Objectives:

The simulated situation aims at providing a good understanding of how to use EX-ACT for the "*deforestation*" and "*afforestation*" modules.

Indicative time to carry out the exercise: 30 minutes


Source: Encyclopedia Britannicaa


Source: Forest policy research.org


Source: planetark.com

Description of the Brazilian context:

Simulations of deforestation suggest that, over the coming decades, the State of the Amazonian forest will suffer from a rapid increase in forest loss due to the pressure from farmers, loggers and general development. Therefore, in 2006, the Government of the State of the Amazonas decided to create the JUMA reserve. The reserve aimed at reducing deforestation, protecting forests with a high value of biodiversity as well as enhancing the quality of life of the 322 families of traditional populations who presently live within the limits of the Reserve. The reserve lies along one main highway and is crossed by another, which attracts illegal logging. The reserve is on LAC soils.

Proposed activities:

- *Reducing the expected deforestation*

350 000 ha of tropical rain forest will be deforested and will be set aside in the future if nothing happens between 2008 and 2050 (in the absence of a reserve). With the project we assumed that 80% of this area will remain under reserve control.

- *Reforestation*

With the implementation of the reserve, 100 ha of tropical rain forest will be reforested each year (from 2008 to 2050) on land that is set aside. Without the implementation of the reserve, no area will be reforested.

Additional help

You can use the table below to identify the surface areas concerned by the project. Insert the amount of hectares for each situation.

EX-ACT Module	Type of vegetation	Initial situation	Without project	With project
Existing forested area				
Afforestation/reforestation				

Main outputs:

This simulation (354 200 ha) allows for the conservation of natural resources and encourages sustainable management by controlling and monitoring reduced deforestation. Even if it is not accounted for in EX-ACT, the simulation should also guarantee an improvement in the region's living standards, in order to develop sustainable economic activities and to sponsor research and conservation projects within and outside the Juma reserve.

References:

The Juma sustainable development reserve project: reducing GHG from deforestation in the state of Amazonas, Brazil. Project design document (PDD) Available at: http://www.climate-standards.org/projects/files/pdd_juma_project_v_3_0.pdf

Objectives:

This simulated situation aims at using EX-ACT among the "*deforestation"* and "*perennial"* modules within a non-optimistic approach.

Indicative time to make the exercise: 15 minutes

Source Photos: www.celsias.co.nz, slowfoodperth.org, orangminyak.wordpress.com

Description of the Indonesian context:

Palm oil comes from the fruit of the palm tree, a tropical specie that originated in West Africa, which is presently produced as a hybrid in many parts of the world. The world demand for palm oil has soared in the last two decades, primary for food and consumer products purposes, and more recently as raw material for the use of biofuel. Indonesia and Malaysia are the two main producers of palm oil reaching 87% of the world production in 2007.

Palm plantations in such highly populated countries are associated with a wide and fast rate of deforestation. It is said to be one of the most prominent oil yields per hectare making the smallholders more interested in planting palm trees rather than exploiting the wood in natural forests. According to certain NGO's almost the totality of natural forests has been deforested thus posing a threat to the biodiversity, strengthening population migration as a huge agricultural exploitation spread.

Proposed activities:

The following activities will be proposed in Indonesia (Asia insular, tropical wet) during 3 years of implementation phase and 17 years of capitalization phase.

- *Deforesting natural forests*

Initially there were 10 000 ha of natural forest on LAC soils that would have been kept in the future without the palm tree plantation. With the palm plantation, the totality of the forest will be deforested using fire.

- *Developing perennial crops*

10 000 ha of palm trees will be planted in the future in answer to the biofuel demand. Without any project intervention, no perennials will be planted.

Additional help

You can use the table below to identify the surface areas concerned by the project. Insert the amount of hectares for each situation. The total surface area must be the same in the 3 situations (initial, without and with).

EX-ACT Module	Type of land use	Initial situation	Without project	With project
Other Land Use Change (LUC)	Forest			
LUC/Perennial	Palm tree (perennial)			
TOTAL				

Main outputs:

In terms of mitigation, the plantation of palm trees in this context is not suitable. The linked deforestation to plant perennial crops severely degrades the final carbon balance, which is not compensated by the plantation of palm trees. The result will be even worse if the use of inputs is accounted for and therefore questions the relevance of such practices.

References:

http://www.rfi.fr/contenu/20100223-conference-le-palmier-huile-bali
http://www.pecad.fas.usda.gov/highlights/2007/12/Indonesia_palmoil/

Objectives:

This simulated situation aims at providing a good understanding of how to use EX-ACT for the "*annual"*, "*perennial"*, "*other land use change"* and "*inputs"* modules.

Indicative time to make the exercise: 45 minutes

Source Photos: SDC

Description of the Benin context:

Food security has become a priority for the Government of Benin. 87% of the population lives in rural areas and essentially lives from agricultural resources. Cotton is the main cash crop, but due to low prices and unbalanced markets, incomes of smallholders decreased greatly strengthening the vulnerability of millions of people especially in the north of the country. Water management and infrastructure, intensifying food crops, diversification of production systems towards small livestock or aquaculture are the main activities considered in order to reach a sustainable level of food security.

Proposed activities:

The following activities will be proposed to 10 000 households working about 7 000 ha of lands. The project will be financed during five years and the benefits of it should occur during additional 15 years.

- *Developing perennial crops*

With the proposed project, 1 000 ha of set aside lands are expected to be planted into perennial crops (cashew) and the biomass will not be burnt during the cultivation period. Fire will be used for this conversion.

- *Decreasing the cotton areas*

Some improvements such as manure application and ceasing to burn residue are proposed with the project situation. Whereas 5 000 ha of conventional cotton would be burnt without the project, only 1 000 ha of such practices will remain with the project. Without the project farmers would still cultivate 5 000 ha of conventional cotton.

With the project, 3 000 ha will be improved by applying manure and extending crop rotation. (For the sake of simplicity, livestock is not accounted for in the simulation), and 1 000 ha will be converted into upland rainfed rice. Improved seeds and varieties as well as extended crop rotations will be used.

- *Improving the cassava crops*

1000 ha of cassava will be improved by adopting no tillage practices and other improved agronomic practices.

- *Changes in inputs used*

Currently, farmers use an average of 15 kg of urea per hectare per year on cotton crops. The simulation aims to help farmers to buy 50 kg per hectare per year on the whole area planted with cotton. Although decreasing the consumption of pesticides is recommended, it is expected that farmers will still apply 6 L of pesticides (half herbicides and half insecticides) per hectare per year on the cotton crops.

Additional help
You can use the table below to identify the surface areas concerned by the project. Insert the amount of hectares for each situation. The total surface area must be the same in the 3 situations (initial, without and with).

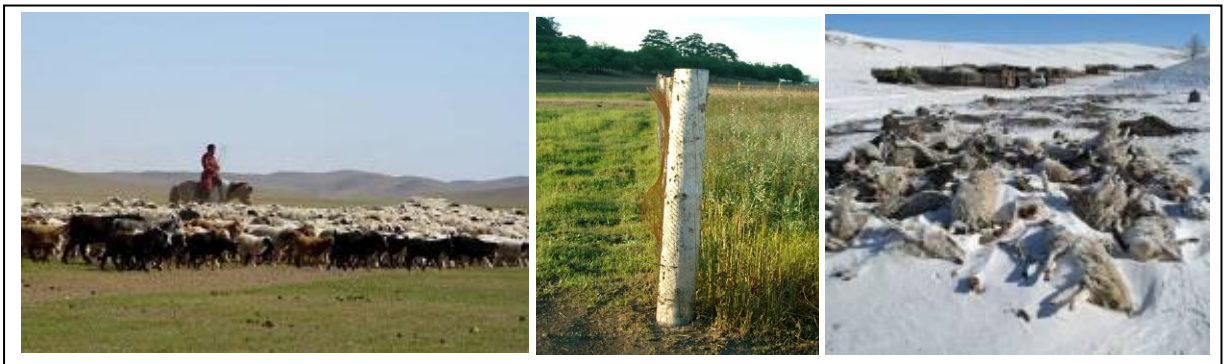
EX-ACT Module	Type of land use	Initial situation	Without project	With project
Other LUC	Set aside			
Other LUC/Perennial	Cashew (perennial)			
Annual	Traditional cotton			
	Improved cotton			
	Traditional cassava			
	Improved cassava			
	Upland rainfed rice			
TOTAL				

Main outputs:
Mitigation to climate change can be carried out in synergy with food security and reducing poverty. Cotton prices are decreasing and will be replaced by rice crops, which should contribute to food security. Further, the cotton is replaced to some extent by the perennial crops that are expected to store carbon as well as bring income to the smallholders.

References:
FAO country brief reports. 2010. Available at http://countrybriefs.fao.org/TO/default.asp

Objectives:
This simulated situation aims at providing a good understanding of how to use EX-ACT for the "*livestock"* and "*grassland"* modules.

Indicative time to make the exercise: 30 min



Source Photos: SDC

Description of the Mongolian context:
The Mongolian pastoral livestock sector has already suffered from climate variability, particularly due to severe winters (dzud) and summer droughts. The sector is highly sensitive to climate change and considering the livestock-based subsistence economy and that almost half of the population is engaged in that sector, mitigation and adaptation options to climate change are vital in order to achieve sustainable development. In addition to the impacts of climate change, there is an unsustainable natural resource management caused by human activity.

During the past 60 years in Mongolia, high-nutrient plants decreased by 1.5–2.3 times and are expected to decline further because of increased temperatures and decreased precipitation. Low nutrient plants like *Carex duriuscula-Artemisia* became dominant in pasture communities. Pasture diversity is expected to change as a result of increased temperatures and moisture decline. For example, by 2050, 11% of the steppe pasture in Mongolia would be replaced by desert and, accordingly, the pasture quality will also be degraded.

Livestock depends to a great extent on the availability of pasture resources. About 70% of the national pasture area is degraded. Despite the poor state of pastureland, the number of animals has sharply increased which has lead to a larger risk of grassland degradation making it increasingly difficult to provide the necessary amount of feed for the livestock.

Proposed activities:
The following activities will be proposed to 10 000 beneficiary households that currently own an average of 200 animals including sheep (70%), cattle (10%) and goats (20%). Without the project, livestock is expected to increase in the next 20 years (by 50% for sheep, by 30% for cattle and by 80% for goats). The implementation of this project should allow farmers to keep the same livestock numbers as at the present time.

- *Increasing livestock productivity*

Measures will be taken to increase sheep and cattle productivity through the use of different kinds of supplementary **feed** to increase livestock **weight**. The simulated project will promote the use of animal feed, targeting a progressive daily norm of 300 grams per sheep and 1 500 grams per cattle, reaching 90% of the livestock. It was assumed that currently only 3% of

livestock receives improved feeding practices. In the future without the implementation of the proposed project, it is expected that only 10% of livestock will be under improved feeding practices. Goats will be kept within extensive management systems (no improved feeding practices).

- *Maintenance of pastures*

The proposed project focuses on **improving pasture yield**, including the revival of traditional pasture management, which involves the use of only one pasture for the length of one season; restoration of degraded pasture with increased vegetation cover; expansion/rehabilitation of pasture water supply, development of irrigated pasture, modifying the schedule of grazing.

For the sake of simplicity, it was assumed that the improvements will not be carried out with chemical fertilizers and shall not take into account the decreased pastureland mainly due to a transfer of pastureland into other types of land classifications, i.e. protected areas, settlement, mining and roads.

Within this project it is expected that:

- ¼ of the total grazed surface (reaching 2 million ha for the 10,000 households) will be improved, without inputs just with moderate grazing pressure.
- A wide action on 5000 ha of irrigated and cultivated pasture should reduce the livestock dependency on nature and climate, enabling to improve this grassland area. The irrigated pasture will lead to the installation of a solid roll sprinkle irrigation system.
- Remaining pasture area will stay moderately degraded (lower pasture pressure).

Without this frame it is assumed that the area that will be improved by the project will remain moderately degraded and the rest will become severely degraded in the future due to increased pasture grazing pressure.

Summing-up of the different pasture degradation trends:

Initial State	Final state without project	Final state with project	Area to enter
Moderately degraded (M)	M	Improved without inputs	?
	M	Improved with inputs	?
	Severely degraded	M	?

The period of analysis will be 5 years of implementation and 15 years of capitalisation.

Main outputs:
Implementing such activities should allow i) conserving the natural resources, ii) enhancing capacities and livelihood opportunities of rural communities, iii) increasing food security and supply, and maybe improving understanding of climate extremes and forecasting.

References:
http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP41_Batima.pdf

Objectives:

This simulated situation aimed at providing a good understanding of how using EX-ACT in the "*irrigated rice"*, "*inputs"* and "*annual modules"*.

Indicative time to make the exercise: 50 min

Source Photos: Pierre-luc Sutter & www. youth.ewb.ca/frcelsias.co.nz

Description of the Ghana riziculture:

The rice became an important food and cash crop in Ghana. The consumption is increasing regularly because of the fast population growth, in particular in the urban zones. However, the country has to import near to two thirds of its needs. It is possible to increase the local production of rice considering the natural agro-climatic conditions of the country. The following proposed activities aims at improving and increasing the rice production.

Activities that are proposed:

This exercise propose to work with approximately 8 500 households cultivating an average of 1,25 ha of rice per household. There are two kinds of rice i) non-flooded upland rice (40 % of the total area), ii) rainfed and deepwater rice (60 % of the total area).

The flooded rice is currently cultivated during 150 days, without pre-season flooding (> 180 days). The straw is burnt for sanitary issues. No inputs are currently brought in rice fields.

- *Improved Seed*

The proposed project will bring improved seeds in every kind of rice, presenting better yield, some resistances and shortening the culture period (100 days cultivation period for Nerica variety).

- *Water management*

The project will be realized within 5 years. It is expected that only 30% of the targeted farmers will change their water regime management to intensify rice production (water control and saving, increased yields, better input management). During the cultivation period the fields will go from deepwater regime to intermittently irrigated regime.

- *Fertilisation management*

In synergy with the livestock services, an on-going programme diffuses wildly the use of the rice straw which will be exported (from both types of rice) to realize efficient manure. That will help to fertilize the total upland rice area with the project situation. Furthermore, the crop rotation of the upland rice will be improved to fight against pests.

The totality of irrigated rice will be fertilized with 120 kg / ha/year of urea in the situation with project.

Without the implementation of the project it is expected that:

- 30% of total upland rice will be converted to other annual crops, because of low yield. Burning practices are still on-going.
- A private initiative will launch 10 % of the total deepwater rice continuously flooded during the period of cultivation. Pests will be controlled by the adoption of a long flooded pre-season and residue burning. The fertilisation brought on this new rice category would be 200 kg/ha/year of urea.

The period of analysis will be 5 years of implementation and 15 years of capitalisation.

Additional help

You can use the table below to identify the surface areas concerned by the project. Insert the amount of hectares for each situation. The total surface area must be the same in the 3 situations (initial, without and with).

EX-ACT module	Type of land use	Initial situation	Without project	With project
Annual	Traditional upland rice			
	Improved upland rice			
	Annual			
Irrigated rice	Traditional paddy			
	Improved paddy (deepwater)			
	Improved paddy (intermittently flooded)			
	Private initiative on paddy			
TOTAL				

Main outputs:

Implementing such activities should allow i) enhancing capacities of rural communities, ii) increasing food security and supply.

References:

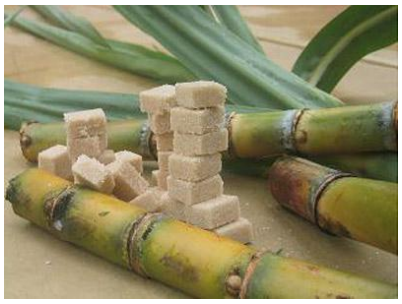
http://www.afdb.org/fr/projects-operations/project-portfolio/project/p-gh-aab-001/

Objectives:

This simulated situation aims at providing a good understanding of how using EX-ACT among the "*deforestation*", *"non forest land use change", "annual", "irrigated rice", "inputs"* and *"other investments".*

Indicative time to carry out the exercise: 50 minutes





Description of the context:

The Markala Sugar Project is the first Public-Private Partnership operation between Mali and the African Development Bank in the agro-industrial sector. The objective of the project is to ensure a sustainable increase in the income of sugar sector stakeholders, in order to cover the country's sugar needs. It also takes into account the production of biofuel as a renewable energy for sugar processing. Implementing the project will require optimal management of water resources, especially during the dry season.

Proposed activities:

The present exercise is based on a real case study, simplified for the sake of simplicity and covering some land use change activities that will occur in the project. The project will be financed during 5 years, and the capitalization phase will last 15 years.

At the present time, there is no plantation of sugar cane. The 16 382 ha of interest are divided in 6770 ha of dry cereal (rice, sorghum, mil), 900 ha are tree savannah land, and the rest is shared between degraded lands (4231 ha) and set aside lands (4481 ha). It is expected that without the implementation of the project, the current situation would remain as it is.

- *Development of sugar cane*

The project will develop the plantation of 14 132 ha of sugar cane through land use changes and conversion between different annual crops. The sugar cane will be implemented with the project under better water and nutrient management, without residue burning.

The 900 ha of tree savannah land will be deforested and sugar cane will be planted instead. The conversion will be done with fire use. Without the project it is expected that the savannah would have remained as it is.

The 6770 ha of dry cereal whose residue is burnt will be converted to sugar cane.

The other sugar cane plantations (6462 ha) will result from land use change, half from set aside and half from degraded lands.

- *Development of other crops*

1250 ha of food crops will be implemented on current set aside lands. Those food crops will have improved water management and no residue burning practises.

1000 ha of degraded lands will be converted in paddy rice, intermittently flooded and with non flooded preseason > 180 days, with the straw incorporated long before the cultivation.

- *Use of fertilizers and pesticides*

With the project, fertilizers and pesticides will be used on sugar cane.
The quantity of fertilizers used per year and per hectare is 200kg of Nitrogen (N), 125 kg/ha of potassium synthetic fertilizer (K_20) and 12 kg of Phosphorous synthetic fertilizer (P_2O_5).

The whole sugar cane area will receive an insecticide treatment of 2 litres per ha per year.

Independent farmers, who cultivate 40% of the sugar cane area, will apply half less herbicides than the estate company, which cultivate 60% of sugar cane area. Therefore they will make 2 treatments of 3 litres per year instead of 4 treatments for the estate company.

For the sake of simplicity, we consider that the mass density of all pesticides is equal to 1 litre per kg. It is assumed that the food crop area and the irrigated rice will not use any fertilizers, as well as of the traditional annual crops that are currently in place.

- *Use of irrigation*

With the project, the better water management expected is due to the installation of centre pivot sprinklers that are going to be installed on the 14 132 ha of sugar cane.

- *Industrial process of sugar cane*

The plant will produce an annual output of 190 000 tonnes of sugar, 15 000 m^3 of anhydrous ethanol (substituting gasoline) and the cogeneration of 30 MW of electricity. It is assumed that 27 MW will be used for the electricity needs of the plant. The remaining 3MW will be sold to the electricity network of the Republic of Mali. The plant will operate half of the year, 24 hours a day. During the combustion of ethanol by the engine, methane and nitrous oxide emissions will occur. The emission factor for these emissions is 0,025 t CO_2 eq-m^3. The consumption of gasoil is also accounted for the land preparation, planting and sugar cane crop maintenance. It has been expected to reach 2544 m^3/year.

Additional help

You can use the table below to identify the surface areas concerned by the project. Insert the amount of hectares for each situation. The total surface area must be the same in the 3 situations (initial, without and with).

EX-ACT Modules	Type of land use and land use change	Initial situation	Without project	With project
Deforestation	Savannah tree to sugar cane			
Other LUC	Degraded land to sugar cane			
Other LUC	Set aside to sugar cane			
TOTAL SUGAR CANE		0	0	14 132
Other LUC	Set aside to food crop			
Other LUC	Degraded land to paddy rice			
Annual	Annual to sugar cane			
Annual (comes from LUC)	Food crop			
Irrigated rice (comes from LUC)	Paddy rice			

Main outputs:
This simulation allows for i) using the EX-ACT tool with biofuel considerations, ii) raising questions about biofuel projects.

References:
http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/MALI%20-%20AR%20Agricultural%20Component%20Markala%20Project.pdf

Objective:

The following exercise suggests realizing a Carbon balance appraisal with the EX-ACT tool. In this exercise, a mix of the Tier 1 and Tier 2 approaches is going to be used within the forestry and agricultural sector.

Indicative time for the exercise: 40 minutes

The REDD+ is a program aiming at Reducing the Emissions linked to Deforestation and forest Degradation. Such program has now been put into place in Nigeria, in the Cross-River region. The dominant soil is supposedly LAC soils. The implementation phase is 5 years and the capitalization phase 15.

- *Deforestation*

Deforestation practices will decrease with the project. **Without the project**, 1000 Ha of tropical moist forest will be deforested for logging. 10 logs/Ha will be exported, where each log is equivalent to $5M^3$ with an average density of $0.8T/M^3$.

The Government of Nigeria is suggesting to **develop perennials** on 500Ha of land, in particular palm trees on degraded secondary forest-land. This activity will provide revenues and also supply preservation acceptance for the primary forests. The forest coefficients defined in EX-ACT will only be provided for the primary forests. An ad-hoc analysis of the plant cover soils are indicating that the carbon contents in the secondary Nigerian forests are 88 T of carbon/Ha in the above ground biomass, where 1 T of biomass contains 0.47 T of carbon. The below ground biomass is proportionally 0.37 times the above ground biomass.
The carbon contents of the litter, dead wood and soil is hypothetically the same as for the Tier1 forestry coefficients.

- *Annuals*

The low agricultural yields have been identified as the major cause of deforestation. In order to successfully implement the project, the Government of the Cross-river state is suggesting to improve 250Ha of annuals, through applied manure, mainly focused upon the production of Yam. Previously 5 kg of urea was used while, with the project, 75 kg of N, 15 kg of P and 10 kg of K will be used and a precautious reincorporation of crop residues (12 T/Ha). Initially, the crop residues (5 T/Ha) were burnt. Such regional project has demonstrated a carbon soil increase of 2.75 T of carbon during a 5-year period.

- *Perennials*

With the project, the cultivated perennials will consume per hectares 125 kg of N, 35 kg of P and 25 kg of K. The fertilization procedure will allow an above ground biomass growth rate of 11t C/ha per year.