

NATIONAL REPORT ON COMBATING DESERTIFICATION

CYPRUS

**Environment Service, Ministry of Agriculture,
Natural Resources and Environment
February, 2007**

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Conditions in Cyprus are typical of all countries in the Mediterranean region: semi-arid climate; poor and erodible soils; water shortages; vegetation cover losses, largely due to uncontrolled fires; rural land abandonment and a high urbanization rate; often unsustainable practices in agriculture, irrigation, water exploitation, etc. Cyprus has long been experiencing the impacts of desertification as a result of this combination of natural and human-induced factors.

Desertification Factors in Cyprus

■ **Climate**

Low rainfall, with strong seasonal variations and uneven geographic distribution, coupled with high temperatures during the summer season. Over the recent decades, precipitation is characterized by a decreasing pattern, while temperature follows an increasing trend.

■ **Soil**

Soil degradation, particularly erosion, due to human factors, such as the overexploitation of natural resources, intensive cultivation and inappropriate agricultural practices, as well as deforestation, fires and rainstorms.

■ **Water Resources**

Restricted availability of water resources, due to long periods of drought, overexploitation, population growth and socioeconomic development.

■ **Anthropogenic factors**

Rural land abandonment as a result of urbanization; overexploitation of land resources; inappropriate agricultural, irrigation and drainage practices; overgrazing; deforestation and forest fires.

Measures to Prevent and Mitigate Desertification in Cyprus

■ **Water management**

During the last few decades attention was paid to the systematic study and construction of water development infrastructure, both for storage and recharge purposes. Currently, government water policy focuses on the maximum potential exploitation of non-conventional water resources, such as recycled water, and the efficient use of available resources. Substantial work has also been carried out in investing in and developing appropriate irrigation methods.

■ **Management of agricultural land and soils**

The Rural Development Plan covers a number of measures and provides support for the use of environmentally friendly farming methods, such as crop rotation; the preservation of traditional varieties of cultivations, shrubs and other plants; the reconstruction of bench terraces and dry stonewalls; the afforestation of abandoned agricultural land; and agriculture in disadvantaged areas of the island.

■ Forest management

The National Forest Programme promotes the protection and extension of the country's forest cover and the afforestation of abandoned land and degraded areas. Furthermore, the Rural Development Plan covers measures for the protection of forests against fire, the reforestation of burnt areas, the afforestation of agricultural and non-agricultural land and the development of private forests. An extensive protection system against fires is also in place.

National Action Programme

The Environment Service is currently in the process of preparing the tenders for the preparation of a National Action Programme. This will include measures for the management of water resources; the promotion of sustainable agricultural practices, traditional agricultural methods and traditional crop varieties; the further promotion of afforestation, the enhancement of the fire protection system; as well as institutional and fiscal measures to encourage population to remain in the rural areas. Additionally, the programme will include education and awareness raising activities regarding the impacts of desertification, appropriate practices and other necessary measures to combat it.

1. Focal point institution

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Country-specific websites relating to desertification	www.moa.gov.cy

2. Status of NAP

Date of validation	
NAP review(s)	
NAP has been integrated into the poverty reduction strategy	
NAP has been integrated into the national development strategy	
NAP implementation has started with or without the conclusions of partnership agreements	
Expected NAP validation	
Final draft of NAP exists	

Formulation of a draft NAP is under way

Basic Guidelines for a NAP have been established	Yes
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Process has only been initiated	Yes
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Process has not yet started	
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3. Member of SRAP/RAP

<i>Name of subregional and/or regional co-operation framework</i>	<i>Involvement specifically in topics such as water harvesting techniques, soil erosion, etc.</i>
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2.	
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4. Composition of the NCB

	<i>Name of institution</i>	<i>Government</i>	<i>NGO</i>	<i>Male/Female</i>
1.	Environment Service	<input checked="" type="checkbox"/>		
2.	Forestry Department	<input checked="" type="checkbox"/>		
	Department of Agriculture	<input checked="" type="checkbox"/>		
3.	Fisheries Department	<input checked="" type="checkbox"/>		
4.	Water Development Department	<input checked="" type="checkbox"/>		
5.	Geological Survey Department	<input checked="" type="checkbox"/>		
6.	Meteorological Services	<input checked="" type="checkbox"/>		
7.	Town Planning and Housing Department	<input checked="" type="checkbox"/>		
8.	Institute for Agricultural Research	<input checked="" type="checkbox"/>		

5. Total number of NGOs accredited to the process:

<i>Has an NGO National Coordinating Committee on desertification been established; if yes, how many NGOs or civil society organisations participate in it?</i>	<i>No. However NGOs are represented in all major committees by the Federation of Environmental and Ecological Organisations of Cyprus.</i>
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6. Total number of acts and laws passed relating to the UNCCD: 1

	<i>Title of the law</i>	<i>Date of the Adoption</i>
1.	Law ratifying the Convention to Combat Desertification (No.	23.12.1999

23(III)/1999)

7. The consultative process

Number of partnership agreements that have been concluded and/or re being initiated within the framework of the UNCCD

<i>Official title of partnership</i>	<i>Donor(s), international organisation(s), and/or agencies of the UN system involved</i>	<i>Date of (expected) conclusion</i>
1.		
2.		

List of consultative meetings on UNCCD implementation

<i>Name of meeting</i>	<i>Date/year</i>	<i>Donor countries involved</i>	<i>International organisations or agencies of the UN system involved</i>
1.			
2.			

8. Name up to 10 projects currently under implementation which are directly or indirectly related to the UNCCD

	<i>Name of project</i>	<i>Project implemented within the framework of</i>	<i>Timeframe</i>	<i>Partners involved</i>	<i>Overall budget</i>
1.	Programme for the preservation and improvement of the natural environment in rural areas	Rural Development Plan	2004 - 2006	Department of Agriculture	91.800.000 euro
2.	Programme for the protection, and the sustainable development and management of forest resources	Rural Development Plan	2004 - 2006	Forestry Department	8.500.000 euro
3.	National Forest Programme		2001 – 2010	Forestry Department	
4.	Programme for the treatment and reuse of recycled water	Water management policy	- 2012	Water Development Department	
5.	Water Development Programme	Water management policy	- 2015	Water Development Department	

Desertification is currently one of the problems that threaten the world's ecosystems and social structures. The Mediterranean region has long been experiencing the impacts of desertification and suffered from the fragility of its ecosystems, particularly in the coastal areas where most of the population is concentrated. As a result, Cyprus has long recognized the pressing need for controlling and managing the phenomenon of desertification, with its complex dynamics which are affected both by natural phenomena as well as human activities, and its short and long term impacts on the natural environment and society as a whole.

Cyprus has signed and, in 1999, ratified the Convention to Combat Desertification. The competent authority for implementing the Convention is the Ministry of Agriculture, Natural Resources and Environment.

The need for controlling and managing the impacts of desertification is being given primary consideration. Activities to combat desertification are currently pursued by a number of government departments and agencies that deal with specific aspects of the environment which are being affected, including the water, forests, agriculture, etc. Cyprus does not yet have a National Action Programme, however a wide range of measures have already been implemented by a number of Departments to combat the problems encountered. The Environment Service is currently in the process of preparing tenders for the preparation of the country's National Action Programme. The programme will integrate and guide the multitude of efforts to combat desertification.

CLIMATE

Cyprus has an intense Mediterranean climate with strong seasonal characteristics with respect to weather, temperature and rainfall. Hot dry summers from mid-May to mid-September and rainy, rather changeable winters from November to mid-March are separated by short autumn and spring seasons with rapid changes in weather conditions. Generally, summer is a season of high temperatures and almost negligible rainfall.

Rainfall

Rainfall is geographically unevenly distributed, with maximum precipitation falling on the island's two mountainous masses and minimum precipitation observed in the eastern plain and the coastal areas. The average annual total precipitation increases from approximately 450 millimetres in the southwestern windward slopes to nearly 1100 millimetres at the top of the central Troodos massif.

Rainfall in the warmer months contributes little or nothing to water resources and agriculture. The small amounts that fall are rapidly absorbed by the very dry soil and soon evaporated in high temperatures and low humidities. Autumn and winter rainfall, on which agriculture and water supply generally depend, is somewhat variable. The average rainfall for the year is about 480 millimetres, but it was as low as 182 millimetres in 1972/73 and as high as 759 millimetres in 1968/69. Statistical analysis of rainfall in Cyprus reveals a decreasing trend of rainfall amounts over the last 30 years.

Temperature

Cyprus has hot summers and mild winters, and the seasonal difference between mid-summer and mid-winter temperatures is quite large at 18°C inland and about 14°C in coastal areas. In July and August the mean daily temperature ranges between 29°C on the central plain and 22°C on the Troodos mountains, while the average maximum temperature for these months ranges between 36°C and 27°C respectively. In January the mean daily temperature is 10°C on the central plain and 3°C on the higher parts of the Troodos mountains with an average minimum temperature of 5°C and 0°C respectively.

Trends in precipitation and temperature

During the 20th century remarkable variations and trends were observed in the climate of Cyprus, particularly in the two basic climatic parameters, precipitation and temperature. Specifically, the precipitation presented a decreasing trend and the temperature presented an increasing one. The rates of change were greater during the second half of the century. Over the last few decades the number of years of low precipitation and drought is greater than before and the semi-arid conditions have deteriorated. Most of the warm years of the century were observed in the last 20 years.

The decrease in the amount of precipitation has been remarkable. While the average annual precipitation in the first 30 years of the century was 559 mm, the average precipitation in the last 30-year period was 462 mm, which corresponds to a decrease of 17%.

On the other hand, the average annual temperature, both in urban and in rural areas, presented an increasing trend. The greater increase in temperature in the towns is due to the urbanization effect, however, the fact that an increase is also observed in rural areas, is indicative of the general increase in temperature in the region as well as globally. In

Nicosia the average annual temperature increased from 18.9°C in the first 30-year period of the century to 19.7°C in the last 30-year period, an increase of 0.8°C.

Precipitation: the rate of decrease in the average precipitation in Cyprus during the 20th century was 1 millimetre per year.

Temperature: temperature in Cyprus during the 20th century followed a reverse trend than precipitation, with a rate of increase of 0.01°C per year.

The dryness of the climate and the trends in precipitation and rainfall are factors which contribute significantly to the desertification process in Cyprus.

SOIL

Land degradation, particularly erosion, is very common in Cyprus due to the nature of its soils and the geographical and climatic features. New threats have also arisen as a result of recent social and economic changes. These include the overexploitation of natural resources and the intensification of agriculture and land use planning that do not take into account the protection of soils; land uptake for urbanization and infrastructure development; and pollution from industrial activities and waste. Additionally, rainstorms, deforestation and forest fires, especially during the summer season, also exert significant pressure on soil quality.

Erosion mainly affects arable land and land under permanent crops. The statistical data available indicate that erosion has actually decreased in absolute values over time, while fluctuations are observed in the share of land that is affected. During the period 1995 – 1999, 1130 km², or 56% of agricultural land, was affected by erosion.

Degraded agricultural land

	<i>Agricultural land</i>		<i>Arable land and land under permanent crops</i>		<i>Meadows and pastures</i>	
	Area (km ²)	%	Area (km ²)	%	Area (km ²)	%
1980 – 1984	1 305	56	1 285	73	20	51
1985 – 1989	1 230	58	1 210	77	20	44
1990 – 1994	1 215	49	1 200	77	15	42
1995 – 1999	1 130	56	1 120	78	10	76

Generally, in Cyprus soil erosion is at low levels, with less than 1 mm of eroded soil per year.

WATER RESOURCES

Like all small islands, Cyprus has a fragile ecosystem with very limited water resources. Apart from the very low precipitation, the problem is accentuated by the small catchments area for rainfall, the limited surface and ground water storage capacities.

Until recently, all water resources available in Cyprus came from rainfall. Geographically speaking, rainfall is unevenly distributed in Cyprus, with maximum precipitation falling on the two mountainous masses and minimum precipitation occurring in the eastern plain and the coastal areas. The variation in rainfall is not only regional, but also annual and often two or three consecutive dry years are observed. Additionally, the amount of water, which corresponds to the total surface of the Government controlled area, totals 2670 million cubic metres, whereas only 14%, or 370 million cubic metres, is available for use, since the remaining 86% returns to the atmosphere through evapotranspiration. The mean annual quantity of 370 million cubic metres is distributed between surface and groundwater in the ratio of 1.75:1.

It can be clearly seen that water resources are not sufficient and are becoming even less so due to a number of factors such as overexploitation, population growth, and socioeconomic development. Moreover, due to the long periods of drought, water availability is severely restricted to meet the needs.

Groundwater abstraction is also a significant factor towards desertification. Overexploitation has in many cases led to depletion of aquifers and, often to water salinisation due to sea intrusion, thus adding to the desertification problem. Additionally, the use of low quality waters for irrigation is a factor that contributes to desertification. The long-term use of these waters causes degradation of the colloidal phase of the soils, high build-up of salinity, high concentration of toxic elements with an inevitable effect on commercial growing plants, etc.

ANTHROPOGENIC FACTORS

Anthropogenic factors refer to those caused by the absence of people and those caused from undesirable, irrational or accidental human activities and are amongst the most significant causes of desertification in Cyprus. Lands which have been abandoned are more vulnerable and likely to face desertification. Absence of people means lack of human activities, which in turn means less protected or cultivated areas, exposed to winds, erosion and other natural forces. This is particularly the case in Cyprus as in recent decades rural areas are increasingly being abandoned as a result of the high rate of urbanization. Human activities, however, often contribute significantly to desertification. Some of the major causes include:

- Intensive cultivation and overexploitation of land resources which overburden the soil and reduce its productivity.
- Over-grazing which destroys the permanent vegetation land cover which protects the soil from erosion.
- Deforestation which destroys the trees which hold the soil.
- Overexploitation of water resources.
- Inappropriate irrigation practices and inadequate drainage which increase the salinity of the soil.

WATER MANAGEMENT

Management of water resources

The management of water supply and demand is a crucial measure in mitigating desertification. Groundwater, dams, desalination plants and recycled water are currently the principal sources of water in Cyprus. For the past few decades attention was turned to the systematic study and construction of water development infrastructure, both for storage and recharge purposes, which included the construction of a great number of dams and off-stream reservoirs so as to ensure the long-term use of water. Presently, the storage capacity of dams totals approximately 327.3 MCM and is used mainly for domestic and irrigation purposes, as well as for recharging. However, despite the good results of the water development policy pursued in Cyprus, the increasing water demand and the reduction in rainfall due to the climatic changes worldwide and the impacts of the greenhouse effect have led to water shortages. Furthermore, over-abstraction has led to serious problems of groundwater depletion and sea intrusion. As a result in the past few years water rationing measures had been periodically introduced with adverse impacts on agriculture and the economy of the island. The first step taken to combat shortages and resolve problems was the construction of 2 desalination plants, one at Dhekelia and the other near the Larnaca airport.

Currently the Government water policy focuses on the maximum potential exploitation of non-conventional water resources, such as recycled water. Tertiary treated recycled water is used for irrigation of existing crop land and for recharging aquifers. A programme is currently under implementation for the expansion of all central sewage systems, of the 4 major urban areas of Cyprus – Nicosia, Limassol, Larnaca and Paphos – and the tourist areas of Ayia Napa and Paralimni, as well as for the installation of plants for 38 rural areas of over 2000 person equivalent population. One of the central components of the programme is the reuse of the recycled water from these treatment plants for agricultural purposes.

Another aspect of Government policy is the efficient use of available water, including the better use of pricing and water conservation measures, as well as the protection, preservation and improvement of water quality, and the introduction of new effective management procedures.

Irrigation

Another important factor is the quality of water used for irrigation. The use of low quality water in irrigation, and the inappropriate irrigation and drainage techniques often applied increase the soil salinity in agricultural lands leading to their degradation. Substantial work has been carried out so far in Cyprus, particularly in investing in and developing appropriate irrigation methods, identifying water requirements by main irrigated crop, scheduling of irrigation and effective water use, and water quality combined with crop resilience.

More than 95% of the irrigated agricultural lands are under modern improved irrigation systems, thus ensuring appropriate irrigation methods, reducing the possibilities of soil pollution, and contributing to the conservation of water. Additionally, guidance in protecting and technical support is given to farmers regarding salinity and infiltration problems, and

irrigation management methods for overcoming them, as well as guidelines and indicative concentration limit values for crops.

MANAGEMENT OF AGRICULTURAL LAND AND SOILS

One of the sectors of the Rural Development Plan addresses measures to preserve and enhance the environment. Some of these measures include:

1. Economic support for the adoption of environmentally friendly farming methods, at a total estimated sum of approximately 24,5 million Euro. This covers the following:
 - a) Cultivation of potatoes: Due to many years of intensive cultivation, usually as continuous monocultures in relatively large areas of the island, serious problems have been created, such as the overburdening of the environment and reductions in the productivity of the soils in these areas. As a result it is necessary to implement the traditional system of the three-year crop rotation, together with an integrated production management system to protect the environment and ensure the sustainable development of the sector.
 - b) Citrus cultivations: This activity covers the taking of measures to ensure the rational use of pesticides, fertilizers and water to eliminate the problems which have been created by inappropriate agricultural practices.
 - c) Vineyards: As a result of the serious problems faced in this sector, including high costs, the high maintenance required by such cultivations and the general trend of countryside abandonment, mechanical cultivation has been significantly limited, thus increasing the risks to the environment arising from the degradation of ground and surface waters, and soils. The re-introduction of mechanical cultivation will help reduce some of these risks.
 - d) Encouragement of organic farming: The objectives of this measure are to reduce the pollution caused by agriculture, ensure the sustainable management of soil resources and preserve the biological diversity of agricultural ecosystems.
2. Support for measures to preserve the natural value of the agricultural environment, at a total sum of approximately 7,6 million Euro. This includes actions to preserve the traditional varieties of cultivations, such as almond trees, carob trees, etc., the preservation of shrubs and other traditional plants, and the implementation of measures for the annual cleanup of and removal of unwanted vegetation in agricultural lands which are not extensively exploited anymore or have been abandoned. Furthermore, it covers the conservation and reconstruction of bench terraces and dry stonewalls, which contain soils, thus preventing erosion.
3. Afforestation of agricultural land, with a total provision of 2,5 million Euro. The objectives of this measure are to extent the forest cover of the island and at the same time utilize land expanses which are no longer exploited for agricultural purposes and which will eventually be degraded if left abandoned.
4. Economic support in disadvantageous areas, at a total cost of 42 million Euro. The objective is to support agriculture in disadvantaged areas to balance the loss of income that results from permanent physical disadvantages (steep slopes, high altitude, shallow or barren soils) or adverse physical phenomena (low rainfall), so as to ensure the continued use of the agricultural lands in such areas.

FOREST MANAGEMENT

Forest land and afforestation

The extent of forest land in Cyprus has increased over the past few years, mainly at the expense of agricultural land, as a result of government policy and the on-going project to afforest land under extreme conditions that began in 1980. More specifically, between 1950 and 2000 there was a net increase of 110,9 km² of forest land, of which 101,3 km² was related to agricultural land net losses.

Forest land area (km²)

Category	1950	1970	1980	1985	1990	1995	2000	2002
Forest and other wooded land	1.597	1.680	1.678	1.701	1.701	1.701	3.855	3.863
Predominantly coniferous	1.080	1.163	1.161	1.184	1.184	1.184	1.706	1.714
Predominantly broadleaved	10	10	10	10	10	10	10	10
Other wooded land	507	507	507	507	507	507	2.139	2.139

Data for the years 2000 and 2002 are based on a new mapping carried out in 1998. This covered not only state but also private and other wooded land.

Changes in forest and other wooded land (km²)

		From:	1	2	3	4	5	6	Total gains
To:									
1	Agricultural land			9,4					
2	Forest and other wooded land		110,7		0	0	12,1	0	122,8
3	Built-up land			2,5					
4	Wetlands			0					
5	Open land			0					
6	Waters			0					
	Total losses			11,9					

Area under reforestation (km²)

	2002	2003	2004	2005
Area reforested	3.45	3.93	2.64	2.03

The National Forest Programme which was adopted in 2001 and two of its key objectives are:

- The protection and extension of the country's forest cover, and

- The afforestation of government and other abandoned private land and the rehabilitation of the environment in degraded areas of the broader countryside.

Furthermore, one of the four priority sectors of the Rural Development Plan 2004 – 2006, is the Protection, Development and Sustainable Management of Forest Resources. This axis covers a number of measures towards this objective, including:

1. The protection of forests from fires and natural destructions and the reforestation of burned areas, at an estimated amount of 4,5 million Euro. The measures cover the following actions:
 - a) **Protection of forests from fire**
 - i. information provision and awareness raising,
 - ii. development and improvement of the existing prevention system,
 - iii. improvement of the detection system.
 - b) **Reforestation of burned areas**
Economic support for the reforestation of burned areas, to local and state authorities.
2. Afforestation of non-agricultural land, at an estimated total amount of 3 million Euro. This measure includes the following actions:
 - a) **Afforestation of non-agricultural land**
Economic support for the reforestation of non-agricultural land
 - b) **Development of private forestry**
This concerns the existing private forests and includes actions for their protection, management and development through economic support measures.

Forest Fires

Forest fires constitute a major cause of land degradation in Cyprus. A range of factors contributes to the increase in the risk of forest fires, such as the long dry and warm summers, strong winds, and the flammable vegetation cover. The problem is accentuated by the desertion of many agricultural areas and forest recreation activities. The largest percent of forest fires is caused by human negligence, particularly through agricultural and recreational activities.

Apart from the measures currently implemented under the Rural Development Plan, a number of preventive measures are also being taken by the Forestry Department, including:

1. The implementation of the provisions of the relevant forests legislation, which imposes strict fines to offenders.
2. Awareness campaigns, which are organized every year to educate and raise the awareness of citizens.
3. The regular patrolling of forest areas during the summer season.

Burnt areas (km²)

	2002	2003	2004	2005
State Forests	0.2	0.11	0.14	0.43
Private or government land near state forests	18.54	12.63	9.6	22.31

Preventive management measures include the creation of fire belts, forest roads for the inspection of forests and quick access, forestry telecommunications, lookout points and fire guard-houses, forest stations, etc. Furthermore, a number of departments and local authorities are cooperating in an elaborate fire protection system covering all areas outside the state forests.

Forest grazing

Forest grazing is also a major cause of land degradation. The problem is particularly present in the Akamas, Machairas and Randi forests, but also in areas outside the state forests. The provisions of the Forests Law ensure that measures are being taken to eliminate or diminish grazing in the forests.

NATIONAL ACTION PROGRAMME

The Environment Service is currently in the process of preparing the tenders for the preparation of the Cyprus National Action Programme to combat desertification. The programme will involve a number of government departments and will include policies and measures relating to the following key areas:

- Management of water resources
- The promotion of sustainable agricultural practices that will help alleviate the problems that arise from intensive cultivation, soil degradation and erosion, inappropriate irrigation and drainage methods, and the overexploitation of land resources.
- The promotion of traditional agricultural practices, such as crop rotation, and the cultivation of traditional varieties of crops which are more suitable to the climatic conditions of the island.
- Measures to prevent overgrazing.
- Measures to further promote afforestation, particularly of abandoned agricultural land. Additional, further enhancement of the existing system for protection of agricultural land and forests against fires.
- Institutional and fiscal measures to encourage population to remain in rural areas, and / or maintain its interest on the land even if it has moved, thus preventing the abandonment of the countryside for urbanization.
- Integration of management and conservation measures for the protection of biodiversity, with a focus on the biodiversity of rural lands.
- Training regarding the impacts of desertification; appropriate agricultural, irrigation and drainage practices; traditional cultivation methods; and traditional crop varieties and their advantages.
- Raising public awareness regarding the issue of desertification and the actions that must be taken to combat it.