EX-ACT Training Exercises

Answers Booklet

(January/2015)

Answers and Results for the EX-ACT Training Exercises

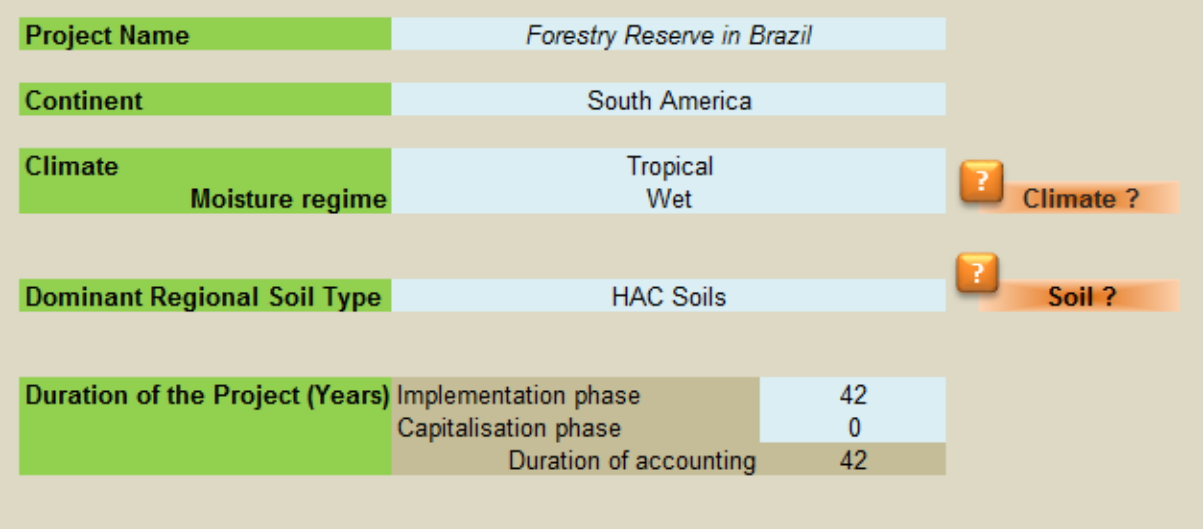
Situation 1: Forestry Reserve in Brazil

General description of the project

Firstly, the **Description module** has to be filled with the information on project location and duration: The project takes place in Brazil, South America, under a tropical wet climate. The dominant type of soil are low activity clay soils: "LAC soils".

The project is implemented over the period of 42 years. For the sake of simplicity, we assume here that all project impacts occur during the 42-year lasting implementation phase and thus set the capitalization phase to 0.

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



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. Since both activities concern changes in land use the **Land Use Change module** requires completion. Deforestation and afforestation have impacts on carbon emissions as e.g. through carbon stored in soils and plant biomass.

Deforestation

The type of vegetation concerned is tropical rain forest, whereby EX-ACT differentiates between those tropical rain forest that is naturally grown or part of plantations.

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

- Natural forest: Extensive management practices, with reduced or minimal human intervention.

- Plantation: Intensive management practices.

The distinction between the two categories also depends on the definitions fixed by the country of interest. Since the exercise is concerned with a natural primary forest that shall be conserved under the reserve, we choose "Forest Zone 1".

No information is provided regarding the usually harvested wood products that will be conserved in their natural form and thus keep to store carbon for a long time (e.g. in the case of building material for construction). For the sake of simplicity and in order to engage in a conservative estimate, we assume that no wood is harvested for such purposes here.

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 be conserved. In both cases the deforested area will be set aside (final use after deforestation).

The deforestation activities thus can be entered as follows:

2.1. Deforestation

AEZ map — Zone 1 = Tropical rain forest — Zone 2 = Tropical moist deciduous forest — Zone 3 = Tropical dry forest — Zone 4 = Tropical shrubland

Type of vegetation that will be deforested	HWP# (tDM/ha)	Fire Use? (y/n)	Final use after deforestation	Forested area (ha) Start	Forested area (ha) Without	*	Forested area (ha) With	*	Deforested area (ha) Without	Deforested area (ha) With	Total Emissions (tCO2-eq) Without	Total Emissions (tCO2-eq) With	Balance
Forest Zone 1	0	YES	Set aside	350000	0	D	280000	D	350000	70000	272,066,560	54,413,312	-217,653,248
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Total Deforestation											272,066,560	54,413,312	-217,653,248

#Harvested Wood Products

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Afforestation

Also for the afforestation component the considered vegetation is tropical rainforest, though we are treating now forest that is planted. While thus "Plantation Zone 1" might firstly seem to be the best selected forest type, the correct choice is nevertheless again "Forest Zone 1", since the forest will not be extensively managed and as part of the natural reserve planting density and tree species are chosen to resemble the characteristics of the existing natural forest in proximity.

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 the total area of reforestation will reach 4200 ha.

The afforestation activities thus can be entered as follows:

2.2. Afforestation and Reforestation

AEZ map — Zone 1 = Tropical rain forest — Zone 2 = Tropical moist deciduous forest — Zone 3 = Tropical dry forest — Zone 4 = Tropical shrubland

Type of vegetation that will be planted	Fire Use? (y/n)	Previous land use	Area that will be afforested/reforested Without	*	Area that will be afforested/reforested With	*	Total Emissions (tCO2-eq) Without	Total Emissions (tCO2-eq) With	Balance
Forest Zone 1	NO	Set Aside	0	D	4200	D	0	-3,236,490	-3,236,490
Select the vegetation	NO	Select previous use	0	D	0	D	0	0	0
Select the vegetation	NO	Select previous use	0	D	0	D	0	0	0
Select the vegetation	NO	Select previous use	0	D	0	D	0	0	0
Select the vegetation	NO	Select previous use	0	D	0	D	0	0	0
Select the vegetation	NO	Select previous use	0	D	0	D	0	0	0
Total Af-/Reforestation							0	-3,236,490	-3,236,490

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

EX-ACT Results

When clicking on **Detailed Results** users may want to first review the inserted information in terms of correctness on the effectuated land use changes. For this purpose one can scroll down to the section "**Surface evolutions by land use"**, which is a matrix summarizing all inserted the changes:

Evolutions of land use / category (hectares - ha)				
		Initial State	Without project	With project
Forest/Plantation		350,000	0	284,200
Agriculture	Annual	0	0	0
	Perennial	0	0	0
	Rice	0	0	0
Grassland		0	0	0
Other lands	Degraded	0	0	0
	Other	4,200	354,200	70,000
Wetlands		0	0	0
Total area (ha)		354,200	354,200	354,200

Thus the total area of interest accounts for 354 200 ha.

At the beginning of the 350 000 ha are forest, while 4 200 ha are other land (set aside).

Without the project 350 000 ha will be converted from forestland to other land (set aside) and 4 200 ha continue to be set aside land.

With the project, 280 000 ha of forest are conserved and 70 000 ha of initial forest becomes set aside land. Finally, 4 200 ha of set aside lands become forestland.

Results provided by EX-ACT

Given the inserted information, EX-ACT indicates the following impacts on GHG emissions and carbon stock changes:

Project Name	*Forestry Reserve in Brazil*	Climate	*Tropical (Wet)*	Duration of the Project (Years)	*42*		
Continent	*South America*	Dominant Regional Soil Type	*LAC Soils*	Total area (ha)	*354200*		

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	CO_2 Soil	CO_2 Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq Positive = source / negative = sink										
Land use changes											
Deforestation	272,066,560	54,413,312	-217,653,248	-196,935,200	-14,546,400		-1,602,048	-4,569,600	6,477,775	1,295,555	-5,182,220
Afforestation	0	-3,236,490	-3,236,490	-3,018,294	-218,196		0	0	0	-77,059	-77,059
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	0	0	0			0	0		0	0	0
Total	272,066,560	51,176,822	**-220,889,738**	-199,953,494	-14,764,596	0	-1,602,048	-4,569,600	6,477,775	1,218,496	-5,259,279
Per hectare	768	144	-624	-564.5	-41.7	0.0	-4.5	-12.9			
Per hectare per year	18.3	3.4	-14.8	-13.4	-1.0	0.0	-0.1	-0.3	18.3	3.4	-14.8

Name of the project	Brz Juma Reserve	Climate	Tropical (Wet)	Duration (yr)	42
Continent	South America	Soil	LAC Soils	Total area (ha)	354200

Component of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance Result per GHG CO_2 Biomass	Soil	Other	N_2O	CH_4	Results per year without	with	Balance
	All GHG in tCO_2eq Positive = source / negative = sink										
Land Use Changes											
Deforestation	271,233,280	54,246,656	-216,986,624	-196,935,200	-14,546,400		-1,666,560	-3,838,464	6,457,935	1,291,587	-5,166,348
Afforestation	0	-3,236,490	-3,236,490	-3,018,294	-218,196		0	0	0	-77,059	-77,059
Other	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestock	0	0	0				0	0	0	0	0
Degradation	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	0	0	0			0	0		0	0	0
Total	271,233,280	51,010,166	**-220,223,114**	-199,953,494	-14,764,596	0	-1,666,560	-3,838,464	6,457,935	1,214,528	-5,243,407
Per hectare	766	144	-622	-564.5	-41.7	-4.7	-10.8	0.0			
Per hectare per year	18.2	3.4	-14.8	-13.4	-1.0	-0.1	-0.3	0.0	18.2	3.4	-14.8

The top row replicates the information inserted in the description module and thus displays the most central information on the chosen geographical context and project duration. The first block from the left directly below, provides then the single GHG impact of with- and without-project scenario as well as the difference between them – also called the GHG balance – which provides the quantification of the marginal difference achieved through project implementation.

The here considered project sketch can thereby be seen as having two main impacts:

- The reduction of deforestation by the project preserves a **carbon sink** accounting for 217.6 million tonnes of CO2-e throughout the 42 years of analysis. The middle block of results indicates that this preservation of stored carbon results mainly from conserving carbon in biomass and to a lesser extend also from preserving carbon in soil. In total this allows to avoid the emission of 5.2 million tonnes of CO2-e per year (third block of results).

- The reforestation activity implies the creation of a new **carbon sink** accounting for 3.2 million tonnes of CO2-e during 42 years, hence a sink of 77059 tonnes of CO2-e each year. The main impact from sequestered CO2 emissions is again due to the increase in forest biomass.

In total the two activities thus constitute a net **GHG balance** of 220.8 million tonnes of CO2-e over the full project duration of 42 years or 14.8 tonnes of CO2-e/ha/year. Most of the mitigation potential comes from the reduction in deforestation.

Situation 2: Palm trees in Indonesia

General description of the project

First, the **Description module** has to be filled with the information provided in the exercise:

The project takes place in Indonesia, Asia insular, under a tropical wet climate. The dominant soil type is a Low Activity Clay (LAC).

The project will finance activities during 3 years and the implementation phase is thus set to 3 years. The projects impacts are analyzed during an additional capitalization phase of 17 years.

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

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

Components of the project

Two different activities are realized as part of the project: The first one concerns deforestation, while a second activity is the implementation of perennial crops. Both may impact GHG emissions and consequently, the **Land Use Change** module has to be completed.

Deforestation

Opposite to the previous exercise, here deforestation is taking place with the project in order to establish palm trees plantations.

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

The first section of the Land Use Change module that concerns deforestation can thus be filled as below:

2.1. Deforestation

AEZ map | Zone 1 = Tropical rain forest | Zone 2 = Tropical moist deciduous forest | Zone 3 = Tropical dry forest | Zone 4 = Tropical shrubland

Type of vegetation that will be deforested	HWP# (tDM/ha)	Fire Use? (y/n)	Final use after deforestation	Forested area (ha) Start	Forested area (ha) Without	*	Forested area (ha) With	*	Deforested area (ha) Without	Deforested area (ha) With	Total Emissions (tCO2-eq) Without	Total Emissions (tCO2-eq) With	Balance
Forest Zone 1	0	YES	Perennial/Tree Crop	10000	10000	D	0	D	0	10000	0	8,287,702	8,287,702
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
									Total Deforestation		0	8,287,702	8,287,702

#Harvested Wood Products

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Perennial crops

The user already indicated that the forest will be converted to perennial crops in the situation with project. EX-ACT follows the logic that every area has to be entered only once into the tool per scenario: When navigating to the perennial crop section in the **Crop Production module**, the 10,000 ha of perennial crops are thus automatically displayed under the section perennial after deforestation and do not have to be entered a second time.

Since it would not be a reasonable practice on a palm tree plantation, it is indicated that no burning of the perennial crop area takes place after harvest.

The perennial section of the Crop Production module thus appears as follows:

3.2. Perrenial systems (agroforestry, orchards, tree crops…)

Yield?

3.2.1. Perrenial systems from other LU or converted to other LU (please fill step 2.LUC previously)

Description	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha) Start	Area (ha) Without	Area (ha) With	Total Emissions (tCO2-eq) Without	Total Emissions (tCO2-eq) With	Balance
Perennial after Deforestation	NO		0	0	10,000	0	-6,729,500	-6,729,500
Converted to A/R	NO		0	0	0	0	0	0
Perennial after non-forest LU	NO		0	0	0	0	0	0
Converted to OLUC	NO		0	0	0	0	0	0

Land use and land use change matrix

Detailed matrices of changes

When clicking on "Detailed matrices of changes" in the results section the user will be provided with the detailed land uses and land use changes that took place under the project.

Matrix of changes Without project — Mineral soils (ha) — Organic Soils (ha): 0

Back to main results

INITIAL \ FINAL	Forest/Plantation	Agriculture Annual	Agriculture Perennial	Agriculture Rice	Grassland	Other lands Degraded	Other lands Other	Total Initial
Forest/Plantation	10000	0	0	0	0	0	0	10000
Agriculture Annual	0	0	0	0	0	0	0	0
Agriculture Perennial	0	0	0	0	0	0	0	0
Agriculture Rice	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0
Other lands Degraded	0	0	0	0	0	0	0	0
Other lands Other	0	0	0	0	0	0	0	0
Total Final	10000	0	0	0	0	0	0	10000

Matrix of changes With project — Mineral soils (ha) — Organic Soils (ha): 0

INITIAL \ FINAL	Forest/Plantation	Agriculture Annual	Agriculture Perennial	Agriculture Rice	Grassland	Other Land Degraded	Other Land Other	Total Initial
Forest/Plantation	0	0	10000	0	0	0	0	10000
Agriculture Annual	0	0	0	0	0	0	0	0
Agriculture Perennial	0	0	0	0	0	0	0	0
Agriculture Rice	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0
Other lands Degraded	0	0	0	0	0	0	0	0
Other lands Other	0	0	0	0	0	0	0	0
Total Final	0	0	10000	0	0	0	0	10000

EX-ACT provides two detailed land use change matrices for the without project situation (top) and the with project situation (bottom) respectively. In both matrices each land use category is listed twice: Once as row denominating the initial land use and once as column, indicating the final land use. In this way the middle-diagonal of the matrices show those land uses that remain the same throughout the project, while the other cells allow to identify the land use change dynamics.

In this simple example the total area of interest is 10 000 ha. In the situation "without project" (top), there is no land use change taking place and the 10 000 ha remain constantly as forestland. In the matrix at the bottom, it is instead visible that under the with-project scenario the initial 10 000 ha of forestland are converted into perennial croplands.

Results provided by EX-ACT

Following the indicated scenario, EX-ACT provides the following results:

Project Name	Indonesia Palm Oil	Climate	Tropical (Wet)	Duration of the Project (Years)	20
Continent	Asia (Insular)	Dominant Regional Soil Type	LAC Soils	Total area (ha)	10000

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq Positive = source / negative = sink										
Land use changes											
Deforestation	0	8,287,702	8,287,702	8,030,550	0		66,752	190,400	0	414,385	414,385
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	-6,729,500	-6,729,500	-6,600,000	-129,500		0	0	0	-336,475	-336,475
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	0	0	0			0	0		0	0	0
Total	0	1,558,202	**1,558,202**	1,430,550	-129,500	0	66,752	190,400	0	77,910	77,910
Per hectare	0	156	156	143.1	-13.0	0.0	6.7	19.0			
Per hectare per year	0.0	7.8	7.8	7.2	-0.6	0.0	0.3	1.0	0.0	7.8	7.8

The two activities proposed by the project imply different impacts on GHG emissions:

- The deforestation activity creates a **source of GHG** reaching 8.2 million tonnes of eq-CO2 over the full duration of analysis of 20 years. Thereby it is in this example the loss of biomass that leads to the reduction in relevant stocks of CO2.

-The subsequent plantation of palm trees leads instead to a new generation of plant biomass that implies a **sink of GHG** reaching 6.7 million tonnes of CO2-e.

Thus the sink generated by the perennial crops is not sufficient enough to compensate the source created by the deforestation activity. Accordingly the project has an overall negative GHG balance, generating a **net source** of 1.5 million tonnes of CO2-e, or 7.8 t CO2-e /year/ha.

Rethinking of the project formulation

Planting palm trees on primary forestland in order to produce biofuels contributes to further climate change and causes on this scale likely also negative impacts for biodiversity and poses problems for integrated pest management. However, one of the declared goals of using biofuels is to reduce CO2 emissions. The project designer will have to reformulate the project. Instead of using forested lands, it would be better to establish palm tree plantations on degraded land or on set aside land. In these cases, the Carbon balance is respectively 414 385 tCO2-e and -363 475 tCO2-e and would thus effectively function as a sink of GHGs. Nonetheless, in this simplified example, we do not have taken into account the impact from increased input needs of cultivation systems on formerly degraded soils (as e.g. in the case of degraded land).

Situation 3: Agricultural project in Benin

General description of the project

First the **Description module** has to be filled 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 can be assumed to take place in the main cotton production area of Benin in the north of the country. This implies a tropical dry climate. The dominant type of soil is a LAC soil.

The project will be implemented during 5 years. The project impacts are analyzed for an additional capitalization phase of 15 years.

Accordingly the Description module should be filled as follows:

Project Name	*Benin Cotton*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Dry	
Dominant Regional Soil Type	LAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Four different activities are realized by the project. First perennial crops will be developed implying the effectuation of land use change. Then, the area cultivated with cotton will decrease, while the cultivated annual crops (cassava) will be improved concerning their cultivation practices. Lastly, the use of fertilizers will be intensified. Consequently the following three modules are going to be utilized to estimate the impact on GHG emissions and sequestration: **Land Use Change, Crop Production, Inputs & Investments**.

Other Land Use Change

Perennial crops (cashew trees) will be planted on set aside land. This implies a land use change that has to be indicated first under the respective section of the Land Use Change module. Thereby the conversion will be carried out using fire.

The information concerning Other LUC can thus be inserted as follows:

2.3. Other Land Use Changes

Fill with your description	Initial land use		Final land use	Message	Fire Use? (y/n)	Area transformed (ha) Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
Developing perennial crops	Set Aside	→	Perennial/Tree Crop		YES	0	D	1000	D	0	6,634	6,634
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
								Total Other LUC		0	6,634	6,634

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Perennial crops module

As already indicated in exercise 2, the newly created perennial crop area is then automatically inserted by the tool under the perennial crop section of the Crop Production module. Since the biomass/residue will not be burnt during the cashew cultivation, no further alterations to the section on perennial crops have to be effectuated by the user.

The perennial module thus automatically appears as follows:

3.2. Perrenial systems (agroforestry, orchards, tree crops...)

Yield?

3.2.1. Perrenial systems from other LU or converted to other LU (please fill step 2.LUC previously)

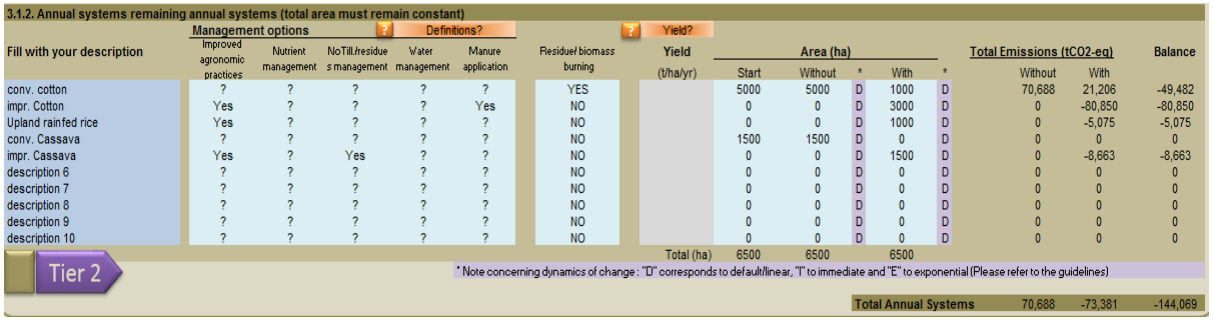
Description	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha) Start	Without	With	Total Emissions (tCO2-eq) Without	With	Balance
Perennial after Deforestation	NO		0	0	0	0	0	0
Converted to A/R	NO		0	0	0	0	0	0
Perennial after non-forest LU	NO		0	0	1,000	0	-117,975	-117,975
Converted to OLUC	NO		0	0	0	0	0	0

Annual crops

For correctly inserting the information as part of the **Crop Production module** it is recommended to first complete the here replicated table.

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
Rainfed rice			1000	Improved seeds and varieties + crop rotation
Conventional cassava	1500	1500		
Improved cassava			1500	No tillage + improved agronomic practices

Once this main information was correctly extracted from the exercise description the annual module can be filled accordingly:



3.1.2. Annual systems remaining annual systems (total area must remain constant)

Fill with your description	Management options: Improved agronomic practices	Nutrient management	NoTill./residues management	Water management	Manure application	Definitions?	Residuel biomass burning	Yield? Yield (t/ha/yr)	Area (ha): Start	Without	*	With	*	Total Emissions (tCO2-eq): Without	With	Balance
conv. cotton	?	?	?	?	?		YES		5000	5000	D	1000	D	70,688	21,206	-49,482
impr. Cotton	Yes	?	?	?	Yes		NO		0	0	D	3000	D	0	-80,850	-80,850
Upland rainfed rice	Yes	?	?	?	?		NO		0	0	D	1000	D	0	-5,075	-5,075
conv. Cassava	?	?	?	?	?		NO		1500	1500	D	0	D	0	0	0
impr. Cassava	Yes	?	Yes	?	?		NO		0	0	D	1500	D	0	-8,663	-8,663
description 6	?	?	?	?	?		NO		0	0	D	0	D	0	0	0
description 7	?	?	?	?	?		NO		0	0	D	0	D	0	0	0
description 8	?	?	?	?	?		NO		0	0	D	0	D	0	0	0
description 9	?	?	?	?	?		NO		0	0	D	0	D	0	0	0
description 10	?	?	?	?	?		NO		0	0	D	0	D	0	0	0
								Total (ha)	6500	6500		6500				

Tier 2

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Total Annual Systems	70,688	-73,381	-144,069

Inputs module

- Use of urea

Presently farmers use 15 kg of urea per hectare per year on the area cultivated with cotton. Consequently a total quantity of 15 kg*5000ha = 75 000 kg of urea is applied per year. Since EX-ACT requires specifications in tonnes of Nitrogen, users have to multiply by the usual Nitrogen concentration for urea of 46.7%. Thus a total of 35.03 tonnes of Nitrogen are applied.

Without the project it is assumed that farmers will continue this fertilization regime.

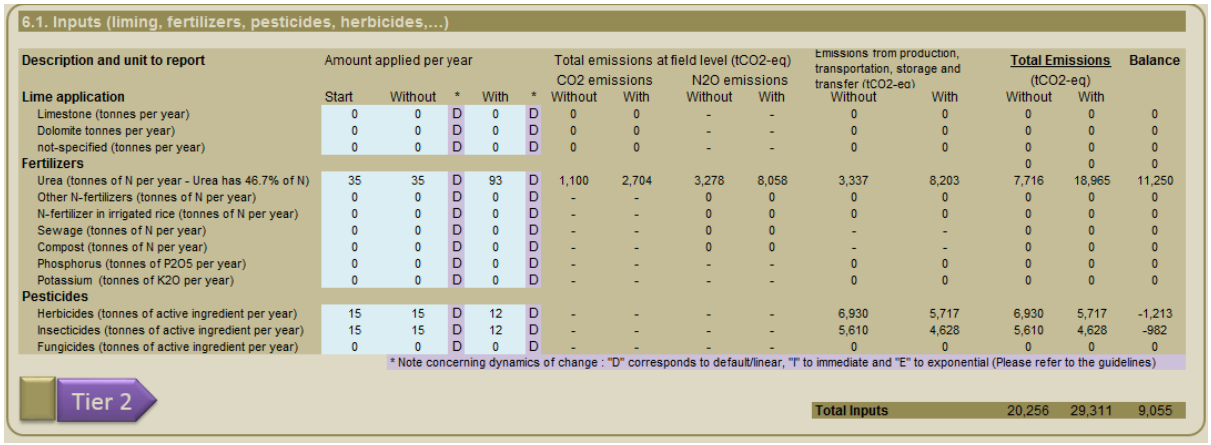
With the project it is instead expected that 50 kg of urea will be annually applied per hectare on all remaining cotton area (4000 ha). Thus the amount of Nitrogen accounts for 0.05*4000*0.467= 93.4 tonnes of N.

- Use of pesticides

At present time, the farmers use 6l of pesticides, including each 3l of herbicides and 3l of insecticides per ha per year on cotton. For the sake of simplicity we will consider that the previous volumes correspond to the volumes of active ingredients. Currently and without the project the quantity of herbicides and insecticides used is thus equivalent to each: 3*5000/1000= 15 tonnes/year.

While decreasing the consumption of pesticides is recommended, it is expected that also under project implementation farmers will still apply 6 l of pesticides (half herbicides and half insecticides) per hectare per year on the entire area cultivated with cotton. Since the cotton fields decreased to a total area of 4000 ha, total annual pesticide consumption decreased proportionately to: 3*4000/1000= 12 tonnes/year (each for herbicides and insecticides).

The **Input module** is thus filled as follows:



6.1. Inputs (liming, fertilizers, pesticides, herbicides,...)

Description and unit to report	Amount applied per year					Total emissions at field level (tCO2-eq)				Emissions from production, transportation, storage and transfer (tCO2-eq)		Total Emissions (tCO2-eq)		Balance
						CO2 emissions		N2O emissions						
Lime application	Start	Without	*	With	*	Without	With	Without	With	Without	With	Without	With	
Limestone (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Dolomite tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
not-specified (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Fertilizers												0	0	0
Urea (tonnes of N per year - Urea has 46.7% of N)	35	35	D	93	D	1,100	2,704	3,278	8,058	3,337	8,203	7,716	18,965	11,250
Other N-fertilizers (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
Sewage (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Compost (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Phosphorus (tonnes of P2O5 per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Potassium (tonnes of K2O per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Pesticides														
Herbicides (tonnes of active ingredient per year)	15	15	D	12	D	-	-	-	-	6,930	5,717	6,930	5,717	-1,213
Insecticides (tonnes of active ingredient per year)	15	15	D	12	D	-	-	-	-	5,610	4,628	5,610	4,628	-982
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0

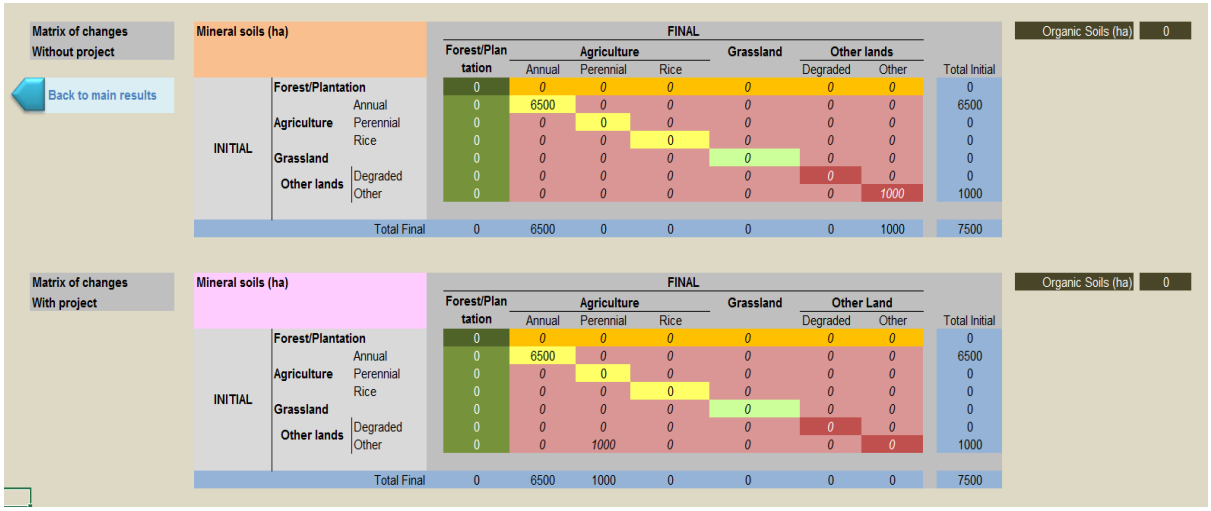
* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Inputs	20,256	29,311	9,055

Land Use and Land Use Change Matrix

In the situation without project, there is no land use change, 6000 ha of annual crops remain annual crops and 1000 of set aside lands equally remains unaltered. Also with project implementation the bigger area of 6000 ha does not experience any land use change and remains annual crops, while 1000 ha are converted from set aside land to perennial cropland.



Matrix of changes Without project — Mineral soils (ha) — Organic Soils (ha) 0

Back to main results

INITIAL	FINAL: Forest/Plantation	Agriculture: Annual	Agriculture: Perennial	Agriculture: Rice	Grassland	Other lands: Degraded	Other lands: Other	Total Initial
Forest/Plantation	0	0	0	0	0	0	0	0
Agriculture – Annual	0	6500	0	0	0	0	0	6500
Agriculture – Perennial	0	0	0	0	0	0	0	0
Agriculture – Rice	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0
Other lands – Degraded	0	0	0	0	0	0	0	0
Other lands – Other	0	0	0	0	0	0	1000	1000
Total Final	0	6500	0	0	0	0	1000	7500

Matrix of changes With project — Mineral soils (ha) — Organic Soils (ha) 0

INITIAL	FINAL: Forest/Plantation	Agriculture: Annual	Agriculture: Perennial	Agriculture: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
Forest/Plantation	0	0	0	0	0	0	0	0
Agriculture – Annual	0	6500	0	0	0	0	0	6500
Agriculture – Perennial	0	0	0	0	0	0	0	0
Agriculture – Rice	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0
Other lands – Degraded	0	0	0	0	0	0	0	0
Other lands – Other	0	0	1000	0	0	0	0	1000
Total Final	0	6500	1000	0	0	0	0	7500

Results provided by EX-ACT

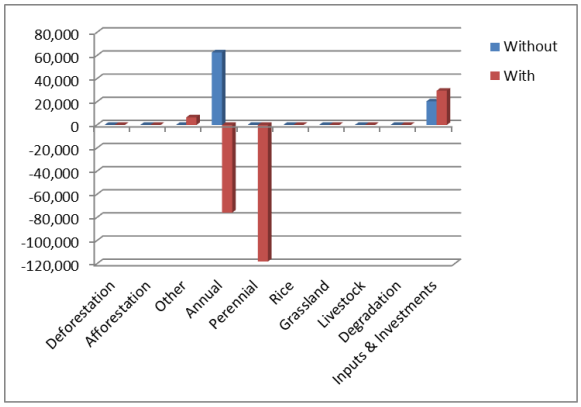
The improvements of cultivation practices on annual cropland proposed by the project lead to a **net sink** of GHG reaching 138 492 tonnes of CO2-e in 20 years. Globally this activity contributes more to mitigation than the planting of cashew trees on 1000 ha, which also constitutes a **net sink**, of 111365 (6,610-117,975) tonnes of CO2-e. However, regarding the impact per hectare, the establishment of cashew trees has the stronger impact.

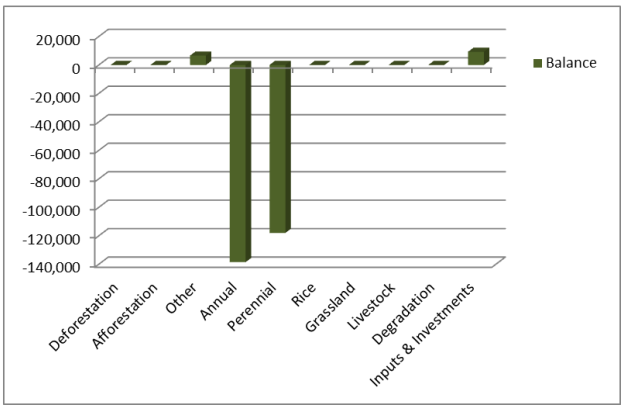
Both impacts compensate for the **GHG sources** introduced by the project from the increase in input consumption. Overall the project thus leads to a GHG balance of 240,608 tonnes of CO2-e that are in parts less emitted and in part sequestered due to project implementation as compared to the

business-as-usual scenario. Over 20 years this translates into the GHG balance of 1.6 tonnes of CO2-e per hectare and year.

Project Name	Benin Cotton	Climate	Tropical (Dry)	Duration of the Project (Years)	20
Continent	Africa	Dominant Regional Soil Type	LAC Soils	Total area (ha)	7500

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq										
	Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	6,610	6,610	11,733	-7,860		2,170	567	0	330	330
Agriculture											
Annual	62,720	-75,772	-138,492	0	-94,588		-12,152	-31,752	3,136	-3,789	-6,925
Perennial	0	-117,975	-117,975	-112,200	-5,775		0	0	0	-5,899	-5,899
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	20,388	29,635	9,248			4,275	4,972		1,019	1,482	462
Total	83,108	-157,501	-240,609	-100,467	-108,223	4,275	-5,010	-31,185	4,155	-7,875	-12,030
Per hectare	11	-21	-32	-12.8	-14.4	0.6	-0.7	-4.2			
Per hectare per year	0.6	-1.1	-1.6	-0.6	-0.7	0.0	0.0	-0.2	0.6	-1.1	-1.6





Carbon footprint (CFP)

The here indicated results could be used by a firm to calculate the Carbon Footprint from producing cotton from the production stage. CFP labels are used as communication and advertising tools to attract new customers and reinforce customer loyalty by underlining a firm's efforts for environmental sustainability.

The exemplary calculations can be carried out as follows:

	Without the project	With the project	
	Traditional coton	Improved coton	Traditional coton
Yield in kg/ha/yr	800	1200	800

Ha	5000	3000	1000
Total production in t/yr	800*5000/1000 = 4000 t	1200*3000/1000 = 3600t	8000*1000/1000 = 800 t
GHG emissions in t CO2-e/yr from cotton production	70 688/20 = 3 534.4	-80 850/20 = -4 042.5	=21 206/20 = 1060.3
GHG emissions in t CO2-e/yr from inputs use	20 256/20=1012.8	29 311/20=1465.55	
Total GHG emissions in t CO2-e/yr	3 534.4+1012.8= 4547.2	-4 042.5+ 1060.3 + 1465.55 = -1516.65	
Carbon Footprint (CFP) in tCO2-e/t cotton/yr	4547.2/4000 = 1.1368	-1516.65/(800+3600) = -0.344	
Amount of cotton to produce one shirt in g	270		
GHG emissions from cotton production for 1 shirt in gCO2-e/shirt	1.1368* 270 = 309.936	-0.344* 270 = - 25.12	
GHG from industrial process in gCO2-e/shirt	3 375		
CFP of one shirt in gCO2-e/shirt	3375 + 309.936 = 3681.936	3375 – (-25.12) = 3400.12	
Emissions per shirt reduced as the result of the project in gCO2-e/shirt	3681.936-3276 = 281.816		

Finally, the logos can be filled in as follow:

Carbon Footprint Label **Carbon Reduction Label**


기후변화대응
3276 g
CO2


저탄소상품
380 g
CO2

Situation 4: Livestock project in Mongolia

General description of the project

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

The project takes place in Mongolia, Continental Asia. While the provided text does not provide any direct information on the dominant climate and soil, the help facilities in the description module may help to identify the area as cool temperate dry climate with HAC soils.

The project will be implemented during 5 years, while an additional capitalization phase of 15 years will be analyzed as well.

The Description module should thus be filled as follows:

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

Components of the project

Two different activities are realized as part of the project: (1) improvement of livestock herds and (2) improvement of grasslands. Thereby also a new irrigation system will be put in place. Consequently, the following two modules have to be completed: **Livestock & Grasslands as well as Inputs & Investments.**

Livestock module

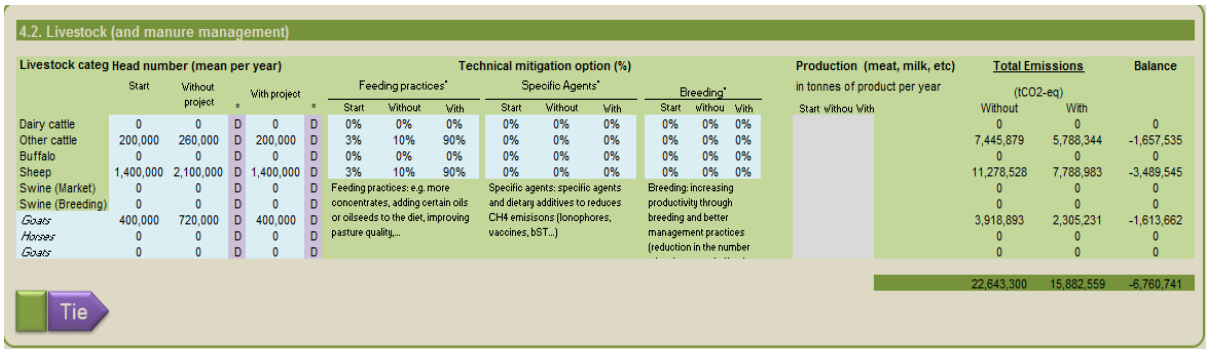
The project focuses on raising sheep, cattle, and goats. No indication is directly provided about the type of cattle and since we assume that mixed production (dairy, meat) will take place, the category "other cattle" is chosen.

It is helpful to first fill the following table before entering values 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%

Accordingly the livestock module can be filled as follows:



Grassland module

Livestock herding is carried out on a total area of 2 000 000 ha of grasslands. The grasslands suffer from grazing pressure. The proposed activities intend to prevent a further increase in grazing pressure and rehabilitate the existing grasslands to a certain extend.

To easier fill in the information in EX-ACT, users may again find it helpful to fill the following table:

Initial state	Final state without project	Final state with project	Surface
Moderately degragded	Moderately degraded	Improved without inputs	50,000 (=1/4 * 2,000,000)
	Moderately degraded	Improved with inputs	5,000
	Severely degraded	Moderately degraded	1,495,000 (=2,000,000 – 500,000 – 5,000)

Accordingly the grassland module can then be filled in the following way:

4.1.2. Grassland systems remaining grassland systems (total area must remain contant)

Fill with your des	Initial State	Final state of the grassland: Without project	Final state of the grassland: With project	Fire use to manage? Periodicity (Without) (y/n)	(year)	eriodicity (With) (y/n)	(year)	Yield Start (t/ha/yr)	Withou	With	Area (ha) Start	*	With *	Total Emissions (tCO2-eq) Without	With	Balance
	Moderately Degraded	Moderately Degraded	Improved without inputs manageme	NO	5	NO	5				500,000	D	D	0	-15,239,583	-15,239,583
	Moderately Degraded	Moderately Degraded	Improved with inputs improvement	NO	5	NO	5				5,000	D	D	0	-252,977	-252,977
	Moderately Degraded	Severely Degraded	Moderately Degraded	NO	5	NO	5				1,495,000	D	D	59,955,729	0	-59,955,729
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	D	D	0	0	0
														59,955,729	-15,492,560	-75,448,290

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelin

Tie

Inputs and Investments module

The installation of an irrigation system (<u>5000 ha of solid roll sprinkle irrigation system</u>) to improve parts of the grassland has to be specified as follows within the **Inputs and Investment module**.

6.3. Construction of new infrastructure (irrigation systems, buildings, roads)

Description and unit to report	Surfaces: Without	Surfaces: With	Total Emissions (tCO2-eq): Without	With	Balance
Irrigation systems (in ha)					
Solid roll sprinkle	0	5000	0.0	427.2	427.2
Please select	0	0	0.0	0.0	0.0
**IRRS = Irrigation Runoff Return System*					
Buildings and roads (in m2)					
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Please select	0	0	0.0	0.0	0.0
Total Construction			0	427	427

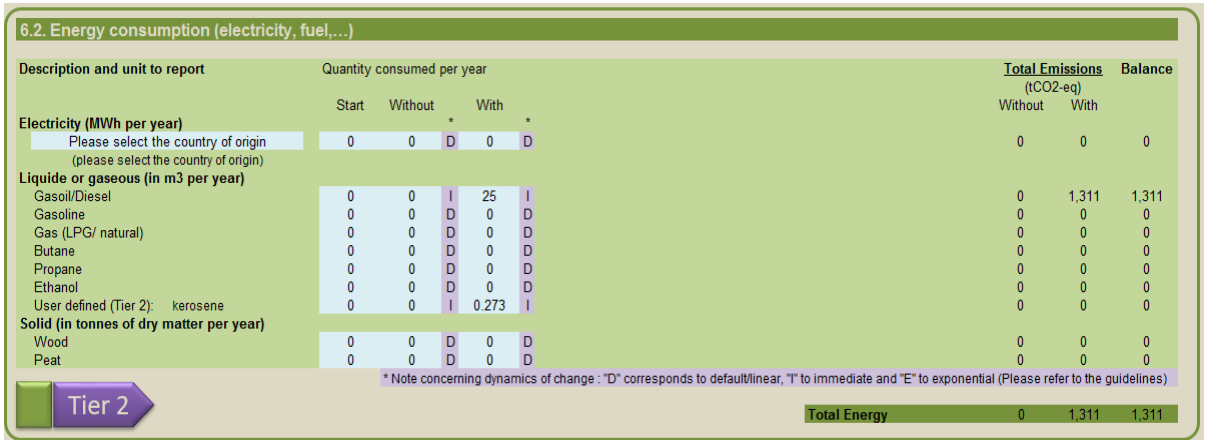
Tier 2

Further emissions occurred from the consumption of gasoil (project vehicles) and kerosene (monitoring flights). The total consumption of gasoil accounts for: 50 m^3 * 2 cars * 5 years = 500 m^3. Since the section on energy use in EX-ACT asks for the average consumption per year over the whole period of analysis, we still have to divide this value by 20 years (implementation + capitalization phase), leading to the equivalent amount of 25 m^3 that could have been consumed on an annual basis.

The total consumption of kerosene instead, accounts for: 546 l * 2 flight per year * 5 years of implementation= 5460 l (or 5.46 m^3). Again dividing by 20 years leads to an equivalent consumption of 0.273 m^3 annually over 20 years.

Since in both cases we assume constant average resource consumption over implementation and capitalization phase and not as usual a lineally increasing dynamic of change until the full value is reached at the end of the implementation phase, the violet button indicating the dynamic of change has to be changed from "D" for default/linear to "I" for immediate. Since for kerosene there is no

predefined default in EX-ACT, it is entered in the last row which provides the option of *user defined* values:



6.2. Energy consumption (electricity, fuel,...)

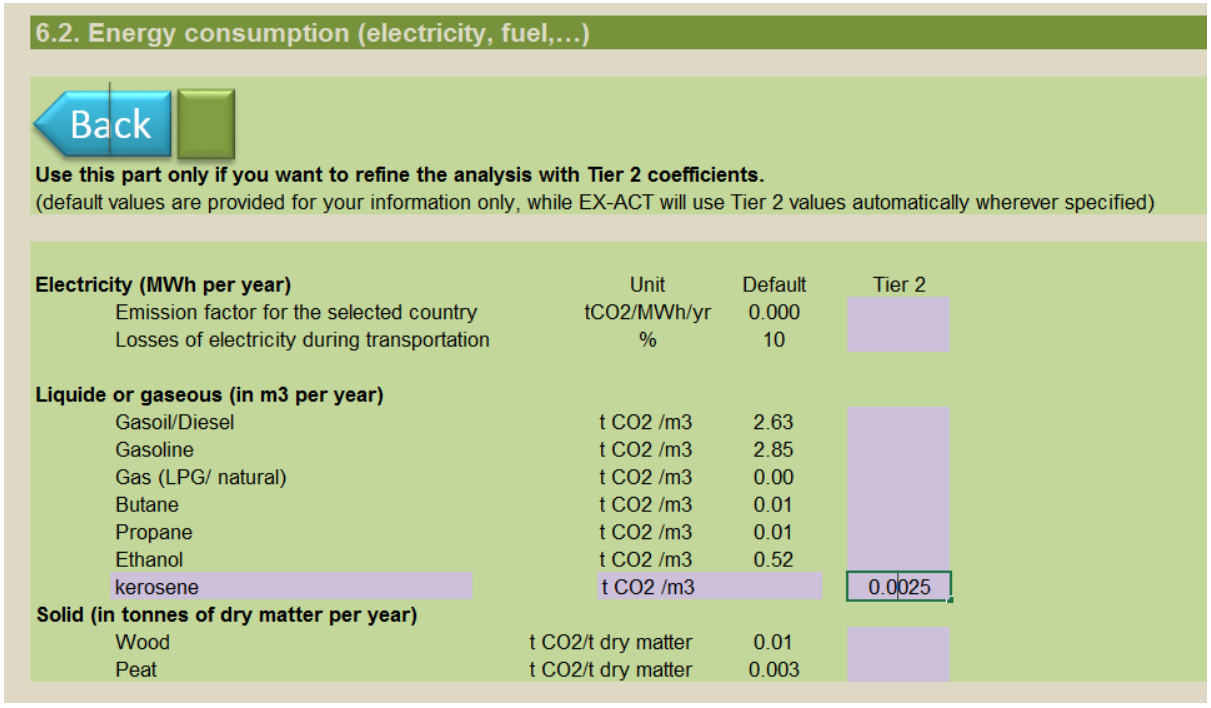
Description and unit to report	Quantity consumed per year					Total Emissions (tCO2-eq)		Balance
	Start	Without	*	With	*	Without	With	
Electricity (MWh per year)								
Please select the country of origin	0	0	D	0	D	0	0	0
(please select the country of origin)								
Liquide or gaseous (in m3 per year)								
Gasoil/Diesel	0	0	I	25	I	0	1,311	1,311
Gasoline	0	0	D	0	D	0	0	0
Gas (LPG/ natural)	0	0	D	0	D	0	0	0
Butane	0	0	D	0	D	0	0	0
Propane	0	0	D	0	D	0	0	0
Ethanol	0	0	D	0	D	0	0	0
User defined (Tier 2): kerosene	0	0	I	0.273	I	0	0	0
Solid (in tonnes of dry matter per year)								
Wood	0	0	D	0	D	0	0	0
Peat	0	0	D	0	D	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Energy	0	1,311	1,311

Until this point the specific emission factor of kerosene as given in the exercise with 2.5 t CO_2e/m^3 of kerosene has not yet been defined. For this users have to select the violet "Tier 2" button. Under the Tier 2 facility users may change the emission factors of any of the default options and specify the emission factors for each new fuel, such as kerosene in the example. For this purpose users should enter the name, unit and emission factor in the violet fields as specified here below:



6.2. Energy consumption (electricity, fuel,...)

Back

Use this part only if you want to refine the analysis with Tier 2 coefficients.
(default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)

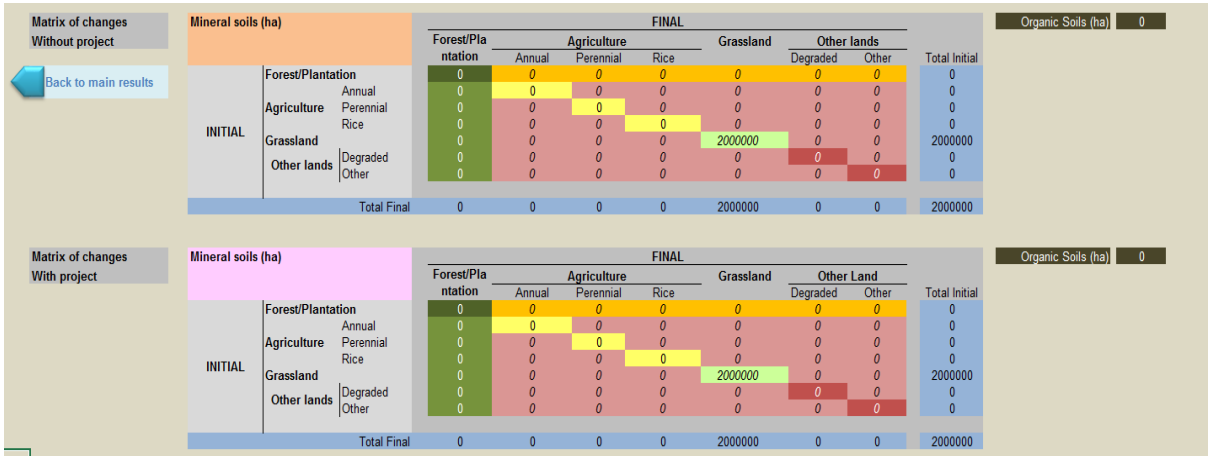
	Unit	Default	Tier 2
Electricity (MWh per year)			
Emission factor for the selected country	tCO2/MWh/yr	0.000	
Losses of electricity during transportation	%	10	
Liquide or gaseous (in m3 per year)			
Gasoil/Diesel	t CO2 /m3	2.63	
Gasoline	t CO2 /m3	2.85	
Gas (LPG/ natural)	t CO2 /m3	0.00	
Butane	t CO2 /m3	0.01	
Propane	t CO2 /m3	0.01	
Ethanol	t CO2 /m3	0.52	
kerosene	t CO2 /m3		0.0025
Solid (in tonnes of dry matter per year)			
Wood	t CO2/t dry matter	0.01	
Peat	t CO2/t dry matter	0.003	

The total emissions from project management (fuel consumption) are 1330 tCO2e and thus relatively low as compared to the other project impacts.

Land use and land use change Matrix

This exercise mainly focuses on livestock. While livestock numbers are not reflected as part of the land use and land use change matrix, grassland areas are of course accounted for. As visible here below,

no land use change is taking place and the exercise shows instead that also pure activities concerned with improvements on given areas can have a relevant impact.



Matrix of changes Without project — Mineral soils (ha) — Organic Soils (ha): 0

Back to main results

			FINAL						
			Forest/Plantation	Agriculture			Grassland	Other lands		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation		0	0	0	0	0	0	0	0
	Agriculture	Annual	0	0	0	0	0	0	0	0
		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 lands	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

Matrix of changes With project — Mineral soils (ha) — Organic Soils (ha): 0

			FINAL						
			Forest/Plantation	Agriculture			Grassland	Other Land		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation		0	0	0	0	0	0	0	0
	Agriculture	Annual	0	0	0	0	0	0	0	0
		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 lands	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

Results provided by EX-ACT

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

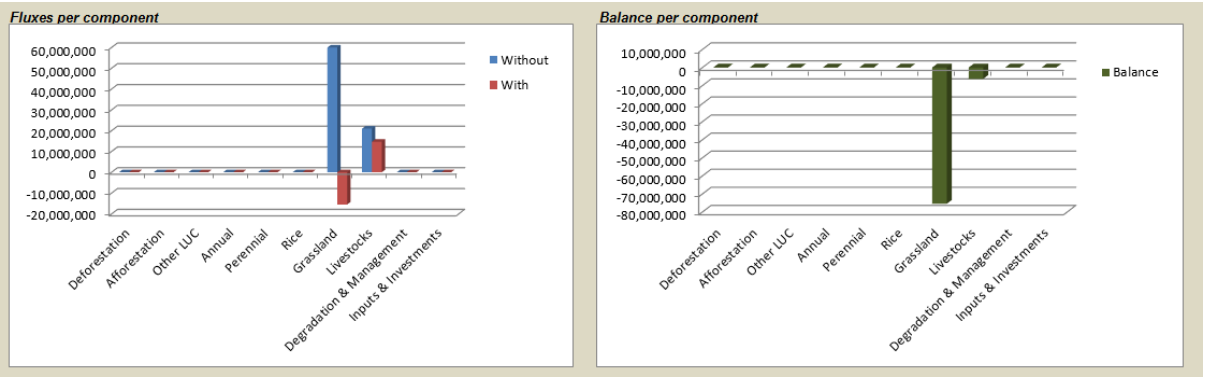
- The livestock improvements create a **sink of GHGs** reaching 6.7 million tonnes of CO2-e in 20 years. The sink is due to the reduction of N2O and CH4 emissions.

-The grassland restoration implies a **sink of GHGs** reaching 75.4 million tonnes of CO2-e in 20 years. This sink is due to the increase in soil carbon. The installation of the irrigation system as well as the project management activities create a insignificant **source of GHGs** reaching 1 738 tonnes of CO2-e in 20 years.

Thus the project is contributing to mitigate further GHG emissions. The gathered activities represent a **net sink** of about 82.2 million tonnes of CO2-e, or 2.0 t CO2-e /year/ha.

Project Name	*Livestock Mongolia*	Climate	*Cool Temperate (Dry)*	Duration of the Project (Years)	*20*
Continent	*Asia (Continental)*	Dominant Regional Soil Type	*HAC Soils*	Total area (ha)	*2000000*

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq										
	Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	59,955,729	-15,492,560	-75,448,290	0	-75,448,290		0	0	2,997,786	-774,628	-3,772,414
Livestocks	22,643,300	15,882,559	-6,760,741				-3,064,318	-3,696,423	1,132,165	794,128	-338,037
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	0	1,738	1,738			1,738	0		0	87	87
Total	82,599,029	391,737	**-82,207,292**	0	-75,448,290	1,738	-3,064,318	-3,696,423	4,129,951	19,587	-4,110,365
Per hectare	41	0	-41	0.0	-37.7	0.0	-1.5	-1.8			
Per hectare per year	2.1	0.0	-2.1	0.0	-1.9	0.0	-0.1	-0.1	2.1	0.0	-2.1


Fluxes per component
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
-10,000,000
-20,000,000
Without
With
Deforestation
Afforestation
Other LUC
Annual
Perennial
Rice
Grassland
Livestocks
Degradation & Management
Inputs & Investments
Balance per component
10,000,000
0
-10,000,000
-20,000,000
-30,000,000
-40,000,000
-50,000,000
-60,000,000
-70,000,000
-80,000,000
Balance
Deforestation
Afforestation
Other LUC
Annual
Perennial
Rice
Grassland
Livestocks
Degradation & Management
Inputs & Investments

Situation 5: Milk production in Kenya

General description of the project

The **description module** has to be filled with the following information provided in the exercise: The project takes place in Kenya, Africa. The climate and the soil type are indicated as: Tropical moist climate & HAC soils.

The project will be implemented during 5 years and further be analyzed during an additional capitalization phase of 15 years.

Project Name	*Milk Production Kenya*	
Continent	Africa	
Climate **Moisture regime**	Tropical Moist	
Dominant Regional Soil Type	HAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Five different activities are realized: (1) reduced deforestation, (2) Other LUC, (3) annual crop production, (4) perennial crop production, (5) grasslands (6) improved livestock management and (5) the application of pesticides. Consequently, the following four modules require completion: **Land Use Change, Crop Production, Grassland and Livestock, Inputs and Investments**.

Deforestation

Currently, 10% of the initial forested area, which is 15 000 ha, is deforested each year, during the implementation phase. With the project, it is expected that only 2% of the initial forest area will be converted into tea plantations annually. The area annually deforested has to be multiplied by the implementation phase of 5 years. The most adequate choice concerning the type of forest for the given context is a tropical moist deciduous forest (forest 2). Those deforested area that is converted into tea plantations, is after its conversion categorized as perennial/tree crop.

EX-ACT Module	Type of vegetation	Start (Ha)	Area forested Without project (Ha)	Area forested With project (Ha)
Deforestation	Tropical moist	15 000	15 000 - 10%*15 000*5 = 7 500	15 000 – 2%*15 000*5*= 13 500

Accordingly the section on deforestation can be filled in the following way:

2.1. Deforestation

? AEZ map — Zone 1 = Tropical rain forest — Zone 2 = Tropical moist deciduous forest — Zone 3 = Tropical dry forest — Zone 4 = Tropical shrubland

Type of vegetation that will be deforested	HWP# (tDM/ha)	Fire Use? (y/n)	Final use after deforestation	Forested area (ha) Start	Without	*	With	*	Deforested area (ha) Without	With	Total Emissions (tCO2-eq) Without	With	Balance
Forest Zone 2	0	NO	Perennial/Tree Crop	15000	7500	D	13500	D	7500	1500	4,195,895	839,179	-3,356,716
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D	0	0	0	0	0

#Harvested Wood Products

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Deforestation 4,195,895 839,179 -3,356,716

Non forest LUC module

With the project, 23 000 ha of degraded lands will become tea plantations, while 2 500ha of set aside land will be converted into grassland (40% Napier Grass and 60% Rhodes Grass). Without the project, there would be no LUC.

LUC	Without project (Ha)	With project (Ha)
Degraded land to tea plantation	0	23 000
Set aside to Napier grass (grassland)	0	2500*0.4 = 1 000
Set aside to Rhode grass (grassland)	0	2500 * 0.6 = 1 500

Accordingly the section on Other Land Use Change is filled in the following way:

2.3. Other Land Use Changes

Fill with your description	Initial land use		Final land use	Message	Fire Use? (y/n)	Area transformed (ha) Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
Degraded to Tea	Degraded Land	⟶	Perennial/Tree Crop		NO	0	D	23000	D	0	-3,348,560	-3,348,560
Set aside to Napier	Set Aside	⟶	Grassland		NO	0	D	1000	D	0	-46,950	-46,950
Set aside to Rhodes	Set Aside	⟶	Grassland		NO	0	D	1500	D	0	-70,425	-70,425
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	⟶	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Other LUC 0 -3,465,935 -3,465,935

The Napier and Rhodes grassland will be improved with inputs, so we also need to fill in the grassland module.

Grassland module

As specified already in earlier exercises, every area has only to be inserted once into EX-ACT: Thus the grassland area (Rhodes + Napier grass) that results from land use change, accounting for 2500ha, is automatically indicated under the Grassland and Livestock module. Thereby it was further indicated

that the land area converted from set aside land into grassland would remain moderately degraded without project implementation, while the project improves their state with inputs. The additional 2,500 ha of already existing Napier grass instead stay under each scenario moderately degraded, and are thus no source or sink but are regarded as a system in balance.

4.1. Grassland systems

4.1.1. Grassland systems from other LU or converted to other LU (please fill step 2.LUC previously)

Description	Initial State	Final state of the grassland: Without project	With project	Fire use to manage? Periodicity (Without) (y/n)	(year)	Periodicity (With) (y/n)	(year)	Yield Start	Without (t/ha/yr)	With	Area (ha) Start	Without	With	Total Emissions (tCO2-eq) Without	With	Balance
Grassland after Deforestation	Select state	Select state	Select state	NO	5	NO	5				0	0	0	0	0	0
Converted to A/R	Select state	Select state	Select state	NO	5	NO	5				0	0	0	0	0	0
Grassland after non-forest LU	Moderately Degraded	Moderately Degraded	Improved with inputs improvement	NO	5	NO	5				0	0	2,500	0	-170,796	-170,796
Converted to OLUC	Select state	Select state	Select state	NO	5	NO	5				0	0	0	0	0	0

4.1.2. Grassland systems remaining grassland systems (total area must remain contant)

Fill with your description	Initial State	Final state of the grassland: Without project	With project	Fire use to manage? Periodicity (Without) (y/n)	(year)	Periodicity (With) (y/n)	(year)	Yield Start	Without (t/ha/yr)	With	Area (ha) Start	Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
	Select state	Select state	Select state	NO	5	NO	5				2,500	2,500	D	2,500	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0
	Select state	Select state	Select state	NO	5	NO	5				0	0	D	0	D	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Grassland Systems	0	-170,796	-170,796

Annual crops

Initially, there are 10 000 ha of maize production in the area and the residues from maize are consumed by grazing animals. With the project, it is expected that improved varieties and no tillage practices will be implemented. No improved agronomic practices are expected without the project. The amount of ha will remain the same in both scenarios.

EX-ACT Module		Start (Ha)	Without project (Ha)	With project (Ha)
Annuals	Conventional maize production	10 000	10 000	
	Improved maize production			10 000
TOTAL		10 000	10 000	10 000

3.1.2. Annual systems remaining annual systems (total area must remain constant)

Fill with your description	Management options: Improved agronomic practices	Nutrient management	NoTill./residues management	Water management	Manure application	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha) Start	Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
Trad maize	?	?	?	?	?	NO		10000	10000	D	0	D	0	0	0
Impr maize	Yes	?	Yes	?	?	NO		0	0	D	10000	D	0	-154,000	-154,000
description 3	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 4	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 5	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 6	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 7	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 8	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 9	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 10	?	?	?	?	?	NO		0	0	D	0	D	0	0	0
							Total (ha)	10000	10000		10000				

Definitions? Yield?

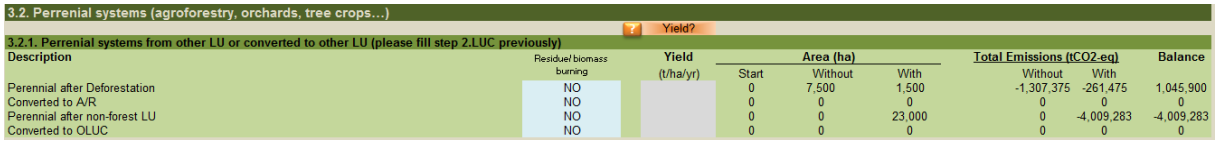
* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Annual Systems	0	-154,000	-154,000

Perennial crops

Due to deforestation 7,500 ha under the without-project scenario and 1,500 ha under the with-project scenario respectively are foreseen to be converted into perennial crops. Moreover under the with-project scenario 23,000 ha of degraded land is converted into perennial crops. Since all three information have sufficiently be specified as part of the Land Use Change module, it is automatically inserted by EX-ACT under the perennial crops section.



3.2. Perrenial systems (agroforestry, orchards, tree crops…)

Yield?

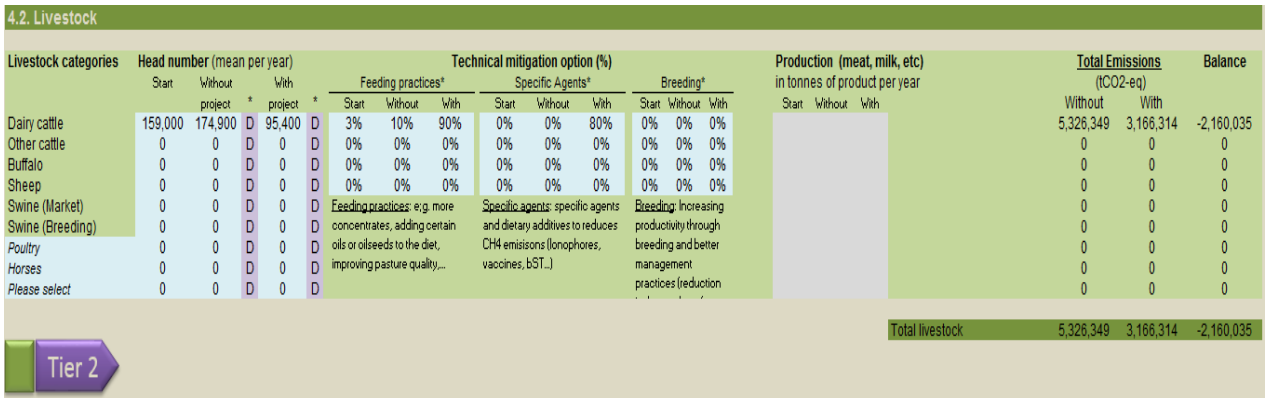
3.2.1. Perrenial systems from other LU or converted to other LU (please fill step 2.LUC previously)

Description	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha)			Total Emissions (tCO2-eq)		Balance
			Start	Without	With	Without	With	
Perennial after Deforestation	NO		0	7,500	1,500	-1,307,375	-261,475	1,045,900
Converted to A/R	NO		0	0	0	0	0	0
Perennial after non-forest LU	NO		0	0	23,000	0	-4,009,283	-4,009,283
Converted to OLUC	NO		0	0	0	0	0	0

Livestock

With the project, it is expected that the total amount of livestock, 159 000 dairy cattle, will be reduced by 40% by the end of the project. Without the project, the number will augment by 10%. Also, with the project, the feeding practices will be improved for 90% of the animals, whilst initially only 3% of the herd receives improved feeding. Without the project, 10% of the farmers will implement improved feeding practices. Moreover, the breeding practices will be improved for 80% of the animals with the project. Presently, there are no improved breeding practices in place.

EX-ACT Module		Start (Ha)	Without project	With project
Livestock	Dairy Cattle	159 000	159 000+(159 000*0,1)= 174 900	159 000-(159 000*0.4)=95 400
	Feeding practices	3%	10%	90%
	Breeding practices	0%	0%	80%



4.2. Livestock

Livestock categories	Head number (mean per year) Start	Without project	*	With project	*	Technical mitigation option (%) Feeding practices* Start	Without	With	Specific Agents* Start	Without	With	Breeding* Start	Without	With	Production (meat, milk, etc) in tonnes of product per year Start	Without	With	Total Emissions (tCO2-eq) Without	With	Balance
Dairy cattle	159,000	174,900	D	95,400	D	3%	10%	90%	0%	0%	80%	0%	0%	0%				5,326,349	3,166,314	-2,160,035
Other cattle	0	0	D	0	D	0%	0%	0%	0%	0%	0%	0%	0%	0%				0	0	0
Buffalo	0	0	D	0	D	0%	0%	0%	0%	0%	0%	0%	0%	0%				0	0	0
Sheep	0	0	D	0	D	0%	0%	0%	0%	0%	0%	0%	0%	0%				0	0	0
Swine (Market)	0	0	D	0	D	Feeding practices: e.g. more			Specific agents: specific agents			Breeding: Increasing						0	0	0
Swine (Breeding)	0	0	D	0	D	concentrates, adding certain			and dietary additives to reduces			productivity through						0	0	0
Poultry	0	0	D	0	D	oils or oilseeds to the diet,			CH4 emisisons (Ionophores,			breeding and better						0	0	0
Horses	0	0	D	0	D	improving pasture quality,...			vaccines, bST...)			management						0	0	0
Please select	0	0	D	0	D							practices (reduction						0	0	0
																		Total livestock	5,326,349	3,166,314	-2,160,035

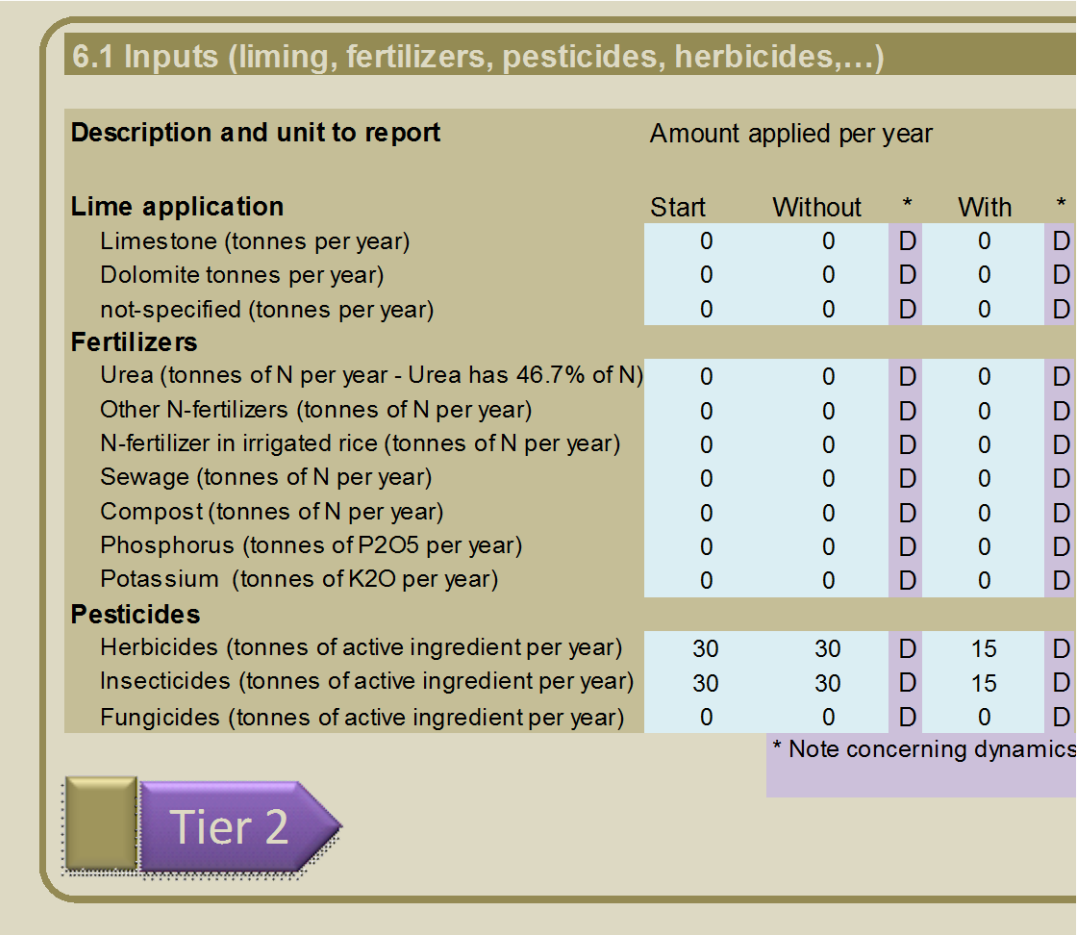
Tier 2

Inputs module

With the project, only 3L instead of 6L of pesticides will be used per ha of maize production. Half of the quantity is insecticide, while the other half is herbicide. In this exercise, we assume that 1L=1kg. In EX-ACT, the units need to be in tonnes and we also know that the total maize production is

10,000Ha. Therefore, without the project, (10 000*(6/2)/1 000)=30 t/year and with the project, (10 000*(3/2)/ 1 000)= 15 t/year are utilized each as herbicide and pesticide.

EX-ACT Module		Start T/year	Without project T/year	With project T/year
Inputs	Insecticides	30	30	15
	Herbicides	30	30	15



6.1 Inputs (liming, fertilizers, pesticides, herbicides,…)

Description and unit to report	Amount applied per year				
Lime application	Start	Without	*	With	*
Limestone (tonnes per year)	0	0	D	0	D
Dolomite tonnes per year)	0	0	D	0	D
not-specified (tonnes per year)	0	0	D	0	D
Fertilizers					
Urea (tonnes of N per year - Urea has 46.7% of N)	0	0	D	0	D
Other N-fertilizers (tonnes of N per year)	0	0	D	0	D
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D
Sewage (tonnes of N per year)	0	0	D	0	D
Compost (tonnes of N per year)	0	0	D	0	D
Phosphorus (tonnes of P2O5 per year)	0	0	D	0	D
Potassium (tonnes of K2O per year)	0	0	D	0	D
Pesticides					
Herbicides (tonnes of active ingredient per year)	30	30	D	15	D
Insecticides (tonnes of active ingredient per year)	30	30	D	15	D
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D

* Note concerning dynamics

Tier 2

Land use and land use change Matrix

This exercise mainly focuses on livestock and perennial crops. As shown in the matrix below the only land use change occurring as part of the without-project scenario concerns deforestation, while the with-project scenario besides also increases the grassland and perennial crop areas.

Matrix of changes Without Project — Mineral soils (ha)

			FINAL: Forest/ Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
INITIAL	Forest/Plantation		7500	0	7500	0	0	0	0	15000
	Cropland	Annual	0	10000	0	0	0	0	0	10000
		Perennial	0	0	0	0	0	0	0	0
		Rice	0	0	0	0	0	0	0	0
	Grassland		0	0	0	0	2500	0	0	2500
	Other Land	Degraded	0	0	0	0	0	23000	0	23000
		Other	0	0	0	0	0	0	2500	2500
		Total Final	7500	10000	7500	0	2500	23000	2500	53000

Matrix of changes With Project — Mineral soils (ha)

			FINAL: Forest/ Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
INITIAL	Forest/Plantation		13500	0	1500	0	0	0	0	15000
	Cropland	Annual	0	10000	0	0	0	0	0	10000
		Perennial	0	0	0	0	0	0	0	0
		Rice	0	0	0	0	0	0	0	0
	Grassland		0	0	0	0	2500	0	0	2500
	Other Land	Degraded	0	0	23000	0	0	0	0	23000
		Other	0	0	0	0	2500	0	0	2500
		Total Final	13500	10000	24500	0	5000	0	0	53000

Results provided by EX-ACT

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

The decreased deforestation with the project creates **a net sink** of 3.3 million tonnes of CO2-e in 20 years.

The LUC, from degraded lands to improved lands creates **a net of sink** of 3.4 million tonnes of CO2-e. This is due to (1) the change from degraded lands to perennial crops (tee) and (2) improving the pastureland with inputs through the plantation of Napier and Rhodes grass. The latter is furthermore reflected in the grassland module, demonstrating an additional **sink** of 0.17 million tonnes of CO2-e due to the reduced state in degradation leading to increased levels of soil carbon.

Moreover, the annuals, due to improved management practices, create **a net sink** of 154 000 tonnes of CO2-e.

The livestock improvements create a **sink of GHG** reaching roughly 2 million tonnes of CO2-e in 20 years. The sink is due to the reduction of N2O and CH4 emissions.

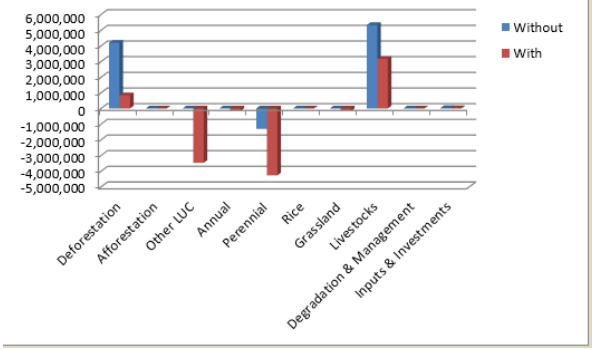
The reduction in input use creates a net sink accounting for 11 000 ton of CO2-e.

Thus the project is contributing to climate change mitigation. The gathered activities represent a **net sink** of about 12.2 million tonnes of CO2-e, or **232 t CO2-e /year/ha**. These huge impacts on a per hectare basis highlight the potential of likewise developing perennials, engaging in mitigation measures in livestock management and reducing deforestation.

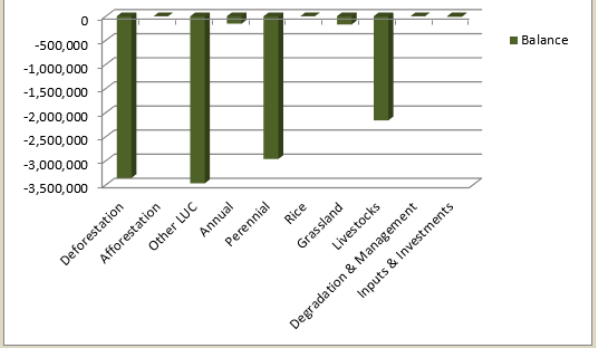
Project Name	*Milk Production Kenya*	Climate	*Tropical (Moist)*	Duration of the Project (Years)	*20*
Continent	*Africa*	Dominant Regional Soil Type	*HAC Soils*	Total area (ha)	*53000*

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq Positive = source / negative = sink										
Land use changes											
Deforestation	4,195,895	839,179	-3,356,716	-3,356,716	0		0	0	209,795	41,959	-167,836
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	-3,465,935	-3,465,935	-158,464	-3,307,471		0	0	0	-173,297	-173,297
Agriculture											
Annual	0	-154,000	-154,000	0	-154,000		0	0	0	-7,700	-7,700
Perennial	-1,307,375	-4,270,758	-2,963,383	-2,755,133	-208,250		0	0	-65,369	-213,538	-148,169
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	-170,796	-170,796	0	-170,796		0	0	0	-8,540	-8,540
Livestocks	5,326,349	3,166,314	-2,160,035				-718,032	-1,442,003	266,317	158,316	-108,002
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	25,080	14,108	-10,973			-10,973	0		1,254	705	-549
Total	8,239,949	-4,041,888	**-12,281,838**	-6,270,314	-3,840,516	-10,973	-718,032	-1,442,003	411,997	-202,094	-614,092
Per hectare	155	-76	-232	-118.5	-72.5	-0.2	-13.5	-27.2			
Per hectare per year	7.8	-3.8	-11.6	-5.9	-3.6	0.0	-0.7	-1.4	7.8	-3.8	-11.6

Fluxes per component



Balance per component



Situation 6: Rice project in Ghana

General description of the project

First the **description module** has to be filled 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, but the provided IPCC maps suggest a Tropical Wet climate and HAC soils as dominant soil type.

The project will be implemented during 5 years. The capitalization phase is estimated to occur during 15 years.

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

Project Name	*Ghana Rice Project*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Moist	
Dominant Regional Soil Type	LAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Three different activities are realized under the project: (1) improvement of flooded rice, (2) improvement of upland rice and (3) the application of fertilizers. Consequently, the following two modules require completion: **Crop Production** and **Inputs**. The non-flooded upland rice is considered as a regular annual crop and is thus explicitly not entered into the section 3.3 Flooded Rice Systems.

Annual crops

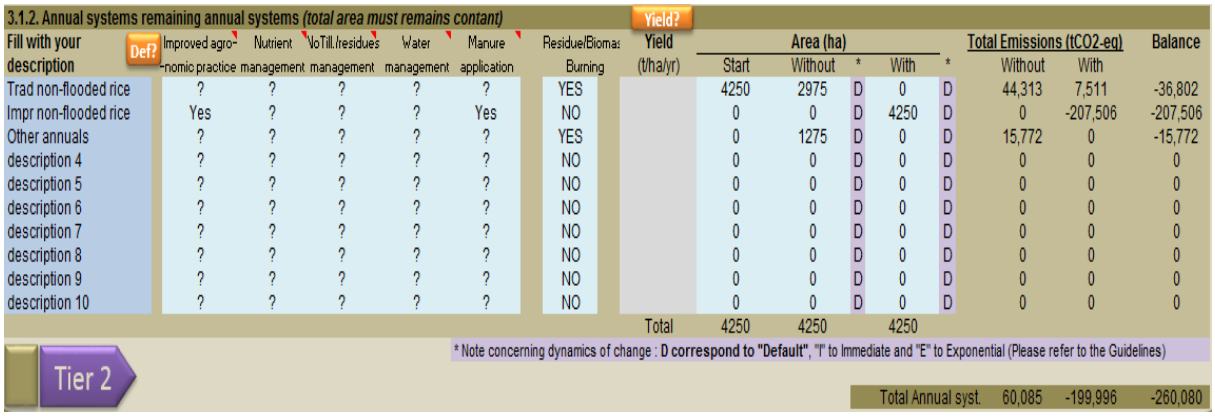
The total area concerned by the project is 8 500x1.25 = 10 625 ha. About 40% of these area is currently under cultivation of upland rice: 1 0625x0,4 = 4 250 ha, whose residue is burnt. The implementation of the project should lead to improve the current area of upland rice by using better agronomic practices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

250x0.3 = 1 275) of this area will be given up to other annual crops (called other annual in the following screenshot).

Again it might be helpful to fill in the following table first, before proceeding to fill in EX-ACT:

	Start	Future without project	Future with project
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

Accordingly the annual module can be filled as follows:



3.1.2. Annual systems remaining annual systems *(total area must remains contant)*

Fill with your description	Def?	Improved agro-nomic practice	Nutrient management	NoTill./residues management	Water management	Manure application	Residue/Biomas Burning	Yield? Yield (t/ha/yr)	Area (ha) Start	Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
Trad non-flooded rice		?	?	?	?	?	YES		4250	2975	D	0	D	44,313	7,511	-36,802
Impr non-flooded rice		Yes	?	?	?	Yes	NO		0	0	D	4250	D	0	-207,506	-207,506
Other annuals		?	?	?	?	?	YES		0	1275	D	0	D	15,772	0	-15,772
description 4		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 5		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 6		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 7		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 8		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 9		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
description 10		?	?	?	?	?	NO		0	0	D	0	D	0	0	0
								Total	4250	4250		4250				

* Note concerning dynamics of change : **D correspond to "Default"**, "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)

Tier 2

Total Annual syst. 60,085 -199,996 -260,080

Rice module

Flooded rice is cultivated on 60% of the total rice area: 8500 x 1.25 x 0.6 = 6375 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 the change in water management: during the cultivation period the rice will be intermittently irrigated. This improvement will be conducted on 30% of the cultivated area.

This information is summarized in the table below:

	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	

Accordingly, the section on flooded rice can be filled as follows:

3.3.2. Flooded Rice systems remaining Flooded Rice systems (total area must remain constant) — Yield?

Fill with your description	Cultivation period (days)	Water regime: During the cultivation period	Water regime: Before the cultivation period	Organic amendment type (straw or other)	Yield (t/ha/yr)	Area (ha): Area (ha)	Area (ha): Without	*	Area (ha): With	*
Trad deepwater rice	150	Rainfed and deep water	Non flooded preseason >180 days	Straw burnt		6375	5737.5	D	0	D
Impr flooded rice (30%)	100	Irrigated - Intermittently flooded	Non flooded preseason >180 days	Straw exported		0	0	D	1912.5	D
Impr deepwater rice(70%)	100	Rainfed and deep water	Non flooded preseason >180 days	Straw exported		0	0	D	4462.5	D
Business initiative	150	Irrigated - Continuously flooded	Flooded preseason (>30 days)	Straw burnt		0	637.5	D	0	D
Rice 5	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
Rice 6	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
Rice 7	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
Rice 8	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
Rice 9	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
Rice 10	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendment		0	0	D	0	D
					Total (ha)	6375	6375		6375	

Tier 2

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponent

Input module

The intensity of fertilization will be improved for the irrigated rice, leading to an application of 8Kg/ha/year with the project. A total of 6375 ha*0.12*0.467= 357 t of N from urea will be used.

The private initiative will use higher amounts of fertilizer, with 637.5 ha *0.2*0.467=60 t of N from Urea.

The input module can thus be filled as follows:

6.1. Inputs (liming, fertilizers, pesticides, herbicides,...)

Description and unit to report	Amount applied per year					Total emissions at field level (tCO2-eq)				Emissions from production, transportation, storage and transfer (tCO2-eq)		Total Emissions (tCO2-eq)		Balance
						CO2 emissions		N2O emissions						
Lime application	Start	Without	*	With	*	Without	With	Without	With	Without	With	Without	With	
Limestone (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Dolomite tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
not-specified (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Fertilizers												0	0	0
Urea (tonnes of N per year - Urea has 46.7% of N)	0	60	D	357	D	1,636	9,818	4,876	29,256	4,963	29,780	11,476	68,853	57,378
Other N-fertilizers (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
Sewage (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Compost (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Phosphorus (tonnes of P2O5 per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Potassium (tonnes of K2O per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Pesticides														
Herbicides (tonnes of active ingredient per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Insecticides (tonnes of active ingredient per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Inputs	11,476	68,853	57,378

Land use and land use change Matrix

The exercise mainly focuses on annual crop production and the improvement of rice cultivation practices. Thus no land use change is taking place and the land use is identical under both scenarios.

Matrix of changes Without project

Back to main results

Mineral soils (ha)

			FINAL							
			Forest/Plantation	Agriculture			Grassland	Other lands		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation		0	0	0	0	0	0	0	0
	Agriculture	Annual	0	4250	0	0	0	0	0	4250
		Perennial	0	0	0	0	0	0	0	0
		Rice	0	0	0	6375	0	0	0	6375
	Grassland		0	0	0	0	0	0	0	0
	Other lands	Degraded	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0
	Total Final		0	4250	0	6375	0	0	0	10625

Matrix of changes With project

Mineral soils (ha)

			FINAL							
			Forest/Plantation	Agriculture			Grassland	Other Land		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation		0	0	0	0	0	0	0	0
	Agriculture	Annual	0	4250	0	0	0	0	0	4250
		Perennial	0	0	0	0	0	0	0	0
		Rice	0	0	0	6375	0	0	0	6375
	Grassland		0	0	0	0	0	0	0	0
	Other lands	Degraded	0	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0	0
	Total Final		0	4250	0	6375	0	0	0	10625

Results provided by EX-ACT

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

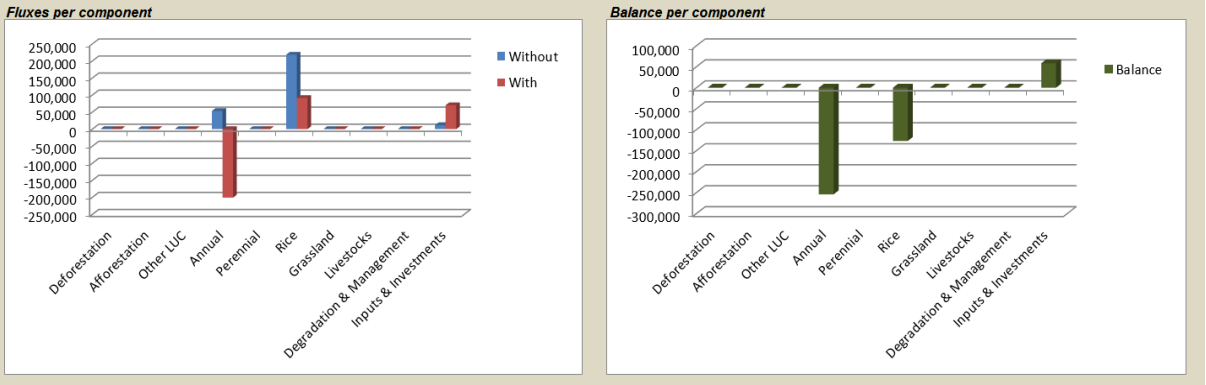
- The improvements on upland rice imply a **sink of GHG** reaching 260 080 tonnes of CO2-e in 20 years. The sink is due to the manure application that stocks Carbon, N_2O and CH_4.

-The irrigated rice improvements imply a **sink of GHG** reaching 148 558 tonnes of CO2-e in 20 years. The sink is mainly due to the reduction of CH_4 emissions. Thereby especially the straw management mitigates a significant source of GHGs due to preventing anaerobic degradation organic matter.

- The growing use of inputs is a **source of GHG**: 57 260 tonnes of CO2-e in 20 years are emitted, while they contribute to improve yields.

Project Name	Ghana Rice Project	Climate	Tropical (Moist)	Duration of the Project (Years)	20
Continent	Africa	Dominant Regional Soil Type	LAC Soils	Total area (ha)	10625

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq										
	Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	53,312	-200,842	-254,154	0	-207,506		-12,912	-33,737	2,666	-10,042	-12,708
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	218,256	91,417	-126,839	0	0		-10,652	-116,187	10,913	4,571	-6,342
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	11,672	70,032	58,360			32,998	25,362		584	3,502	2,918
Total	283,240	-39,394	**-322,634**	0	-207,506	32,998	1,798	-149,924	14,162	-1,970	-16,132
Per hectare	27	-4	-30	3.1	-19.5	3.1	0.2	-14.1			
Per hectare per year	1.3	-0.2	-1.5	0.2	-1.0	0.2	0.0	-0.7	1.3	-0.2	-1.5



Thus the project is contributing to mitigation to climate change. The gathered activities represent a **net sink** of about 351 260 tonnes of CO2-e, or 33 tonnes CO2-e /ha.

Situation 7: Markala Sugar project in Mali

General description of the project

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

The project takes place in Mali, Africa. The exercise does not give 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 implemented during 5 years, while the capitalization phase is set to 15 years.

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

Project Name	*Sugar Project Mali*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Dry	
Dominant Regional Soil Type	LAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

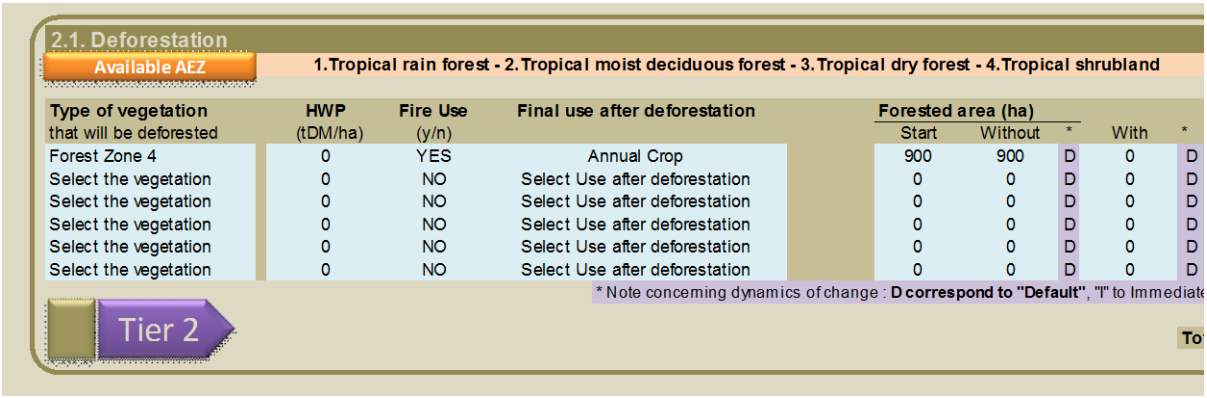
Components of the project

Six different activities are realized through the project: (1) deforestation, (2) other land use change, (3) annual crop production, (4) irrigated rice, (5) inputs and (6) investments. Consequently, the following XXX modules are going to be filled: **Land Use Change, Crop Production, Inputs & Investments.**

Deforestation

With the project, 900 ha of tree savannah will be deforested and converted into sugar cane plantations whereby the conversion is done via fire use. Thereby – though a perennial crop – sugarcane is cultivated on an annual basis and is thus entered as an annual crop. The savannah would have remained in its initial state in absence of the project.

Consequently the section on deforestation can be completed as follows:



2.1. Deforestation

Available AEZ: 1.Tropical rain forest - 2.Tropical moist deciduous forest - 3.Tropical dry forest - 4.Tropical shrubland

Type of vegetation that will be deforested	HWP (tDM/ha)	Fire Use (y/n)	Final use after deforestation	Forested area (ha) Start	Without	*	With	*
Forest Zone 4	0	YES	Annual Crop	900	900	D	0	D
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D
Select the vegetation	0	NO	Select Use after deforestation	0	0	D	0	D

* Note concerning dynamics of change : **D correspond to "Default"**, "I" to Immediate

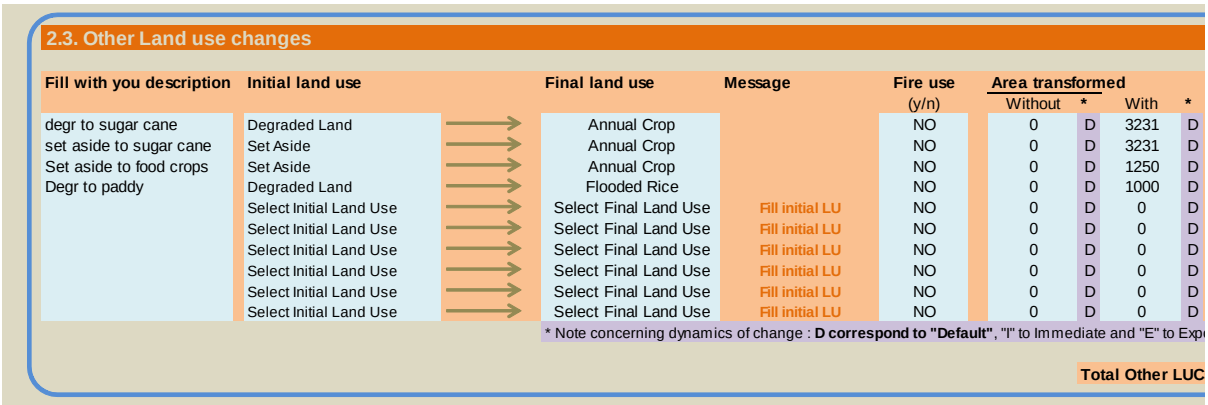
Tier 2

Other Land Use Change

There are four sub-activities of other land use change taking place. Again it might be helpful to fill the following table first before entering data into EX-ACT:

EX-ACT Modules	Type of land use and land use change	Initial situation	Without project	With project
Deforestation	Savannah tree to sugar cane	0	0	900
Other LUC	Degraded land to sugar cane	0	0	(14 132 -900 - 6770)/2 = 3 231
Other LUC	Set aside to sugar cane	0	0	(14 132 -900 - 6770)/2 = 3 231
Annual	Annual to sugar cane	0	0	6 770
TOTAL SUGAR CANE		0	0	14 132
Other LUC	Set aside to food crop	0	0	1250
Other LUC	Degraded land to paddy rice	0	0	1000

As a result the section on other land use change can be completed as follows:



2.3. Other Land use changes

Fill with you description	Initial land use	Final land use	Message	Fire use (y/n)	Area transformed Without	*	With	*
degr to sugar cane	Degraded Land	Annual Crop		NO	0	D	3231	D
set aside to sugar cane	Set Aside	Annual Crop		NO	0	D	3231	D
Set aside to food crops	Set Aside	Annual Crop		NO	0	D	1250	D
Degr to paddy	Degraded Land	Flooded Rice		NO	0	D	1000	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D
	Select Initial Land Use	Select Final Land Use	Fill initial LU	NO	0	D	0	D

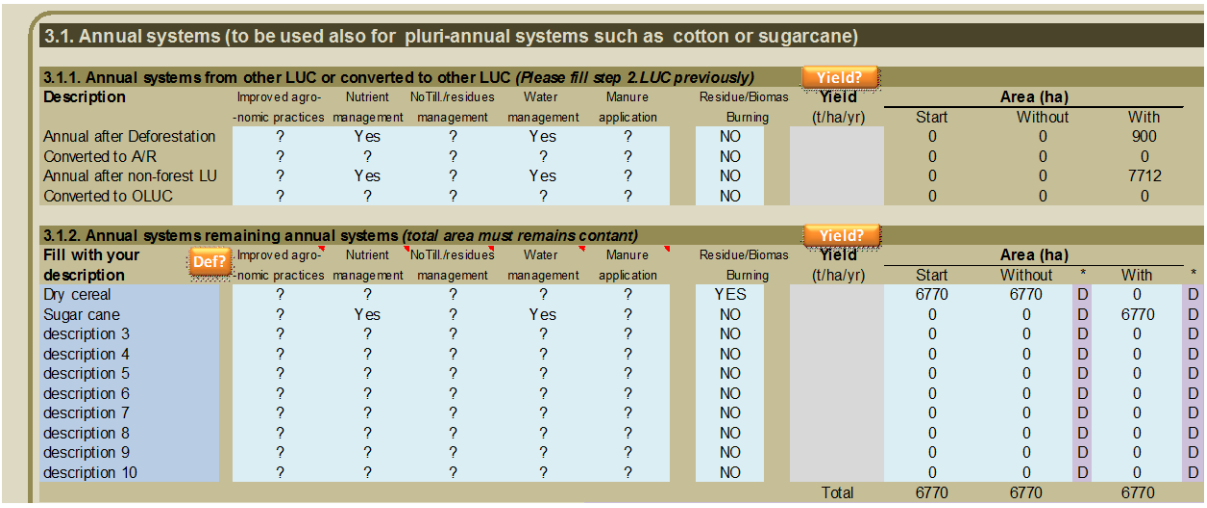
* Note concerning dynamics of change : **D correspond to "Default"**, "I" to Immediate and "E" to Exp

Total Other LUC

Annual crop production

The first four areas that were specified as being in the future cultivated as annual crops stem from deforestation (900 ha) and other land use change (7712 ha). These areas are automatically inserted by EX-ACT into the section on annual crops. In addition 6770 ha of dry cereals are converted into sugarcane under the project. The residue of the dry cereals were burned as part of the current system.

The Annual crops module thus can be completed in the following way:



3.1. Annual systems (to be used also for pluri-annual systems such as cotton or sugarcane)

3.1.1. Annual systems from other LUC or converted to other LUC *(Please fill step 2.LUC previously)* — Yield?

Description	Improved agro-nomic practices	Nutrient management	NoTill./residues management	Water management	Manure application	Residue/Biomas Burning	Yield (t/ha/yr)	Area (ha) Start	Without	With
Annual after Deforestation	?	Yes	?	Yes	?	NO		0	0	900
Converted to A/R	?	?	?	?	?	NO		0	0	0
Annual after non-forest LU	?	Yes	?	Yes	?	NO		0	0	7712
Converted to OLUC	?	?	?	?	?	NO		0	0	0

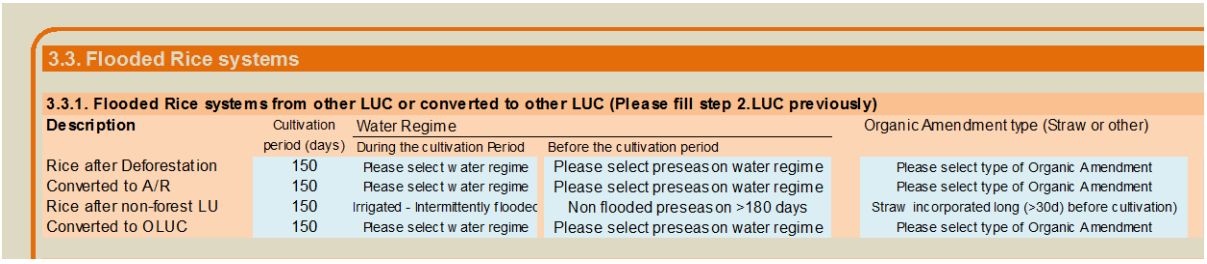
3.1.2. Annual systems remaining annual systems *(total area must remains contant)* — Yield?

Fill with your description (Def?)	Improved agro-nomic practices	Nutrient management	NoTill./residues management	Water management	Manure application	Residue/Biomas Burning	Yield (t/ha/yr)	Area (ha) Start	Without	*	With	*
Dry cereal	?	?	?	?	?	YES		6770	6770	D	0	D
Sugar cane	?	Yes	?	Yes	?	NO		0	0	D	6770	D
description 3	?	?	?	?	?	NO		0	0	D	0	D
description 4	?	?	?	?	?	NO		0	0	D	0	D
description 5	?	?	?	?	?	NO		0	0	D	0	D
description 6	?	?	?	?	?	NO		0	0	D	0	D
description 7	?	?	?	?	?	NO		0	0	D	0	D
description 8	?	?	?	?	?	NO		0	0	D	0	D
description 9	?	?	?	?	?	NO		0	0	D	0	D
description 10	?	?	?	?	?	NO		0	0	D	0	D
							Total	6770	6770		6770	

Irrigated rice

There are 1000 ha of degraded land that is converted into irrigated rice, intermittently flooded and with a non flooded pre-season of > 180 days, while the straw is incorporated long before the cultivation. These management practices thus have to be specified in the row "Rice after Non-Forest LUC".

Consequently, the section on irrigated rice can be completed as follows:



3.3. Flooded Rice systems

3.3.1. Flooded Rice systems from other LUC or converted to other LUC (Please fill step 2.LUC previously)

Description	Cultivation period (days)	Water Regime: During the cultivation Period	Water Regime: Before the cultivation period	Organic Amendment type (Straw or other)
Rice after Deforestation	150	Please select w ater regime	Please select preseason water regime	Please select type of Organic Amendment
Converted to A/R	150	Please select w ater regime	Please select preseason water regime	Please select type of Organic Amendment
Rice after non-forest LU	150	Irrigated - Intermittently floodec	Non flooded preseason >180 days	Straw incorporated long (>30d) before cultivation)
Converted to OLUC	150	Please select w ater regime	Please select preseason water regime	Please select type of Organic Amendment

Inputs module

In order to fill the inputs module in EX-ACT, it might be helpful to fill in the following table first:

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 as follows:

6.1 Inputs (liming, fertilizers, pesticides, herbicides,…)

Description and unit to report	Amount applied per year				
Lime application	Start	Without	*	With	*
Limestone (tonnes per year)	0	0	D	0	D
Dolomite tonnes per year)	0	0	D	0	D
not-specified (tonnes per year)	0	0	D	0	D
Fertilizers					
Urea (tonnes of N per year - Urea has 46.7% of N)	0	0	D	0	D
Other N-fertilizers (tonnes of N per year)	0	0	D	2,826	D
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D
Sewage (tonnes of N per year)	0	0	D	0	D
Compost (tonnes of N per year)	0	0	D	0	D
Phosphorus (tonnes of P2O5 per year)	0	0	D	170	D
Potassium (tonnes of K2O per year)	0	0	D	1,767	D
Pesticides					
Herbicides (tonnes of active ingredient per year)	0	0	D	136	D
Insecticides (tonnes of active ingredient per year)	0	0	D	28	D
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D

Investment module

There are two sub-activities within the investment module: (1) Use of irrigation and (2) The Industrial Process of Sugarcane. With regards to sub-activity 1, the activity is adequately captured by the installation of central pivot sprinklers on the 14 132 ha of sugarcane. Concerning the second sub-activity a few additional calculations are required:

- With the project the operating of the sugarcane plant will consume the following amount of energy:

  (30 MW*24h)*(365/2) * 40% = 52 560 MWh/yr. The emission factor is 0.25 tCO2-e/MWh

  Thereby the specific emission factor has again to be specified by clicking on the violet Tier 2 button and entering the emission factor manually.

  The exercise specifies that the positive externality of cogenerating further electricity will not be considered as part of this exercise for reasons of simplification and time management.

- 15 000m3 of ethanol replace the consumption of 10 000m3 of gasoline consumption (15 000 * 2/3). The emission factor of ethanol is 0.025 t CO2-e/m^3. The specific emission factor again has to be entered under the Tier 2 section.

- Further, the project introduces a total consumption of gasoil for land preparation of 2544 m^3/yr.

The sections on investments can therefore be completed as follows:

- Irrigation system installation:

6.3 Construction of new infrastructure for the project (irrigation systems, buildings, roads)

Description and unit to report	Surface concerned	
	Without	With
Irrigation systems (total in ha)		
Please select	0	0
Center-pivot sprinkle	0	14132

- Energy consumption:

6.2 Energy consumption (electricity, fuel,…)

Description and unit to report	Quantity consumed per year				
	Start	Without	*	With	*
Electricity (MWh per year)					
Other Africa	0	0	D	52560	D
Liquide or gaseous (in m^3 per year)					
Gasoil/Diesel	0	0	D	2544	D
Gasoline	10000	10000	D	0	D
Gas (LPG/ natural)	0	0	D	0	D
Butane	0	0	D	0	D
Propane	0	0	D	0	D
Ethanol	0	0	D	15000	D
User defined (Tier 2): 0	0	0	D	0	D
Solid (in tonnes of dry matter per year)					
Wood	0	0	D	0	D
Peat	0	0	D	0	D

- Tier 2 specification concerning energy consumption:

6.2 Energy consumption (electricity, fuel,…)

Back

Use this part only if you want to refine analysis with Tier 2 coefficients
(default values are provided for your information only, while EX-ACT will use Tier 2 values automa

Emissions factors			
Electricity	Unit	Default	Tier 2
Emission factor for the selected country	MWh/yr	0.431	0.25
Losses of electricity during transportation	%	10	
Liquide or gaseous (in m^3 per year)			
Gasoil/Diesel	t CO_2 /m^3	2.63	
Gasoline	t CO_2 /m^3	2.85	
Gas (LPG/ natural)	t CO_2 /m^3	0.00	
Butane	t CO_2 /m^3	0.01	
Propane	t CO_2 /m^3	0.01	
Ethanol	t CO_2 /m^3	0.52	0.025
Solid (in tonnes of dry matter per year)			
Wood	t CO_2/t dry matter	0.01	
Peat	t CO_2/t dry matter	0.003	

Land use and land use change matrix

In the situation without project no land use change is taking place and there are instead the constant land uses of 900 ha forest plantation, 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 will be deforested and converted into sugar cane. Furthermore, degraded land (3231 ha), set aside land (4481 ha) and dry cereals (6770 ha) will be converted into sugar cane plantations. Also, 1000 ha of the degraded lands was transformed into paddy rice plantations. The total amount of ha are in both cases 16 382 ha.

Matrix of changes Without Project — Mineral soils (ha)

Back

			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
	Cropland	Annual	0	6770	0	0	0	0	0	6770
		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 Land	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

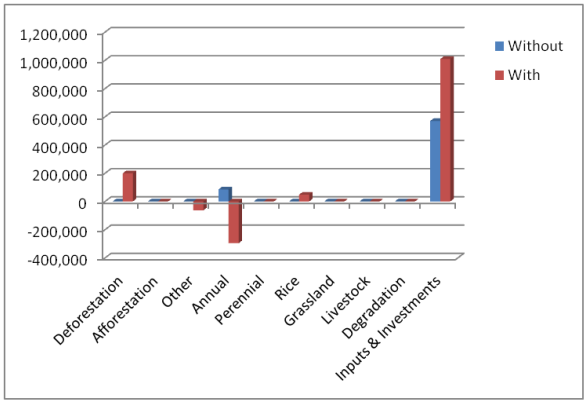
Matrix of changes With Project — Mineral soils (ha)

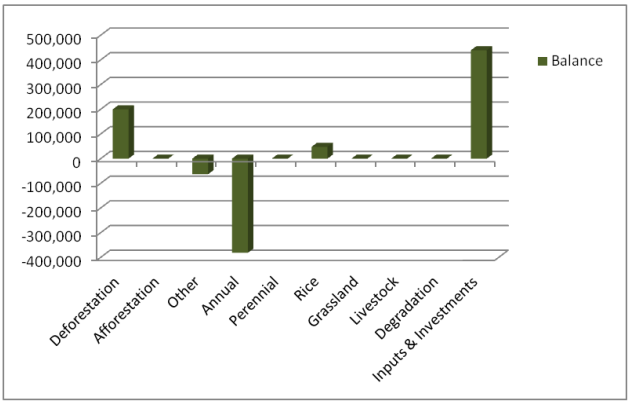
			FINAL						
			Forest/ Plantation	Cropland			Grassland	Other Land		Total Initial
				Annual	Perennial	Rice		Degraded	Other	
INITIAL	Forest/Plantation		0	900	0	0	0	0	0	900
	Cropland	Annual	0	6770	0	0	0	0	0	6770
		Perennial	0	0	0	0	0	0	0	0
		Rice	0	0	0	0	0	0	0	0
	Grassland		0	0	0	0	0	0	0	0
	Other Land	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 EX-ACT

The improvements proposed in the different modules finally lead to a **net source** of GHG emissions reaching 229 247 tonnes of CO2-e in 20 years. In contrast to the other examples, this exercise thereby identifies that also the intense use of fertilizers may account for the strongest emission source (425,549 tonnes CO2-e in 20 years) even surpassing the impact of the limited area that gets deforested (200 404 tones CO2-e in 20 years). Thereby the project also has a strongly positive component given by the sustainable production of energy.

Name of the project	Sugar Project Mali	Climate	Tropical (Dry)					Duration (yr)	20	
Continent	Africa	Soil	LAC Soils					Total area (ha)	16382	
Component of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance Result per GHG CO_2 Biomass	Soil	Other	N_2O	CH_4	Results per year without	with	Balance
	All GHG in tCO_2eq Positive = source / negative = sink										
Land Use Changes											
Deforestation	0	200,404	200,404	147,543	42,446		2,703	7,711	0	10,020	10,020
Afforestation	0	0	0	0	0		0	0	0	0	0
Other	0	-63,110	-63,110	-62,055	-1,056		0	0	0	-3,156	-3,156
Agriculture											
Annual	95,712	-294,907	-390,619	0	-306,871		-19,771	-63,977	4,786	-14,745	-19,531
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	0	57,023	57,023	0	0		0	57,023	0	2,851	2,851
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestock	0	0	0				0	0	0	0	0
Degradation	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	574,279	999,828	425,549			193,926	231,623		28,714	49,991	21,277
Total	669,991	899,238	**229,247**	85,488	-265,480	193,926	214,556	758	33,500	44,962	11,462
Per hectare	41	55	14	17.1	-16.2	13.1	0.0	0.0			
Per hectare per year	2.0	2.7	0.7	0.9	-0.8	0.7	0.0	0.0	2.0	2.7	0.7





Situation 8: Agro-forestry project in the Cross-river region, Nigeria

General description of the project

Firstly, the **description module** has to be filled 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 we know that the project is implemented in the Cross-river region of Nigeria, which is characterized by a tropical wet climate. The dominant type of soil corresponds to LAC soils.

The project will be implemented during 5 years. The project is analyzed over a further capitalization phase of 15 years.

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

Project Name	*Agroforestry Nigeria*	
Continent	Africa	
Climate	Tropical	
Moisture regime	Wet	
Dominant Regional Soil Type	LAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Four different activities are realized. The first one deals with deforestation, the second one with annual crop production, the third with the improvement of perennial crops (palm trees), the last one with the use of inputs. Consequently, the following four modules are going to be filled: **Land Use Change, Crop Production, Inputs.**

Deforestation module

As the exercise makes use of Tier 2 coefficients, it is useful to first carry out some preparatory calculations.

- Without the project, 1000 Ha of tropical forest will be deforested, while a specified amount of wood products will be exported through logging from the plantation. How to account for harvested wood products (as e.g. later used in the furniture industry) is a debated issue within

the IPCC. The current conservative solution in EX-ACT is to neither account them as source of sequestration or emission. For this purpose the amount of Harvested Wood Products (HWP) is calculated in the following way:

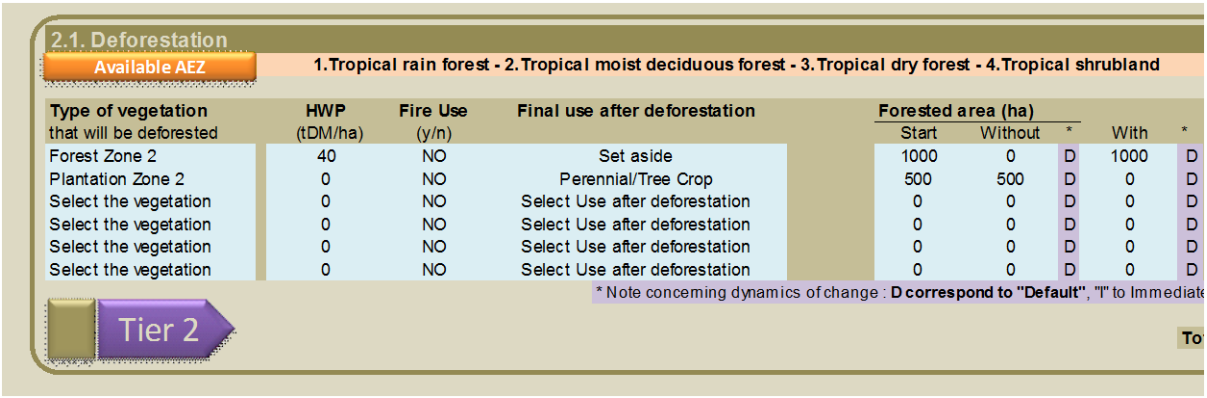
	HWP (T DM/ha)
Vegetation type (Tropical rain forest)	(5*0.8)*10= **40 T DM/ha**

- In addition the Government of Nigeria decided to develop 500 ha of perennial crops on degraded secondary forest land. While the above ground biomass is directly stated in the exercise, the belowground biomass has to be calculated.

	Above-ground biomass (t C/ha)	Below-ground biomass (t C/ha)
Specific vegetation type (palm trees)	98.4*0.47 = **42 t**	42*0.37 = **15.5 t**

- Litter, dead wood and soils are reported to have the same condition as non-degraded secondary forest.

Consequently the section on deforestation can be filled as follows:



When clicking on the violet Tier 2 button the further coefficients on the state of the degraded secondary forest can be specified:

Type of vegetation (that will be deforested)	Above-ground		Below-ground		Litter		Dead wood		Soil C	
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2
Forest - Zone 1	145.7		53.9		3.7		0.0		60.0	
Forest - Zone 2	122.2		29.3		3.7		0.0		60.0	
Forest - Zone 3	56.4		15.8		3.7		0.0		60.0	
Forest - Zone 4	32.9		13.2		3.7		0.0		60.0	
Plantation - Zone 1	70.5		26.1		3.7		0.0		60.0	
Plantation - Zone 2	56.4	42.0	11.3	15.5	3.7	3.7	0.0	0.0	60.0	60.0
Plantation - Zone 3	28.2		7.9		3.7		0.0		60.0	
Plantation - Zone 4	14.1		5.6		3.7		0.0		60.0	

Annual crops

As part of the project 250 ha of crops (mainly yam) will be converted from traditional to improved management practices, which implies besides others the use of manure and stopping the burning of crop residues. In a first step we can thus fill the following information into the annual module:

3.1.2. Annual systems remaining annual systems *(total area must remains contant)*

Fill with your description	Def?	Improved agro-nomic practices	Nutrient management	NoTill./residues management	Water management	Manure application	Residue/Biomas Burning	Yield? Yield (t/ha/yr)	Area (ha) Start	Without	*	With	*
Trad Yam		?	?	?	?	?	YES		250	250	D	0	D
Impr Yam		?	?	?	?	Yes	NO		0	0	D	250	D
description 3		?	?	?	?	?	NO		0	0	D	0	D
description 4		?	?	?	?	?	NO		0	0	D	0	D
description 5		?	?	?	?	?	NO		0	0	D	0	D
description 6		?	?	?	?	?	NO		0	0	D	0	D
description 7		?	?	?	?	?	NO		0	0	D	0	D
description 8		?	?	?	?	?	NO		0	0	D	0	D
description 9		?	?	?	?	?	NO		0	0	D	0	D
description 10		?	?	?	?	?	NO		0	0	D	0	D
								Total	250	250		250	

The exercise nevertheless also informs us that due to the increased fertilization we will have a higher amount of crop residues (12 t instead of the earlier 5 t), while in five years 4 t of Carbon will be sequestered under these conditions in the earlier depleted soil. Using the conversion factor 4*44/12/5 this is equivalent to 2.933 t of CO2-e per hectare over the five years of project implementation.

Accordingly the Tier 2 information can be filled in the following way:

3.1. Annual systems (to be used also for pluri-annual systems such as cotton or sug

Back

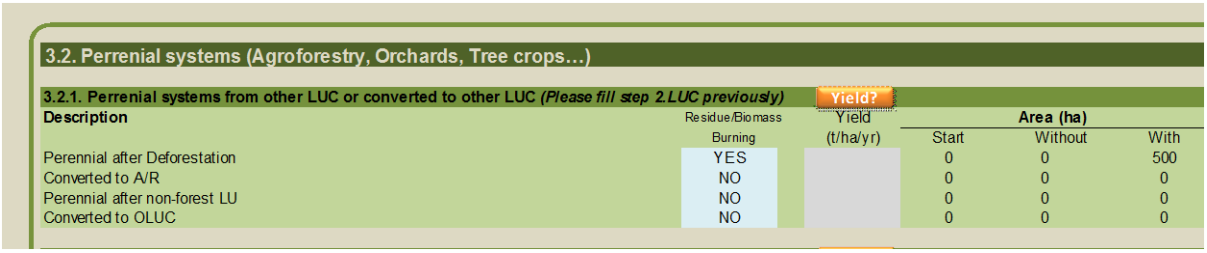
Use this part only if you want to refine analysis with Tier 2 coefficients
(default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever

Systems	Rates of soil C sequestration ($t CO_2$/ha/yr)		Residues/Biomass available (t Dry Matter per ha)	
Annual systems from (or to) other LUC	Default	Tier 2	Default	Tier 2
Annual after Deforestation	0		10	
Converted to A/R	0		10	
Annual after non-forest LU	0		10	
Converted to OLUC	0		10	
Annual systems remaining annual systems				
Trad Yam	0		10	5.0
Impr Yam	2.79	2.933	10	12.0
description 3	0		10	

Perennial crops

As presented in earlier exercises, the area occupied with perennial crops resulting from land use change is entered automatically by EX-ACT into the perennial section, once that the LUC was specified. In the exercise we nevertheless are informed that – unusually for a perennial crop – selected residue burning will take place.

Thus the perennial section should be filled in the following way:



3.2. Perrenial systems (Agroforestry, Orchards, Tree crops…)

3.2.1. Perrenial systems from other LUC or converted to other LUC *(Please fill step 2.LUC previously)*

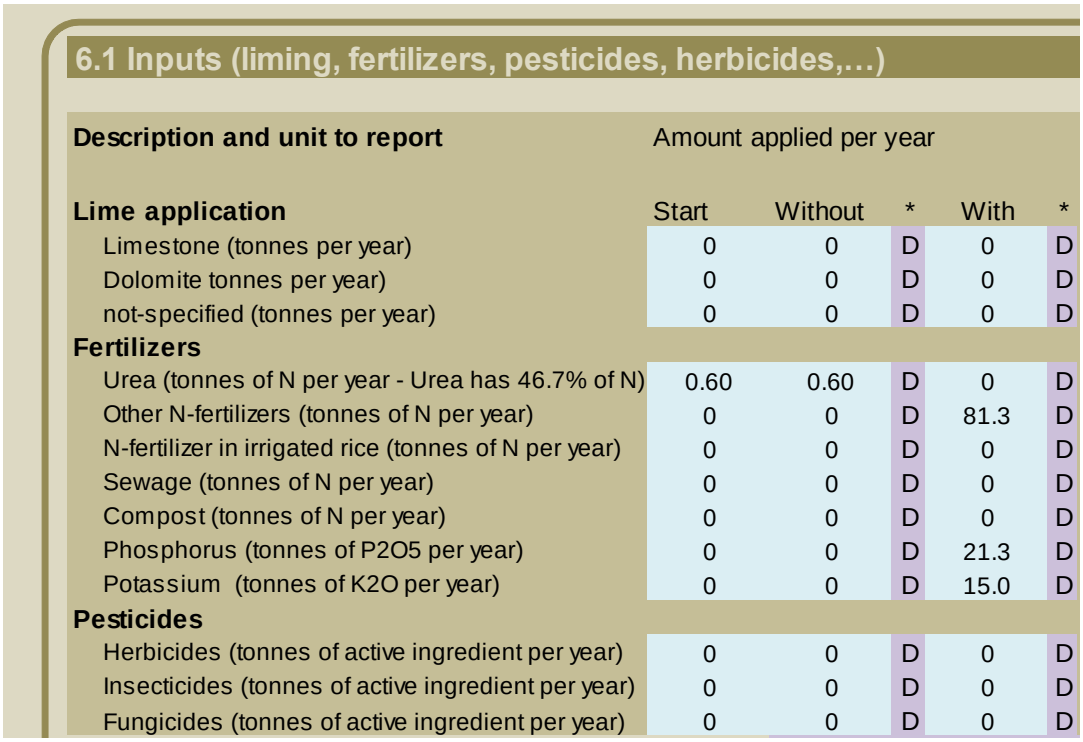
Description	Residue/Biomass Burning	Yield? Yield (t/ha/yr)	Area (ha) Start	Without	With
Perennial after Deforestation	YES		0	0	500
Converted to A/R	NO		0	0	0
Perennial after non-forest LU	NO		0	0	0
Converted to OLUC	NO		0	0	0

Inputs module

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

Fertilizer	Annuals	Perennials	Total/fertilizer	Unit
Without project				
N from Urea	0.60	-	0.60	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 thus be filled as follows:



6.1 Inputs (liming, fertilizers, pesticides, herbicides,…)

Description and unit to report	Amount applied per year Start	Without	*	With	*
Lime application					
Limestone (tonnes per year)	0	0	D	0	D
Dolomite tonnes per year)	0	0	D	0	D
not-specified (tonnes per year)	0	0	D	0	D
Fertilizers					
Urea (tonnes of N per year - Urea has 46.7% of N)	0.60	0.60	D	0	D
Other N-fertilizers (tonnes of N per year)	0	0	D	81.3	D
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D
Sewage (tonnes of N per year)	0	0	D	0	D
Compost (tonnes of N per year)	0	0	D	0	D
Phosphorus (tonnes of P2O5 per year)	0	0	D	21.3	D
Potassium (tonnes of K2O per year)	0	0	D	15.0	D
Pesticides					
Herbicides (tonnes of active ingredient per year)	0	0	D	0	D
Insecticides (tonnes of active ingredient per year)	0	0	D	0	D
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D

Land use and land use change matrix

In the situation without project, lodging would lead to to the deforestation of a smaller amount of forest (1000 ha). With the implementation of the project, these forest area will be conserved, and thus continue to act as a stock of CO_2. Further, with the project, 500 ha of degraded secondary forest is developed into a palm tree plantation. The total area analyzed is under both scenarios 1750 ha.

Matrix of changes Without Project — Mineral soils (ha)

INITIAL	FINAL: Forest/Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
Forest/Plantation	500	0	0	0	0	0	1000	1500
Cropland – Annual	0	250	0	0	0	0	0	250
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	0	0
Total Final	500	250	0	0	0	0	1000	1750

Matrix of changes With Project — Mineral soils (ha)

INITIAL	FINAL: Forest/Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
Forest/Plantation	1000	0	500	0	0	0	0	1500
Cropland – Annual	0	250	0	0	0	0	0	250
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	0	0
Total Final	1000	250	500	0	0	0	0	1750

Results provided by EX-ACT

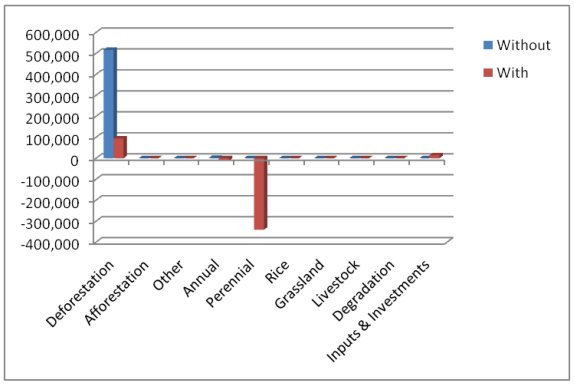
The improvements proposed concerning reduced deforestation, development of perennial crops no degraded forest land and improvement of annual crops lead to a **net sink** of GHGs reaching 777.362 tonnes of CO2-e over the duration of 20 years.

These activities jointly compensate for the **sources of GHGs** due to the consumption of inputs, which accounts for 13 738 tonnes of CO2-e.

The overall GHG balance of the project thus accounts for 763,623 tonnes of CO2-e.

Project Name: *Agroforestry Nigeria*	Climate: *Tropical (Wet)*	Duration of the Project (Years): *20*
Continent: *Africa*	Dominant Regional Soil Type: *LAC Soils*	Total area (ha): *1750*

Components of the project	Gross fluxes Without	Gross fluxes With	Balance	Share per GHG of the Balance CO_2 Biomass	CO_2 Soil	CO_2 Other	N_2O	CH_4	Result per year Without	Result per year With	Balance
All GHG in tCO2eq — Positive = source / negative = sink											
Land use changes											
Deforestation	516,369	93,940	-422,429	-387,779	-34,650		0	0	25,818	4,697	-21,121
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	1,767	-12,612	-14,380	0	-12,833		-365	-1,181	88	-631	-719
Perennial	0	-340,553	-340,553	-342,833	-6,125		4,381	4,025	0	-17,028	-17,028
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	131	13,870	13,738			7,129	6,610		7	693	687
Total	518,268	-245,356	**-763,623**	-730,613	-53,608	7,129	10,625	2,844	25,913	-12,268	-38,181
Per hectare	296	-140	-436	-413.4	-30.6	4.1	6.1	1.6			
Per hectare per year	14.8	-7.0	-21.8	-20.7	-1.5	0.2	0.3	0.1	14.8	-7.0	-21.8


600,000
500,000
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300,000
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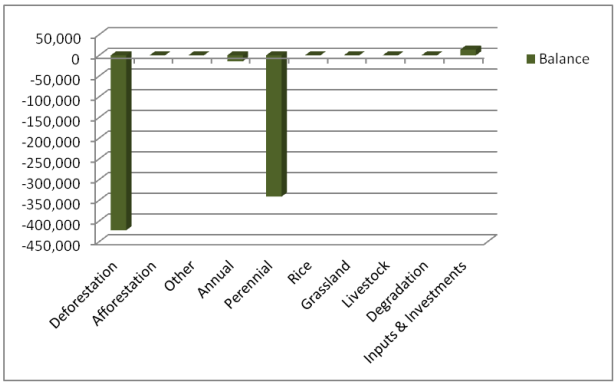
Deforestation
Afforestation
Other
Annual
Perennial
Rice
Grassland
Livestock
Degradation
Inputs & Investments


50,000
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-50,000
-100,000
-150,000
-200,000
-250,000
-300,000
-350,000
-400,000
-450,000
Balance
Deforestation
Afforestation
Other
Annual
Perennial
Rice
Grassland
Livestock
Degradation
Inputs & Investments

Situation 9: Forest Rehabilitation in Kazakhstan

General description of the project

The description module has to be filled with the following information provided in the exercise: The project takes place in Kazakhstan, Asia. The climate and the soil type are indicated as: Cool Temperate Dry & HAC soils.

The project will be implemented during 12 years. In order to likewise capture the impacts on forest growth and soil carbon that occur after the implementation phase, we add 8 years of capitalization phase in order to analyse a minimum duration of 20 years.

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

Project Name	*Forest Rehabilitation in Kazakhstan*	
Continent	Asia (Continental)	
Climate	Cool Temperate	
Moisture regime	Dry	
Dominant Regional Soil Type	HAC Soils	
Duration of the Project (Years)	Implementation phase	12
	Capitalisation phase	8
	Duration of accounting	20

Components of the project

Three different activities are realized: (1) Reducing forest fires, (2) Forest rehabilitation, (3) Development of Agroforestry. Consequently, the following 2 modules require completion: Land Use Change and Land degradation.

Forest degradation and management

Reducing forest fires

In the project context forest degradation is taking place due to forest fires. Thereby the project reduces the total amount of forest biomass that is every second year destroyed from 2% in the without project situation to 1%.

The first section of the Land degradation module can thus be filled as below:

5.1. Forest degradation and Management

AEZ map | Zone 1 = Temperate oceanic forest | Zone 2 = Temperate continental forest | Zone 3 = Temperate mountains sys Zone 4 =

Type of vegetation that will be degraded	Degradation level of the vegetation: Initial State	At the end: Without project	At the end: With project	Fire occurrence and severity: Without (y/n)	Periodicity (year)	Impact (% burnt)	With (y/n)	Periodicity (year)	Impact (% burnt)	Area (ha): Start	Without	*	With	*	Total Emissions (tCO2-eq): Without	With	Balance
Forest Zone 2	Low	Low	Very low	YES	2	5%	YES	2	1%	642,000	642,000	D	642,000	D	1,297,066	-17,145,235	-18,442,302
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Total Forest Degradation and Management															1,297,066	-17,145,235	-18,442,302

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Forest rehabilitation

Since refined data on the specific forest carbon stocks in the project data are available, it is not necessary to use default values provided by the IPCC, but the Tier 2 section can be utilized in order to refine the analysis with location specific coefficients.

The project started with a low loss of 10% of the total biomass as compared to a non-degraded forest. With the project implementation we will achieve a state of very low degradation, equal to 5% of biomass lost as compared to a non-degraded situation.

Thereby non-degraded forest in the project area is characterized by an above ground biomass of 30.5 t C, and a below ground biomass of 4.1 t C per hectare. Since we do not have refined information on litter, deadwood and soil carbon stocks, we further utilize the default values provided by the IPCC.

Thus, the Tier 2 section of the Forest degradation and management module should be filled as follows:

Back

Use this part only if you want to refine the analysis with Tier 2 coefficients.

(default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)

Degradation level (% of biomass lost)	Default	Tier 2
None	0	
Very low	10	
Low	20	
Moderate	40	
Large	60	
Extrem	80	

Type of vegetation that will be degraded	Above-ground		Below-ground		Litter		Dead wood		Soil carbon	
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2
Forest - Zone 1	84.6		18.6		28.00		0.0		33.0	
Forest - Zone 2	56.4	30.5	14.1	4.1	28.00	28.0	0.0	0.0	33.0	33.0
Forest - Zone 3	61.1		13.4		28.00		0.0		33.0	
	0.0		0.0		0.00		0.0		0.0	
Plantation - Zone 1	75.2		16.5		28.00		0.0		33.0	
Plantation - Zone 2	47.0		11.8		28.00		0.0		33.0	
Plantation - Zone 3	47.0		11.8		28.00		0.0		33.0	
	0.0		0.0		0.00		0.0		0.0	

Land Use Change

There is only one sub-activity of other land use change taking place. This activity consist on development of Agroforestry (18,000 ha) on formerly degraded land as describe below:

2.3. Other Land Use Changes

Fill with your description	Initial land use		Final land use	Message	Fire Use? (y/n)	Area transformed (ha) Without	*	With	*	Total Emissions (tCO2-eq) Without	With	Balance
agroforestry activities	Degraded Land	→	Perennial/Tree Crop		NO	0	D	18000	D	0	-1,620,300	-1,620,300
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
	Select Initial Land Use	→	Select Final Land Use	Fill initial LU	NO	0	D	0	D	0	0	0
									Total Other LUC	0	-1,620,300	-1,620,300

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Results provided by EX-ACT

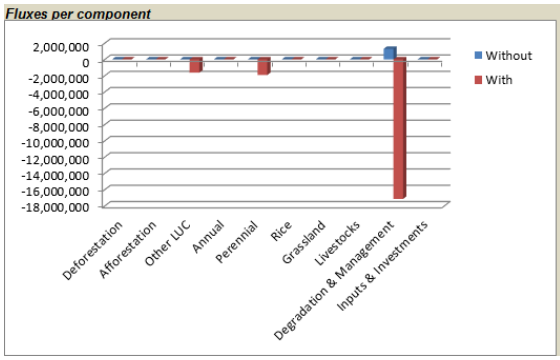
- The reduction of forest fires under the Degradation and Management module by the project preserves a **carbon sink** accounting for 18,528,650 tonnes of CO2-e throughout the 20 years of analysis. The middle block of results indicates that this preservation of stored carbon results mainly from conserving carbon in biomass and to a lesser extend also from preserving carbon in soil. In total this allows to avoid the emission of 926,433 tonnes of CO2-e per year (third block of results).

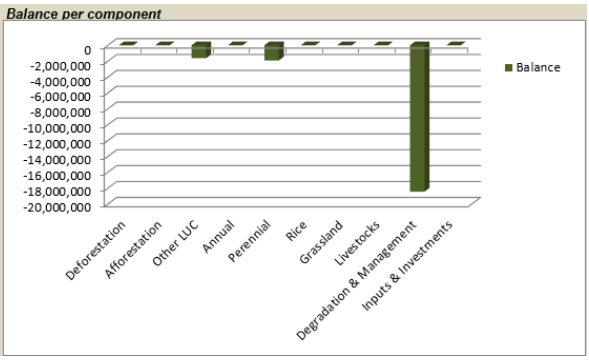
- The development of agroforestry implies the creation of a new **carbon sink** accounting for roughly 3.5 million tonnes of CO2-e during 20 years.

In such a way the project provides overall climate change mitigation benefits of 22 million tCO2-e in 20 years, which is equivalent to roughly 1.7 million tCO2-e per year.

Project Name	Forest Rehabilitation in Kaz	Climate	Cool Temperate (Dry)	Duration of the Project (Years)	20
Continent	Asia (Continental)	Dominant Regional Soil Type	HAC Soils	Total area (ha)	660000

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq										
	Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	-1,620,300	-1,620,300	-72,600	-1,547,700		0	0	0	-81,015	-81,015
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	-1,908,900	-1,908,900	-1,871,100	-37,800		0	0	0	-95,445	-95,445
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	1,297,066	-17,145,235	-18,442,302	-14,736,040	-2,718,870		-443,858	-543,534	64,853	-857,262	-922,115
Inputs & Investments	0	0	0			0	0		0	0	0
Total	1,297,066	-20,674,435	**-21,971,502**	-16,679,740	-4,304,370	0	-443,858	-543,534	64,853	-1,033,722	-1,098,575
Per hectare	2	-31	-33	-25.3	-6.5	0.0	-0.7	-0.8			
Per hectare per year	0.1	-1.6	-1.7	-1.3	-0.3	0.0	0.0	0.0	0.1	-1.6	-1.7





Situation 10: Rice Cropping in Viet Nam

General description of the project

First the **Description module** has to be filled by identifying the adequate location, climate and soil parameters for Viet Nam. If you are unsure about the correct variables the help buttons on "climate" and "soil" in the EX-ACT tool may be of help.

The project is implemented in Viet Nam, Asia (Continential). The climate can be identified as tropical moist. The dominant type of soil was selected as LAC soil.

The project will be implemented during 5 years. The project impacts are analyzed for an additional capitalization phase of 15 years.

Accordingly the Description module should be filled as follows:

Project Name	*EX 10: Rice Cropping in VietNam*	
Continent	Asia (Continental)	
Climate	Tropical	
Moisture regime	Moist	
Dominant Regional Soil Type	LAC Soils	
Duration of the Project (Years)	Implementation phase	5
	Capitalisation phase	15
	Duration of accounting	20

Components of the project

Two main activities are realized by the project. Firstly, flooded rice cropping systems will be improved with selected production practices. Secondly, rice straw will be utilized as renewable energy resources that will replace a conventional fossil fuel.

Consequently the following two modules are going to be utilized to estimate the impact on GHG emissions: **Crop Production**, and **Inputs & Investments**.

Annual crops

For correctly inserting the information as part of the **Crop Production module** it is recommended to first complete the here replicated table.

Type of rice production system	Start (ha)	Future without project (ha)	Future with project (ha)	Cultivation period (days per year)	Water regime: During cultivation	Water regime: Before cultivation	Management of organic amendments

Conventional: 3 rice crops	20,000	20,000	0	270	Continuously flooded	Flooded (>30 days)	Straw incorporat (<30 days)
Conventional: 2 rice crops	80,000	80,000	0	180	Continuously flooded	Flooded (>30 days)	Straw incorporat (>30 days)
3R3G: 2 rice crops	0	0	40,000	180	Continuously flooded	Flooded (>30 days)	Compost
1M5R: 2 rice crops	0	0	60,000	180	Intermittently flooded	Non-flooded (<180 days	Compost

Once this main information was correctly extracted from the exercise description the annual module on flooded rice systems can be filled accordingly:

3.3.2. Flooded Rice systems remaining Flooded Rice systems (total area must remain constant)

Fill with your description	Cultivation period (days)	Water regime		ganic amendment type (straw or oth	Area (ha)					Total Emissions (tCO2-eq)		Balance
		During the cultivation period	Before the cultivation period		Area (ha)	Without	*	With	*	Without	With	
Conv., 3 rice crops	270	Irrigated - Continuously flooded	Flooded preseason (>30 days)	Straw incorporated shortly (<30d) befor	20000	20000	D	0	D	20,122,392	2,515,299	-17,607,093
Conv., 2 rice crops	180	Irrigated - Continuously flooded	Flooded preseason (>30 days)	Straw incorporated long (>30d) before c	80000	80000	D	0	D	31,215,514	3,901,939	-27,313,575
3R3G, 2 rice crops	180	Irrigated - Continuously flooded	Flooded preseason (>30 days)	Compost	0	0	D	40000	D	0	8,979,632	8,979,632
1M5R, 2 rice crops	180	Irrigated - Intermittently flooded	Non flooded preseason <180 days	Compost	0	0	D	60000	D	0	3,969,942	3,969,942
Rice 5	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
Rice 6	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
Rice 7	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
Rice 8	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
Rice 9	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
Rice 10	150	Please select water regime	Please select preseason water regime	Please select type of Organic Amendmen	0	0	D	0	D	0	0	0
				Total (ha)	100000	100000		100000				
										Total Flooded Rice Sys	51,337,906	19,366,812	-31,971,094

Inputs module

- Use of fertilizers and pesticides

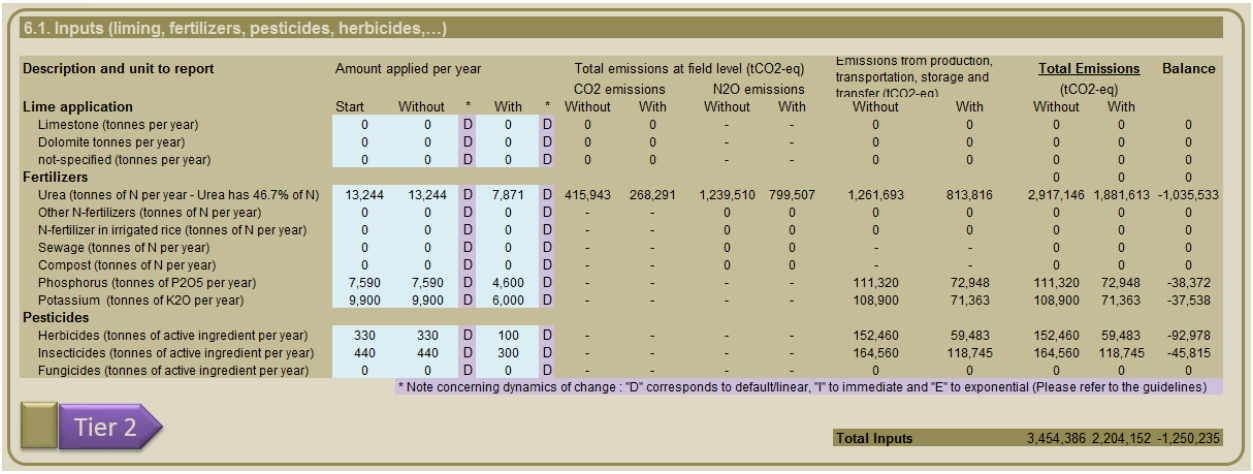
For fertilizers the content of active substances is provided in the exercise as Urea (46.7 % N), DAP (18% N, 46% P_2O) and Potassium Chloride (60% K2O). For pesticides no concentrations of active substances is provided and we assume here simplifying that product quantity = quantity of active substance. This will structurally overestimate the resulting GHG emissions from pesticides, which should be subject to a more specific analysis in the case that results show that pesticides are a relevant contributor to overall emissions.

With regards to application rates the exercise description identifies that application rates per hectare are reduced due to the project intervention. In addition, the practice of have a cropping sequence of three consecutive rice crops is changed towards two rice crops only, which further reduces the quantity of inputs that are used over the year.

The table below identifies the quantity of fertilizer used per hectare and at the scale of the entire project.

			Fertilizer use per ha (kg/ha)			Pesticide use per ha (l/ha)		Fertilizer: total project (t)			Pesticides: total project (1000 l)		
	Area (ha)	Rice crops/year	Urea	DAP	Pot Chl	Insecticides	Herbicides	N	P	K	Insecticides	Herbicides	
Without	80000	2	200	150	150	3	4	9632	5520	7200	240	320	
project	20000	3	300	225	225	4.5	6	3612	2070	2700	90	120	
								13244	7590	9900	330	440	Total (t)
With	80000	2	130	100	100	1	3	6296.8	3680	4800	80	240	
project	20000	2	130	100	100	1	3	1574.2	920	1200	20	60	
								7871	4600	6000	100	300	Total (t)

The **Input module** is thus filled as follows:



6.1. Inputs (liming, fertilizers, pesticides, herbicides,...)

Description and unit to report	Amount applied per year					Total emissions at field level (tCO2-eq)				Emissions from production, transportation, storage and transfer (tCO2-eq)		Total Emissions (tCO2-eq)		Balance
						CO2 emissions		N2O emissions						
Lime application	Start	Without	*	With	*	Without	With	Without	With	Without	With	Without	With	
Limestone (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Dolomite tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
not-specified (tonnes per year)	0	0	D	0	D	0	0	-	-	0	0	0	0	0
Fertilizers												0	0	0
Urea (tonnes of N per year - Urea has 46.7% of N)	13,244	13,244	D	7,871	D	415,943	268,291	1,239,510	799,507	1,261,693	813,816	2,917,146	1,881,613	-1,035,533
Other N-fertilizers (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
N-fertilizer in irrigated rice (tonnes of N per year)	0	0	D	0	D	-	-	0	0	0	0	0	0	0
Sewage (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Compost (tonnes of N per year)	0	0	D	0	D	-	-	0	0	-	-	0	0	0
Phosphorus (tonnes of P2O5 per year)	7,590	7,590	D	4,600	D	-	-	-	-	111,320	72,948	111,320	72,948	-38,372
Potassium (tonnes of K2O per year)	9,900	9,900	D	6,000	D	-	-	-	-	108,900	71,363	108,900	71,363	-37,538
Pesticides														
Herbicides (tonnes of active ingredient per year)	330	330	D	100	D	-	-	-	-	152,460	59,483	152,460	59,483	-92,978
Insecticides (tonnes of active ingredient per year)	440	440	D	300	D	-	-	-	-	164,560	118,745	164,560	118,745	-45,815
Fungicides (tonnes of active ingredient per year)	0	0	D	0	D	-	-	-	-	0	0	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

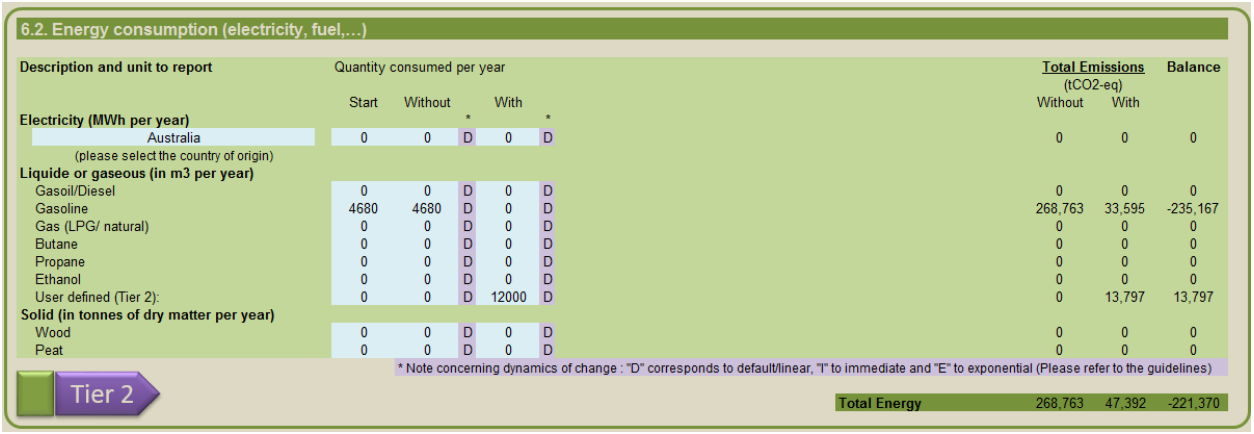
Tier 2

Total Inputs 3,454,386 2,204,152 -1,250,235

- Use of rice husk

The 100 rice briquetting machines will produce a total of 12,000 t of rice husk briquettes per year. Since rice husk briquettes are not available as default energy source in the EX-ACT tool, we have to enter it as Tier 2 option. For this purpose you should insert the 12,000 t in the line "User defined (Tier 2)" and specify the emission factor of 0.0657 tCO2-e/t in the Tier 2 section as identified in the screenshots below.

Gasoline is entered regularly within EX-ACT.



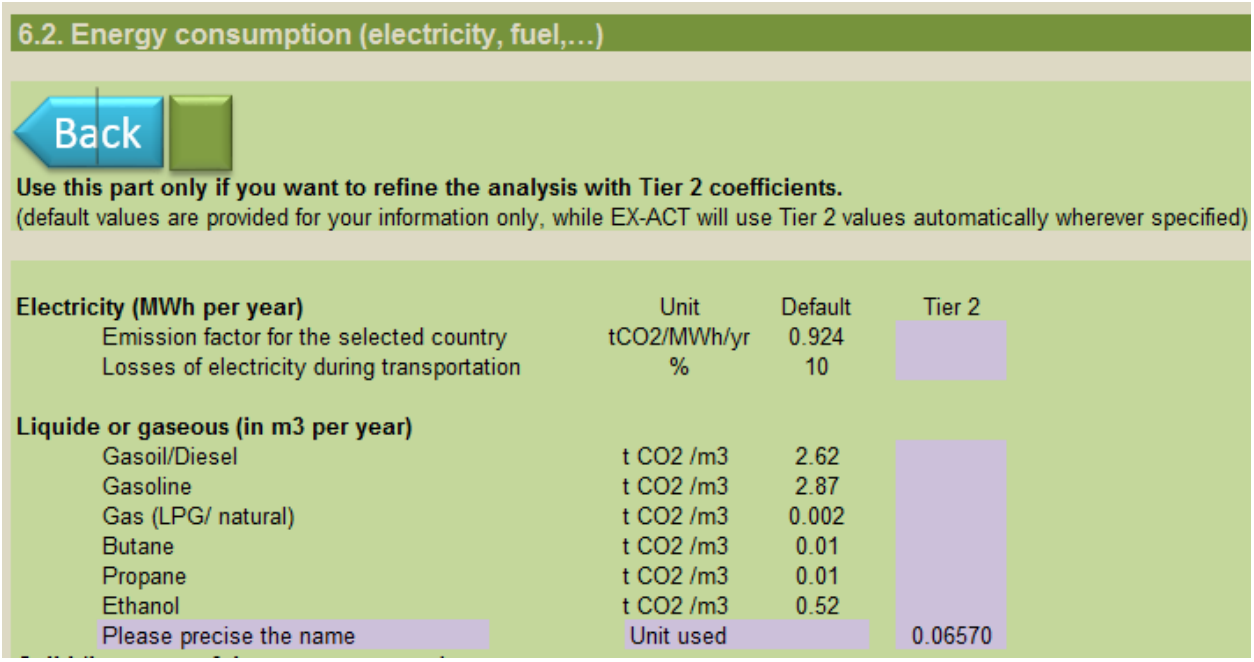
6.2. Energy consumption (electricity, fuel,...)

Description and unit to report	Quantity consumed per year					Total Emissions (tCO2-eq)		Balance
	Start	Without	*	With	*	Without	With	
Electricity (MWh per year)								
Australia	0	0	D	0	D	0	0	0
(please select the country of origin)								
Liquide or gaseous (in m3 per year)								
Gasoil/Diesel	0	0	D	0	D	0	0	0
Gasoline	4680	4680	D	0	D	268,763	33,595	-235,167
Gas (LPG/ natural)	0	0	D	0	D	0	0	0
Butane	0	0	D	0	D	0	0	0
Propane	0	0	D	0	D	0	0	0
Ethanol	0	0	D	0	D	0	0	0
User defined (Tier 2):	0	0	D	12000	D	0	13,797	13,797
Solid (in tonnes of dry matter per year)								
Wood	0	0	D	0	D	0	0	0
Peat	0	0	D	0	D	0	0	0

* Note concerning dynamics of change : "D" corresponds to default/linear, "I" to immediate and "E" to exponential (Please refer to the guidelines)

Tier 2

Total Energy	268,763	47,392	-221,370



6.2. Energy consumption (electricity, fuel,...)

Back

Use this part only if you want to refine the analysis with Tier 2 coefficients.
(default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)

Electricity (MWh per year)	Unit	Default	Tier 2
Emission factor for the selected country	tCO2/MWh/yr	0.924	
Losses of electricity during transportation	%	10	
Liquide or gaseous (in m3 per year)			
Gasoil/Diesel	t CO2 /m3	2.62	
Gasoline	t CO2 /m3	2.87	
Gas (LPG/ natural)	t CO2 /m3	0.002	
Butane	t CO2 /m3	0.01	
Propane	t CO2 /m3	0.01	
Ethanol	t CO2 /m3	0.52	
Please precise the name	Unit used		0.06570

Results provided by EX-ACT

Flooded rice cultivation on the total of 100,000 hectare lead to a very high level of GHG emissions. The proposed improvements introduced by the project that reduce rice cultivation from triple to double cropping (due to seasonal salinity problems), the introduction of intermittend flooding as well as non-flooded preseason provides strong reductions of methane emissions of overall 1.6 million tCO2-e per year.

Also the benefits from reducing the amounts of fertilizer consumption provide relevant GHG benefits of 63,000 tCO2-e per year, while substituting conventional energy by rice husk likewise provides GHG mitigation benefits of 11,000 tCO2-e per year.

Over the full duration of analysis and the entire project area, GHG mitigation benefits of 33.4 million tCO2-e are provided.

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq										
	Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	0	0	0	0		0	0	0	0	0
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	51,337,906	19,366,812	-31,971,094	0	0		0	-31,971,094	2,566,895	968,341	-1,598,555
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	3,723,149	2,251,544	-1,471,605			########	-440,003		186,157	112,577	-73,580
Total	55,061,055	21,618,356	**-33,442,699**	0	0	########	-440,003	-31,971,094	2,753,053	1,080,918	-1,672,135
Per hectare	551	216	-334	-10.3	0.0	-10.3	-4.4	-319.7			
Per hectare per year	27.5	10.8	-16.7	-0.5	0.0	-0.5	-0.2	-16.0	27.5	10.8	-16.7

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 directly enters activity data into the topic module, EX-ACT is missing the information on which IPCC coefficients to use. In case no emissions are calculated after entering activity data users should control the correctness of information in the description module.

Possible mistakes within the situation 1 (Brazil)

- EX-ACT asks for the **forested areas that remains as forest** and not for the areas that is deforested
- 2 different activities → 2 different sections within the Land Use Change module (Deforestation and Afforestation/Reforestation)
- Afforestation/Reforestation: 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)
- Differentiate between the 2 kinds of "fire use": one during land use change, one as crop residue management strategy (Crop Production module).

Possible mistakes within the situation 3 (Benin)

- Only the irrigated rice (flooded permanently or part of the year) is considered in the dedicated section on irrigated rice systems. Non-flooded rice such as upland rice or pure rainfed rice are considered as ordinary annual crops.
- All data filled in the other land use module are automatically inserted by EX-ACT into the respective module sections and do not have to be entered a second time manually.

Possible mistakes within the situation 4 (Mongolia)

- Only the installations of **new** irrigation systems are accounted in the investment module with the default coefficients.

Possible mistakes within the situation 5 (Ghana)

- Upland rice is considered as an ordinary annual crop and not in the section on irrigated rice.
- Only the mineral fertilizers are entered in the input module, manure is accounted in every annual system.