



## 5 Afforestation

**The Role of Ministry of State for Environmental Affairs in implementing the National Program for safe use of treated sewage water for afforestation**

### 5-a Introduction

The Arab Republic of Egypt is concerned with maintaining a clean environment (air, water and soil). Consequently, it gives extreme priority to meeting the different environmental challenges, correcting wrong practices that lead to environmental pollution and impose a risk on citizens' health, or to those which deplete natural wealth due to over exploitation of water, air or soil natural resources.

To contribute in this respect, the Ministry of State for Environmental Affairs has developed a plan for the protection of water resources from the different types of pollution, and for the safe utilization of treated wastewater in planting man-made forests that can be of economic benefit, as the State is currently spending billions of pounds on the treatment of such

wastewater without benefiting from it.

The reuse of treated sewage water in afforestation is considered a fundamental adjunct to Egypt's water resources. This quantity, which amounts until today to 2.4 billion cubic meter/year, was never exploited, but was considered a significant burden, since it pollutes the environment when discharged into the Nile, sea or in the desert; sometimes, it is left to seep into the soil, thus polluting aquifer stocks and increasing the underground water table. With scientific progress and increase of environmental awareness, exploitation of such type of water has become a strategic inevitability.

The Ministry of State for Environmental Affairs (EEAA) is responsible for the implementation of the National Program for



Egyptian-Chinese Friendship Tree forest at Sadat City

for afforestation Safe Use of Treated sewage water in cooperation with the Ministry of Agriculture and Land Reclamation (Undersecretary of State for Afforestation and Environment), the Ministry of Housing, Utilities and Urban Communities (MHUC), the Ministry of Health and Population (MoHP), the Ministry of Local Development (MoLD), the Ministry of Water Resources and Irrigation (MWRI) and Specialized Research Centers.

## 5-b Objectives of The National Program

### a. Strategic Objectives

- Solving the problem of 2.4 billion cubic meter of accumulated wastewater; Disposal of such quantity represents a major environmental problem.
- Benefiting from this huge water quantity and not squandering a water resource that could be exploited economically.
- Limiting the discharge of wastewater into the River Nile or in seas in order to prevent bacteriological and chemical pollution of water (from heavy elements and harmful organic compounds), and the degradation of fish wealth, river and marine bio-ecological systems. Discharging into open desert also pollutes both surface and deep underground reservoirs.
- Preventing adverse practices related to the use of untreated wastewater in producing agriculture and food products.
- Contributing to the provision of health benefits to individuals as a result of eradicating reproduction sources of insects and disease vectors caused by the accumulation of stale wastewater.
- Transforming an area of 400,000 feddans from desert into ecologically rich areas in terms of:
  1. Preserving the soil.
  2. Enriching natural and biological components in arid and semi-arid areas.
  3. Forming attraction and development zones for potential inhabitants of these areas.
  4. Adding productive desert lands to the agricultural environmental system.
- Participating in cleaning air pollutants, adding climate soothing factors in arid and semi-arid areas mostly adjacent to desert boundaries, and protecting cities and housing areas from sand dispersion and dust storms.



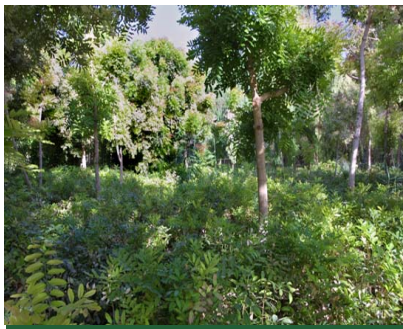
Workers in timber forests observe environmental

*Afforestation*

- Participating in restoring the equilibrium of the biosphere components through increasing oxygen quantity and absorbing quantities of carbon dioxide.

**b. Direct Economic Objectives**

- Create agricultural industry based on woods as:
  1. Bio-diesel oil extraction and refining units from the seeds of *Jatropha curcas* trees.
  2. Establishing small plants for the production of silk yarn from silk-worm bred on mulberry trees.
  3. Establishing a factory for the production of ropes from the cultivation of *Agava sisalana*, used for anchoring ships and in port uses.



Mahogany Trees in Luxor forest

- Benefiting from treated wastewater and transforming it into an economic value sharing in some offsetting the high costs of for establishing wastewater treatment plants.

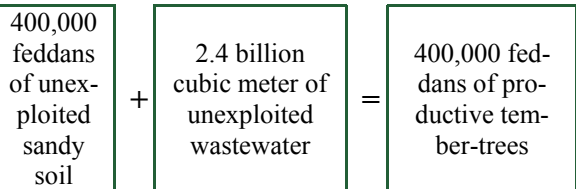


Jatropha curcas in Luxor Forest

- Establishing a wood factory to be used in the manufacturing of furniture, housing and coal industries.
- Replace imported wood by locally produced wood, which would improve the balance of payment.
- Create job opportunities for genders living in the areas where these activities will take place.

**c. Indirect Objectives**

- Improve air quality.
- Protect water and soil sources from pollution.
- Cultivate new lands and combat desertification.



Forest-trees cultivation using wastewater

### 5-c Program Implementation Sites

This program is implemented in areas sur-

rounding wastewater stations in the different Egyptian governorates with a desert backlog.

List of established Afforestation Areas Irrigated by Treated Sewage Water						
Sr.	Governorate	Forest	Area (Feddan)	Plant Dis-charge Capacity (m <sup>3</sup> /day)	Irrigation System	Cultivated Plant Varieties
1	Ismailia	Sarabium	1000	90000	Drip irrigation	Cupressus sp. – Pinus sp. – Khaya senegalensis – Casuarina sp. – Eucalyptus sp. – Morus sp. – Concarpus sp. – Agava sisalana – Dendrocalamus strictus
2	Mounefia	El Sadat*	500	18000	Drip irrigation	Cupressus sp. – Pinus sp. – Acacia saligna – Casuarina sp. – Eucalyptus sp. – Agava sisalana – Morus sp. – Khaya senegalensis – Ornamental trees and plants
3	Luxor	Luxor	1700	30000	Modified Flood and Drip Irrigation	Khaya senegalensis – Eucalyptus sp. – Acacia saligna – Morus sp. – Jatropha curcas
4	Kena	Kena	500	23000	Modified Flood Irrigation	Eucalyptus sp. – Khaya senegalensis
5	South Sinai	Tur Sinai	200	3500	Modified Flood and Drip Irrigation	Casuarinas sp. – Eucalyptus sp. – Morus sp. – Popular sp.
6	Aswan	Edfu	300	8000	Modified Flood Irrigation	Khaya senegalensis
7	New Valley	El Kharja	400	13000	Modified Flood Irrigation	Khaya senegalensis – Casuarina sp. – Eucalyptus sp. – Terminalia sp. – Tamarix sp.
8	New Valley	Paris	200	18000	Drip Irrigation	Cupressus sp. – Pinus sp. – Acacia saligna – Casuarina sp. – Eucalyptus sp.
9	Giza	El Saf	500	65000	Drip Irrigation	Khaya senegalensis – Casuarina sp.
10	Dakahleya	Gamasa	150	1500	Drip Irrigation	Cupressus sp. – Pinus sp.
11	South Sinai	Sharm El Sheikh	60	3000	Drip Irrigation	Casuarina sp. – Eucalyptus sp. – Ornamental trees and plants
<b>Total</b>			<b>5510</b>			
* Egyptian-Chinese Friendship Forest						

### List of Under Establishment Afforestation Areas Irrigated by Treated Sewage Water

Sr.	Governorate	Forest	Area (Feddan)	Plant Dis-charge Capacity (m <sup>3</sup> /Day)	Irrigation System		Cultivated Plant Varieties
12	Aswan	Aswan	500	8000	Drip	Irrigation	Khaya senegalensis – Acacia saligna – Eucalyptus sp. – Terminalia sp.
13	Aswan	Nasr El Nouba	100	1400	Drip	Irrigation	Khaya senegalensis – Acacia saligna – Eucalyptus sp. – Terminalia sp.
14	Beni Sueif	El Wasta	500	10000	Drip	Irrigation	Khaya senegalensis – Jatropha curcas
15	New Valley	Moot	700	10000	Drip	Irrigation	Terminalia sp.
16	North Sinai	El Ar-ish	200	15000	Drip	Irrigation	Khaya senegalensis – Jatropha curcas
17	Assiout	Assiout	40	50000	Drip	Irrigation	Khaya senegalensis – Jatropha curcas
18	Sohag	West of Sohag	1000	28000	Drip	Irrigation and Modified Flood Irrigation	Khaya senegalensis
19	Sohag	East of Sohag	1000	28000	Drip	Irrigation and Modified Flood Irrigation	Khaya senegalensis
20	Red Sea	Hurghada	200	10000	Drip	Irrigation	Casuarina sp. – Khaya senegalensis
21	South Sinai	Nouei-ba	200	4000	Drip	Irrigation	Casuarina sp. – Khaya senegalensis
22	Suez	Attakah	400	30000	Drip	Irrigation	Jatropha curcas – Eucalyptus sp. – Cupressus sp. – Casuarina sp.
<b>Total</b>			<b>4840</b>				

### 5-d Ongoing Activities and Future Action Plan

Afforestation are currently cultivated and irrigated by treated sewage water. Some tember forests have been planted, and there are plans for providing necessary funding for cultivating 80 thousand feddans of forest-trees (10 thousand feddans annually), adjacent to sewage water treatment plants on the desert backlog. The project aims to cultivate 400,000 feddans using 2.4 billion cubic meter of treated wastewater annually.

### Types of Tember Trees Cultivated in Forests

Tember trees varieties cultivated in forests have been selected carefully based on sound scientific experience providing high economic value, and suitable for the region's ecological (environmental) conditions (soil and climate). Windbreakers have been planted for roads and cultivated areas to suit local climatic conditions.



Eucalyptus sp

### 5-e Benefits from State Afforestation Planting Efforts

- a. The program realizes one of aspects of the safe use of treated sewage water in the cultivating of man-made forests. During the current phases, the program has several objectives including:
  - Benefiting from treated wastewater in cultivating forests and improving envi-

ronmental conditions with respect to climate and increased biodiversity.

- Reclaiming and adding new desert areas, and establishing new communities adjacent to these forests.



Cupressus sp.

- Creating wood industries and adding new income sources of secondary production such as breeding silkworms, silk and Agava sisalana industries, and biodiesel oil and ornamental plants production.

#### Types of Tember Trees Cultivated in Forests

1	Cupressus sp.
2	Pinus sp.
3	Khaya senegalensis (African Mahogany)
4	Eucalyptus sp.
5	Acacia saligna
6	Morus sp.
7	Agava sisalana
8	Casuarina sp.
9	Concarpus sp.
10	Dendrocalamus Strictus (Bamboo – Under experimentation)
11	Jatropha curcas
12	Terminalia sp.
13	Popular sp.
14	Some ornamental trees and plants

- Providing new job opportunities for genders.
- Protecting water sources and soil from

## Afforestation

pollution.

- Satisfying part of the wood demand from locally produced wood instead of imported wood, thus improving the balance of payment.
- Protecting desert areas and new cities from winds, sand dispersions and sandy storms with their associated health and environment adverse impacts.



Flamenco at Sarabium Forest

- Using these forests as domestic tourist sites and as entertainment places for the residents in the new cities.

### b. Feasibility Study Financial and Economic Results

Return percentage per pound (cost and value) = LE1.34

Domestic return rate = 15.6%



silkworms on mulberry leaves at Sarabium Forest in Ismailia

### c. Social Feasibility Results

- Participating in solving unemployment problem among gender by providing 5 feddans in average to each graduate.
- Transforming treated wastewater to an economic added value to national production, resulting in increased national income.



Concarp sp.

Improving balance of payment deficit by replacing imported woods by locally produced woods.

### d. Environmental Impact Assessment (EIA) (Environmental Feasibility)

- Improving air quality and decreasing pollution.
- Safe disposal of wastewater, thus reducing pollution.

This shows that the National Program for the safe usage of treated sewage water for Afforestation has an economic advantage and no harmful environmental impacts; rather, it improves environmental quality. Thus, several international bodies and Arab states are encouraged to participate in this program and transfer the pioneering Egyptian experience in this domain. The Algerian Popular Democratic Republic was the first Arab state to adopt this program.

## 5-f Tree Planting and Green Areas in Egyptian Governorates

Tree planting projects and increasing green areas are considered one of the most important projects given particular concern by the Ministry of State for Environmental Affairs. The implementation of these projects results in:

- Improving air quality, reducing pollution rates and air suspended dust.



Agave sisalma in Ismailia Forest

- Upgrading air quality, thus improving public health level. With the assistance of all Egypt's governorates, municipalities and several organizations and NGOs, the Ministry has provided technical and financial support for establishing nurseries for tree planting projects in governorates as well as for providing necessary seedlings required for tree planting.
- The Ministry puts great efforts in contributing in the establishment of gardens in Greater Cairo and all other governorates. The Ministry has also provided technical and financial contributions for developing slum areas and establishing public gardens and tree planting in their access roads, as well as exploiting empty spaces within cities and residential neighborhoods to increase green areas.

## 5-g Green Belt Project around Greater Cairo (Cairo, Giza and Qalioubeya)

### a. Project General Objectives

- Spreading green areas in available empty spaces around the ring road of Greater Cairo to beautify the capital, develop a feeling and care for trees and the taste of citizens.
- Contributing in environment pollution protection by intensifying greenery around Greater Cairo in order to mitigate harmful vital impacts affecting public health and safety.
- Investing the areas around Greater Cairo through tree planting for achieving national economic benefit from cultivated trees.
- Protecting Greater Cairo residents against chest and allergy diseases and preserving their health.
- Providing employment opportunities to young graduates through orienting them with project activity-related maintenance techniques.
- Benefiting from the treated wastewater used to be wasted into the desert to avoid the loss of the huge investments spent on treatment.

### b. Direct Objectives

Green Belt Project will contribute in preventing:

- Increased air pollution rates around Greater Cairo.
- Increased rates of gaseous pollutants, emissions and dust harmful to health.
- Weak capacity of the ecosystem in Greater Cairo to undertake its essential vital functions requested for human health, creatures and development.
- Negative health impact on Greater Cairo residents.



A nursery for producing Mahogany trees seedling at Luxor Forest, producing around one million seedlings per year

### Implementation Phases

The targeted area to be planted is 100 km long and 25 m wide on both sides. There are four implementation phases:

**Phase One:** 50 km in Cairo governorate, 28 km in Giza governorate and 22 km in Qaliubeya.

**Phase Two:** Includes the roads intersecting with the ring road, with a depth of 25km on both sides.

**Phase Three:** Establishment of 80 feddans gardens, in addition to gardens and forests in the forests in October Panorama, El Roubeki, Tenth of Ramadan, Imbaba airport, El Saf, 15 May, 6 of October and El Tebin.

**Phase Four:** Green belts around new cities.



Tree planting in Environment Youths Neighborhood, El Kharga Oasis

The investment cost of the first phase on the ring road is LE 13,721,000.

Technical studies have been completed. Tendering procedures are currently being undertaken for the project first phase among major Agriculture Companies.

### 5-h Future Vision

MSEA Afforestation and tree planting efforts have major importance and environmental impacts including the full reuse of huge quantities of sewage water, constituting a heavy burden with respect to their disposal, in activities of economic, social and environmental benefits, contributing in the sustainable development of marginal and unexploited desert areas.

These fruitful efforts will have great impact on the future represented mainly in the continuous increase in treated wastewater quantities; the successive establishment of wastewater treatment plants countrywide. The current quantity estimated at 2.4 billion m<sup>3</sup>/year is expected to increase to more than 4 billion m<sup>3</sup>/year within the coming few years.

This would require an increase in the constructive efforts by MSEA and other line ministries in collaboration with relevant organizations in afforestation and tree-planting using treated wastewater.

MSEA is adopting leading projects for studying the potential of using treated sew-

age water in new developed activities to be implemented in the near future with the objective of diversifying the methods of using such wastewaters safely in the production of safe products such as agriculture non-edible products used in advanced agriculture industries.

The future MSEA efforts will comprise the transfer of more unexploited desert areas into economically productive areas participating in environment improvement in the Arab Republic of Egypt. The Ministry is also planning to intensify tree planting efforts and the establishment of gardens in old cities as well as in new urban communities due to their health, aesthetic, environmental and tourism beneficial impacts.

#### General Information on The Advantages of Tree Planting

- A medium size tree absorbs 1.7 kg of carbon dioxide daily, and produces 140 liters of oxygen daily.
- A medium size car generates around 11.9 kg of carbon dioxide daily (if it moves 50 km/day).
- 7 trees should be planted for eliminating the pollution impact of one car. Since in Cairo, 1.5 million cars circulate daily, it would be necessary to plant 10.5 million trees.
- In addition to the benefits of trees in absorbing carbon dioxide, they also reduce the speed of air carrying dust, which would cause suspended pollutants to deposit leaving the air cleaner.



Jatropha flowering and fruiting before



Ornamental shrubs



Sericulture activities



Larvae in the third stage