

**ROMANIA**

**MINISTRY OF AGRICULTURE, FOOD AND  
FORESTS**

**NATIONAL REPORT ON THE IMPLEMENTATION  
OF THE UNITED NATIONS CONVENTION TO  
COMBAT DESERTIFICATION (UNCCD) IN  
ROMANIA**

Bucharest

2002

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## *(ii) Summary*

The main national strategy and action plans having components relevant for the objectives of Convention to Combat Desertification, have been realised in 2000 and presented at the UNCCD Secretary in Bonn:

**“National strategy and action programme concerning desertification, land degradation and drought prevent and control”**

Taking into account this state of the things, in Romania all actions that try to reduce the effect of drought and aridization are part of the national strategy.

**Chapter (iii)** enumerates briefly the national strategy topics related to the objectives of CCD.

The politics frame contains the following targets:

The land use management

Sustainable management of the natural capital

Biodiversity conservation

Sustainable development in forestry and agriculture

Sustainable water resources management

The regional co-operation

Socio- economical measures

**In the chapter (iv)**, is presented (in addition to the 2000 National Report) the actual legislation in Romania referring to aspects of protection and improvement of water, soil and forest resources that, implicitly, is referring to desertification and soil degradation; we mention:

*Law No. 58/1999 to applied the Convention on Biodiversity; Research Law No. 51/1996; Law on Hunting Fund No. 103/1996; Law on Recycling waste No. 137/1996; Ministry Ordinance concerning the activities with environmental impact No 125/1996 and 168/1997, Ministry Ordinance No 647/2001 concerning the procedure for obtaining auhtorisation for picking, capturing and acquiring wild plants and animals, their commercialisation on national market*

*or for export and their import; Governmental Ordinance concerning the water cadastral survey of Romania, No 399/1997; Governmental Ordinance concerning the effects of natural calamities No 329/1997, Governmental Ordinance concerning the water development works protecting against floods, 615/1997, Ministry Ordinance concerning the attestation of the persons that may perform field studies and land reclamation works in forests 449/1998, Law for regulating the forestry regime and managing the national forestry fund, 141/1999, Ministry Ordinance concerning the approve of the Forestry Technical Norms for the managing of the forest vegetation that is not a part of the national forest fund 264/1999, Law for re-constitute the property rights on farming and forestry lands, No 1/2000, Law Concerning the Environmental Fund No 73/2000 modified and completed by the Governmental Ordinance no. 93/2001, Law for completing the Low of Environmental Protection No 159/2000, Law for juridical circulation of the forest lands, 66/2002, Law concerning regulating the forestry regime and managing the national forestry fund, No 75/2002*

**In the chapter (v)** are presented the main institutions involved in combating desertification and the up-date name of the ministries (in addition to the 2000 National Report): Ministry of Agriculture, Food and Forests (the actual name), Ministry of Water and Environmental Protection (the actual name), Research institutes, Forestry manager's offices, National Society of Land Improvement, National Company Romanian Waters

The civil society has also: 25 NGO's involved in these actions and Romanian Organisation for Soil Tillage (ORCLS)

**Regarding the consultative process (chapter vi)**, Romania has participated to The Consultative Meeting for the Implementation of the UN Convention concerning the Desertification Combat in Central and Easter Europe (Prague, 3-4 Sept. 2001)

A co-operation exists at both European and regional level in order to conserve and protect the soil resources. Thus, Romania co-operates to form a

database for the European soils, having contributed with a digital map representing the Romanian soils at a 1:1,000,000 scale expressed in FAO legend, and to develop a database of soil profiles within the European countries.

Regionally, Romania co-operated to the following projects: SOVEUR - concerning the vulnerability to pollution classification of the soils within the Central and East-European countries; INCO-COPERNICUS concerning the sub-soil compacting in the Central and East-European countries; FAO' concerning the rehabilitation of polluted soils in Romania; INCO-COPERNICUS concerning a simulation model with spatial distribution for the physical and agro-physical state forecast of the soil, INCO-COPERNICUS concerning water and soil management for the agricultural output in urban areas.

**Chapter (vii)** describes the measures that have been taken or will be taken concerning desertification and monitoring of drought consequences.

There are four kinds of measures:

1. Prevent and control measures for desertification and drought

Scenarios to determine possible areas with drought

Environmental components protection under droughty conditions

Rehabilitation and development of the irrigation systems

The forest belts and passages

Hydrological system improvement in dammed water areas

Slope terracing

The promotion of the alternative and drought resistant crops and of the special soil management

Ecological rebuilding of the dry woods

Water resources management in drought conditions (Alternative solutions,

Improvement of the supplementary water resources).

2. Measures for controlling land degradation

Eroded soils

Landslides

Salt-affected soils

Sand and sandy soils (sandy dunes)

*The afforestation of 7.000 ha of degraded lands will be achieved under The Kyoto Protocol with Prototype Carbon Fund administered by World Bank. The location of this area is in the southeast and southwest part of Romania, on low quality agricultural lands on flying sands and eroded soils.*

Compacted soils

Acid soils

Soils with low organic matter and macronutrients content

Polluted soils

3. Making the population aware and educating it

4. Scientific research and education development

**In the chapter (viii)**, there is presented the total costs for the application of the national strategy (4,460,288 thousand \$).

**The chapter (ix)** presents a review of the indicators utilised such as:

1. Monitoring of zones affected by desertification and drought

*Climatic* indicators

*Pedological* indicators:

*Hydric* indicators (water):

*Agricultural* indicators:

*Forestry* indicators:

*Biological* indicators (of vegetation and biodiversity)

2. Monitoring of areas with degradation soils

Monitoring of areas affected by *water-erosion*

Monitoring of *land-slides*

Monitoring of *wind-erosion*

Monitoring of *salt-affected* soils

Monitoring of *polluted* soils

Monitoring of soils vulnerable to *compaction*

### 3. Organisation of desertification and drought monitoring

Network type

#### *(iii) The strategies and priorities established within the framework of sustainable development plans and/or policies*

The main national strategy and action plans having components relevant for the objectives of Convention to Combat Desertification, have been realised in 2000 and presented at the UNCCD Secretary in Bonn (in addition to the 2000 National Report):

“National strategy and action programme concerning desertification, land degradation and drought prevent and control”

Started with the necessity of solved the desertification problems the strategically objective was classified into 6 priority axis (table 1).

#### **THE POLITICS FRAME**

##### **1) The land use management**

The strategy concerning the objectives, measures and actions in the territory arrangement in our country is rediscovered in European Chart, too.

The fundamental objectives are:

the balanced socio-economical development of the regions to hold under controls the crowded areas and the area development in decline.

the amelioration of life welfare, the territory arrangement to meet the improvement work conditions, cultures, relations, equipment and others.

the responsible administration of natural resources and environmental protection

the rational territory use.

The particularly objectives are:

The rural areas development, the creation of acceptable conditions of life, especially in the poor areas;

The check of urban areas growth, by soil occupation plans and by economical activity development to improve life conditions

The frontier areas need a co-ordination policy of the neighbouring states to open the frontiers for common use of infrastructure facilities and to facilitate a regional development

The mountain areas – by ecological, economical, agricultural, forest roles, social and cultural, also by natural resources

Structural insufficient stability of living areas that needs a special help

Declined industrial areas with slowly economical activity caused by industrial reconversion and wear mono-structural equipment which needs special support program

The seacoast areas and the islands need balanced development and a check urbanisation, following the objectives dictated by environment protection.

The territory management needs to be elaborated according local, regional and national necessities.



Table 1

**General and specific objectives for desertification, land degradation and drought prevent and control (2001-2020)**

General objective 1: Desertification, drought and lands degradation prevention and control in the areas under desertification  
 General objective 2: Lands degradation prevention and control in the wet areas

1 <sup>st</sup> priority axis	2 <sup>nd</sup> priority axis	3 <sup>rd</sup> priority axis	4 <sup>th</sup> priority axis	5 <sup>th</sup> priority axis	6 <sup>th</sup> priority axis
Improvement and perfecting of legislation	Capacity building	Human resources	Development of scientifically and technical potential	Rural development in the area under desertification risks	Rural development in the wet areas under land degradation
<b>Specific objectives</b>					
Improvement of water use legislation Perfection of legislation on soil protection Improvement of legislation on bad lands reclamation and halting of torrential phenomenon Promoting of legislation framework to combat drought and desertification	2.1 Setting of institutional framework for implementing the strategy and actions plan 2.2 Setting of special offices for environment survey in the area under change 2.3 Setting up of water use associations 2.4 Development of pedology and agrochemistry in the area under change	3.1 Universities graduates in the field of combat desertification and implementing the strategy and actions plan 3.2 Permanent contact with local people 3.3 development of partnership with local people to implement the strategy and actions plan 3.4 ONG's involving 3.5 Creation of new jobs complementary to traditional farming activities	4.1 Building of special scientific teams for the problems of drought, land degradations and desertification 4.2 Research approach of droughts, desertification and land degradation prevention 4.3 Building of informational system on drought, desertification and land degradation 4.4 Identifying of areas under risks of desertification and land degradation	5.1 Water supply for rural development 5.2 Completion of energy resources by alternative way 5.3 Improving the local climate for prevention of droughts, land degradation and combat desertification 5.4 Improving of soil 5.5 Prevention and combat wind and rain erosion of soil 5.6 Re-use of abandoned crop land 5.7 Improving of degraded pastures 5.8 Diversifying of farming yield 5.9 Maintaining and preserving the biodiversity 5.10 Drought and desertification trends monitorization	6.1 Anti-erosional improving of crop fields 6.2 Prevention and combat the rain erosion, land slides and other types of land degradation 6.3 Re-use of abandoned crop field by improve of fertility 6.4 Improving of soil 6.5 Improving of degraded pastures 6.6 Cadaster and monitoring of soil degradations

## **2) Sustainable management of the natural capital**

The sustainability of the natural capital in the area under desertification must start from “*agroforestry*” and suppose the balanced relations between agricultural and forestry ecosystems.

The political and socio- economical premises concerning natural capital are: the environmental protection actions and measures must occupy important place in all national programs of economical development to establish the responsibilities of states institutions and of other organisations for a sustainable development non government organisations implication in all decision levels to aware the environment protection

The effects of droughts, soil degradations and desertification are reflected in natural capital degradations (natural, part-natural, artificial ecosystems). For the attenuation of these effects it must to take into account the politic framework by:

- the soil degradation and overexploitation
- the replacement of some forests ecosystems with others
- the degradation and overexploitation of water resources
- the diminution of food resources from domestic and wild animals through conserving and amelioration of natural ecosystems
- the promotion of specific agrotechnical measures for extending areas under aridity
- the overloading of traditional energy resources (wood, coal )

Also it must to be considered:

- the encouragement of extending of small area experience accumulated in the alternative energy sources to all the country
- the wind power resource mapping
- the setting of a scientific-technical centre to encourage the use of alternative energy

### **3) Biodiversity conservation**

Biodiversity conservation is conditioned by human factors due to activities, which lead to soil and water erosion, air pollution, pesticides and chemical manure use, the industrial and domestic wastes depositing, the deforestation and excessive grazing. The negative impact reduction of economical activities must to achieve the following objectives:

the industrial and energetic units modernisation

the legislative measures for the pollution reduction

the forests conservation trough the proper forest management

the state control of chemicals used in agriculture and forestry

For the biodiversity conservation and increase the resistance to desertification is imposed:

the protected areas extension

the phytocenosis rehabilitation with local species

the protection foresights implementation over the biodiversity in –situ and ex-situ on international Conventions where Romania subscribe.

the moist areas restoration and extension

the regional and bilateral international co-operation in biodiversity protection

### **4) Sustainable development in forestry and agriculture**

The forest and agricultural ecosystems are basic components of natural capital.

The actions, which answer, of a sustainable agriculture are:

- building of a agricultural exploitation framework to eliminate economical and ecological damages
- exploitation trough lands amalgamation and association
- gradual restriction of the arable fields on the slope over 12 % and with degraded soils, either trough conversion of other agricultural employment or trough afforestation

***The agricultural systems development in following directions:***

dry-farming systems in absence of irrigation areas  
systems with limited irrigation in water deficit resources areas  
intensive agricultural systems in areas provided with sufficient water resources to irrigate  
application of composted organic manure  
introduction of the protection management through optimum pesticides utilisation  
creation of complex agro-zootechnical systems  
ecological reconstruction of bad lands, degraded trough industrial activities (mining, sterile waste dumps, petroleum and salty waters pollution, heavy metal pollution etc.) on basic principle that the pollutants pays)  
low productive soils amelioration (sands, salty, affected by moist and/or low acidity) just in case of economical and strategically justification )  
races and hybrids of plants creation with great drought resistance  
plantation of protection forests belts in affected areas  
perfection and extension insurance system of crops.

***The actions designed to answer of a sustainable forestry are:***

integrity assurance and sustainable development of forest capital as well as the extension of lands area with forest vegetation  
institution of the concept of sustainable management  
stability assurance and functional efficacy rise of forest ecosystems  
reconstruction of the forest affected by decline  
to sustain the forest owners for durable management of forests  
representative forest ecosystems integration in the national network protected areas  
durable management of game and piscicultural resources  
development of forest services and produces, others than the wood  
adapting the forest administration and checking forest regime in conditions on different property forms

public, lands holders and the political society awareness about the importance of national patrimony forest

### **5) Sustainable water resources management**

The water scarcity in semidry and dry submoist areas have become a chronic phenomena with negative effects of economical nature in agriculture, vegetable crops, zootechnics, forestry and fisheries. The effects also are felt in potable water supply, transportation, electric power producing, and people health and know amplification, particularly, over dry periods. For the sustainable development of affected areas it must to take into account in the planning of water resources for irrigation, the normal and dry conditions to eliminate short crises.

In that sense it is impose to:

Setting up of the diagnosis indices (aridity indices, precipitation amount, groundwater level, water volume in the lakes, river discharges)

Setting up of the particular moment of crisis starting

Setting up of the responsibilities of institutions

Continuous people information

### **6) The regional co-operation**

To know the time and space evolution of the environment factors, and hydric factors particularly, we need data and information from very large areas, which pass beyond the frontiers. Consequently, it results a straight importance of states co-operation in region on problems concerning the prevention and combat desertification.

So, it must have in view:

collection, analysis and change of pointed out data and information for the sake to have under systematic observation the lands degradation in the affected areas and for a good understanding of processes that occur in desertification and drought co-operation on monitoring of desertification, lands degradation and drought development of joint research programme to establish the causes that produce such phenomena and the measures required preventing and combating them.

## 7) Socio- economical measures

- *The socio-economical purposes* of actions in the areas exposed to desertification, lands degradation and drought, are considering:
  - compensation by the state from budget resources of agriculture losses caused by damaging climatic phenomenon
  - economical diversification in rural zone, by active support in developing non-agricultural activities. In this way a initiation of developing programme, stimulating small and middle industries, developing services and infrastructure could be suitable
  - legislation improvement to protect forest-steppe areas, under desertification, lands degradation and drought risks
  - evening school establishment for adults in rural zone to help population for cover the gaps in general education, especially ecological education
  - educate programme elaboration and ecological education books for children in the pre-university education
  - ONG's stimulation to protect the environment, struggle against pollution and drawing them in short and medium programme
  - educate activity intensification by the joint efforts of Local Councils, Police, The Forests Properties Association and zonal mass-media
  - inclusion in the local developing programme of a measures chapter to combat desertification, lands degradation and drought
  - assurance systems promotion against the risk factors by aware the rural people, the assurance offer diversification
  - capacity building of local public administration concerning the management in drought field, on desertification and lands degradation, informational support assurance and technical assistance
  - preventing and combating desertification, drought and lands degradation in areas with desertification risks
  - preventing and combating lands degradation in moist zones

*(iv) The institutional measures taken to implement the Convention*

(in addition to the 2000 National report)

**L 58/1994** - To ratify the Convention concerning the biological diversity signed at Rio de Janeiro on 5 June 1992 (Of. J. no 199/ 2 August 1994)

**L 51/1996** - To approve GO 25/1995 for implementing and financing research-development activities (Of. J. no 134/ 27 June 1996)

**L 103/1996** - Law of hunting fund and game protection (Of. J. no 235/27 September 1996)

**L 137/1996** - To approve GO 33/1995 related to measures for collecting, recycling and re-introducing in the productive circuit all kind of reusable waste (Of. J. no 264/ 28 October 1996)

**OM 125/1996** - To approve the Procedure regulating the economic and social activities having an environmental impact (Of. J. no 73/ 11 April 1996)

**HG (GD) 168/1997** - For service and product regime that could endanger the life, health, work security and environmental protection (Of. J. no 85/ 8 May 1997)

**OM 399/1997** - To approve the methodology for implementing, keeping and managing the water cadastral survey of Romania (Of. J. no 111/4 June 1997)

**HG (GD) 329/1997** - To adopt some measures for removing the effects of natural calamities which have damaged in November 1995 the national forestry fund and afforested pastures in Covasna, Harghita, Mures and Bistrita Nasaud counties

**OM 615/1997** - To approve the Procedure of issuing the agreement of crossing the dam dykes and other water development works protecting against floods, and Technical Guide for designing and developing works for crossing the dykes, dams and other developments made to protect against floods (Of. J. no 241 bis/15 September 1997).

**OM 449/1998** - To approve the methodology for certifying physical and legal persons that may perform field studies, draw up technical and economic documentation and develop land reclamation works in the forestry field (Of. J. no 268/17 June 1998)

**L 141/1999** - To approve OG (GD) 96/1998 for regulating the forestry regime and managing the national forestry fund (Of. J. no 355/27 July 1999)

**OM 264/1999** - To approve the Forestry Technical Norms for managing the forest vegetation existing beyond the national forestry fund (Of. J. no 233/25 May 1999)

**OG 147/1999** and

**L 573/2001** to establish the Water User Association who received the irrigation infrastructure for 100000 ha.

**L 1/2000** - To re-constitute the property rights on farming and forestry lands required according to the Law 18/1991 and Law 169/1997 (Of. J. no 8/17 January 2000)

**L 73/2000** - Concerning the Environmental Forestry Fund (Of. J. no 207/11 May 2000)

**L 159/2000** - For completing the Law of Environmental Protection 137/1995 (Of. J. no 512/22 October 2000)

**L 440/2001** and **OG 23/2000** to establish the National Society for Land Reclamation

**OM 384/2001** to approve the Methodological Norms concerning the financial support from the budget for some land reclamation actions.

**L 575/2001** concerning The Management Plan for National Territory

**L 66/2001** – To approve the OG 226/2000 concerning juridical circulation of the forest lands

**L 72/2002** – Concerning the pastures regime and management.

**L 75/2002** – To modify and complete the OG 96/98 concerning regulating of the forestry regime and managing the national forestry fund



**OM 117/2002** to allow financial support from the budget for completing of the irrigation equipment on 100000 ha

**OG 38/2002** to allow financial support from the budget for soil studies and soil testing and allow financial support from the budget for the Monitoring National System for agricultural soil-land and for the forestry soil-vegetation.

It is working also (in a final stage) at a the project “Prevention and management of disasters” which include aspects concerning land slides and soil erosion control; the project is assist by the World Bank and Ministry of Water and Environmental Protection

***(v) The participatory process in support of the preparation and implementation of the action programme***

The main institutions involved in activities related to desertification control, protection and improvement of degraded soils and drought prevention are as follows (in addition to the 2000 National Report):

Ministry of Agriculture, Food and Forests (MAAP) – the actual name of the ministry

Ministry of Water and Environmental Protection (MAPM) - the actual name of the ministry

Research institutes of MAAP and MM (Forest Research and Management Institute; National Institute for Meteorology, Hydrology and Waters Management; Research Institute for Soil Science and Agrochemistry; Institute of Studies and Design for Land Reclamation Projects; Research and Technological Engineering Institute for Irrigation and Drainage, Baneasa-Giurgiu; National Institute of Research – Development for Environment Protection; Research Institute of the Life Quality; Research Institute for Grains and Technical Crops Fundulea; Research and Production Institute for Grass Cultivation, Magurele- Brasov);

Forestry manager's offices the

National Society of Land Reclamation

National Company Romanian Waters

The civil society has also:

25 NGO's involved in these actions

Romanian Organisation for Soil Tillage (ORCLS)

***(vi) The consultative process in support of the preparation and implementation of the national action programme and the partnership agreement with developed country Parties and other interested entities***

Romania has accessed to the Convention to Combat Desertification and has actively participated to The Consultative Meeting for the Implementation of the UN Convention concerning the Desertification Combat in Central and Easter Europe (Prague, 3-4 Sept. 2001)

A co-operation exists at both European and regional level in order to conserve and protect the soil resources. Thus, Romania co-operates to form a database for the European soils, having contributed with a digital map representing the Romanian soils at a 1:1,000,000 scale expressed in FAO legend, and to develop a database of soil profiles within the European countries.

Regionally, Romania co-operated to the following:

SOVEUR project initiated by FAO concerning the vulnerability to pollution classification of the soils within the Central and East-European countries;

INCO-COPERNICUS project: Action concerning the sub-soil compacting in the Central and East-European countries;

FAO project: Rehabilitation of polluted soils in Romania;

INCO-COPERNICUS project: A simulation model with spatial distribution for the physical and agro-physical state forecast of the soil - SIDASS

INCO-COPERNICUS project: Water and soil management for the agricultural output in urban areas – SWAPUA

Development of a Joint project. Romania - Spain “National Plan to Combat Desertification in Romania”

Participation to the International Conference: “Mitigation of the drought effects and preventing land desertification”, 21-24 April, 2002, Bled, Slovenia

Romania coordinated the International Program INCO-COPERNICUS Concerted Action “Experiences with the impact of subsoil compaction on soil nutrients, crop growth and environment, and ways to prevent subsoil Compaction”. This program lasted 3 years 1999-2001 and was a counter-part for Central and Eastern European Countries to a similar program developed in the EC Countries. The program has been closed with a workshop in Buşteni – Romania, 14-18 June 2001 and was attended by specialists from 11 countries.

On 3-6 September 2002 will be held in Constantza an International Conference on “Soils under Global Climate Change - a challenge for the 21<sup>st</sup> Century”. One of the topics is: “Drought under various soil and management conditions inter-relations with farming and environment”

In order to understand better the importance of the soil, water resources, vegetation, etc. particularly within the drought-stricken regions or in those presenting a desertification tendency, as well as to act for their sustainable use, involving of the Government, communities, land owners, etc., are necessary. Moreover, regional and international co-operations are needed in the fields of environmental protection, soil and water resources conservation.

For this reason, the parties agree, depending on their own capabilities, to integrate and co-ordinate the collecting, analysis and change of relevant data and information to ensure a permanent control of the land degradation in the damaged regions and better understand and assess the drought and desertification phenomena and their effects.

For knowing the state and evolution of the environmental factors generally it is necessary to gather data and information on very large areas, which go beyond the state limits. Consequently a co-operation among countries that belong to the same region is very important.

*(vii) The measures taken or planned within the framework of the national action programmes, including measures to improve the economic environment, to conserve natural resources, to improve institutional organisation, to improve knowledge of desertification and to monitor and assess the effects of drought*

**A. PREVENT AND CONTROL MEASURES FOR DESERTIFICATION AND DROUGHT**

➤ *Scenarios* to determine possible areas with drought

The medium or long-term hydrological forecasting programme is one instrument to foresee drought; the study of the multi-annual data shows the effect of drought on ground water level. Drought forecasting is useful for the elaboration of programme for integrated use of water resources: surface, phreatic and groundwater.

➤ *Environmental components protection* under droughty conditions

- Air Pollution under droughty conditions
- Qualitative and quantitative management of water resources under droughty conditions

The areas that should be protected in the near future (5 – 10 years) are situated in the Getic and western piedmonts as well as in the Transylvania Depression and the Moldavian Plateau.

The following measures also limit the drought impact:

change of operation rules for reservoirs, conjugated operation of ground and surface water resources as well as change of water supply priorities;  
conservation and improvement of water use efficiency in domestic life (reduction of water consumption; repair of sanitary installation defects), in agriculture (use of

waste water, reuse of drained water, irrigation at night) and in industry (water recycling and reutilization);

changes of the present technology, especially in agriculture (growing of crops that require small water quantities or that can use drained water; rehabilitation and modernisation of irrigation systems including self-acting supply of water demand) and industry (bringing in some technology using air as cooling or cleaning device; utilisation of some technological systems to limit water and soil pollution in relation to emission quantity and consumption);

quantitative estimation and forecasting of water resources, i.e. water demand under the conditions of climate change and desertification tendency;

maintenance of the minimal flows downstream the hydraulically structures, which will protect water quality, aquatic ecosystems and those neighbouring river courses, ensure water demand of the downstream uses and ground water supply.

- Prevention and fighting against land degradation caused by soil chemical pollution

to complete methodologies for remaking the degraded soils due to the mining activity, particularly in those areas where the drought also affected the land (Oradea, Tr. Severin, Deva);

to limit the industrial waste storage surface and develop ecological storage for ensuring the protection off both soil, and ground and surface waters against diffusion pollution;

to enforce the self-monitoring within the economic units which generate an intensive pollution by heavy metals or other dangerous substances for the soil, including liquid leakage (resulting from urban activities, chemical, petrochemical, metallurgical industries, etc.), mainly in the areas affected by drought (Bacau, Tulcea, Govora, Tg. Mures, Tr. Magurele); preventive or operational control measures taken by the environmental protection bodies;

to make a new analysis of the soil pollution sources and level on the occasion of issuing new environmental protection authorisations; consequently, for those

anthropic activities likely to pollute a certain area, comprehensive investigations (physical, chemical and biological analyses of the soil samples, risk studies) are compulsory; according to these analyses recommendations and measures that should be taken on long or short term.

➤ **Rehabilitation** and development of the irrigation systems

Irrigation when is rationally applied represents the main measure regarding the soil humidity deficit control. If we relate to the present arranged area, our country has a very important patrimony, from this point of view. But the realities prove that 3.2 mil arranged hectares, the area that could be actually irrigated is very small, due to different causes (lack of watering equipment, advanced wear and curtail of pump stations equipment, lack of mobile pump sets, deterioration and theft of automatic elements, deterioration of pipe networks from irrigation plots).

The main problem to be solved by the rehabilitation action of irrigating systems is *the increase of global systems efficiency*.

This implies *the increase of water distribution and water transport efficiency, increase of pump systems efficiency and increase of land watering efficiency in the field*.

Within the global efficiency, that regarding *water transport and water distribution system (channel and pipe network) is the most important*. The main cause of water transport and water distribution efficiency is the lack of water by infiltration. From ICITID researches made on irrigating systems changes, the volume lost due to infiltration represents 50% from the water volume of the system.

As a working action there are **two studies (in a final stage) for the irrigation system rehabilitation on 50000 ha** in Galati and Dolj area. This studies received financial support from the World Bank.

- In these conditions, the necessity *to stuff the irrigation channels* becomes compulsory, taking into account the important water volumes, which could be saved.

In order to develop the irrigating systems, the following will be taken into account:

Re-launching of irrigation use and, at least, the rehabilitation and modernisation of all areas where these would prove to be viable;

Promotion and encouragement of irrigation under large management types of agricultural farms from viable areas;

Efficiency of exploitation works and irrigation maintenance in viable areas;

Financial support, by progressive investments, of rehabilitation works (modernisation of 1.3 mil ha which are comprised in actual irrigation systems, economically viable);

Financial support of progressive investments in order to arrange new irrigation areas.

➤ ***The forest belts*** and passages

The most efficient way for desertification prevent and control is setting up of the network of forest belts and passages. For this targets the following are to be done:

*Setting up of the forest belts* for 300, 500, 1000 ha agricultural land, the forest belt surface being of 2-5%. For small farms of 30, 50 or 100 ha the border forest belts are suitable.

The distances between the main forest belts must be of 250-400 m, and between the secondary forest belts of 500-1000 m.

The main species recommended for the drought areas are: *Robinia pseudacacia*, *Quercus pedunculiflora*, *Gleditsia triacanthos*, *Ulmus pumila*, *Tilia tomentosa*, *Fraxinus sp.*, *Acer campestre* etc: in the sub-humid areas the recommended species are: *Quercus cerris*, *Populus alba*, *P. nigra*. The recommended shrubs are: *Acer tataricum*, *Crataegus monogyna*, *Sambucus nigra*,



*Prunus padus*. The fruit trees are also suitable for these areas, the recommended species are: *Prunus cerasifera*, *Prunus avium*, *Cydonia oblonga* etc.

The crop lands suitable for forest belts setting up are in the steppe and forest-steppe area from the following districts: Mehedinti, Dolj, Olt, Teleorman, Giurgiu, Calarasi, Buzau, Braila, Galati, Vaslui, Iasi, Botosani, Constanta and Tulcea.

The main long term target is the forest belts setting up for only 1 million ha, situated in the most exposed area to desertification. (it means 67-70 thousands of km).

*Setting up of the forest belts* near the 6000-km lines of communication, the forest belts surfaces being of 18000 ha.

*Setting up of the protective forest belts* near the 4000-km irrigation made of 3 rows of *Populus* sp or *Salix* sp. The *Populus x canadensis* R<sub>O</sub>-16 is recommended. The forest belt surface will be of 2000 ha.

The recreative forests will cover 9000 ha.

*The forest passages* between any kinds of forest belt, woods etc. is compulsory to be of a rectangularity shape. For the first 10 years 100 ha have to be taken into account.

*The common pasture rehabilitation* situated in the affected areas must be equipped with summerhouses (made by trees) for the animals and with eolian watering places.

➤ **Hydrological system** improvement in dikes areas

To exploit the dammed precincts, must be act only in a complex way – *hydromeliorative works (draining and irrigation) and agro-pedo-meliorative works*.

The hydrological conditions improvement *must take into account the fact that many factors act over dammed areas, in this way determining changes in the ground water evolution due to dammed river fluctuations, water flow from the terrace and rainfalls.*

In this way, terraces from the Danube River meadow are, mostly, arranged with irrigation systems, *the water from evacuating* network acting over them also.

As a result, the hydrological system improvement in dammed areas is directly related to operating of hydro-meliorative works, whose role is, mainly, to reach this purpose.

➤ ***Slope terracing***

Terracing will be take into account only on the stable lands, without landslides or earth movements.

The main targets of this action are the water flow diminishing on the slope.

*Cavities* for afforestation are frequently use, are able to hold important amounts of water also. The needs for the present proposed action are of 5000- 6700 cavities/ha almost.

➤ The promotion of the alternative and drought ***resistant crops*** and of the special soil management

The crop assortment will be adapted to the water assurance conditions, taking into account the economical needs of the basic products (cereal, technical and forage crops, leguminous plants, vegetables etc.). Alternative crops more tolerant to the water deficit will be promoted for the drought conditions:

maize hybrids of a short vegetation period in non-irrigated areas

sorghum or winter barley instead of maize

pea instead of soya bean

rape and sunflower as drought resistance oleaginous plants

Sudan grass and perennial crops (lucerne and perennial herbs)

the maize, soya, bean, sugar-beet and vegetables will be cultivated particularly under irrigated conditions

The crop rotation and the cropping system will provide the water accumulation and conservation in the soil, the improvement of the soil physical, chemical and biological properties, and the avoidance of the spreading of the pathogenic agents, pest and weeds.

Minimum tillage system and tillage alternation will be promoted in order to maintain the plant remnants on the topsoil and the water accumulation and conservation in the soil and to decrease the water and wind erosion and to save fuel.

The outfit of tractors, agricultural machinery and equipment must be assured for tillage in the optimum period.

The soil fertility will be improved using predominantly the organic fertilisation with manure, compost or green manure, annual and perennial leguminous plants and a minimum quantity of chemical fertilisers.

Plant breeds and hybrids with a short period of vegetation, more tolerant to drought and heat will be cultivated.

The plant growing methods (plant density, row distance, seeding period, weeding, plant protection treatments) will be adapted to the soil water storage, precipitation prognosis and water providing by irrigation.

The integrated measures for weed and pest control will be taken into account.

The following measures will be promoted *in the case of the pastures*: regulation of the animal loading according to pasture productivity, spring grazing will begin only after the dry of the topsoil and the plants are above 10cm height; the grazing season will end a month before the soil freezing, grazing interdiction in the rainy days, alternative lawn use (1-2 years as pasture, 1-2 years as hayfield); summer houses for animals; reseeding (only on the plain surfaces) of the degraded pastures (with productivity below 1 to / ha dry matter or pastoral value below 25) with mixtures of drought resistant species (Sudan grass, sorghum, Italian millet, forage maize etc.) the amendment with phosphogypsum (5-8 to / ha every 8 years) is recommended on the low-moderate salty soils with plant associations of *Festuca valesiaca* or *Puccinellia limosa*; in addition to the land amendment, the land improvement

measures are compulsory on the pastures of *Salicornia europaea* – *Suaeda maritima* with more than 15% exchangeable sodium; the temporary lawns on the sands are profitable only under irrigation, after the entirely soil melioration for deflation control (shelterbelts), levelling and fertilisation.

➤ Ecological ***rebuilding of the dry woods***

The forests affected by drying due to the long-term droughts and to the human activities also, are situated in the lower part of Romanian territory especially and in the other sandy area etc., covered with xerophyllous species of *Quercus*.

The main measures take into account is:

Land surveying and evaluation

Afforestation seedlings for the affected areas

Specific technologies concerning tillage, afforestation and taking care of the new forests.

The decline forests measures for their rehabilitation are:

Improving of the pest control activities

Special techniques for attention

Better composition and structure regarding the new conditions

➤ ***Water resources management*** in case of drought

Water resources management in the areas in danger of drought, contains:

- Demands management and water resources re-assignment in order to obtain more efficient water use. This is the reason why the establishment of a prices system which could control the efficient water use by introducing new technologies and modifying some structural works, is of a great importance:
- Incentives and facilities use for an efficient water consumption;
- Special measures consisting in:

Improvement and co-ordination in the water resources management;

Improvement of the performance and operation parameters of the storage reservoirs and generally of the water management works;

Conjuncture use of the ground resources;

Use of the inter-basin derivations;

Re-use of the purified waters for necessities which allow it (cooling waters, waters for domestic use);

Acknowledgement of the environment and the ecosystems with water demands;

Settlement of the water right.

➤ *Alternative solutions:*

In the areas the most vulnerable to extended drought it is important to take certain measures with a difficult hierarchy. The solutions generally consist in a series of options of an institutional, scientific, technical, social and political nature, which have to be assumed at the local, regional and central level. It is important to mention that these measures should be taken before the drought signs.

Among these measures it is worth mentioning the following:

a) Projection and building of new storage reservoirs in those areas far from the water sources or where the ground water reserves is reduced;

b) Evaluation of the interconnection possibilities of the structures endowed with another water supply systems;

c) Evaluation of the available waster volumes and extension of the existent storage reservoirs capacity, whose keeping possibility was scarce;

d) Metering of the water flow discharges and determination of the storage reservoirs keeping capacity; determination of the initial point of the water keeping action and the rational water use during the drought period;

e) Promotion of some prospecting programs by drillings in order to determine the stocking capacity of the ground water in the adjacent alluvial layers:

f) Build galleries and wells big in diameter in order to intercept the phreatic layer;

g) Use of the long-range meteorological forecasts in order to determine the starting point of the water keeping measures;

h) Interconnection of certain water supply public systems with another ones, which have available source and the capacity to face the drought conditions;

i) Build immediately certain temporary (permanent) water supply systems through the pipes for the communities in danger of water penury;

j) Provide possibilities for the water transport by auto-cisterns and railways for the water supply of the communities, which live in desperate conditions because of the lack of water.

A series of special measures have to be taken in the activity sectors:

▪ **In agriculture:**

Adequate metering measures;

Establish a water price structure so as to encourage its efficient use;

Informational and educational services for the users in order to obtain an efficient water resources use;

Name a co-ordinator who has the obligation to control the efficient waster use;

Encourage certain water management measures at the farms level among which we could mention.

Lining channels;

Systems of water re-use;

Change the transport channels with big water losses with pipes or channels properly endowed;

Use of the reel hose machines and handmove equipment;

Land levelling;

Soil treatment;

Detect and repair all the areas with losses in the irrigation systems:

Use first of all the purified water for irrigation anywhere it is possible.

Incentives for efficient water use, including different services like: educational programs, demonstrative projects, financial Incentives and also reduction of tones, lower interest credits, subsidies for braying equipment, water taxes reduction.

- In **municipalities**:

Name a co-ordinator for the problems of the efficient water use;

Draw up a plan of the efficient water use;

Stuff and population training and participation to the efforts of the efficient water use;

Implementation of a water loss reduction programs.

- In the improvement of the **water supply systems**:

Water use metering;

Introduce alternatively certain un-drinking water distribution systems;

Make sure that the fire hydrants are tight closed.

- In **equipment** change

Use of toilets with reduced water consumption or diaphragm introduction; showers with reduced discharge cooling water quantity reduction at the specific equipment;

- In the **landscape** domain:

Lawns watering during the colder day periods and when the wind is not blowing;

Use of deep roots tress;

Sprinklers use for lawns watering;

Sensors for the humidity detection;

Soil lest and organic substances addition;

Diminishing the use of the grass beds and uses the common natural grass;

Use of bushes and garden plants to reduce the evapotranspiration;

Diminishing the fertilising substances, which need water.

➤ ***Improvement of the supplementary water resources***

Projection and building of new storage reservoirs, channels and feed pipes in the areas far from the water sources where the ground water reserves are reduced.

In this case it is works to keep building the Siret - Baragan channel with a total length of 189 km. The cost of this work is of about 800 mil USD. The channel efficiency consists in reducing the danger of the land aridization. It will also provide water to irrigate a surface of 519.000 ha in the Northern and Central Baragan a severe drought area, trying to avoid the periods with a lower crop or the lack of crops, obtaining in this way mean supplementary crops of 2 t cereals/ha/year that represent 1 mil t/years, equivalent with 100 mil USD/years. This fact makes possible the initial investment recovery in about 10-12 years.

## **B. MEASURES FOR CONTROLLING LAND DEGRADATION**

### ➤ *Eroded* soils

Taking into account the extent of areas affected by water erosion (6.30 mil ha), prevention and controlling this phenomenon represents one of the most important objectives of this strategy.

The first action consists of an inventory of control erosion works (2.2 mil. ha), and selecting those areas where these works could be covered in condition of economical and ecological efficiency or in aim to save some national strategic interests.

According to the degradation intensity, in the conception of this strategy, there are two main kinds of measures:

- Rehabilitation measures.

This category comprises the agricultural lands with intense erosion processes but which are not completely destroyed and can be recovered for agricultural use after an improvement period. The measures which would to be applied consists of: withdrawn from cropping, sodding and used as grassland for a period of 10 years, and applying works that will diminish substantially the erosion rate. These works could be made on contractual basis with the farmers which have to receive subsidies for partial recovery of the losses from their profit resulted by an economically less efficient system introduction, but with high efficiency in soil



protection. The implementation of these measures has to be done at minimal cost. The area of lands of this category is circa 3.0 - 3.5 mil. ha.

- Ecological reconstruction measures.

In this category enter the lands with excessively eroded soils that not have chances of rehabilitation for agricultural use.

The ecological reconstruction is achieved through afforestation and sodding, accompanied by adequate works to allow vegetation install. The exploitation regime is that of a reservation of two kinds. The first one allows timber or grass harvesting according to a program that permits normal development of the soil - plant system. The second type is that of a reservation with severe restrictions. In this category could be included a land area of 1.5 - 2 mil. ha.

The rehabilitation and ecological reconstruction of lands with eroded soils requires special laws, which should allow to elaborate a program of implementation, financed from public funds.

#### ➤ *Landslides*

The measures for preventing and controlling landslides are complex and various. They depend on the landslide type, geological and lithological conditions and especially on the hydrological and geomorphologic land peculiarities.

The main measures are: interception (capture and drainage) of ground water (in some cases also of the surface runoff) from the area affected by landslides (and sometimes from up-hill) forest planting to stabilise the terrain and improve of the biological drainage. Special consolidation works where buildings, roads, highways, railways, bridges or other objectives of economic or social interest are to be protected.

The rehabilitation and ecological reconstruction measures are principally the same as for the eroded soils, with the difference that in this case the terrain and soil non-uniformity is very high.

The area affected by landslides is of about 0.702 mil ha.

➤ *Salt-affected* soils

In this problem, the first condition is to change the politics concerning the melioration of the salt-affected soils (circa 0.64 mil ha) putting the accent on the prevent of the salinization (extension and intensification) on good soils, and on the development of adapted technologies specific for weak salty soils, but not to promote special melioration works of saline and sodic soils, works that are very expensive, difficult to be maintained, with doubtful ecological efficiency and certainly without economical efficiency. Otherwise, in Romania the quasi-totality of salt affected soils (Solonchaks and Solonetz) are “natural” ones and represent well-individualised ecosystems, very stable and with a specific ecological value. Such terrain can be (and really they are) used as such: for grasslands (pastures), for recreational spaces for cattle, fishponds, some tourist activities etc.

In the case of weak-moderate salt affected soils, which are used for agriculture, the main melioration measures are the following:

In the case of salty soils: irrigation on drained ground to remove the soluble salts. The work is accompanied by gypsum application when sodium (bi) carbonate is present or exchangeable sodium occurs in the soil adsorptive complex.

In the case of sodic (alkali) soils: application of gypsum and deep loosening to improve the soil permeability; when soluble salts are present (simultaneous with gypsum application), irrigation for salt leaching is applied. In all cases artificial drainage (tile or open one) is required.

During the melioration period salt tolerant crops or meliorative ones are used (barley, sunflower, lucerne, a. o.).

**It was realized a 63 ha plot for salt affected land melioration** in Braila area (Salt Lake), which receive financial support from the Ministry of Agriculture, Food and Forests Melioration Fund for Land Reclamation.

➤ *Sand and sandy soils* (sandy dunes)

Like in the precedent cases, the first step consists of reanalysing the politics of improvement, melioration and use of sands and sandy soils (0.439 mil ha), in the

sense of going back to the strategy promoted at the beginning of the XX-th century, that is of afforestation of sandy soils from the dry zone, where the danger of wind erosion is very high, and keeping for agricultural production only some limited areas (provided with irrigation), according to the necessities of supplying the market with specific products, especially early vegetables.

The main measures for melioration of sandy soils or of sands, cropped or used as grasslands are as following:

Protection against wind erosion, by keeping the ground surface as much as possible covered with vegetation all year around (but especially during dry season), forestry wind breaks, irrigation to moisten the soil surface, and where it is possible, use of synthetic conditioners for soil structure development and stabilisation;

Increase of organic matter content, green and/or organic manure;

Improvement of water holding capacity by increasing the silt and clay content, objective that can be achieved by incorporation of loamy, loamy - clayey materials (e.g. loess material).

➤ ***Compacted*** soils

Further prevention of physical degradation of antropical compacted soils and of those affected by structure degradation, crusting, sealing a. o. through adequate cropping technologies as follows: types of agricultural machinery which would avoid compaction of arable layer and of subsoil, increase of tractors stock for making possible tillage operations at optimum soil moisture content, decrease of the number of field works, introduction of new tillage systems, inclusive – within suitable zones and in conditions of weed control by specific means – of minimum tillage systems, introduction of long-term crop rotation with protective and meliorative plants, etc. Taking again of periodical deep loosening and deep ripping works on terrain with deep primary compaction of pedogenetic origin (circa 1 mil. ha)

➤ ***Acid*** soils

Correction of soil acidity over circa 2.3 mil. ha agricultural land (1.6 mil. ha arable land; 0.634 mil ha pastures and meadows, 0.101 mil ha vineyards and orchards) by periodical liming, according to agrochemical soil analyses.

➤ ***Soils with low organic matter and macronutrients*** content

Increase as much as possible of organic matter (humus) reserve of soil, on circa 7.7 mil. ha agricultural land, from which 4.3 mil. ha arable land, through applying de organic fertilisers (manure), crop rotation with meliorative plants, increase of plant roots biomass by advanced agricultural technologies, enhancing some biological activities in soil.

Achievement of a positive balance of nutrients in soil by adding chemical and natural fertilisers, according with the requirements of durable agriculture, the results of periodically soil and plant analyses and with the peculiarities of different crops.

➤ ***Polluted*** soils

The measures of preventing and controlling soil pollution are taken depending on: the source and the nature of pollution, the distance from the pollution source, the genetic soil types and the geomorphologic characteristic of the area.

For soils polluted with heavy metals and sulphur are taken into consideration the measures that allow immobilisation in soil of heavy metals and prevent their translocation in plant: liming, mineral and organic fertilisation, a favourable macronutrients balance, pH 6-6.5;

For soils polluted with oil residues and salty water one recommend a complex set of works which includes: agropedological meliorative works, removal of water excess, meliorative cropping technologies, biological measures and in extreme cases even the removal of top soil and replacing it with a non-polluted earthy material if it is too strongly polluted;

Soils polluted with fluorine require the following meliorative measures: dilution of the pollutant by its mixing with non contaminant materials with a high adsorptive capacity, like clays and aluminium oxides; reducing fluorine mobility by liming and keeping a pH between 5.5-7.0.

Terrain degraded by mining activities require ecological restoration through levelling of mine dumps covering with earthy material, chemical and mineral fertilisation, manuring and correction of soil acidity;

For the cinder-dump originating from thermoelectric plants, technologies of technical and biological restoration are applied; the terrain polluted with cinders from thermoelectric plants are improved through measures specific for controlling the pollution with heavy metals, sulphur and soluble salts.

### **C. MAKING POPULATION AWARE AND EDUCATING IT**

Currently, this activity is quasi absent. The following are considered necessary for the future:

Organisation of conferences in rural areas on subjects of desertification, draught and soil degradation

Publishing brochures, leaflets and other illustrative documents presenting the effects of desertification, draught and soil degradation and the measures that can be taken at the local level to alleviate the socio-economic consequences of these processes

Involvement of radio and TV stations, of mass media in general, in the actions of dissemination and education of the importance of preserving, protecting and improving the soil resources.

Facilitate the access of population to data and information on the means of diminishing the effects of draught, involving the bodies of the local state administrations, the non-governmental organisations and the specialists in agriculture or environmental protection.

Develop and implement local, regional or national programs for desertification control and/or alleviation of draught effects, involving the population and the local communities.

Study ecology in pre-school and elementary education.

#### **D. SCIENTIFIC RESEARCH AND EDUCATION DEVELOPMENT**

In Romania, the research programmes concerning desertification, land improvement and drought are promoted, through the specialised institutions.

The drought phenomena increasing and desertification tendency on a large area impose the necessity of co-operation between the specialised institutions of our country and a regional and international co-operation

The specialist training must be done in the agronomic, land improvement and environment protection universities.

The post-university training courses must take into account also.

The main targets are:

Setting up of the research teams for desertification, land degradation and drought prevent and drought

Setting up of the research programme for desertification, land degradation and drought prevent and drought

Setting up of the National Informational System for desertification, land degradation and drought monitoring

The secondary targets are:

People evolution and structure in the affected areas

Birth rate in the affected areas

Sustainable development indicators evolution

In our country the most important way to prevent and control the soil degradation is by afforestation. For this purpose a political framework was established, as well as for according the facilities (free seedlings and technical assistance) to the land owners who wish to realise forest plantations; 2.3 mil forest seedling were accorded (free of charge) between 1999-2001 by the National Forest Company (the state forest fund administrator).

In the last decade the afforestation of the degraded lands was realised on almost 5700 ha (1304 ha in 2000 and 2001).

The inventory of other degraded land available for afforestation is on.

**7700 ha of degraded agricultural** land was given to the Forest National Company by Gov. Decision no. 357/2002 in order to be meliorated by afforestation. The main difficulty of this action is the lack of financial support. Some money was obtained for the afforestation of 7000 ha by a project under *The Kyoto Protocol* with Prototype Carbon Fund administered by World Bank. The location of this area is in the southeast and southwest part of Romania, on low quality agricultural lands on flying sands and eroded soils.



***(viii) Financial allocations from national budget in support of implementation as well as financial assistance and technical co-operation received and needed, identifying and prioritising requirements***

Due to the fact that the prevention and combat of desertification, land degradation and drought is of national and international interest on short, medium and long term, the financial resources should come mainly from the state budget and external funds. Also the budget of the local communities in the areas that are included in the strategy should include special funds in this respect.

The allocation of funds should be done according to the priorities established by the present strategy.

The allocated funds should follow two main directions:  
improvement of environment factor quality;  
economic, social and cultural development of the affected areas.

The costs for the application of the strategy account for 4,460,288 thousand \$, of which:

Legislation improvement and development 103 thousand \$

Institutional development 10,065 thousand \$

Provide for the human resources 9,310 thousand \$

Development of the technical and scientific basis 301,300 thousand \$

Rural development and landscape restructuring in the areas with a desertification risk 1,875,560 thousand \$.

Landscape restructuring and rural development in wet areas with land degradation risk 2,263,920 thousand \$.

*(ix) A review of the benchmarks and indicators utilised to measure progress and an assessment thereof*

**A. MONITORING OF ZONES AFFECTED BY DESERTIFICATION AND DROUGHT**

should use a range of indicators as follows:

➤ ***Climatic*** indicators

base indicators – which are derived from some climatic data;

complex indicators – that are obtained through combination of base indicators with other data types: climatic, agricultural, socio-economic, soil degradation etc. (aridity index, drought resistance index etc.)

➤ ***Pedological*** indicators:

soil moisture and soil temperature regimes, especially during the plant growing period; soil water balance and its components (runoff, infiltration, evaporation, useful consumption etc.);

water and wind erosion, and the elements necessary to use erosion mathematical models (pluvial erosivity, soil erodability etc.);

soil salinity, soil sodicity;

natural drainage of the area;

frequency and duration of flooding;

soil structure degradation, crusting, sealing, compaction;

equilibrium between organic matter input/output, level of microbial biomass, and the amount of residual organic matter;

basic chemical properties: organic matter content and its composition, microbial carbon content, C/N ratio, macronutrients (N, P, K) content, soil reaction (pH).

➤ ***Hydric*** indicators (water):

rainfall aggressiveness (precipitation amount, frequency and intensity, USLE index of pluvial erosivity);

evapotranspiration;

surface runoff infiltration;

natural drainage at the area;

water resources: quantity, seasonal and annual dynamic, and its trend;  
frequency and duration of floods.

➤ ***Agricultural*** indicators:

annual variation of yields;  
crop behaviour during growing season.

➤ ***Forestry*** indicators:

evolution of health state of forests

dynamic of forest resource area

damages caused by biotic and abiotic agents

changes in quantity and value of non-woody forestry products

area of natural and semi-natural secular forests and of strictly protected forests, and of those with special regime of management

dynamic of the area of forests with special protective functions (of waters, soil, climate protected areas, recreational areas etc).

➤ ***Biological*** indicators (of vegetation and biodiversity)

*a) Vegetation and microbiological indicators:*

seasonal and annual dynamic of the primary vegetation's biomass (NDVI index) using satellite data from NOAA/AVHRR SPOT, VGT, a. o.);

root/aerial biomass ratio of vegetation cover;

degree and type of land cover;

percent of abandoned lands;

microbiological activity from soil, number and micro-organisms types;

aridification of natural vegetation (structure, composition spatial distribution, biological types);

fire-risk of forests.

*b) Indicators concerning biodiversity status*

▪ Indicators of ecosystems quantity

percent of auto-regenerating areas, that corresponds to natural and semi-natural ecosystems, and the percent of strongly modified areas following human activities;

percent of auto – regenerating areas of each kind of ecosystems from the total area;  
extension of natural and semi-natural areas upon size classes (100 - 1000; 1000 - 10.000 ha).

- Indicators of biodiversity quality of ecosystems:  
species distribution and quantity face to a reference level;  
indigenous species number in percent face to a reference level;  
total percent of forested areas;  
percent of agro-ecosystems areas from natural zones;  
percent of endemic resources;  
percent of coastal and marine areas having important biological resources.

- Indicators of threatened and/or extinct species and of habitat:  
number of threatened or extinct species as percent from groups used as bio-indicators;  
number of threatened habitats as percent from total.

➤ Indicators of *demographic* (human) pressure

- Indicators concerning losses of habitat:  
% de auto – regenerating areas converted yearly to agricultural production, to urban use or to other intensive uses;  
% percent of riverbed significantly affected by dams or regularisation.

- Indicators of over-exploitation:  
total amount of harvested biomass face to the exploitation levels estimated as supportable;  
the average size, weight, age per species unit, for animals that browse, reported to the reference year;  
size of the agricultural area lost in the last 10 years, owing to erosion as % from the area converted to agricultural production in the same period at nation-wide level;  
unsuitable agricultural practices (kind, intensity).

- Indicators of exotic species:  
total number of exotic species as % from a particular taxonomic group;

relative biomass of exotic species as % from a particular taxonomic group.

- Pollution indicators:

average quantity of a substances group, strongly harmful to biodiversity as compared with soil, water and air standards established by the European Commission in 1988.

## **B. MONITORING OF AREAS WITH DEGRADATION SOILS**

- Monitoring of areas affected by *water-erosion*

multiplying of existing observation plots (agricultural and forestry) in aim to cover all bio-climatic zones and soil types. A special attention will be paid to the areas where this processes acts with maximum intensity: Hills adjacent to Carpathian Bend, Barlad Tableland, and Transylvania Tableland.

- Monitoring of *land-slides*

implementation of monitoring points within areas with active dynamic of landslides that is in areas with marly-clayey and sandy-clayey lithological substratum from Pericarpathian Hills, Barlad Tableland and Transylvania Tableland.

- Monitoring of *wind-erosion*

starting the monitoring in sandy dune areas from Oltenia and Baragan (Eastern part of the Romanian Danube Plain). Monitoring points will be also installed within areas with soils developed on loess from the steppe-zone (Kastanozems and Chernozems). On those soils wind-erosion in not studies yet.

- Monitoring of *salt-affected* soils

monitoring of the soil salinity and soil sodicity dynamics. At the time being this activity is already organised within Braila Plain and Lower Siret Plain. Nowadays is taken into account to extend it in Southern Oltenia and the Western Plain.

- Monitoring of *polluted* soils

developing and perfecting of monitoring areas with soils polluted by heavy metals and acid rains (Baia Mare, Copsa Mica, Zlatna, Valea Calugareasca) or by oil and

salty water, within the frame of the existing agricultural and forestry monitoring system of soil quality (16x16 km grid).

➤ Monitoring of soils vulnerable to *compaction*

developing and perfecting of a special monitoring within areas with soils developed on loess or other silty materials, soils with an non-equilibrated texture a. o. within the frame of national system of agricultural and forestry monitoring (16x16 km grid).

### **C. ORGANISATION OF DESERTIFICATION AND DROUGHT MONITORING**

➤ *Network* type

One appreciates that the present day agricultural and forestry soil quality monitoring network (16x16 km grid) may take successfully the function to monitor also desertification, drought and land degradation. But there is the condition to extend it and to improve its density having as base the present day national grid (4x4 km) of forestry monitoring system. Also it appears necessary to install some supplementary observational points in the areas with serious ecological problems like those from the zone subjected to desertification: areas with shallow or skeletal soils from Dobrogea (on green schist, limestone, granites), areas with strongly eroded soils from Dobrogea and Southern Moldavia, areas with salt affected soils from Eastern Romanian Danube Plain (Calmatui Valley, Ianca Valley, Lower Siret Plain) and from Western Plain, embanked areas from Danube Flood Plain and Danube Delta, areas with sandy soils from Romanian Danube Plain and Danube Delta.

In aim to implement such a complex monitoring system the following urgent measures are considered to be taken:

sharing the tasks among the all involved institutes;

elaboration of a unitary methodology that has to be accepted by decision-makers factors according to the existing methodologies in this field of interest.

providing the necessary funds for procuring equipment, programmes, training personnel etc.;

the special department created in this aim will gather and integrate all data concerning the monitoring of the environmental factors from the zones with high risk to desertification, drought and land degradation.