to OLUC	NO		?	?	?	?	?	NO	10
Annual System1	Current system *	YES	Equilibrium 0	* A conservative approach is to consider this system at equilibrium or decreasing					YES	10
Annual System2	traditional upland rice	NO		?	?	?	?	?	YES	10
Annual System3	improved upland rice	NO		Yes	?	?	?	Yes	NO	10
Annual System4	other annual	NO		?	?	?	?	?	YES	10
Annual System5		NO		?	?	?	?	?	NO	10
Annual System6		NO		?	?	?	?	?	NO	10
Annual System7		NO		?	?	?	?	?	NO	10
Annual System8		NO		?	?	?	?	?	NO	10
Annual System9		NO		?	?	?	?	?	NO	10
Annual System10		NO		?	?	?	?	?	NO	10

Positive value= gain for soil

Description/example of the different options See FAOSTAT

Improved agronomic practices:	using improved varieties, extending crop rotation…
Nutrient management:	precision farming, improve N use effciency
Tillage / residues Management	Adoption of reduced,minimum or zero tillage, with or without mulching, including Cons
Water management:	Effective irrigation measure
Manure application	Manure or Biosolids application to the field as input

Mitigation potential

Vegetation Type	Areas Start t0	Without project End	Rate	With Project End	Rate	Soil CO2 Change Without tCO2	With tCO2	CO2eq emitted from Burning Without tCO2	With tCO2	**Total Balance** Without tCO2	With tCO2	**Difference** tCO2
System A1	0	0	Linear	0	Linear	0	0	0	0	0	0	**0**
System A2	0	0	Linear	0	Linear	0	0	0	0	0	0	**0**
System A3	0	0	Linear	0	Linear	0	0	0	0	0	0	**0**
System A4	0	0	Linear	0	Linear	0	0	0	0	0	0	**0**
Annual System1	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System2	4250	2975	*Linear*	0	*Linear*	0	0	39318	6664	39318	6664	**-32654**
Annual System3	0	0	*Linear*	4250	*Linear*	0	-207506	0	0	0	-207506	**-207506**
Annual System4	0	1275	*Linear*	0	*Linear*	0	0	13994	0	13994	0	**-13994**
Annual System5	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System6	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System7	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System8	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System9	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Annual System10	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	**0**
Total Syst 1-10	4250	4250		4250								
						Agric. Annual Total				**53312**	**-200842**	**-254154**

Rice module

Flooded rice is cultivated under 60% of the total rice area: 8 500x1,25x0,6=6 375 ha.
The implementation of the project will lead to change the rice management in two different ways.
The first way is to export the residue instead of burning it. This will be adopted on 70% of the current flooded rice area, whose water management will not change.
The second way is to act on the water management: during the cultivation period the rice will be intermittently irrigated. This improvement will be conducted on 30% of current area.

The exercise can be translated as follows:

	Start (ha)	Future without project (ha)	Future with project (ha)
Traditional rice	8500x1,25x0,6=6375	8500x1,25x0,6x0,9=5737,5	0
Improved rice rainfed deepwater	0	0	8500x1,25x0,6x0,7=4462,5
Improved rice irrigated	0	0	8500x1,25x0,6x0,3=1912,5
Private initiative	0	8500x1,25x0,6x0,1=637,5	

Finally the rice module can be filled as follows:

	Your description	Cultivation period (Days)	Water Regime: During the cultivation Period	Water Regime: Before the cultivation period (need help)	Organic Amendment type (Straw or other)
Reserved system R1	from Deforestation	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Reserved system R2	converted to A/R	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Reserved system R3	from OLUC	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Reserved system R4	Rice to OLUC	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice1	traditional rice	150	Rainfed and deep water	Non flooded preseason >180 days	Straw burnt
Rice2	improved rice (70%)	100	Rainfed and deep water	Non flooded preseason >180 days	Straw exported
Rice3	improved rice (30%)	100	Irrigated - Intermittently flooded	Non flooded preseason >180 days	Straw exported
Rice4	private initiative	150	Irrigated - Continuously flooded	Flooded preseason (>30 days)	Straw burnt
Rice5		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice6		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice7		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice8		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice9		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment
Rice10		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment

* usefull information can be obtained at www.irri.org/science/ricestat and faostat.fao.org
e.g. Rice crop calendar by country: http://www.irri.org/science/ricestat/data/may2008/WRS2008-AppendixTable04.pdf

CH4 emission from rice systems — **Change over the period (t CO2eq)**

Areas (ha) of the different options						Soil C changes All period		CH4 emitted All period		Straw burning		Total t CO2 eq		Difference tCO2eq
Type	Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Without	With	Without	With	Without	With	Without	With	
System R1	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System R2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System R3	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System R4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice1	6375	5737.5	Linear	0	Linear	0	0	87472	11982	40134	5498	127606	17480	-110126
Rice2	0	0	Linear	4462.5	Linear	0	0	0	39143	0	0	0	39143	39143
Rice3	0	0	Linear	1912.5	Linear	0	0	0	34794	0	0	0	34794	34794
Rice4	0	637.5	Linear	0	Linear	0	0	86801	0	3848	0	90650	0	-90650
Rice5	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice6	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice7	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice8	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice9	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice10	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Total Systems 1-10	6375	6375		6375										
											Total	218256	91417	-126839

Input module

The fertilization will be improved for the rice (excepted-upland rice) with 120 Kg/ha/year with the project. A total of 8 500 ha x1,25x0,6x0,12 = 765 T of urea will be used. The private initiative will use more intensive fertilization, with 8500x1,25x0,6x0,1x0,2 = 128 T of Urea.

The input module can be filled as follows:

Carbon dioxide emissions from Urea application														
				Amount of Urea in tonnes per year					Emission (t CO2eq) per year			Total Emission (tCO2eq)		
	IPCC factor	Specific factor	Default Factor	Start	Without Project		With Project		Start	End				Difference
				t0	End	Rate	End	Rate		Without	With	Without	With	
Urea	0.2		YES		127.5	Linear	765	Linear	0	25.5	153	446	2,678	2231
								Sub-Total I-2	0	25.5	153	446	2678	2231

Land use and land use change Matrix

The exercise mainly focuses annual and rice improvements. There is no land use change, hence the same numbers presented in the matrix in the two situations (without and with project). Indeed the project only works to improve the pre-existing field.

Results provided by the EX-ACT tool

Two of the three activities proposed with the project imply positive impacts on climate change mitigation:

- The upland rice improvements imply a **sink of GHG** reaching 254 154 tons of eq-CO_2 in 20 years. The sink is due to the manure application that stocks Carbon, N_2O and CH_4.

-The irrigated rice improvements imply a **sink of GHG** reaching 126 839 tons of eq-CO_2 in 20 years. The sink is mainly due to the reduction of CH_4 emissions. The straw management mitigates a significant source of GHG due to the anaerobic degradation of the organic matter that produces methane.

- The growing use of inputs is a **source of GHG**: 43,153 tons of eq-CO_2 in 20 years are emitted to improve the yield.

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital.
Deforestation	0		0	0	0	0	0	0	0	0	0
Forest Degradation	0		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	0		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	0		0	0	0	0	0	0	0	0	0
Agriculture											
Annual Crops	-254154	this is a sink	0	-207506	-12912	-33737	-36308	-217847	-12708	-7262	-14523
Agroforestry/Perennial Crops	0		0	0	0	0	0	0	0	0	0
Irrigated Rice	-126839	this is a sink	0	0	-10652	-116187	-18120	-108719	-6342	-3624	-7248
Grassland	0		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	0		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	0		---		0	0	0	0	0	0	0
Inputs	43153	this is a source	27026		16127	---	6165	36988	2158	1233	2466
Other Investment	0		0		---	---	0	0	0	0	0
Final Balance	-337840	It is a sink	27026	-207506	-7437	-149924	-48263	-289577	-16892	-9653	-19305
In % of Emission without project:	-120.6%										
Result per ha	-31.8		2.5	-19.5	-0.7	-14.1	-4.5	-27.3	-1.6	-0.9	-1.8

Thus the project is contributing to mitigation to climate change. The gathered activities represent a **net sink** of about 337 840 tons of eq-CO_2, or 31,8 tons eq-CO_2/ha.

Situation 6: Markala Sugar project in Mali

General description of the project

Firstly, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Mali, Africa. We do not have direct information regarding the dominant climate. Nonetheless, according the IPCC map, we assume a tropical dry climate and LAC soils. Further, the project deals with deforestation, land use change, annuals, inputs as well as different investments.

The project will be financed during 5 years, hence an implementation phase of 5 years. The capitalization phase is estimated to occur during 15 years.

The description module in EX-ACT should be filled as follows:

Project Name	*Markala sugar project in Mali*

Continent	Africa

Climate	Tropical
Moisture regime	Dry

See "Climate" for Help

Dominant Regional Soil Type	LAC Soils

See "Soil" for Help

Duration of the Project (Years)	Implementation phase	5
	Capitalization phase	15
	Duration of accounting	20

Components of the project

Six different activities are realized: (1) deforestation, (2) land use change, (3) annuals, (4) irrigated rice, (5) inputs and (6) investments. The activities may have impacts on GHG emissions. Consequently, the following six modules are going to be filled in are: **deforestation, land use change, annuals, irrigated rice, inputs and other investments.**

Deforestation module

With the project, 900 ha of tree savannah will be deforested and converted into sugar cane plantations where the conversion is done via fire use. The savannah would have remained as it presently is without the project.

Consequently the deforestation module can be completed as follows:

Type of Default forest/plantation proposed within the specified Climatic zone		
	Ecological Zone	Go to Map
Natural Forest	Forest1	Tropical rain forest
	Forest2	Tropical moist deciduous forest
	Forest3	Tropical dry forest
	Forest4	Tropical shrubland
Plantation	Plantation1	Tropical rain forest
	Plantation2	Tropical moist deciduous forest
	Plantation3	Tropical dry forest
	Plantation4	Tropical shrubland

Suggested Default Values per hectare (/ha)							
Above-Ground Biomass		Below-Ground Biomass		Litter	Dead Wood		Soil C
tonnes dm	t C	tonnes dm	t C	t C	tC		tC
310	145.7	114.7	53.9	3.65	0		35
260	122.2	62.4	29.3	3.65	0		35
120	56.4	33.6	15.8	3.65	0		35
70	32.9	28.0	13.2	3.65	0		35
150	70.5	55.5	26.1	3.65	0		35
120	56.4	24.0	11.3	3.65	0		35
60	28.2	16.8	7.9	3.65	0		35
30	14.1	12.0	5.6	3.65	0		35

If you have your own data fill the information ->

Specific Vegetation 1	0	0	0	0	0		0		0	
Specific Vegetation 2	0	0	0	0	0		0		0	
Specific Vegetation 3	0	0	0	0	0		0		0	
Specific Vegetation 4	0	0	0	0	0		0		0	

	Conversion details (Harvest wood product exported before the conversion, use of fire, final use after conversion)							Losses (positive value) and gain (negative value) per ha							
	Vegetation Type	HWP before		Fire use		Final Use after	Biomass (tC/ha)	Biomass		Soil			CH4	N2O	Total
Name		t DM/ha	t C exported	yes/no	% released	deforestation	1 yr after	t C	t CO2	k_{soil}	Delta C	tCO2/yr	kg	kg	tCO2 eq
Def.1	Forest4		0	YES	0.72	Annual Crop	5.0	49.7	**182.3**	0.58	14.7	**2.7**	342.7	10.1	**10.3**
Def.2	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.3	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.4	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.5	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.6	Please specify the vegetation		0	NO	0	Select Use after deforestation	0.0	0.0	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.7	Specific Vegetation 1		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.8	Specific Vegetation 2		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.9	Specific Vegetation 3		0	NO	0	Select Use after deforestation	0.0	0.00	**0.0**	0.00	0.0	**0.0**	0.0	0.0	**0.0**
Def.10	Specific Vegetation 4		0	NO	0	Select Use after deforestation	0.0	1.00	**3.7**	0.00	0.0	**0.0**	0.0	0.0	**0.0**

GHG emissions

Vegetation Ty	Forested Area (ha)					Area deforested (ha)		Biomass loss		Biomass gain (1yr after)		Soil (baseline)		Fire		Total Balance		Difference
	Start	Without Project		With Project		Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate			tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
Def.1	*900*	*900*	*Linear*	*0*	*Linear*	0	900	0	164043	0	-16500	0	42446	0	9290	0	199279	199279
Def.2	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.3	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.4	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.5	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.6	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.7	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.8	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.9	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.10	*0*	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0	0	0	0	0

Deforestation Total			0	199279	199279

Non forest Land Use Change (LUC)

There are four sub-activities within the LUC activity. In order to avoid confusion, a set-up of the following table is suggested:

Activity	Ha
Set aside to sugar cane	3231
Degraded to sugar cane	3231
Set aside to food crops	1250
Degraded to paddy rice	1000

As a result the LUC module can be completed as follows:

		Description of LUC			Burnt before	Default C Stocks (tC/ha)				Delta (tCO2)		Emitted during Burning	
Name	Your Name	Initial Land Use	Final Land Use	Alert	conversion	Biom. Ini.	Biom. Fin.	Soil Ini.	Soil Fin.	Biomass	Soil /yr *	CH4 (kg)	N2O (kg)
LUC-1	Set aside to sugar	Set Aside	Annual Crop		NO	5.0	5.0	32.6	20.3	0.0	-2.2	0.0	0.0
LUC-2	Degraded to sugar	Degraded Land	Annual Crop		NO	1.0	5.0	11.6	20.3	14.7	1.6	0.0	0.0
LUC-3	Set aside to food crops	Set Aside	Annual Crop		NO	5.0	5.0	32.6	20.3	0.0	-2.2	0.0	0.0
LUC-4	Degraded to paddy rice	Degraded Land	Paddy Rice		NO	1.0	5.0	11.6	38.5	14.7	4.9	0.0	0.0
LUC-5		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-6		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-7		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-8		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-9		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-10		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-11		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-12		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-13		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-14		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-15		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUC-16		Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Default Soil Native (tC/ha)	35

*Soil effect limited to 20 years
Positive value= gain for soil

GHG emissions

Vegetation Type		Area concerned by LUC				Biomass Change		Soil Change		Fire		Total Balance		Difference
		Without Project		With Project		Without	With	Without	With	Without	With	Without	With	
		Area	Rate	Area	Rate	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
LUC-1	Set aside to sugar	*0*	*Linear*	*3231*	*Linear*	0	0	0	126985	0	0	0	126985	**126985**
LUC-2	Degraded to sugar	*0*	*Linear*	*3231*	*Linear*	0	-47388	0	-90704	0	0	0	-138092	**-138092**
LUC-3	Set aside to food crops	*0*	*Linear*	*1250*	*Linear*	0	0	0	49128	0	0	0	49128	**49128**
LUC-4	Degraded to paddy rice	*0*	*Linear*	*1000*	*Linear*	0	-14667	0	-86465	0	0	0	-101131	**-101131**
LUC-5		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-6		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-7		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-8		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-9		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-10		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-11		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-12		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-13		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-14		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-15		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**
LUC-16		*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	**0**

Other LUC total			0	-63110	-63110

Annual crops module

Within the annual crops module, the first four scenarios derived from the deforestation (900 ha) and the LUC sub-activities apart from the paddy rice activity that will be completed within the Irrigated rice section (6462 ha + 1250 ha) are represented in the table beneath. Furthermore, an additional activity is added in the annual crops model; that of 6770 ha of dry cereal that are converted into sugar cane plantations. The residue of the annuals within the current system was burnt.

The Annual crops module can be completed as follows:

Your description	User-defined practices	Name	Rate in tC/ha/yr	Improved agro--nomic practices	Nutrient management	NoTillage/residues management	Water management	Manure application	Residue/Biomass Burning	t dm/ha
from Deforestation	NO			?	Yes	?	Yes	?	NO	10
Converted to A/R	NO			?	?	?	?	?	NO	10
Annual From OLUC	NO			?	Yes	?	Yes	?	NO	10
Converted to OLUC	NO			?	?	?	?	?	NO	10
Current system *	YES	Equilibrium	0	* A conservative approach is to consider this system at equilibrium or decreasing					YES	10
Dry cereal to sugar c	NO			?	Yes	?	Yes	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10
	NO			?	?	?	?	?	NO	10

Positive value= gain for soil

Description/example of the different options See FAOSTAT

Improved agronomic practices: using improved varieties, extending crop rotation…
Nutrient management: precision farming, improve N use effciency
Tillage / residues Management Adoption of reduced,minimum or zero tillage, with or without mulching, including Conse
Water management: Effective irrigation measure
Manure application Manure or Biosolids application to the field as input

Areas Start t0	Without project End	Without project Rate	With Project End	With Project Rate	Soil CO2 Change Without tCO2	Soil CO2 Change With tCO2	CO2eq emitted from Burning Without tCO2	CO2eq emitted from Burning With tCO2	Total Balance Without tCO2	Total Balance With tCO2	Difference tCO2
0	0	Linear	900	Linear	0	-17955	0	0	0	-17955	-17955
0	0	Linear	0	Linear	0	0	0	0	0	0	0
0	0	Linear	7712	Linear	0	-153854	0	0	0	-153854	-153854
0	0	Linear	0	Linear	0	0	0	0	0	0	0
6770	6770	*Linear*	0	*Linear*	0	0	84923	10615	84923	10615	-74308
0	0	*Linear*	6770	*Linear*	0	-135062	0	0	0	-135062	-135062
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
6770	6770		6770								
						Agric. Annual Total			**84923**	**-296256**	**-381178**

Irrigated rice module

There are 1000 ha of degraded lands that is converted into paddy rice plantations, intermittently flooded and with a non flooded pre-season of > 180 days, with the straw incorporated long before the cultivation. It is important to verify what type of system that is appropriate. The rice model comes from the LUC model. In that case, the system of Reserved system R3, from OLUC. Further, the rice plantation is Irrigated – intermittently flooded, non-flooded pre season > 180 days, Straw incorporated long (>30 days)before cultivation.

Consequently, the Irrigated rice module can be completed as follows:

	Your description	Cultivation period (Days)	Water Regime During the cultivation Period	Before the cultivation period need help	Organic Amendment type (Straw or other)	rate tonne	Specific C change Delta C* tCO2eq/ha/yr	Default IPCC calculation kg CH4 per ha/day	kg CH4 per ha	Straw Burnt t CO2 eq
Reserved system R1	from Deforestation	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Reserved system R2	converted to A/R	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Reserved system R3	from OLUC	150	Irrigated - Intermittently flooded	Non flooded preseason >180 days	Straw incorporated long (>30d) before cultivation)	5.5		0.87	130.3	0.00
Reserved system R4	Rice to OLUC	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice1		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice2		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice3		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice4		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice5		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice6		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice7		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice8		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice9		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00
Rice10		150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment	5.5		0.00	0.0	0.00

* usefull information can be obtained at www.irri.org/science/ricestat and faostat.fao.org
e.g. Rice crop calendar by country: http://www.irri.org/science/ricestat/data/may2008/WRS2008-AppendixTable04.pdf

*Soil effect limited to 20 years
Positive value= gain for soil

CH4 emission from rice systems						Change over the period (t CO2eq)								
Areas (ha) of the different options						Soil C changes All period		CH4 emitted All period		Straw burning		Total t CO2 eq		Difference tCO2eq
Type	Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Without	With	Without	With	Without	With	Without	With	
System R1	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System R2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
System R3	0	0	Linear	1000	Linear	0	0	0	47899	0	0	0	47899	47899
System R4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice1	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice3	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice5	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice6	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice7	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice8	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice9	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Rice10	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0
Total Systems 1-10	0	0		0										

Total	0	47899	47899

Inputs module

In order to avoid confusion, the set-up of the following table is recommended before entering the numbers in the EX-ACT tool.

Inputs	Sub category	Start	Without project	With project
Fertilizers	Nitrogen (N)	0	0	(14 132*200)/1000 = 2826,4 T/yr
	Potassium (K)	0	0	(14 132*125)/1000 = 1767 T/yr
	Phosphate (P)	0	0	(14 132*12)/1000 = 170 T/yr
Pesticides	Herbicides	0	0	((6*(0.4*14 132))+(12*(0.6*14 132))/1000 = 135.75 T/yr
	Insecticides	0	0	(2*14 132)/1000 = 28,26 T/yr

Once this is done, the inputs model can be completed is follows:

N_2O emissions from N application on managed soils (except manure management see Livestock Module)

Type of input	IPCC factor	Specific factor	Default Factor	Amount of N Applied (t per year) Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Emission (t CO2eq) per year Start	Emission (t CO2eq) per year End Without	Emission (t CO2eq) per year End With	Total Emission (tCO2eq) Without	Total Emission (tCO2eq) With	Difference
Urea	0.01		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
N Fertiliser (other than Urea)	0.01		YES	0	0	Linear	2826	Linear	0.0	0.0	8761.8	0	153,332	153332
N Fertiliser in non-upland Rice*	0.003		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Sewage	0.01		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Compost	0.01		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
								Sub-Total I-3	0.0	0.0	8761.8	0	153332	153332

*N fertilizer from upland rice should be included above (N fertilizer)

CO_2 equivalent emissions from production, transportation, storage and transfer of agricultural chemicals

Type of input**	Default factor*	Specific factor	Default Factor	Amount in tonnes of product (active ingrediente for Pesticides) Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Start	End Without	End With	Total Emission Without	Total Emission With	Difference
Urea	4.8		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
N Fertiliser (other than Urea)	4.8		YES	0	0	Linear	2826	Linear	0.0	0.0	13472.5	0	235,769	235769
N Fertiliser in non-upland Rice*	4.8		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Phosphorus synthetic fertilizer	0.7		YES	0	0	Linear	170	Linear	0.0	0.0	124.3	0	2,175	2175
Potassium synthetic fertilizer	0.6		YES	0	0	Linear	1767	Linear	0.0	0.0	971.6	0	17,003	17003
Limestone (Lime)	0.6		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Dolomite (Lime)	0.6		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Generic Lime	0.6		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
Herbicides (Pesticides)	23.1		YES	0	0	Linear	136	Linear	0.0	0.0	3133.5	0	54,837	54837
Insecticides (Pesticides)	18.7		YES	0	0	Linear	28	Linear	0.0	0.0	528.5	0	9,248	9248
Fungicides (Pesticides)	14.3		YES	0	0	Linear	0	Linear	0.0	0.0	0.0	0	0	0
								Sub-Total I-4	0.0	0.0	18230.4	0	319031	319031

* from Lal (2004) Table 5 - central value -tCO2/t product
** tonnes of N, P2O5, K2O and CaCO3

Total "Inputs"	0	472363	472363

Investment module

There are two sub-activities within the investment module: (1) Use of irrigation and (2) the Industrial Process of sugar cane. With regards to the sub-activity 1, the activity is the installation of central pivot sprinklers, installed on 14 132 ha of sugar cane plantations. Concerning the second sub-activity, there are a few calculations that requires further attention.

- The annual electricity consumption, with the project, derived from the industrial sugar cane remains (that are burnt) is calculated as follows:

  (30 MW*24h)*(365/2) = 131 400 MWh/yr

- Initially and without the project, 15 000 m^3 of gasoline is produced whilst with the project as a result from the sugar cane plantations, 15 000 m^3 of gasoline is substituted by anhydrous ethanol, with a m^3 emissions factor equivalent of 0.025 t CO_2.

- With the project, the total consumption of gasoil (accounted for the land preparation) is expected to reach 2544 m^3/yr.

The investment module can therefore be completed as follows:

Released GHG associated with Electricity Consumption

Origin of Electricity	Other Africa				Losses of electricity during transportation
Default values (T CO2 / MWh)	YES	0.431			10%

OPTION 1 (Based on Total Electricity consumption over the whole duration of the project)

Total Electricity Consumption (MWh)		Associated tCO2eq
Without Project	0	0.0
With Project	0	0.0

OPTION 2 (Based on Annual Electricity consumption at the beginning and according to dynamic changes)

Annual Electricity Consumption (MWh/yr)					Emission (t CO2eq)	
Start	Without Project		With Project		All Period	
t0	End	Rate	End	Rate	Without	With
	0	Linear	131400	Linear		1091075

OPTION1 + OPTION2	Sub-Total Without	11.9	Sub-Total With	1091075.2	Difference	1091063.3

Released GHG associated with Fuel consumption (agricultural or forestry machinery, generators...)

GHG emissions associated with inputs transportation is not included here! But in "Inputs"

OPTION 1 (Based on Total consumption over the whole duration of the project)

Total Liquid Fuel Consumption (m3)	Gasoil/Diesel	Gasoline	Associated tCO2eq
Without Project	0	0	0
With Project	0	0	0

OPTION 2 (Based on Annual Fuel consumption at the beginning and according to dynamic changes)

Type of Fuel	Default value t CO2 /m3	Specific Value	Default Factor	Annual Fuel Consumption (m3/yr) Start t0	Without Project End	Without Project Rate	With Project End	With Project Rate	Emission (t CO2eq) All Period Without	Emission (t CO2eq) All Period With
Gasoil/Diesel	2.63		YES	0	0	Linear	2544	Linear	0	117213
Gasoline	2.85		YES	15000	15000	Linear	0	Linear	855400	106925
Gas (LPG/ natural)	1.69		YES	0	0	Linear	0	Linear	0	0
Propane	1.53		YES	0	0	Linear	0	Linear	0	0
Butane	1.76		YES	0	0	Linear	0	Linear	0	0
User defined	Ethanol	0.025	NO	0	0	Linear	15000	Linear	0	6563
	t CO2/t dry matter			Annual Consumption in t dry matter						
Wood	0.010		YES	0	0	Linear	0	Linear	0	0
Peat	0.003		YES	0	0	Linear	0	Linear	0	0

OPTION1 + OPTION2	Sub-Total Without	855400.3	Sub-Total With	230700.8	Difference	-624699.5

Released GHG associated with installation of irrigation systems

Installation of irrigation system	surface (ha)	Type of irrigation syste	Associated tCO2eq
Without Project	0	Please select	0.0
With Project	14132	Center-pivot sprinkle	1119.3

Difference	1119.3

IRSS = Irrigation runoff return system

Released GHG associated with building of infrastructure

Type of construction or infrastructure	Default value t CO2 /m2	Specific Value	Default Factor	surface (m2) Without	surface (m2) With	Emission (t CO2eq) Without	Emission (t CO2eq) With
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
Please select	0.000		YES			0.0	0.0
			Subtotal	0.0	0.0	Difference	0.0

SUB-TOTAL FOR INVESTMENT	Without	855412	With	1322895	Difference	467483

Land use and land use change Matrix

In the situation without project, there is a smaller amount of forest plantation (900ha), 6770 ha of dry cereal, 4231 ha of degraded land and 4481 ha of set aside land. With the implementation of the project, 900 ha tree savannah has been deforested and converted into sugar cane plantations. Furthermore, the 6770 ha of dry cereal have also been turned into sugar cane plantations. Moreover, one can observe the shift of degraded and set aside lands to sugar cane plantations (3231 ha + 4481 ha). The hectares in question have an improved nutrient and water management. In addition, 1000 ha of the degraded lands has become paddy rice plantations. The total amount of ha are in both cases 16 382 ha.

Project name	Markala sugar project in Mali

Mineral soils *Without Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	900	0	0	0	0	0	0	900
	Annual	0	6770	0	0	0	0	0	6770
Cropland	Perennial	0	0	0	0	0	0	0	0
	Rice	0	0	0	0	0	0	0	0
Grassland		0	0	0	0	0	0	0	0
Other Lar	Degraded	0	0	0	0	0	4231	0	4231
	Other	0	0	0	0	0	0	4481	4481
	Total Final	900	6770	0	0	0	4231	4481	16382
							Organic soils		0

Mineral soils *With Project*		FINAL							
		Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
			Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation	0	900	0	0	0	0	0	900
	Annual	0	6770	0	0	0	0	0	6770
Cropland	Perennial	0	0	0	0	0	0	0	0
	Rice	0	0	0	0	0	0	0	0
Grassland		0	0	0	0	0	0	0	0
Other Lar	Degraded	0	3231	0	1000	0	0	0	4231
	Other	0	4481	0	0	0	0	0	4481
	Total Final	0	15382	0	1000	0	0	0	16382

Results provided by the EX-ACT tool

The improvements proposed in the different modules finally lead to a **net source** of GHG reaching 742 736 tons of eq-CO2 in 20 years. It is mainly due to the deforestation, inputs and investment modules.

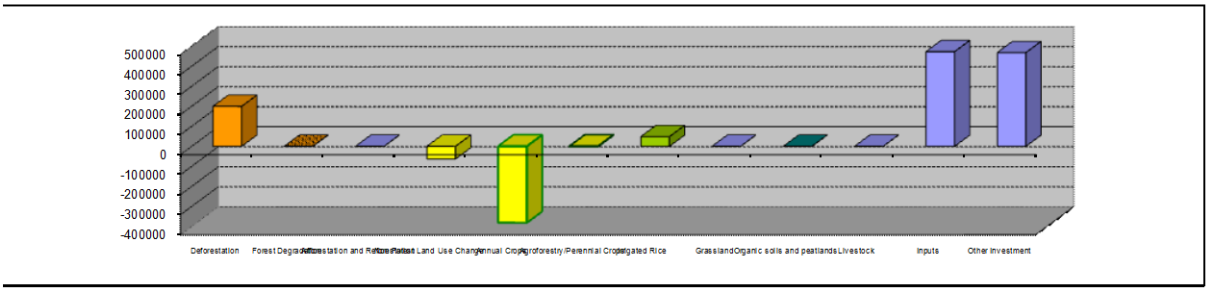
Finally the implementation of the project **indirectly** allows for contributing to climate change mitigation of the country since with the LUC, from degraded and set aside lands to sugar cane plantations, Mail will be able to produce green electricity, which is in the long-run a sustainable option even though the project, momentarily emits 742.7 T of CO_2 per year or 2.3 tons of eq-CO_2 per year per ha.

Project Summary	
Name	Markala sugar project in Mali
Continent	Africa
Climate	Tropical Dry
Dominante Soil	LAC Soils

Area (Initial state in ha)		
Forest/Plantation		900
Cropland	Annual	6770
	Perennial	0
	Rice	0
Grassland		0
Other Land	Degraded	4231
	Other	4481
Organic soils/peatlands		0

Duration of the Project (years)	
Implementatio	5
Capitalisation	15
Total	20
Total Area	
Mineral soils	16382
Organic soils	0
Total Area	**16382**

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital.
Deforestation	**199279**	**this is a source**	147543	42446	2812	6477	199279	0	9964	39856	0
Forest Degradation	**0**		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	**0**		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	**-63110**	**this is a sink**	-62055	-1056	0	0	-62205	-905	-3156	-12441	-60
Agriculture											
Annual Crops	**-381178**	**this is a sink**	0	-306871	-20567	-53740	-54454	-326724	-19059	-10891	-21782
Agroforestry/Perennial Crops	**0**		0	0	0	0	0	0	0	0	0
Irrigated Rice	**47899**	**this is a source**	0	0	0	47899	6843	41057	2395	1369	2737
Grassland	**0**		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	**0**		–	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	**0**		---		0	0	0	0	0	0	0
Inputs	**472363**	**this is a source**	319031		153332	---	67480	404883	23618	13496	26992
Other Investment	**467483**	**this is a source**	467483		---	---	67743	399740	23374	13549	26649
Final Balance	**742736**	**It is a source**	**872003**	**-265480**	**135577**	**637**	**224685**	**518051**	**37137**	**44937**	**34537**
In % of Emission without project:	**79.0%**										
Result per ha	**45.3**		**53.2**	**-16.2**	**8.3**	**0.0**	**13.7**	**31.6**	**2.3**	**2.7**	**2.1**



Situation 7: Agro-forestry project in the Cross-river region, Nigeria

General description of the project

Firstly, the **description module** has to be filled in with the information provided in the exercise.

The project takes place in Nigeria, Africa. We do not have direct information regarding the dominant climate. However the project deals with deforestation, annuals and perennials and we know that the project happens in the Cross-river region, Nigeria, hence a tropical wet climate. The dominant type of soil corresponds to LAC soils.

The project will be financed during 5 years, hence an implementation phase of 5 years. The capitalization phase is estimated to occur during 15 years.

Finally the description module in EX-ACT should be filled as follows:

Project Name	*Cross-river project in Nigeria*
Continent	Africa
Climate **Moisture regime**	Tropical Wet
	See "Climate" for Help
Dominant Regional Soil Type	LAC Soils
	See "Soil" for Help

Duration of the Project (Years)	Implementation phase	5
	Capitalization phase	15
	Duration of accounting	20

Components of the project

Four different activities are realized. The first one deals with the deforestation, the second one with annuals, the third with the improvement of perennials (palm trees) but that will consequently be filled in by the tool according to the deforestation module, the last one with the use of inputs. The activities may have impacts on GHG emissions. Consequently, the following four modules are going to be filled: **deforestation, annuals, perennials and inputs.**

Deforestation module

Since it is a mixed Tier 1 and Tier 2 exercise, we firstly need to carry out a few calculations. We have primary and secondary forest.

1. Without the project, 1000 Ha of tropical forest with be deforested. In this case, the coefficients are not given and we therefore need to calculate Harvested Wood Production (HWP).

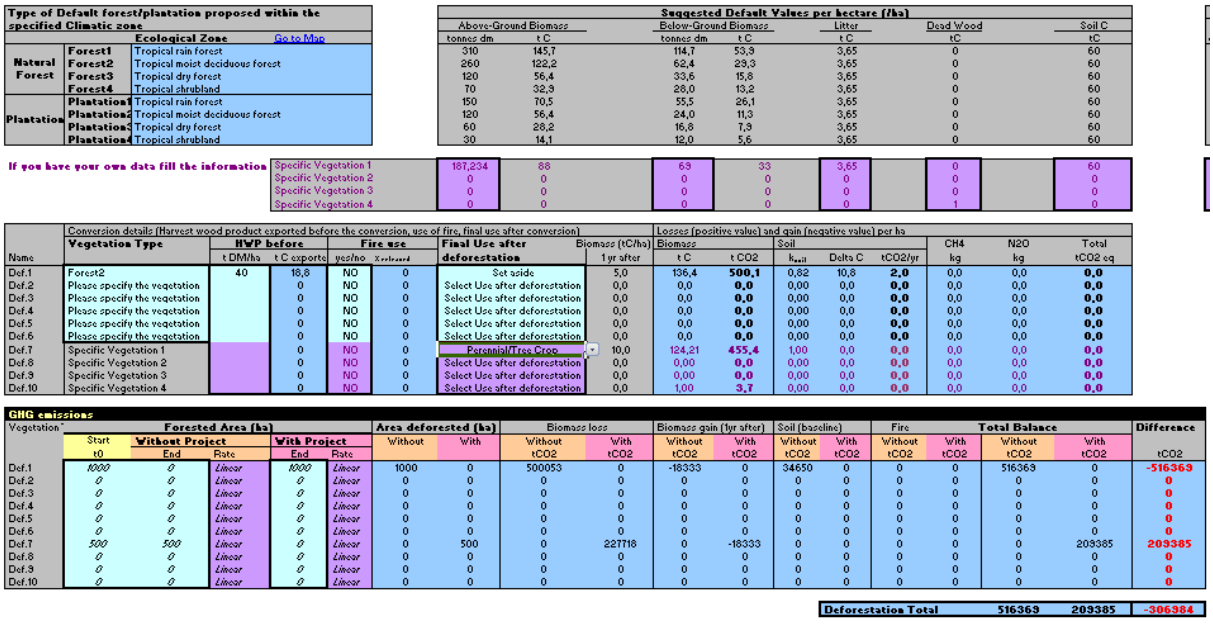
	HWP (T DM/ha)
Vegetation type (Tropical rain forest)	(5*0.8)*10= **40 T DM/ha**

2. The Government of Nigeria decided to develop 500 Ha of perennials from set aside land. This needs to be filled according to the Tier 2 approach. Firstly however, the above- and below-ground biomass needs to be calculated.

	Above-ground biomass (T DM)	Below-ground biomass (T/DM)
Specific vegetation type (palm trees)	88/0.47 = **187.2340426 T DM**	187.2340426*0.37 = **69.27659574 T DM**

3. The litter, dead wood and soils have the same coefficients as in Tier 1.

Consequently the deforestation module can be completed as follows:



Type of Default forest/plantation proposed within the specified Climatic zone		Ecological Zone (Go to Map)
Natural Forest	Forest1	Tropical rain forest
	Forest2	Tropical moist deciduous forest
	Forest3	Tropical dry forest
	Forest4	Tropical shrubland
Plantation	Plantation1	Tropical rain forest
	Plantation2	Tropical moist deciduous forest
	Plantation3	Tropical dry forest
	Plantation4	Tropical shrubland

Suggested Default Values per hectare (/ha)						
Above-Ground Biomass		Below-Ground Biomass		Litter	Dead Wood	Soil C
tonnes dm	t C	tonnes dm	t C	t C	tC	tC
310	145,7	114,7	53,9	3,65	0	60
260	122,2	62,4	29,3	3,65	0	60
120	56,4	33,6	15,8	3,65	0	60
70	32,9	28,0	13,2	3,65	0	60
150	70,5	55,5	26,1	3,65	0	60
120	56,4	24,0	11,3	3,65	0	60
60	28,2	16,8	7,9	3,65	0	60
30	14,1	12,0	5,6	3,65	0	60

If you have your own data fill the information									
Specific Vegetation 1	187,234	88	69	33	3,65	0	60
Specific Vegetation 2	0	0	0	0	0	0	0
Specific Vegetation 3	0	0	0	0	0	0	0
Specific Vegetation 4	0	0	0	0	0	1	0

Conversion details (Harvest wood product exported before the conversion, use of fire, final use after conversion)								Losses (positive value) and gain (negative value) per ha						
	Vegetation Type	HWP before		Fire use		Final Use after	Biomass (tC/ha)	Biomass		Soil			CH4	N2O	Total
Name		t DM/ha	t C exported	yes/no	X-related	deforestation	1 yr after	t C	t CO2	k_{soil}	Delta C	tCO2/yr	kg	kg	tCO2 eq
Def.1	Forest2	40	18,8	NO	0	Set aside	5,0	136,4	**500,1**	0,82	10,8	**2,0**	0,0	0,0	**0,0**
Def.2	Please specify the vegetation		0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.3	Please specify the vegetation		0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.4	Please specify the vegetation		0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.5	Please specify the vegetation		0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.6	Please specify the vegetation		0	NO	0	Select Use after deforestation	0,0	0,0	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.7	Specific Vegetation 1		0	NO	0	Perennial/Tree Crop	10,0	124,21	**455,4**	1,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.8	Specific Vegetation 2		0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.9	Specific Vegetation 3		0	NO	0	Select Use after deforestation	0,0	0,00	**0,0**	0,00	0,0	**0,0**	0,0	0,0	**0,0**
Def.10	Specific Vegetation 4		0	NO	0	Select Use after deforestation	0,0	1,00	**3,7**	0,00	0,0	**0,0**	0,0	0,0	**0,0**

GHG emissions																		
Vegetation	Forested Area (ha)					Area deforested (ha)		Biomass loss		Biomass gain (1yr after)		Soil (baseline)		Fire		Total Balance		Difference
	Start	Without Project		With Project		Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	
	t0	End	Rate	End	Rate			tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
Def.1	1000	0	Linear	1000	Linear	1000	0	500053	0	-18333	0	34650	0	0	0	516369	0	-516369
Def.2	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.3	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.4	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.5	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.6	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.7	500	500	Linear	0	Linear	0	500	0	227718	0	-18333	0	0	0	0	0	209385	209385
Def.8	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.9	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
Def.10	0	0	Linear	0	Linear	0	0	0	0	0	0	0	0	0	0	0	0	0
																Deforestation Total	516369	209385	-306984

Annual crops module

Firstly, since it is a mixed Tier 2 exercise, we need to calculate the rate in T C/ha/year and also clarify the residue/biomass in T/DM/ha.

Production	Rate in T C/ha/year
Improved Yam production	2.75/5 = **0.55 T C/ha/year**

	Residue/Biomass in T/DM/ha
Conventional Yam production	**12**
Improved Yam production	**5**

Once we have these numbers, the annual module can be filled as follows:

	Your description	User-defined practices Name	ate in tC/ha/yr	Improved agric Nutrient -nomic practic management	NoTillage/residu management	Water managemer	Manure application	Residue/Biomass Burning	t dm/ha
Reserved system A	from Deforestatio	NO		? ?	?	?	?	NO	10
Reserved system A	Converted to A/R	NO		? ?	?	?	?	NO	10
Reserved system A	Annual From OLU	NO		? ?	?	?	?	NO	10
Reserved system A	Converted to OLU	NO		? ?	?	?	?	NO	10
Annual System1	Current system *	YES	Equilibrium 0	conservative approach is to consider this system at equilibrium or decrea				YES	5
Annual System2	improved producti	YES	0,55	? ?	?	?	Yes	NO	12
Annual System3		NO		? ?	?	?	?	NO	10
Annual System4		NO		? ?	?	?	?	NO	10
Annual System5		NO		? ?	?	?	?	NO	10
Annual System6		NO		? ?	?	?	?	NO	10
Annual System7		NO		? ?	?	?	?	NO	10
Annual System8		NO		? ?	?	?	?	NO	10
Annual System9		NO		? ?	?	?	?	NO	10
Annual System10		NO		? ?	?	?	?	NO	10

Positive value= gain for so **Description/example of the different options** See FAOSTAT

Improved agronomic practice using improved varieties, extending crop rotation...
Nutrient management: precision farming, improve N use effciency
Tillage / residues Managemer Adoption of reduced,minimum or zero tillage, with or without mulching, including
Water management: Effective irrigation measure
Manure application Manure or Biosolids application to the field as input

Mitigation potential

Vegetation Type	Areas Start t0	Without project End	Rate	With Project End	Rate	Soil CO2 Change Without tCO2	With tCO2	CO2eq emitted from Burn Without tCO2	With tCO2	Total Balance Without tCO2	With tCO2	Difference tCO2
System A1	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A2	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A3	0	0	Linear	0	Linear	0	0	0	0	0	0	0
System A4	0	0	Linear	0	Linear	0	0	0	0	0	0	0
Annual System1	250	250	*Linear*	0	*Linear*	0	0	1568	196	1568	196	-1372
Annual System2	0	0	*Linear*	250	*Linear*	0	-8823	0	0	0	-8823	-8823
Annual System3	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System4	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System5	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System6	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System7	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System8	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System9	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Annual System10	0	0	*Linear*	0	*Linear*	0	0	0	0	0	0	0
Total Syst 1-10	250	250		250								
								Agric. Annual Total		1568	-8627	-10195

Perennials module

The following table demonstrates the perennial module, originating from the deforestation module. Here, it is specified that the above ground biomass growth rate is of 11% per year. This needs to be specified within the perennials module as well as the burning practices.

	Your description	Residue/Biomass Burning	Interval (yr)	Tons dm/ha	Aboveground Biomass Growth rate (tC/ha) Default	Specific	Belowground Biomass Growth rate (tC/ha) Default	Specific	Soil Effect Default t CO2/ha/yr	User default available	tCO2/ha/yr	CH4 kg	N2O kg	CO2eq t
Reserved system P1	From Deforestation	YES	1	10	10	11	0		0,7	NO		18,4	1,68	0,9
Reserved system P2	Converted to A/R	NO	1	10	0		0		0,7	NO		0	0	0,0
Reserved system P3	OLUC to Perennial	NO	1	10	10		0		0,7	NO		0	0	0,0
Reserved system P4	Perennial to OLUC	NO	1	10	0		0		0,7	NO		0	0	0,0
Perennial Syst 1		NO	1	10	0		0		0,7	NO		0	0	0,0
Perennial Syst 2		NO	1	10	0		0		0,7	NO		0	0	0,0
Perennial Syst 3		NO	1	10	0		0		0,7	NO		0	0	0,0
Perennial Syst 4		NO	1	10	0		0		0,7	NO		0	0	0,0
Perennial Syst 5		NO	1	10	0		0		0,7	NO		0	0	0,0

The default (tiers 1 assumption) is that if the system is in equilibrium therefore default growth rate is 0 Positive value= gain for soil
Only System P1 and P3 are considered by default not in equilibrium

Mitigation potential

Vegetation Type	Areas Start t0	Without project End	Rate	With Project End	Rate	CO_2 fluxes from Biomass Without	With	CO_2 fluxes from Soil Without	With	CO_2eq emitted from Burn Without	With	Total Balance Without tCO_2	With tCO_2	Difference tCO2eq
System P1	0	*0*	*Linear*	*500*	*Linear*	0	-342833	0	-6125	0	7938	0	-341020	-341020
System P2	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
System P3	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
System P4	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Perennial Syst 1	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Perennial Syst 2	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Perennial Syst 3	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Perennial Syst 4	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Perennial Syst 5	0	*0*	*Linear*	*0*	*Linear*	0	0	0	0	0	0	0	0	0
Total Syst 1-5	0	0		0										
									Agric. Annual Total			0	-341020	-341020

Inputs module

The following table demonstrates the total amount of urea and fertilizers (N, P, K).

Fertilizer	Annuals	Perennials	Total/fertilizer	Unit
Without project				
Urea	1.25	-	1.25	T/year
With project				
N	0.075*250=18.75	0.125*500=62.5	18.75+62.5=81.3	T/year
P	0.015*250=3.75	0.035*500=17.5	3.75+17.5=21.3	T/year
K	0.01*250=2.5	0.025*500=12.5	2.5+12.5=15	T/year

The inputs module can be filled as follows:

Carbon dioxide emissions from Urea application

	IPCC factor	Specific factor	Default Factor	Amount of Urea in tonnes per year: Start t0	Without Project: End	Without Project: Rate	With Project: End	With Project: Rate	Emission (t CO2eq) per yea: Start	Emission (t CO2eq) per yea: End Without	Emission (t CO2eq) per yea: End With	Total Emission (tCO2eq): Without	Total Emission (tCO2eq): With	Difference
Urea	0,2		YES	1,25	1,25	Linear	0	Linear	0,25	0,25	0	5	1	-4
								Sub-Total I-2	0,25	0,25	0	5	1	-4

N_2O emissions from N application on managed soils (except manure management see Livestock Module)

Type of input	IPCC factor	Specific factor	Default Factor	Amount of N Applied (t per year): Start t0	Without Project: End	Without Project: Rate	With Project: End 0	With Project: Rate	Emission (t CO2eq) per yea: Start	Emission (t CO2eq) per yea: End Without	Emission (t CO2eq) per yea: End With	Total Emission (tCO2eq): Without	Total Emission (tCO2eq): With	Difference
Urea	0,01		YES	1	1	Linear	0	Linear	1,8	1,8	0,0	36	5	-32
N Fertiliser (other than Urea)	0,01		YES	0	0	Linear	81	Linear	0,0	0,0	251,9	0	4 408	4408
N Fertiliser in non-upland Rice*	0,003		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Sewage	0,01		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Compost	0,01		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
								Sub-Total I-3	1,8	1,8	251,9	36	4412	4376

*N fertilizer from upland rice should be included above (N fertilizer)

CO_2 equivalent emissions from production, transportation, storage and transfer of agricultural chemicals

Type of input**	Default factor*	Specific factor	Default Factor	Amount in tonnes of product (active ingrediente for Pesticides): Start t0	Without Project: End	Without Project: Rate	With Project: End	With Project: Rate	Start	End Without	End With	Total Emission: Without	Total Emission: With	Difference
Urea	4,8		YES	1	1	Linear	0	Linear	2,8	2,8	0,0	56	7	-49
N Fertiliser (other than Urea)	4,8		YES	0	0	Linear	81	Linear	0,0	0,0	387,3	0	6 778	6778
N Fertiliser in non-upland Rice*	4,8		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Phosphorus synthetic fertilizer	0,7		YES	0	0	Linear	21	Linear	0,0	0,0	15,6	0	273	273
Potassium synthetic fertilizer	0,6		YES	0	0	Linear	15	Linear	0,0	0,0	8,3	0	144	144
Limestone (Lime)	0,6		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Dolomite (Lime)	0,6		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Generic Lime	0,6		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Herbicides (Pesticides)	23,1		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Insecticides (Pesticides)	18,7		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
Fungicides (Pesticides)	14,3		YES	0	0	Linear	0	Linear	0,0	0,0	0,0	0	0	0
								Sub-Total I-4	2,8	2,8	411,1	56	7202	7146
								Total "Inputs"				97	11615	11518

* from Lal (2004) Table 5 – central value -tCO2/t product
** tonnes of N, P2O5, K2O and CaCO3

Land use and land use change Matrix

In the situation without project, there is a smaller amount of forest plantation (500ha) and 1000 ha of set aside land that would become deforested due to poor agricultural yield. With the implementation of the project, 1000 ha forest will remain tropical moist forest, acting as a sink of carbon emissions. Further, with the project, 250 ha of conventional Yam production will be improved via manure application and no burning practices. The total amount of ha is in both cases 1750 ha.

Project name	Cross-river project in Nigeria

Mineral soils — ***Without Project***

			FINAL							
			Forest/ Plantation	**Cropland**			**Grassland**	**Other Land**		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	**Forest/Plantation**		500	*0*	*0*	*0*	*0*	*0*	*1000*	1500
		Annual	*0*	250	*0*	*0*	*0*	*0*	*0*	250
	Cropland	Perennial	*0*	*0*	0	*0*	*0*	*0*	*0*	0
		Rice	*0*	*0*	*0*	0	*0*	*0*	*0*	0
	Grassland		*0*	*0*	*0*	*0*	0	*0*	*0*	0
	Other Lar	Degraded	*0*	*0*	*0*	*0*	*0*	0	*0*	0
		Other	*0*	*0*	*0*	*0*	*0*	*0*	0	0
	Total Final		500	250	0	0	0	0	1000	1750
								Organic soils		0

Mineral soils — ***With Project***

			FINAL							
			Forest/ Plantation	**Cropland**			**Grassland**	**Other Land**		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	**Forest/Plantation**		1000	*0*	*500*	*0*	*0*	*0*	*0*	1500
		Annual	*0*	250	*0*	*0*	*0*	*0*	*0*	250
	Cropland	Perennial	*0*	*0*	0	*0*	*0*	*0*	*0*	0
		Rice	*0*	*0*	*0*	0	*0*	*0*	*0*	0
	Grassland		*0*	*0*	*0*	*0*	0	*0*	*0*	0
	Other Lar	Degraded	*0*	*0*	*0*	*0*	*0*	0	*0*	0
		Other	*0*	*0*	*0*	*0*	*0*	*0*	0	0
	Total Final		1000	250	500	0	0	0	0	1750
								Organic soils		0

Results provided by the EX-ACT tool

The improvements proposed in the deforestation and annual crops module lead to a **net sink** of GHG reaching 658 200 tons of eq-CO2 in 20 years. Globally this activity contributes more to mitigation than deforesting 1000 ha of primary forest.

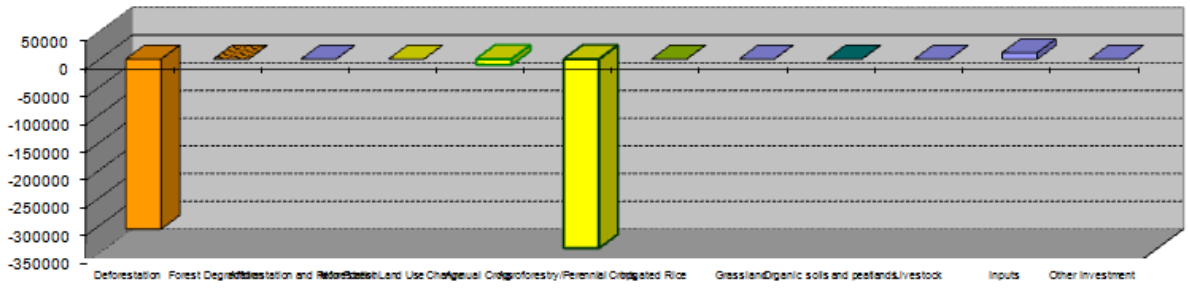
The two activities gathered compensates for the **source of GHG** due to the consumption of inputs, which is 11 518 tons of eq-CO2 per year and per ha. Finally the implementation of the project allows for contributing to climate change mitigation, with a **benefit** of 646 682 tons of eq-CO2 during 20 years in comparison to a situation in which the project would not happen (a net source of 518 034 eq-CO2) , or 18.5 tons of eq-CO2 per year per ha.

Project Summary	
Name	Nigeria tier 2
Continent	Africa
Climate	Tropical Wet
Dominante Soil T	LAC Soils

Area (Initial state in ha)		
Forest/Plantation		1500
Cropland	Annual	250
	Perennial	0
	Rice	0
Grassland		0
Other Land	Degraded	0
	Other	0
Organic soils/peatlands		0

Duration of the Project (years)	
Implementati	5
Capitalisatior	15
Total	20
Total Area	
Mineral soils	1750
Organic soils	0
Total Area	1750

Components of the Project	Balance (Project - Baseline) All GHG in tCO2eq		CO2 Biomass	CO2 Soil	N2O	CH4	Per phase of the project Implement.	Per phase of the project Capital.	Mean per year Total	Mean per year Implement.	Mean per year Capital.
Deforestation	-306984	this is a sink	-272334	-34650	0	0	-306984	0	-15349	-61397	0
Forest Degradation	0		0	0	0	0	0	0	0	0	0
Afforestation and Reforestation	0		0	0	0	0	0	0	0	0	0
Non Forest Land Use Change	0		0	0	0	0	0	0	0	0	0
Agriculture											
Annual Crops	-10195	this is a sink	0	-8823	-380	-992	-1456	-8739	-510	-291	-583
Agroforestry/Perennial Crops	-341020	this is a sink	-342833	-6125	4557	3381	-40074	-300946	-17051	-8015	-20063
Irrigated Rice	0		0	0	0	0	0	0	0	0	0
Grassland	0		0	0	0	0	0	0	0	0	0
Organic soils and peatlands	0		--	0	0	0	0	0	0	0	0
Other GHG Emissions			CO2 (other)								
Livestock	0		---		0	0	0	0	0	0	0
Inputs	11518	this is a source	7142		4376	---	1645	9872	576	329	658
Other Investment	0		0		---	---	0	0	0	0	0
Final Balance	-646682	It is a sink	-608026	-49598	8553	2389	-346870	-299812	-32334	-69374	-19987
In % of Emission without project:	-124,8%										
Result per ha	-369,5		-347,4	-28,3	4,9	1,4	-198,2	-171,3	-18,5	-39,6	-11,4



Main mistakes to avoid

Filling EX-ACT modules step by step

Before filling in any data the user has to complete the description module. If the user forgets this, the tool does not calculate anything as the used default coefficients depends on climate, soil and continent.

Possible mistakes within the situation 1 (Brazil)

- EX-ACT asks for the **forested areas that remain** and not the areas that disappear
- 2 different activities → 2 different EX-ACT modules (Deforestation and A/R)
- A/R module: ha x year = 100*42= 4200 ha reforested during 42 years
- Natural vs plantation: It is advised to check the country definition

Possible mistakes within the situation 2 (Indonesia)

- Be careful: with project= deforestation, without project = forest remains (it is the contrary of the previous situation in Brazil)
- 2 kinds of "fire use": one for the land use change, one used during the cultivation of palm trees.

Possible mistakes within the situation 3 (Benin)

- Only the irrigated rice (flooded permanently or part of the year) is accounted in the rice module. Non flooded rice such as upland rice or pure rainfed rice are considered as annual crops and thus accounted in the annual module.
- All data filled in the other land use module are implemented automatically in the related new land use systems in the blue lines.

Possible mistakes within the situation 4 (Mongolia)

- Inputs used for livestock such as antibiotics, concentrate feed, etc, have to be accounted among the livestock module and not in the input module.
- Regarding the additional technical mitigation options, it is not the exact quantity of antibiotics that is accounted but the use or not of it for a certain percentage of the herd.
- Only the installations of **new** irrigation systems are accounted in the investment module with the default coefficients.
- In the livestock module, don't forget to fill in the country type (developed/developing) and the mean average temperature. It will have importance on the coefficients used.

Possible mistakes within the situation 5 (Ghana)

- Upland rice is accounted among the annual module and not in the rice module.
- Only the mineral fertilizers are accounted in the input module, manure is accounted in every annual system.

Other precisions

Fuel consumption associated with inputs transportation is already embodied in input module, thus it should not be accounted in the investment module.