Presentation of the problem
The regions of Sidi Bouzid and Gafsa in the southern part of Tunisia are considered the most desertification-sensitive areas. The present excessive exploitation of the steppic rangeland in the Center and the South of Tunisia is one of the main causes for increased desertification and soil degradation of the region. As a consequence, the reduction of up to 80% of the livestock (cows, sheep and goats) has been announced (MARH, 2007), a reduction which would lead to a considerable loss in income for a large part of the population which will cause social and economic problems and intensifications of land use.

Objectives
Improve both the management and the governance of rangeland to establish a balance between the need of the livestock and the availability of fodder.

Contribution to the adaptation to climate change
The management and the improvement of the existing rangeland, their enrichment by natural regeneration and planting of fodder species and pastoral crops may help to alleviate the negative effects related to drought. Planting of agro-forestry species adapted to drought would provide not only fodder but also shading and firewood, as well as environment-related services such as soil improvement, erosion control and soil carbon sequestration.

Main components of the project
• Banning grazing on rangelands (fencing) or deferred grazing to rehabilitate vegetation (G'del)
• Improve the fencing strategy through land scarification or rehabilitation of hydric and hydrological regime of pasture lands of Regs
• Creation of fodder reserves: planting of fodder shrubs and irrigated fodder crops
• Intensification of fodder crops
• Valorization of agricultural by-products in animal feed
• Improvement of infrastructure of rangelands.

PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation:</th>
<th>Ministry of Agriculture (MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional partners</td>
<td>MA, ME, GDA, NGO, OER, livestock farmers</td>
</tr>
<tr>
<td>Implementation period:</td>
<td>5 years</td>
</tr>
<tr>
<td>Priority of the project:</td>
<td>High</td>
</tr>
<tr>
<td>Monitoring indicators:</td>
<td>Respect of rangeland fencing, survival of plantations, vegetation cover density</td>
</tr>
</tbody>
</table>

COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs</th>
<th>6 MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks and vulnerability due to the non-action</td>
<td>Assuming a reduction of 20% in sheep and goat population in the two governorates and an average loss in revenue of 100 DT per person and year, the direct cost damages would be 14.14 MDT per year.</td>
</tr>
</tbody>
</table>
**Sector:** Coastal ecosystems

**Title of the project:** Conservation of ecological functions of coastal lowlands

**Intervention zone:** Gulfs of Tunis and Hammamet

---

**PROJECT DESCRIPTION**

**Presentation of the problem**

Projections indicate that with a rise in sea level of 50 cm, part of the land that covers a surface of 182,000 ha has to be considered as a flood endangered zone. At the same time, longer droughts result in very strong human pressure due to changes in the use of the land around these areas and an urbanization more and more dense and widespread affecting (infringing) the wetlands. This will be the case in particular at the outskirts of the City of Tunis (Raoued, Berges du Lac Nord,) and in the northern part of the City of Sfax (ME, 2008).

**Objectives**

Transform the sebkhas to permanent water surfaces with a continuous exchange with the sea.

**Contribution to the adaptation to climate change**

The protection of natural and artificial wetlands mainly serves to maintain the existing ecosystem and to protect other neighboring systems or systems located downstream as well as their exploitation according to their real potential. The ecosystems of wetlands are important elements for the aquatic environment from both ecological and functional point of view. Their potential is very important when it comes to the sustainable management of catchment areas, e.g. by contributing to the reduction of the impact of pollution, preventing the effects of droughts and floods and by promoting the refilling of the groundwater resources (WWF, *l’indice Eaux douces et Zones humides, 2003)*

**Main components of the project**

- Rehabilitation actions to transform the sebkhas to permanent water surfaces with a continuous exchange with the sea;
- Management of banks comparable to what has been done with the sebkhas of Ariana in the Gulf of Tunis and those of Sidi ben Ghayadha in Mahdia.

---

**PROJECT IMPLEMENTATION**

**Implementation:** Coastline Protection and Development Agency (APAL)

**Institutional partners**

Hotels and other organizations benefiting from the protection actions, NGOs

**Implementation period:** 5 years

**Priority of the project:** High

**Monitoring indicators:** water level of the sebkha, salinity of water, exchange flow between the sebkha and the sea.

---

**COSTS / BENEFITS OF THE PROJECT**

**Project costs**

5,5 MDT

**Risks and vulnerability due to the non-action**

- Pollution of sebkhas;
- Loss of biodiversity of wetlands;
- Degradation of living conditions;
- High risk of floods and of groundwater contamination.
Sector: Water and soil conservation

Title of the project: Protection and management of catchment area of Oued Leben

Intervention zone: Catchment area Oued Leben - Sidi Bouzid

PROJECT DESCRIPTION

Presentation of the problem
The project zone is characterized by an average rainfall of about 200 to 300 mm, with a high interannual irregularity and a reduced vegetation cover making it particularly vulnerable to hydric erosion and desertification. The climate changes will increase these erosion factors, which will inevitably lead to reduced fertility and yield of the agricultural land or even to an irreversible loss of farmland.

Objectives
Limit the phenomenon of desertification more and more visible in the region and valorize available water resources for the benefit of rural population living near these catchment areas to promote an integrated agricultural land management.

Contribution to the adaptation to climate change
The protection and the valorization of eroded agricultural lands, control of desertification and land sterilization, mobilization of run-off, contribution to groundwater recharge and protection of infrastructure against floods are all elements of integrated land management for a better adaptation to CC.

Main components of the project
• Construction of tabias (mud walls);
• Construction of earth dams, correction of erosion gullies;
• Pastoral, forestry and tree plantations;
• Development of micro-projects creating revenues for the affected populations, set-up of irrigated perimeters, organization of the population in Agricultural Development Groups (GDA), awareness-raising and training for the rural communities in the field of adaptation to CC.

PROJECT IMPLEMENTATION

Implementation: Ministry of Agriculture
Institutional partners: DGACTA, CRDA and local partners

Implementation period: 3 years
Priority of the project: High
Monitoring indicators: proportion of the land affected by erosion, availability of water, land use, revenues.

COSTS / BENEFITS OF THE PROJECT

Project costs: 5,4 MDT

Risks and vulnerability due to the non-action
• Loss of infrastructures;
• Loss of productive agricultural capital
**Sector:** Water and Soil Conservation

**Title of the project:** Integrated rural management of the catchment area of Sebkhat Mchiguig

**Intervention zone:** Zone located between Sfax and Sidi Bouzid

### PROJECT DESCRIPTION

**Presentation of the problem**

The catchment area of Sebkhat Mchiguig overlaps between the governorate of Sfax and Sidi Bouzid and covers a total area of 48,000 ha. This sebkha is located on the bottom side of the mountain chain of Djebel El Khchem-Kef Echih-Djebel Bouchih with a maximum range of 2,600 ha. Rainfall is random, stormy and irregular from year to year. Besides rainfall, other climatic and soil factors related to human action contribute to an exacerbation of natural phenomena such as hydric erosion, flooding and drought.

**Objectives**

Erosion reduction and increase of available water resources in the area.

**Contribution to the adaptation to climate change**

A better management of the local natural resources (water, soil, and rangeland) will guarantee the sustainability of agricultural activity and improve the quality of groundwater. Furthermore, the improvement of the rangelands will promote the soil carbon sequestration. The conservation of the sebkha will also contribute to the ecological balance.

**Main components of the project**

- Construction of five small lakes (earth dams);
- Management of the catchment area, development and equipment of a drink water borehole;
- Development of micro-projects creating revenues for the affected population

### PROJECT IMPLEMENTATION

**Implementation:** Ministry of Agriculture

**Institutional partners**

DGAC TA, CRDA and local partners

**Implementation period:** 3 years

**Priority of the project:** High

**Monitoring indicators:** proportion of land affected by erosion, availability and quality of the water, land use, revenues.

### COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs</th>
<th>6 MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks and vulnerability due to the non-action</td>
<td></td>
</tr>
<tr>
<td>• Exacerbation of the hydric erosion</td>
<td></td>
</tr>
<tr>
<td>• Increase of the risks of floods and droughts</td>
<td></td>
</tr>
<tr>
<td>• Socio-economic costs may be considerable</td>
<td></td>
</tr>
</tbody>
</table>
Presentation of the problem
Tunisia is mainly an arid country. It receives an average of 230 mm of rain per year, i.e. 35 billion cubic meters per year. Whereas during drought years the volume of rain may be reduced to 11 billion cubic meters per year, it may reach 90 billion cubic meters in rainy years.
The erosion phenomenon in Tunisia has adverse effects on the management and the conservation of natural resources. The most frequent forms of soil degradation – which cause a loss of soil of approximately 22,000 ha/year – are hydric erosion (10,000 ha/year), wind erosion (8,000 ha/year) and, to a lesser degree, soil salinization (2,000 ha/year) and urbanization (2,000 ha/year).

Objectives
Develop a support tool for decision makers that will enable them to better plan and monitor development activities and support their maintenance and preservation activities.

Contribution to the adaptation to climate change
The implementation of adaptation measures to CC requires a better knowledge of the present situation as well as a detailed qualitative and quantitative assessment of the work already accomplished. This will allow better planning of future development activities that, according to an ecosystemic approach, will ensure a sustainable development of water and soil resources.

Main components of the project
• Set-up of a digital spatial database describing the different water and soil conservation works (CES) accomplished in the last twenty years;
• Develop a support tool for decision makers that will enable them to better plan and monitor development activities and support their maintenance and preservation activities
• Periodical updating of inventory data.

Project costs
100 MDT

Risks and vulnerability due to the non-action
Non-action will lead to investments in water and soil conservation works (CES) that are not based on detailed information that will allow a prioritization of the investments according to the type of investment or the region and of their socio-economic, environmental and sustainability related impacts.
**Presentation of the problem**

Towns, villages and farmland situated along the Oued Medjerda have suffered major damage caused by the floods in the catchment area of the Oued Medjerda.

**Objectives**

Minimize the risks and damages caused by flooding in the affected low areas situated along the Oued Medjerda.

**Contribution to the adaptation to climate change**

Extreme events and in particular floods increase in frequency and intensity causing inevitably more damages to goods and properties.

This project contributes to avoid the devastating overflow of floods in the catchment area of the Oued Medjerda.

**Main components of the project**

- Reinforce the reservoir function of the catchment area in terms of flood control;
- Reinforce the present flood forecast and warning system (SPIA);
- Develop an evacuation and flood control system;
- Management and control of the flood-sensible lowlands.

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**PROJECT IMPLEMENTATION**

**Implementation:** Ministry of Agriculture

**Institutional partners**

DGBGTH, BPEH, DGRE, Ministry of equipment, housing and land use planning.

**Implementation period:** 3 years

**Priority of the project:** High

**Monitoring indicators:** Sustainability of the structural measures, adaptation of the population affected by floods.

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**COSTS / BENEFITS OF THE PROJECT**

**Project costs**

13.8 MDT

**Risks and vulnerability due to the non-action**

- Frequent high intensity floods,
- Loss/destruction of infrastructure,
- Health hazard and risks for human lives.
**Sector:** Forest ecosystems

**Title of the project:** Rehabilitation and development of forests and pastures in the degraded forest areas of cork oak.

**Intervention zone:** Nefza (4860 ha) – Governorate of Béja

### PROJECT DESCRIPTION

**Presentation of the problem**
The cork oak forests suffer from a qualitative and quantitative decline mainly due to their vulnerability to forest fires, parasite attacks and the general aging of the cork oak forests accentuated by the effects of climate change.

In 2005, there were only about 90,423 ha of cork oak forests still existing in a potential cork oak plantation area of about 150,000 ha, of which 22,500 ha were degraded with a cover varying between 10 and 50%. The intervention zone of Nefza (4,860 ha) is part of this area.

**Objectives**
- Protection and development of the forest resources;
- Improvement of the living conditions of forest populations.

**Contribution to the adaptation to climate change**
The cork oak forests accommodate a rich biodiversity with approximately 700 plant species, 70 bird species and 25 mammal species. Besides protecting the catchment area and the hydraulic infrastructure against the adverse effects of hydric erosion, the rehabilitation of the degraded cork oak plantations will also contribute to the carbon sequestration and will help to save and maintain the biodiversity of these forests and the esthetic and landscape-related values of the region.

**Main components of the project**
- Reforestation of low density cork oak forests;
- Appropriate silvicultural treatments;
- Reorganization of the cork harvest and reinforcement of the technical and organizational capacities of the main actors;
- Development of pastoral perimeters;
- Promotion and development of quality livestock farming and economically viable agriculture for the benefit of the population.

### PROJECT IMPLEMENTATION

**Implementation:** Ministry of Agriculture

**Institutional partners**
DGF, OEP, ODESYPANO, CRDA, INRGREF, local authorities, GDA, NGOs, private sector and specialized institutions.

**Implementation period:** 7 years

**Priority of the project:** High

**Monitoring indicators:** improvement of the vegetation cover, revenues for the local population.

### COSTS / BENEFITS OF THE PROJECT

**Project costs**
6 MDT

**Risks and vulnerability due to the non-action**
- Increased sensitivity of the trees to diverse pathogenic agents
- Degradation of certain forest stands;
- Degradation of living conditions of local people;
- Reduction of water resources.
**Sector:** Forests

**Title of the project:** Biological consolidation of sand encroachment control structures in southern Tunisian

**Intervention zone:** Governorates in Southern Tunisia

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### PROJECT DESCRIPTION

**Presentation of the problem**
Studies show, that by 2050 the region may be subject to a sensible increase in temperature and a reduction of precipitations, which may lead to a marked aridification of the soil. Based on these facts, Southern Tunisia, which mainly consists of desert ecosystems, has to be considered highly vulnerable.

**Objectives**
Planting of forest trees and shrubs over a surface of about 8,000 ha.

**Contribution to the adaptation to climate change**
Reforestation is considered the most efficient way for soil fixation, greenhouse gas reduction and adaptation to climate change.

**Main components of the project**
- Identification of the priority sites;
- Implementation of a planting program;
- Environmental monitoring and evaluation.

---

### PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Ministry of Agriculture (MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional partners</td>
<td>DGF, CRDA, concerned forestry districts.</td>
</tr>
</tbody>
</table>

**Implementation period:** 2 years

**Priority of the project:** High

**Monitoring indicators:** reforested surfaces.

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### COSTS / BENEFITS OF THE PROJECT

**Project costs**
Project costs are estimated to about 1.5 MDT/ha, in total about 12 MDT

**Risks and vulnerability due to the non-action**
- Risk of soil degradation;
- Soil degradation and marked desertification.
Presentation of the problem
Agro-forestry plantations are considered the most efficient way for soil fixation, greenhouse gas fixation and adaptation to climate change. For this reason, many programs have been launched to promote the forest and pastoral cover, thereby increasing the forest cover rate from about 9% of the national area in 1992 to 13% at present, with an average annual reforestation rate of 19,500 ha.

This approach is consolidated in different programs with the objective of reaching a reforestation rate of 16% in 2020.

Objectives
Increase the forest cover rate of the country through agro-forestry plantations with the objective of reaching a reforestation rate of 16% by the year 2020.

Contribution to the adaptation to climate change
This project will contribute to soil fixation and reduction of greenhouse gas emission by planting trees on land subject to degradation, to the preservation of the environment, the desertification control and the increase in revenues for the farmers incomes.

Main components of the project
Planting of forest trees and shrubs for multiple purposes on a surface area of about 7,500 ha annually between 2012 and 2020.

PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation: Ministry of Agriculture (MA)</th>
<th>Institutional partners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DGF, forest districts, ODESYPANO, GDA of the forestry zones, private owners.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation period: 9 years</th>
<th>Priority of the project: High</th>
</tr>
</thead>
</table>

| Monitoring indicators: planted surface, forest cover rate. | |
|----------------------------------------------------------| |

COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs</th>
<th>100 MDT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Risks and vulnerability due to the non-action</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Degradation of the vegetation cover;</td>
</tr>
<tr>
<td>• Decrease of agricultural and pastoral production on soils subjected to erosion;</td>
</tr>
<tr>
<td>• Loss of capacity of the dams;</td>
</tr>
<tr>
<td>• Desertification;</td>
</tr>
<tr>
<td>• Degradation of the rural infrastructure;</td>
</tr>
<tr>
<td>• Loss of revenues for the local population.</td>
</tr>
</tbody>
</table>
Sector: Forests

Title of the project: Rehabilitation and improvement of the forests and rangelands in the Ain Rabbaw-Sidi Bouzid region

Intervention zone: Ain Rabbaw-Sidi Bouzid

Presentation of the problem
The governorate of Sidi Bouzid has a total surface area of 7,379 sq. km located mainly in an arid bioclimatic zone. The development of the regional economy depends on the development of the agriculture, which constitutes the main economic sector in terms of employment with more than 40% of the economically active population in the governorate compared to 16% on the national level. The decrease of water resources and the desertification are increasingly menacing consequences of the climate change and a considerable challenge for the development of the region. This project aims at the sustainable management of the natural resources in order to combat desertification, promote reforestation and develop agricultural and ecotourism activities that create revenues for the population in the Ain Rabbaw-Sidi Bouzid region.

Objectives
• Development of rangeland in the sector of Ain Rabbaw and rehabilitation of their productivity;
• Identification of technical methods for rehabilitation targeting an increase of productivity of the degraded rangelands by the use of species with a high pastoral value well adapted to the future conditions of the region.

Contribution to the adaptation to climate change
The reforestation is considered one of the most efficient ways for soil fixation, reduction of greenhouse gases and adaptation to climate change.

Main components of the project
• Improvement of the pastures of about 1,000 ha by the plantation of smooth cactus plants in the main area and atriplex (saltbush) in the salty area.
• Consolidation of the water and soil conservation works (CES) by fodder scrubs to increase the input of fodder units (UF) of the rangelands and the marginalized lands.
• Improvement of the forest rangelands and the esparto grass cover on a surface of about 100 ha.
• Creation of a national park for recreation and adventure.

Project implementation

Implementation: Ministry of Agriculture (MA)
Institutional partners: DGF, CRDA Sidi Bouzid and OPE.
Implementation period: 4 years
Priority of the project: High
Monitoring indicators: reforestation surface, improvement of the fodder productivity.

Costs / Benefits of the project
Project costs: 5 MDT
Risks and vulnerability due to the non-action
• Risk of soil degradation;
• Soil degradation and desertification.
**Sector:** Forests

**Title of the project:** Reforestation and rehabilitation of the cork oak forests in Northwestern Tunisia

**Intervention zone:** The regions of Jendouba, Béja and Bizerte.

**PROJECT DESCRIPTION**

**Presentation of the problem**
The cork oak forests cover an important surface in the governorates located in the northwestern part of Tunisia. They play a primary role in the soil fixation and the prevention of hydric erosion, especially in the mountainous regions.

These forests are showing signs of aging and therefore are in need of rehabilitation in order to guarantee their survival.

**Objectives**
Reforestation and rehabilitation of 20,000 ha of cork oak forests in Northwestern Tunisia.

**Contribution to the adaptation to climate change**
The reforestation is considered the most efficient way for soil fixation, the reduction of greenhouse gases and the adaptation to climate change.

**Main components of the project**
The project aims at the regeneration of a total surface area of 20,000 ha in the regions of Jendouba, Béja and Bizerte by reforestation with natural stands of cork oak, the productivity of which is in continuous decline due to their advanced age.

**PROJECT IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Implementation: Ministry of Agriculture (MA)</th>
<th>Institutional partners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DGF, CRDA of Jendouba, Béja and Bizerte and ODESYPANO.</td>
</tr>
</tbody>
</table>

**Implementation period:** 4 years  
**Priority of the project:** High

**Monitoring indicators:** density of the forest cover, indicators for the reduction of forest fires (surface area, number, cartography, etc.).

**COSTS / BENEFITS OF THE PROJECT**

<table>
<thead>
<tr>
<th>Project costs</th>
<th>40 MDT</th>
</tr>
</thead>
</table>

**Risks and vulnerability due to the non-action**
- Risk of soil degradation;
- Regression of forests;
- Decrease in revenues of the local population.
**ECOSYSTEMS**

<table>
<thead>
<tr>
<th>Sector:</th>
<th>Ecosystems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title of the project:</strong></td>
<td>Development of adapted species for multiple uses in the arid regions.</td>
</tr>
<tr>
<td><strong>Intervention zone:</strong></td>
<td>Sidi Bouzid, Sfax, Gafsa, Tozeur, Kébili, Gabès, Medenine and Tataouine</td>
</tr>
</tbody>
</table>

### PROJECT DESCRIPTION

#### Presentation of the problem
The main problems encountered in the arid regions are the low survival rate of plantations and the low growth of stands. In essence, the planted species are not really adapted to their environment.

#### Objectives
- Improve the plants and the quality of the seeds;
- Develop and multiply species adapted to arid regions.

#### Contribution to the adaptation to climate change
The use of quality plants, of multipurpose adapted species may generate a higher survival rate, a better growth of the stands and better resistance of the plantations to the climate hazards (drought, salinity). Furthermore, the local population may benefit directly and indirectly allowing the development of a local economy.

#### Main components of the project
- Characterization and creation of seed-production stands and development of species adapted to Tunisia’s arid regions.
- Additional means to ensure a better quality of the seeds while obeying to the international standards.
- Consolidation and rehabilitation works of the existing modern nurseries.
- Establishing and implementation of a planting program including 5,000 ha of multipurpose species.

### PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation:</th>
<th>Ministry of Agriculture (MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional partners</td>
<td>DGF, INRGREF</td>
</tr>
<tr>
<td>Implementation period:</td>
<td>5 years</td>
</tr>
<tr>
<td>Priority of the project:</td>
<td>High</td>
</tr>
<tr>
<td>Monitoring indicators:</td>
<td>number of modernized nurseries, quality of the seeds, differentiation of the provenances, variability of the production, planted surfaces.</td>
</tr>
</tbody>
</table>

### COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs</th>
<th>100 MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks and vulnerability due to the non-action</td>
<td></td>
</tr>
<tr>
<td>• Low survival rate of the plantations;</td>
<td></td>
</tr>
<tr>
<td>• Low growth of the stands;</td>
<td></td>
</tr>
<tr>
<td>• Planting of species not adapted to the environment.</td>
<td></td>
</tr>
</tbody>
</table>
Presentation of the problem
The Nefzaoua region is characterized by a Saharan bioclimate (two thirds of the regional surfaces receive less than 50 mm of rainfall/year) and therefore does not have enough fertile soils despite the extent of its surface area. Furthermore, salting of the soil, superficial crusts (gypseous and limestone) and mobile sands enhanced by the presence of an eroded relief are the main difficulties threatening the soil resources of the region in general. The scarce natural vegetation suffers from numerous degradation phenomena of physical and anthropogenic origin. The rangelands, which often show a poor vegetation cover, are affected by aridity and degradation phenomena (overgrazing, deforestation, ...) and are therefore often transformed into vast stony desert planes (Regs) or sand dunes.

Objectives
• Improve the effectiveness of the management programs for natural resources and desertification control;
• Diversification, intensification of the exploitation and valorization system of agricultural products.

Contribution to the adaptation to climate change
Reduce the impact of the climatic conditions to avoid desertification notably by improving fodder production, reducing the pressure on natural resources and ensuring a more efficient use of water resources.

Main components of the project
• Implementation of a local action plan for the Ségui-Menchia zone;
• Research and development on the mobilization of water and soil management;
• Diversification of the oasis production systems and improvement of their productivity;
• Consolidation of programs for combating sand encroachments.

PROJECT IMPLEMENTATION

Implementation: Ministry of Agriculture (MA)  Institutional partners: CRDA, local actors

Implementation period: 5 years  Priority of the project: High

Monitoring indicators: useable agricultural surface, surfaces affected by the different forms of degradation and desertification, revenues of the population, participation of the population in the programs to fight sand encroachment, intensity of the use of water resources.

COSTS / BENEFITS OF THE PROJECT

Project costs 100 MDT  Risks and vulnerability due to the non-action
• Progression of sand dunes and risks of damage to infrastructure and irrigated perimeters
• Marked erosion of agricultural land and acceleration of desertification
• Degradation of the natural ecosystems.
Presentation of the problem
The climate in the governorate of Tozeur is characterized by aridity and highly variable precipitations. These climatic conditions enhance soil erosion, which may be caused by water or wind. Although located in the Saharan zone, the governorate has substantial water resources. Today the water system used for irrigation is confronted with problems related to the extension of the irrigated perimeters that – in association with the overuse of some groundwater resources - led to an overlapping of the groundwater management. The extension of the rangelands, the predominance of pastoral activities and their fundamental role for the economy of the delegations most suffering from erosion, leads the authorities to consider a reduction of overgrazing and to define an adequate response to the dynamic growth of the herds.

Objectives
Integrated and sustainable management of the natural resources, desertification control.

Contribution to the adaptation to climate change
Ease the impact of the climatic conditions to avoid desertification by improving fodder production, reducing the pressure on the natural resources (water, soil) and promoting a more efficient use of water resources.

Main components of the project
- Diversification of the oasis production systems and improvement of their productivity;
- Development and regeneration of the rangelands and promotion of livestock farming;
- Combating sand encroachment and management of the sand steppes;
- Development of a local economic structure and promotion of activities generating income
- Programs on research and development.

PROJECT IMPLEMENTATION

Implementation: Ministry of Agriculture (MA)
Institutional partners: CRDA, local actors
Implementation period: 5 years
Priority of the project: High
Monitoring indicators: useable agricultural surface, surface affected by the different forms of degradation and desertification, revenues for the population, unemployment rate, participation of the population in programs to fight sand encroachment, intensity of the use of water resources

COSTS / BENEFITS OF THE PROJECT

Project costs: 33 MDT
Risks and vulnerability due to the non-action
- Progression of sand dunes and risks for damaging the infrastructure and the irrigated perimeters;
- Marked erosion of agricultural lands and acceleration of desertification;
- Degradation of the natural ecosystems.
Presentation of the problem
The governorate of Gafsa is characterized by an arid climate with a highly variable pluviometry in both space and time, a high level of evapo-transpiration and winds blowing all year round. The over-exploitation of certain groundwater reservoirs and the degradation of their quality have an effect on the irrigated agriculture. The land is also threatened by the erosion (300,000 ha) with 80,000 ha of very sensitive lands forming high priority zones.

Objectives
Promote the regional development based on the integrated and rational management of the natural resources.

Contribution to the adaptation to climate change
Ease the impact of climatic conditions to avoid desertification through the improvement of fodder production, the reduction of the pressure on the natural resources (water, soil) and the promotion of a more efficient use of water resources.

Main components of the project
• Improve the efficiency of water and promote biological and alternative agriculture;
• Promotion of eco-agriculture;
• Diversification of the oasis production systems and improvement of their productivity;
• Consolidation of programs combating sand encroachment.

PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Institutional partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture (MA)</td>
<td>CRDA, local actors</td>
</tr>
</tbody>
</table>

| Implementation period: 5 years | Priority of the project: High |

Monitoring indicators: useable agricultural surface, surface affected by the different forms of degradation and desertification, revenues of the population, participation of the population in programs to fight sand encroachment, intensity of the use of water resources.

COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs 33 MDT</th>
<th>Risks and vulnerability due to the non-action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Progression of the sand dunes and the risks of damaging the infrastructure and the irrigated perimeters;</td>
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<tr>
<td></td>
<td>• Marked erosion of the agricultural lands and acceleration of desertification;</td>
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<tr>
<td></td>
<td>• Degradation of the natural ecosystems.</td>
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</tbody>
</table>
Presentation of the problem
The region is characterized by a continental climate varying from arid to Saharan, little variable in space but highly variable in time. The good water resources are located in the South of the governorate far away from the big settlements, therefore requiring heavy investments for their mobilization. Furthermore, 80% of the land appropriate for agriculture is sensible to erosion. The agricultural lands are still cultivated in a traditional way and funds are insufficient to protect the irrigated perimeters against the climate hazards, notably against the progression of the sand dunes.

Objectives
Integrated and sustainable management of natural resources and desertification control.

Contribution to the adaptation to climate change
Ease the impact of climate conditions to avoid desertification by improving the fodder production, reducing the pressure on natural resources (water, soil) and promoting a more efficient use of the water resources.

Main components of the project
• Rehabilitation and protection of the Achouch oasis (delegation of Remada) against sand encroachment;
• Protection of the GP19 road and of Bir Amir against encroachment (sector between Remada-Tataouine);
• Desertification control in the governorate of Tataouine;
• Desertification control of the irrigated public perimeters (IPP) of Khil El Kabta (delegation of Ghomrassen);
• Support for the management boards to create rangeland in the delegations of Dhiba, Smar and Tataouine North.

PROJECT DESCRIPTION

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PROJECT IMPLEMENTATION

Implementation: Ministry of Environment (ME)  Institutional partners concerned CRDA, local actors
Implementation period: 5 years  Priority of the project: High
Monitoring indicators: useable agricultural surface, surface affected by the different forms of degradation and desertification, revenues of the population, participation of the population in the programs fighting sans encroachment, intensity of the use of the water resources.

COSTS / BENEFITS OF THE PROJECT

Project costs 33 MDT  Risks and vulnerability due to the non-action
• Progression of the sand dunes and the risks of damaging infrastructure and the irrigated perimeters;
• Marked erosion of the agricultural land and acceleration of desertification;
• Degradation of the natural ecosystems.
Presentation of the problem
The study on the vulnerability of the cork oak stands to CC carried out in 2011 revealed that by 2050 and according to scenario A2, 41,661 ha would be classified as being the stands highly vulnerable to CC, the impact being highly significant with a risk of loss equivalent to 18,500 ha, if no measures were taken. Until now, the forest rangers have been using standardized management methods, forestry and cork oak growing practices, which apply to all lines of cork oak stands. This has been done despite the fact that it has been demonstrated that it is necessary to adapt all these techniques to integrate the impact of climate change.

Objectives
Mitigate the socio-economic and environmental costs of the disturbances aggravated by the climate change and maintain the social values of the present ecological and economic systems of the cork oak stands in order to preserve the economies linked to cork and the means of subsistence of the population depending on this industry.

Contribution to the adaptation to climate change
Improve the resilience of the cork oak stands to climate change by applying the rules of good forestry practice and by adapting the forests to the increasing risks of uncontrolled fires, pest attacks and diseases.

Main components of the project
- Adaptation of the guidelines for the management of cork oak stands;
- Revision and application of the development plans of the forest lines classified as being highly vulnerable to CC;
- Increase the social resilience of the forest population.

PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>Implementation: Ministry of Agriculture (MA)</th>
<th>Institutional partners</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>DGF, forest districts and theirs services on regional level. Jendouba, Ain Draham, Béja, Bizerte</td>
</tr>
</tbody>
</table>

| Implementation period: 5 years | Priority of the project: High |

<table>
<thead>
<tr>
<th>Monitoring indicators:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The development plans of the lines of Feija I, II and IV are revised according to the new development guidelines;</td>
</tr>
<tr>
<td>2. The adaptation measures will be implemented in at least one line in Feija.</td>
</tr>
</tbody>
</table>

COSTS / BENEFITS OF THE PROJECT

<table>
<thead>
<tr>
<th>Project costs</th>
<th>Risks and vulnerability due to the non-action</th>
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<tbody>
<tr>
<td>4 MDT</td>
<td>In economic terms, the actualized loss (2005) in goods and services would amount to 2.475 million DT according to scenario B2, whereas they would amount to 38.021 million DT according to scenario A2. This amount corresponds to a reduction in the accumulated production volume between 2010 and 2050 of 0.4% according to scenario B2 and of 5.6% according to scenario A2.</td>
</tr>
</tbody>
</table>
**ECOSYSTEMS**

**Sector:** Esparto grass surfaces

**Title of the project:** Development of the degraded esparto grass surfaces

**Intervention zone:** Kasserine, Sidi Bouzid, Gafsa, Kairouan, Gabès and Médénine

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**PROJECT DESCRIPTION**

**Presentation of the problem**
The esparto ecosystem particularly threatened by the combined effects of anthropogenic and climatic factors will no longer ensure the environmental services and the supplies necessary for the socio-economic development of the populations depending on this natural resource in general.

**Objectives**
Reinforce the management of the esparto surfaces in the global framework of the integrated development of the territory that takes into account all the components that ensure a sustainable development of the resources. Also, guarantee the socio-economic development of the local population in an environment threatened by the climate change, which will accentuate the degradation of the esparto surfaces.

**Contribution to the adaptation to climate change**
Besides the social and economic role for the population and the National Society for Cellulose and Esparto Paper (SNCPA), the esparto surfaces play an important role in the soil fixation and the desertification control and contribute to the fixation of more or less important quantities of carbon according to the vegetation status and according to the soil cover rate, thereby taking part in the mitigation of greenhouse gas emission. For example, an esparto surface with a productivity of 400 kg of green esparto per ha, may fixe 90 kg of carbon per ha and year.

**Main components of the project**
- Revision of the development plans for the esparto surfaces integrating CC and presentation of innovative technical solutions to preserve and develop those surfaces;
- Socio-economic development of the local population (promotion of ecotourism, promotion of livestock farming, valorization of the manufacturing of local resources, promotion of the esparto handicraft, improvement of the basic infrastructure);
- Reconstitution of the Aleppo pine with the aim of improving the state of the esparto surfaces as undergrowth and promoting the valorization of the Non-Wood Forest Products (PFNL);
- Institutional and legal strengthening of the esparto district;
- Reinforcement of the management capacities.

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**PROJECT IMPLEMENTATION**

**Implementation:** Ministry of Agriculture (MA)

**Institutional partners**
DGF, CRDA, Office de l'Elevage et des Pâturages, SNCPA, NGOs, handicraft, etc.

**Implementation period:** 5 years

**Monitoring indicators:** esparto production, fodder production, revenues for the local population

**Priority of the project:** High

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**COSTS / BENEFITS OF THE PROJECT**

<table>
<thead>
<tr>
<th>Project costs</th>
<th>20 MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risks and vulnerability due to the non-action</strong></td>
<td></td>
</tr>
<tr>
<td>The economic evaluation of the goods and services supplied by the ecosystem helped to estimate the loss of these goods and services which according to certain CC scenarios may disappear or suffer a sensible loss of productivity. The losses of the esparto ecosystem in terms of economic values are estimated to 43% in 2020 and 51% in 2050 compared to the reference year 2007. Therefore, the protection and the preservation of this ecosystem for future generations constitute a priority for the region.</td>
<td></td>
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</tbody>
</table>