T H E R E P U B L I C O F M O L D O V A

NATIONAL ACTION PLAN TO COMBAT DESERTIFICATION

(RÉSUMÉ)

Chisinau-2000

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INTRODUCTION

Republic of Moldova joined the United Nations Convention to Combat Desertification in those countries experiencing serious droughts and/or desertification, particularly in Africa, on December 24, 1998.

One of the objectives of this Convention is elaboration of the National Action Programme. The purpose of the Programme is to identify the factors contributing to desertification and practical measures necessary to combat desertification and mitigate the effect of drought.

The National Action Programme specifies the role of the Government, local communities and land users, and the resources available and required.

The National Action Programme to Combat Desertification has to:

a) incorporate long-term strategy to combat desertification and mitigate the effects of drought, emphasize implementation and be integrated with the national policy for sustainable development;
b) allow for modifications to be made in response to changing circumstances and be sufficiently flexible at the local level to cope with different socio-economic, biological and geo-physical conditions;
c) give particular attention to the implementation of preventive measures for lands that are not yet degraded or which are only slightly degraded;
d) enhance national climatological, meteorological and hydrological capabilities and means to provide for drought early warning;
e) promote policies and strengthen institutional framework which develop cooperation and coordination, in a spirit of partnership, between the donor community, government at all levels, local population and community groups, and facilitate access by local population to appropriate information and technology;
f) provide for effective participation at the local, national and regional levels of non-governmental organisations and local population, particularly resource users, including farmers and pastoralists and their representative organisations, in policy of planning, decision-making, implementation and analysing of the National Action Programme;
g) require regular review and progress reports on their implementation.

The main measures in the environment protection area are:

- maintenance of lands productivity in case of desertification of affected territories via implementation of social accepted and economically feasible ecological soil exploitation systems;
- protection of non-degraded or slightly degraded soils and/or their conservation for natural rehabilitation;
- providing the guarantee of no-recurrence of droughts and de-stabilisation of economy;
- rising living standards for population in the desertification affected areas, including health protection, better sanitary conditions and family planning;
- avoiding negative effects leading to climatic and biodiversity changes as a result of actions undertaken during desertification processes.

General Characteristics of the Republic of Moldova

Geographical position and administrative management

The Republic of Moldova is situated in the South Eastern part of Europe, occupying a considerable part of the territory between two rivers Nistru and Prut and a narrow strip of land along left Bank of Nistru river. It borders Romania to West, and Ukraine to North, East and South. The length of the territory from North to South constitutes 350 km and from West to East – 150 km. The extreme settlements of the country are: Naslavcea at North (48º29 north latitude), Giurgiulesti village at South (45º28 north latitude), Cricova village (26º30 east latitude), and Palanca village at East (30º05 east latitude). The area of the republic is 33.8 km².

The Relief

From the geographical point of view the territory of the republic is situated and belongs to the Eastern European Plain. Valleys of the Dniester and Prut rivers and their streams cause a severe division of the area. At whole, however, the relief is a hilly one. There is a small slope from North West towards South East, the difference between altitudes being from 300 m to 150 m. The central part of the republic, where the internal streams have a height from 300 to 400 m above sea level, makes an exception.

One can distinguish 7 geographical units on the territory of the Republic of Moldova: the Northern Moldova Tableland Plateau, the Northern Moldova Plain, the Southern Moldova Plain, the Down Dniester River Plain, Central Moldova Plateau, the Dniester Plateau River and the Tigheci Plateau Plain (Figure 1).

Out of exogenous processes of relief formation and evolution, observed on the territory of the republic of bigger importance turn out to be such processes as erosion, land slide.

The Republic of Moldova is situated in an active earthquake zone. Earth quakes are possible on the biggest part of its area with a maximum intensity of 7 degrees, and even 8 degrees Richter scale in the Southern part of the country.

Mineral Resources

Non ferrous useful minerals are the main mineral resources of the country, to which one may add an insignificant amount of fuel resources and underground waters. Annual need of the republic during years of intensive development of industry used to be satisfied by an extraction of up to 40 million tons of raw material and of 300 to 350 million tons of underground waters.

At present, only such construction materials as stone, gypsum, limestone, sand, gravel, raw material for cement production are being extracted. Moldova exports for industrial production 98% of its raw materials.

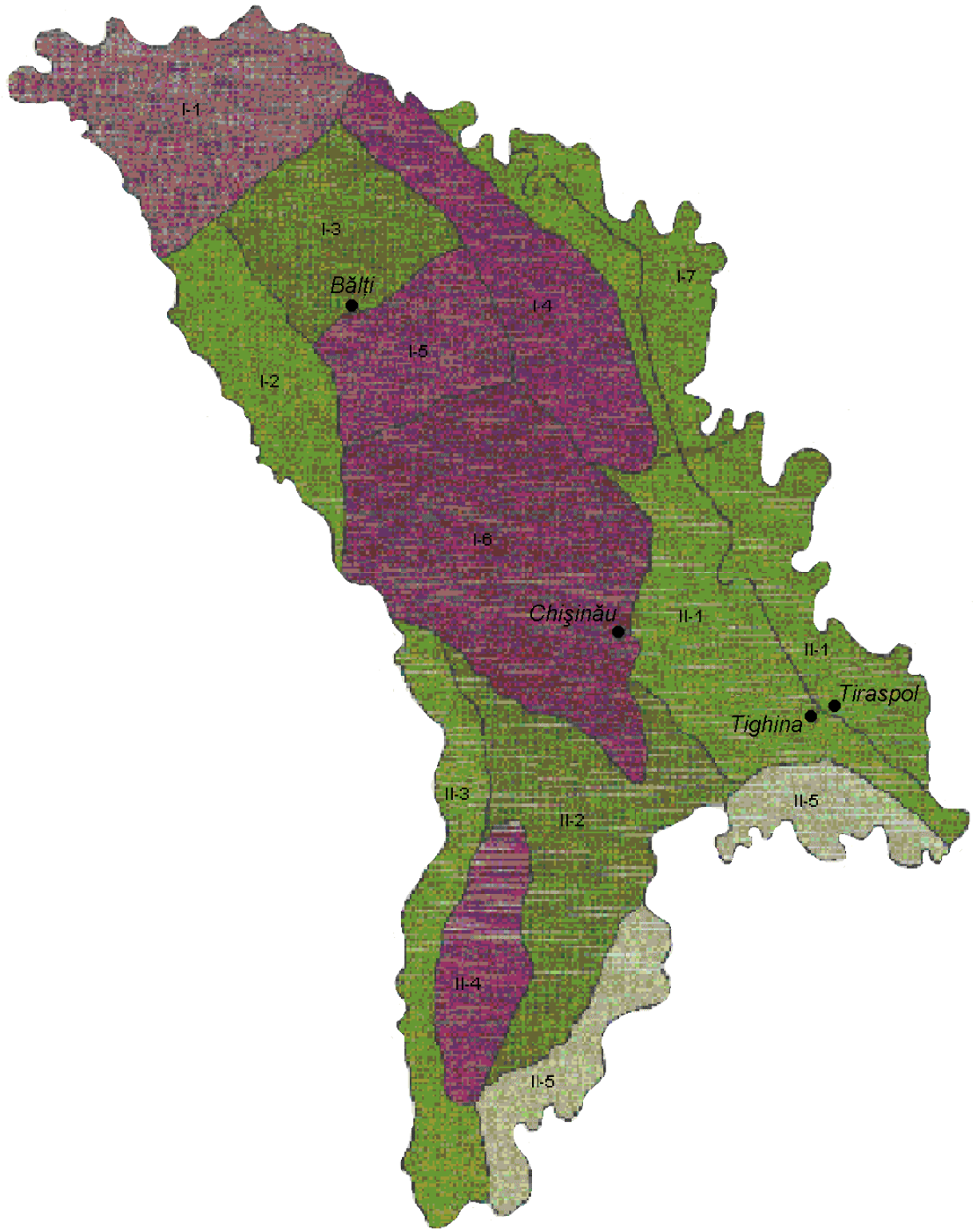
Moldova has a scanty reserve of deep-water resources. The total explored resources constitute 1.5 mill km^3. Per capita water consumption in Moldova constitutes an average of 100 l per 24 hours and 350 l/24 hours in its capital, Chisinau, compared to the United Nations norm of 1000 l/24 hours.

Only a third part of underground water resources meet the requirements of drinking water standard as far as chemical composition and quality is concerned.

Land stock

The land stock of the Republic per January 1, 1999 constitutes 3 million 384.4 thousand hectares. The agricultural land area is 2 mill 556.6 thousand ha or 75.5% of the total area, out of which arable land – 1 ml 809.9 thousand ha (53.3%), orchards and vineyards – 370.7 thousand ha (10.9%), meadows and pastures – 376 thousand ha (11.1%). Forests, forest strips, bushes

Figure 1. Geographical morphological map of the Republic of Moldova



I- forest-steppe zone: I-1-Plateau Plot in the Northern part of the Republic of Moldova; I-2-Terraced field of middle Prut river area; I-3- Baltsi valley; I-4- Nistru river plateau; I-5- Ciuluc-Solonets plateau; I-6- Plateau plot in the Central part of Moldova; I-7 Nistru river valley (Northern part).

II-steppe zone: II-1 Nistru river Valley (Southern part), II-2 Hilly valley of Southern Moldova; II- Terraced Valley of the inferior part of Prut river; II-4- Tigheciului Plateau Plot; II-5- Low adjacent Valley –party of the North West Black Sea Basin.

cover 422.9 thousand ha or 12.5% of the total area. Similar to other countries, in Moldova there is a reduction of per capita arable area, which in conformity to latest data makes 0.407 ha. Degraded soils make more than 2 mill ha.

Moldova's Climate

Climate in Moldova is continental moderate and is characterised by a mild and short winter, little snow and a long warm summer with low amount of precipitation. Drought and changing weather phenomena cause the negative aspect of climate in this region.

Air temperature in winter is unstable. January is the coldest month of the year, the average temperature being from 2.5 to 5.5^0 C. Average monthly temperature of the soil at ploughing layer depth (20 cm) in winter is positive on the entire area is of near 0^0 C. However, when there is no stable snow blanket the soil may get frozen down to a 100 cm depth.

Precipitation falls in the amount of 100 to 140 mm during winter, which makes 20% of the annual amount.

Summer is warm and dry. The warmest month of the year is July, the average temperature during this month being 19 to 22^0 C. Maximum air temperature in certain zones may reach $37 – 40^0$ C and even $62 – 66^0$ C at the soil surface. During the warm period of the year there is a number of 60 to 95 days with high air temperatures of 25^0 C or even more.

Absence of precipitation for a long period of time accompanied by high temperature leads to occurrence of drought. While in the central part of the republic it has an occurrence frequency of once per every 6-7 years, in the South the frequency is from 3 to 4 during the same period of time.

Demographic indices

The population is of 4 mln 320 thousand with a 127.8 person density per 1 km². Rural population predominates (53.8%).

Due to a decrease of newborns number the demographic situation is aggravating at present. The birth rate in 1990 - 1996 has gone down from 17.7 to 12.0. Worsening of life socio-economic conditions and the high minimum consumer basket cost are thought to be the main reasons for this.

At the same time there is an increase of the mortality rate, which in 1996 was 17.3% bigger, compared to 1990. The death rate for reasons of murder, intoxication, exhaustion has gone up twice. The raise of mortality is accompanied by a reduction of life expectation. Compared to 1994 life expectation has reduced with 1.2 years and constituted 67.8 years, out of which 64.3 for men and 71.1 for women. Life expectation in developed European countries than in North America and Japan is 6-10 years higher the one in our Country.

High infant mortality constitutes an acute demographic problem. While in developed countries this rate is 5 – 9% in Moldova it stays of 20 – 23%. This phenomenon is linked with high frequency of respiratory infectious and parasite diseases among babies under one year, as well as born anomalies.

Socio-economic characteristics serve as anthropogenic factors of desertification

Socio-economic crisis has led to the reduction of labour resources. The economic potential of the population able for labour is 56.4% (24369 thousand people) out of the total number of population. 46.1% people out of the total number of population are warmed up in economic activity. A decrease of population number in the group up to 15 years and an increase of number of people in the third age group are observed. The so-called "demographic ageing" phenomenon takes place. The ageing rate of population in 1996 constituted 13.3.

Economy stagnation, inflation, reduction of real income of the population has led to a drastic decrease of population living standard. Consumption of food products during 1990 – 1996 has gone down: meat - 2-3 times; milk, dairy products and eggs – 1.9 times; sugar – 2.6 times; oil - 1.7 times; vegetables, fruit, grapes – 1.9 times. Population in its majority is at the brink of poverty.

I. PROGRAMME BACKGROUND

Desertification factors. In conformity with present concept the desertification factors (Figure 3) are climatic by nature and caused by human activity.

Desertification factors	
Climatic	Caused by human activity

Conditions of desertification	
Impact regulators	Objects of impact
Soil properties, local water resources (level, mineraliza-tion of the phreatic waters, etc.). Plant and animal kingdom. Earth surface (nono-, mezo- and micro-relief)	

Desertification agents
Ecological unbalance, soil erosion, including deflation, saltsatura-tion of land.

Results of desertification (Consequences of the impact)		
Change of soil characteristics and soil processes. Physical and chemical degradation.	Change of mineral content in phreatic waters: depth of phreatic waters, raise of the level of underground mineral waters and of toxic compounds.	Change of vegetation cover: thining out, xerophitization, halo-phytization, etc.

Figure 2. Desertification factors, conditions, agents and consequences.

I.1. Climatological factors as desertification intensifiers

Moldova's biggest part of the territory, in accordance with international UNEP classification of arid land, belongs to sub-humid dry lands ($0.50<Y>0.65$) based on the ratio (Y) of total precipitation (X) to potential evaporation-transpiration (E). In the South Eastern part of the republic there are semi-arid lands with $Y<0.48$. The extreme most northern territory and the highest part in the Codru forest region (350-400 m above sea level) assign in the category of moderate climate zones ($Y>0.65$).

1.2. Human activities – cause of intensification of desertification

Due to the fact that the agricultural land covers in the average 75.5%, and in the South 81%, of the total territory of the country, the agricultural factors appear to be the ones that cause intensification of desertification process in the natural and economic conditions of the Republic of Moldova.

Arable Land

Arable land, orchards and vineyards included, constitute an average of 64.4% of the entire territory of the republic. The area changes from 85.1% at North to 93.1% at South East. Actually it covers the major part of territory. This act as a negative aspect and the main factor leading to intensification of desertification:

- *surface and linear erosion, deflation, land slide. As a result there occurs an increase of the ecological unbalance.*

Land fertility change

Disregard of modern ecological agriculture techniques has generated a decrease of soil fertility.

It has been established that during the last 100 years 2.8 tons of nitrogen, 0.8 tons of phosphor and 6.1 tn/ha of potassium, which make a total of 9.1 tn/ha have been extracted and withdrawn from the land along with harvests. Approximately 20 ml tons of nutritive elements, out of which 4.8 mill tons of nitrogen, 1.7 mill tons of phosphor and 13.8 mill tons of potassium, have been extracted and withdrawn from the entire area of agricultural land.

Thus, the nutritive elements balance in agriculture is a totally negative one, making minus 190-210 kg/ha. In accordance with norms, however, the return of nutritive elements into the soil via application of fertilizers in adequate doses is entitled to generate from 35 to 40% yield increase and vice versa.

Consequences of application of irrigation in agriculture

In the Republic of Moldova the area of irrigated land constitutes 308700 ha or 0.07 ha per capita compared to the average 0.05 ha per capita on the international level.

Productivity of irrigated land in the Republic of Moldova is a reduced one, although there exist numerous convincing examples of a 1.5 to 2 times increase of fertility in irrigated land. Raise of fertility in case of irrigated lands strongly depends on the applied irrigation method, on the water quality and irrigation pattern, soil characteristics, peculiarities of crop rotation and use of agricultural techniques, as well as on the way of management.

An area of 12.8 thousand ha (4%), including 8.54 thousand ha (6%) with a high level of phreatic waters is assessed with the qualification of an unsatisfactory status of irrigated agricultural land; the other 1.5 thousand ha are salt-saturated and 2.8 thousand ha are solonised and have an unaccepted level of phreatic waters. Majority of irrigated land belongs to the category of black land and is quite vulnerable to irrigation.

Excessive pasturage

Pastures cover 369.6 thousand ha or 10.9% of the agricultural land, while the meadows cover an area of 2.4 thousand ha or 0.1% of the agricultural land. As a result of an increase of the number of sheep and cows in private sector, and because of lack of land regulation, combined with the displacement of pastures on slopes the phenomenon of excessive pasturage has been generated.

Irrational use of pastures, without any scientific background, leads to their degradation. Along with the raise of impact on pastures there occurs a subsequent change of two degradation phases: deterioration of the vegetal coat and deterioration of the surface layer of the soil.

1.3. Assessment of desertification conditions as objects and action of regulators

1.3.1. Soil properties

Black soils

Black soils cover the biggest part of the territory of the Republic of Moldova – more than 75%. This type of soil has a cumulative character, a good humidity (down to 80 – 100 cm depth) and a humus content exceeding 1%. It is structured and loosen (mollic). The humidity pattern is a periodical percolate one and non-percolate.

The rendzina and vertical-soils are the soils most vulnerable to desertification.

Rendzinas

Rendzinas are created by limestone and marl, under the influence of a steppe grass association, or forest grass combinations. The genetic soil creation processes take place only in the adulterated surface layer of calcareous rocks.

Vertical soils

Vertical soils are created in conditions of steppe and forest steppe under grass vegetation usually on clay rocks (with high content of fine clay). The soil genetic processes are generated by the specific properties of these rocks, which in a humid state have the characteristic of orange peel and in a dry state crack.

Black soils, swamps and turf soils

Black soils, swamps and turf soils are created in conditions when there is access to humidity. Out of these soils the saline fields are vulnerable to desertification.

Among most vulnerable ones are the typical, carbon containing, black lands with low humidity. The desertification process affects intensively the erosion-degraded soils. Erosion modifies the humidity pattern, the composition and the physical and chemical properties of soils, fact that contributes to worsening of desertification on slopes.

1.3.2. Water resources

Water resources in conditions of desertification of the republic's territory have a huge importance for national economy sectors, especially for irrigation, water supply of the agricultural sector and industry.

River-originating aquatic resources come from the big rivers – Dniester and Prut and small rivers of the republic.

Mineral content of waters in big rivers Dniester and Prut constitutes 380 – 800 mg/l. In the Prut upper part it makes 420 – 460 mg/l (near Sireutsi village) while in its lower part it is 650 – 680 mg/l (near Cahul town). In their majority, rivers in the republic (Camenca, Molochis, Ciornaia, etc.) have a mineral content in the 500 – 1000 mg/l range. High content of minerals is characteristic for Reut river – 1400-1850 mg/l, Lunga river – 3200 – 3700 mg/l and Botna river – 1000 – 2500 mg/l.

The investigated and approved resources of underground waters in the republic constitute 2724 thousand m^3/24 hours.

1.3.3. Animal and Vegetal Kingdom

From the point of view of the number of species the forest ecosystem, the river meadow and steppe contain the most numerous vegetal kingdoms, having respectively about 700, 600 and 550 species. The group of related plants is a considerable one here and constitutes more than 450 species.

Extension of cultivated land causes a change of spontaneous flora. Due to this reason an ever-increasing number of plants is included into the category of rare species, put under protection. About 15 % of species in Moldova are considered rare species.

Forest vegetation in the Republic of Moldova (as per January 1, 1998) covers an area of about 377 thousand hectares. These fields covered with forest vegetation are under management of State Forest institutions (295.3 thousand ha of forest). Part of forest stocks (30.1 thousand ha), is managed by mayoralties, agricultural enterprises and other owners. Additionally to the forest stock fields covered with forest vegetation (51.5 thousand ha) exist also in the forest protection grass land and in plantations of trees and bushes.

Reduction of natural vegetation on the territory of the Republic of Moldova has brought to fauna reduction.

The number of animals, which have an important role in natural ecosystems functioning (ground squirrel, etc.), has decreased due to extensive cultivation of the steppes. Many aquiline and mammal species used to populate the territory of the republic of Moldova not long ago have disappeared. A number of 69 species of disappeared fauna, or on the brink of disappearance and the ones number of which is decreasing are included into the Red Book.

II. STRATEGY TO COMBAT DESERTIFICATION

In actions to combat desertification usually measures used to be undertaken to rather treat the symptoms of this phenomenon than the causes that generated it. These measures used to target minimization of consequences and reduction of human activities, which were thought to contribute to appearance of desertification phenomenon.

Thus, direct actions were undertaken to combat directly such consequences of human activities as soil exhaustion, excessive pasturage, forest cutting and incorrect irrigation methods. At the same time, main social and economic reasons that used to generate this phenomenon were paid no attention to. The created impression was that the desertification victims were the ones that generate this phenomenon. No serious efforts were, however, made to understand these forces. These forces being beyond their influence made people to exploit excessively the land.

It is admitted at present that this narrow direction was one of the main reasons that had led to disappointing outcomes of the implementation of 1977 Action Plan. The Convention is expected to avoid such a drawback and include social and economic issues among envisaged analytical and practical activities. It is expected that such issues will be paid similar attention that is paid to physical and biological issues of desertification.

The Republic of Moldova has made the commitment to consider issues ensuring exclusion of causes that lead to desertification and to pay special attention to social economic factors that contribute to the development of desertification processes. At the same time it makes the commitment to assume a complex approach towards ratio between physical, biological and social economic aspects of desertification and drought processes. In particular, integration of strategies targeted to poverty alleviation, desertification combat and mitigation of draught consequences is envisaged.

It is poverty that makes people from affected regions to extremely exploit the soil, because they face the survival issue today. That is why they can not but choose to act contrary to long term interests. Any implemented strategy needs to envisage measures targeted to liquidation of poverty main consequences.

Such a strategy needs to take into account the social structures and problems linked with the land. It is necessary to pay attention to training, professional education as well as to transportation and communication, in order to envisage a totally integrated approach. The latter is the only way to effectively combat desertification.

II.1. Promotion of sustainable policies in the use of natural resources

II.1.1. Measures aimed to minimize consequences of desertification and droughts. Climatic aspects

General aspects

General actions to be undertaken to combat desertification are the following:

- Establishment, with the help of the soil meteorological observations and geo-botanical surveys, of perimeters of territories affected by the desertification processes.
- Review of land use for agricultural and forestry purposes; restructuring of the land depending of degrading processes under way and the need to maintain the ecological balance between natural ecological systems and the anthropological ones.
- Introduction of a set of economic and legal instruments meant to regulate and motivate both at local and national levels undertaking of desertification prevention and combat measures.
- Development and implementation of regional development policies (at the county level) taking into account, depending on the social, economic and cultural situations, issues linked with drought and desertification combat.

- Management of desertification combat actions on contract basis, with the indication of financial remuneration and compensations. Contracts may be signed between farmers, forest men, owners, government and/or voluntary associations.

II.1.2. Sustainable agriculture as a measure to combat desertification

In the Republic of Moldova the main conditions for development of a sustainable agriculture are the following:

- the development of the organic agriculture as an indivisible part of the sustainable agriculture;
- preservation of existent landscapes and adjustment to their peculiarities;
- structuring and reconstruction of landscapes, extension of forest-covered areas and of planted grass land on slopes following the purpose to maintain the ecological balance between natural anthropological ecosystems, to preserve biodiversity, to protect environment, soil and water resources;
- introduction of crop rotation with a ratio between cultivated crops, the straw cereals and vegetables that contributes to protection of soil fertility, weed control, disease and pest control and increases productivity.

- Diagnosis of crop ecological resistance. Ways to mitigate the impact of desertification

- Arrangement-type and phyto-ameliorative actions to combat desertification

- Land arrangement actions for erosion protection

- Amelioration of structural status of soils via activities indicated below

- Amelioration of salt saturated soils through activities as indicated below

- Ecological reconstruction of territories from the agro-chemical point of view via activities listed below

- Irrigation as a technique used to regulate the humidity pattern of soil and to combat desertification. Soil ecological rehabilitation

- Measures aimed for rehabilitation and preservation of polluted soils

II.1.3. Prevention and measures to combat land slide

*Principal measures to prevent and combat landslide are the following**:***

- construction of canals for rapid evacuation of rain waters;
- drain of land via different techniques;
- capture of slope springs;
- forest plantation of affected land or of the ones that may be affected;
- construction of fences, supporting walls, counter-settees.

II.1.4. Protection and ecological rehabilitation of the grassland vegetation

Measures undertaken to rehabilitate and improve the existent grassland are the following:

- regulation of the number of animals and of pasturage depending on the production capacity of grassland;
- development of surface works:
    - *extraction of stumps, collection of stones, and levelling of moll hills;*

- *disease control through repeated grass-cutting or chemical methods, auto-fertilization or over fertilization, and fertilization;*
- *amendment with gypsum of salt-affected land;*

- water program improvement:
  - *the phreatic and the stagnant ones*
  - *capture of coast springs*
  - *combat water deficit through irrigation*
- rational use of grassland*:*
  - *rational or limited pasturage*
  - *mixed use of land for dry grass and meadow or meadow – dry grass production*
- erosion control through plantation of forests, regulation of pasturage and extra fertilization of degraded soil;
- salinization control through amelioration works and plantation of salt-resistant crops;
- radical rehabilitation of degraded grassland through development of territories with planted grassland.

II.1.5. Forest protection, rehabilitation and extension measures

Actions listed below appear as priority issues in the Action Plan:

- creation of the Ecological Carcass based on forest covered lands, protection forest strips in agrocenoses, green corridors in the river and water reservoir protection zones;
- development of considerable rehabilitation and reconstruction works aimed to ensure amelioration of compositions with tree biotypes resistant to drought or other impacts;
- limited regeneration of forests through nursery-obtained offshoots and saplings and switch to a regeneration through seeds incorporated directly into the soil with the purpose to replace the extracted tree;
- creation of interconnection corridors as mentioned above, which additionally to other advantages would increase vitality of wood bodies;
- extension of forest-covered lands (up to 10-15% of the territory);
- exclusion of degraded territories from the agricultural circuit and development of forest plantation actions; introduction of forest sustainable management;
- application of new growth and forest renovation technologies based on forest management principles.

II.1.6. Measures ensuring the protection, extension and rehabilitation of the ecological balance of territories with excessive humidity

Swamp territories from the river meadows play an important role in the amelioration of the environment. They act to regulate the flow of small and medium rivers; they contribute to self-purification of river waters; they diminish aridity of climate and drought consequences; they serve as basic space for rare plants and wild animals and finally contribute to protection of the biodiversity.

II.1.7. Biodiversity support

Processes to combat desertification have been kept in mind in the development of the biodiversity preservation strategy. Also, during the strategy development process attention was paid to evaluation of present situation, problem identification and establishment of objectives and priorities.

**Biodiversity preservation strategy*

Strategic problems listed below are derived from the objectives of Convention to Combat Desertification, Convention on Biodiversity Preservation and other conventions concerning protection of environment, to which the Republic of Moldova is part.

**Reduction of negative impact generated by the economic activity*

- Introduction of adequate practices in crop production and livestock breeding along with the promotion of an ecological agriculture.
- Introduction of new technologies in industrial and energy generating enterprises and use of purification and waste recycling equipment.
- Improvement of the legal and regulatory framework with the purpose to diminish pollution during production processes.
- Application of adequate practices in forestry management ensuring a sustainable development of forests.
- State control over the use of agricultural chemicals.

**Biodiversity preservation in wetland zones*

- Extension of state protected natural zones.
- Creation of "Orhei" National Park and biosphere Reservation "Lunca Prutului" (Prut River meadow).
- Replacement of introduced substances with rehabilitation of local phitocenoses.
- Implementation of biodiversity protection provisions in-situ and ex-situ of international conventions to which the Republic of Moldova is a party.
- Rehabilitation and extension of wetland zones.
- Implementation of bilateral and regional projects.
- Development of international cooperation in biodiversity protection area.

II.1.8. Measures to be undertaken for water resources sustainable use and management

Water resources play an important role in measures to combat desertification. Reserves of these resources are limited, being especially diminished by transboundary and transition waters.

Measures and policy to be followed in the use of water resources

Reduction of the negative impact of desertification (drought) on the economy of the republic may be obtained through implementation of the following actions:

- use of regulated resources of river waters for irrigation. Use should take into consideration lack of synchronous change of precipitation, fact that causes a non-coincidence of floods and precipitation;
- use (in drought conditions) of shallow waters that meet drinking water requirements for the residential settlements supply and for industrial purposes.

There are two possibilities to carry out irrigation in conditions of water deficit during drought:

- irrigation based on the envisaged total amount of water; However, areas under livestock designated crops may be reduced in this case;
- during drought in management of waters originating from Dniester river replacement of the optimum hydrologic supply program with a minimum necessary supply program.

Quality of drinking water and health of population

The following measures are required to ensure water quality improvement for the final consumer in the Republic of Moldova:

- water softening (removal of Ca, Mg and Na ions from water) by use of filters with cationit, anionit or via electrodialysis;
- removal of nitrates via application of ion exchange systems;
- fluor removal or Fluor incorporation into water.

Measures to be undertaken for prevention of water sources pollution:

- creation and maintenance of sanitary protection zones for underground water sources, especially within the 15 – 30 m perimeter of stringent regimen;
- liquidation of all sources of bacterial and chemical pollution within restricted perimeters;
- cleaning and dis-infection of wells and aqueducts at least twice per year;
- maintenance of water sources and aqueducts in satisfactory sanitary and technical conditions;
- replacement of worn out segments with new spares meant for long term use;
- annual hygienic certification of water sources, of substances used for water quality improvement and for water delivery to the final consumer;

II.1.9. Rational use of existent energy resources and use of renewable sources such as solar energy, wind energy and biological gas

Partial solution of energy supply issues is possible by undertaking the following actions:

- development and implementation of modern technologies with low energy consumption in to industrial and agricultural sector;
- development of energetic forest plantations with rapid growing trees in the rural area, especially in the river meadows, valleys, in land slide areas;
- use of renewable energy sources.

Wind and sun are most important and ecologically inoffensive energy sources.
Potential total capacity of wind power resources does not exceed 100 Wat/m², whenever the wind speed is in the 3.5 to 5.5 m/sec range. Wind energy resources may be used in the rural area to produce electricity and to pomp water from the artesian wells. This might contribute to the solution of water supply problem characteristic for the Southern part of the Republic of Moldova, which practically has a semi-arid territory.

Practical use of the wind and solar energy may be achieved by providing the following activities undertaken:

- study of the wind intensity and characteristics and creation of wind energy cadastre for the territory of the republic;
- creation, implementation and use of experimental equipment facilitating use of wind and solar energy;
- creation of a technical scientific centre dealing with the use of non-traditional renewable energy sources;
- extension of experience accumulated in connection with the use of renewable energy sources over the entire territory of the republic.

Biological gas may be an important non-traditional source of energy for the rural zone. Construction of household or sector facilities for bio-gas production could create the possibility to solve the manure control issue and would contribute to protection of environment.

II.2. Social, economic, political and demographic background to preserve natural resources and to combat desertification

II.2.1. Rise of income and increased possibilities of job creation for the population

Support of entrepreneur-ship and development of small business could contribute to increase job creation possibilities.

The problems that create impediments to the development of small business are the following:
- reduced access to financial material and investment resources;
- lack of necessary infrastructure;
- lack of instruments strengthening this activity.

The following activities are necessary to create incentives for the development of small business:
- improvement of legal and regulatory framework;
- strengthening of institutional framework;
- improvement of management skills in the small business area of local public administration;
- reform of accounting and statistic recording systems;
- incentives for the creation of credit associations and facilitation of credits;
- information support and technical assistance.

II.2.2. Aspects of sustainable development of economy, especially of agriculture in conditions of market economy

The following strategic priorities before year 2005 have been established:

a) capacity of the country economy to ensure a process of enlarged reproduction;
b) achievement and maintenance of population living conditions ensuring a social economic stability;
c) ecological production and ecological society.

II.2.3. Population dynamics and structure within the light of desertification processes

The above statements the following issues need to be evaluated during desertification study process:
- dynamics and structure of population in areas subjected to desertification;
- natural migration and reproduction of population of the Republic of Moldova;
- population morbidity and mortality rate in desertification affected areas;
- civil status and family creation in areas affected by desertification;
- migration processes in different regions of the Republic of Moldova;
- dynamics of human sustainable development characteristics, monitored by the UN.

II.2.4. Socio-economic instruments to combat desertification

In accordance with the “ecological limit” regulations, ecological norms are being developed and they are approved by Law.

The compulsory requirements are the following:

- mitigation of the damage produced as a result of natural resources use;
- responsibility for violation of natural resources use, including application of criminal law sanctions;
- performance of ecological expertise of use of natural resources by economic entities;
- sustainable use of natural resources, etc.
- application of economic mechanisms: preferential credits, exemption, taxation, fees;
- change of economic behaviour to protect environment and natural resources;
- payment of natural resources management costs (administration) by the national government.

The political and social economical background for natural resources maintenance is the following:

- actions and measures to protect the environment and natural resources in all national economy development programs;
- establishment of unique norms for environment protection, in particular soil and water resources;
- establishment of a favourable legal framework and an adequate financial environment, which is beneficial for the population social economic welfare and for the environment and natural resources protection.

II.2.5. Historical problems in desertification control

Modifications that occurred in the geographical area are consequences both of the natural evolution of the environment and also caused by the human activity.
In Moldova at the beginning of XIX century there used to be much more flowing waters compared to the situation at the middle of this century. A considerable diminution of water amount in Moldova's rivers was already observed by the end of the XIX century. According to S.Babicov (1974), modification of river characteristics started as early as first centuries of our era as a result of extensive reclamation.

II.3. Legal and institutional framework, scientific and information support in desertification control

Strategy to combat desertification presupposes coordination of institutional and legal framework on international, regional, national and local levels as well as improvement of the institutional infrastructure.

II.3.1. Legal framework concerning desertification

Legal regulation according to the Constitution includes the following:

- laws adopted by the Parliament of the Republic of Moldova;
- decisions and legal instructions of the Government of the Republic of Moldova;
- commitments made by the Republic of Moldova within Conventions and other international treaties to which our country is a part;
- legal norms issued by departments, etc.

Existent legal framework needs to be amended and harmonised so that it ensures activities to combat desertification.

Regulation regarding water resources management will be improved and laws will be worked out regarding the following:

- soil preservation;
- phreatic and artesian water protection.

In this context the following is necessary:

- improvement of existent regulations on water management in order to bring them in accordance with provisions included into Convention and National Program to Combat Desertification;
- development drafts of the laws on soil protection; and on phreatic and underground water management, and water protection;
- improvement of law regarding protection zones and protection strips of river and water basin waters;
- improvement of standards regarding water use for the municipal needs;
- development of national standards regarding irrigation water quality;
- development of draft law (regulation) on limiting of the urban territory extension.

II.3.2. Regional and international cooperation in desertification control issues

Parties to the UN Convention to Combat Desertification jointly solve the following issues:

- co-ordinate actions aimed to develop a sustainable strategy to combat desertification at national, regional and global levels;
- collaborate via international organisations in the development of action plans;
- create, at national and local levels, actions coordination mechanisms between developed parties and the ones in the development process, between intergovernmental and non-governmental bodies. These actions are aimed at a better implementation of national programs and at the solution of priority problems;
- accept a complex approach to physical, biological and social economic aspects of desertification and drought processes;
- pay a special attention to economic relations favouring the sustainable development of countries.

II.3.3. Governmental bodies and state institutions

For the development and implementation of the National Program to Combat Desertification, it is necessary that activities listed below be undertaken:

- coordination of all actions to combat desertification, including coordination with respective international bodies, by the Ministry of Environment Protection. This will be stipulated by a respective decision of the Government;
- creation of a National Commission to combat desertification, the membership of which will include representatives of ministries, departments and state institutions;
- study of the environment condition in order to establish desertification reasons and consequences and to set objectives (goals) for priority actions;
- development of financial programs to support forest plantation, water management and water protection, land protection, etc.
- settlement of litigation in water and land management issues, etc;
- creation of consulting centres for critical situations, especially in the rural areas;
- development and implementation of food assistance programs for people who suffered in calamities;
- development of a long term Comprehensive National Strategy for areas most severely affected by desertification following the goal to increase productivity of land resources;
- consideration and approval of Long Term Comprehensive National Strategy to Combat Desertification and designation of principal implementation agencies.

II.3.4. Local public administration bodies

Main tasks of public administration power bodies regarding implementation of Convention provisions and the provisions of the National Program to Combat Desertification are the following:

- better information of population regarding degradation and desertification processes, goals and role of the Convention, tasks of the National Program to Combat Desertification;
- identification of concrete areas where it is necessary that improvement of the soil, landscape and flora degradation system be undertaken. Here the specific natural, social and management conditions will be taken into consideration;
- data capture regarding desertification processes;
- participation to the implementation of new technological processes regarding rehabilitation of soil productivity;
- undertaking measures aimed to improve the economic conditions and to ensure the sustainable development at settlement levels;
- implementation of projects devoted to development of alternative sources of survival;
- ensuring a maximum possible participation of population to the implementation of the National Program to Combat Desertification.

II.3.5. Role and duties of landowners and economic entities in natural resources management and desertification combat

Desertification combat, protection and sustainable use of natural resources is obligatory for all physical and legal entities who are utilising the land, irrespective on the ownership form of utilisation purpose. They are expected to meet the following requirements:

- observe the technical regulations and norms in force regarding sustainable use of land and natural resources;
- make use of the Government support in the issues of protection and rational use of territories;
- fulfil the request to temporary suspend or to end an activity, which bear the risk of deterioration or non-recuperative destruction of territories;
- support expenditures linked to damage recovery caused to a territory and does recuperation of consequences, recovering previous conditions as per the moment they had started the production process;
- maintain the protection forest strips and observe the forest regime established for preservation of wood vegetation on the forest covered meadows, that were planted for soil and water resources protection;
- ensure rational organisation, arrangement and exploitation of pastures depending on their renewal capacity and requirements for the soil and grass vegetation protection.

II.3.6. Non-governmental organizations

Additionally to governmental institutions the civil society represented by non-governmental organisations, local communities, and other different layers of the society has also got an important role to play in the implementation of the Convention. Non governmental organisations, the number of which is about 80, have got considerable possibilities to achieve ecological awareness of the population. A big number of these organisations, especially the ones located in the territory, may contribute, in a real way, to the implementation of practical activities to combat desertification in areas affected by degradation and suffering from water insufficiency.

II.3.7. Population information, awareness and education in issues concerning desertification control

Strategy regarding practical actions to be undertaken in information, awareness and education of population in issues regarding desertification control is necessary to foresee the following actions:

- involvement in these kind of actions of all levels of society starting from ordinary people up to experts in different areas of agriculture and people involved directly or indirectly in economic activities within private or collective farms;
- agrarian ecological education needs to cover people of all ages, starting from students and up to adult people in their post graduation period. Use of relevant education methods for a specific age and consideration of people development level.
- seminars for workers and farmers in different areas of economy; training and contests for young people during their university time;
- activation and wide use of mass media instruments (newspapers, radio, TV programs) following the goal to achieve awareness of environmental problems. Mobilisation of public opinion to achieve diminishing of desertification processes.

Population education, training and awareness stipulates the following:

- creation of a public centre (committee) assigned to do consultation and information of society regarding desertification issues;
- involvement of society in desertification prognosis;
- access of population to development of legal and regulatory acts and to information concerning desertification;
- development of programs and teaching materials for education institutions of all levels and for different categories of population;
- use of mass media instruments in desertification prognosis processes;
- publication and dissemination of brochures dedicated to measures necessary for maintenance of natural resources.

II.4. Scientific support for evaluation, prevention and combat desertification

Moldova in its capacity of the Convention member, makes the commitment to support, to the extent of its possibilities, technical scientific research in issues concerning desertification and mitigation of drought consequences, carried out by national institutions in strong collaboration with regional and international bodies. The main research directions in this area will be the following:

- study of desertification and drought processes and factors; development of measures and technologies to adjust to drought, to combat and mitigate its consequences;
- study of soil and biodiversity degradation processes; development of degradation processes control and mitigation measures;
- basis for an inoffensive ecological balance of mineral substances in the soil and for soil fertilisation ecological inoffensive systems;
- scientific grounds for a sustainable agricultural system, which would ensure an ecologically clean agricultural product and would exclude territory desertification and pollution of soil and water;
- study of water resources and improvement of technologies ensuring water sustainable use in case of irrigation; study of other needs to combat drought consequences;
- development of ecologically grounded systems aimed to land improvement, hydrological rehabilitation regime and the degraded land fertility recuperation;

- study of the economic, political and demographic factors leading to desertification and poverty; development of regional and local sustainable development mechanisms and policies.
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II.5. Desertification Monitoring

The conceptual basis in carrying out monitoring of desertification may be developed on the base of the following factors:

- a special investigation system assessing the soil degradation;
- evaluation of impact factors and types of desertification, their joint influence and integral characteristic of desertification degree;
- economy in its capacity of an impacting factor on the ecological status of ecosystems; sustainable development, destruction and recuperation of ecosystems.

The latter should be identified on the base of their necessity on the national level. These tasks will constitute a component of the ecological monitoring system.

Activities listed below are considered basic elements in desertification monitoring:

- climatic survey (drought, frost, and extreme hydro-technical conditions) carried out by the hydro-meteorological service;
- survey of land resources conditions: soil layer, vegetal and animal kingdom and different level ecosystems;
- registration of lands used for agrarian purposes (ploughing, pasturage), forest stock lands, and lands under industrial utilisation, including geologic exploration mines and land used for military-industrial purposes. Recording needs to also cover protected reservation areas, national parks, natural plots and recreation parks;
- geographical information system, which includes a set of electronic maps, software and cartographic data simulation models.

A territorial network of stationary ecological monitoring unit is necessary especially in areas characterised by a severe ecological condition.

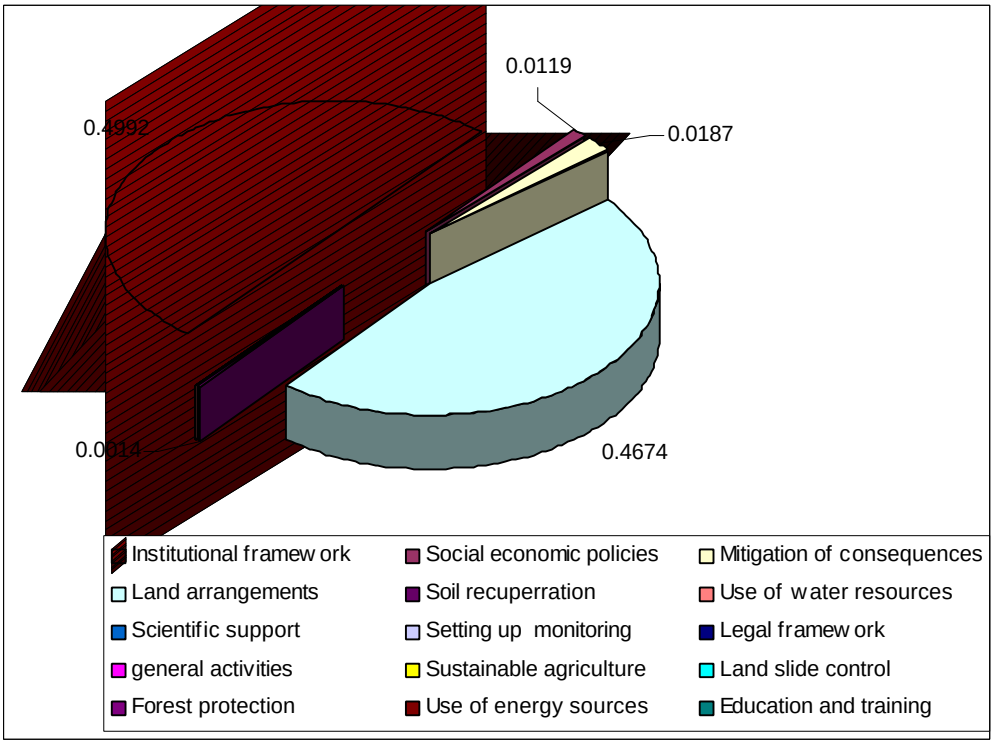
III. STRATEGIC ACTION PLAN TO COMBAT DESERTIFICATION AND BUDGET ESTIMATION

Envisaged actions are based on objectives of the strategy to combat desertification and take into consideration the following: a) creation of the political background in this area (legal and institutional framework, social economic policy and demography); b) general activities and; c) sector activities. The latter stipulates the following: promotion of a sustainable agriculture, arrangements to combat erosion of the territory, prevention and mitigation of landslide, ecological recuperation of soils, protection of forests, water use, scientific support, education and monitoring.

Implementation of the Action Plan to combat desertification is planned for a 10 years period. Sector activities, aimed to ensure an ecological balance, especially of affected zones, will be the core of these actions. Erosion control, ecologically balanced land arrangement through the creation of the ecological carcass and prevention of the extension of affected zones constitute priority activities in this context.

Total cost of envisaged activities has been estimated to make 5368 million lei as per economical situation in 1997. Annual cost is estimated to make 568 million lei. Sector activities stand for the biggest share, their envisaged cost being 5365 million lei (99.9% of the total cost, Chart 1). A considerable budget is necessary for ecological recuperation of soils (2680 million lei or 50% of sector activities costs). Activities aimed on sustainable development of agriculture and those for forest protection respectively envisage budgets of 2509 million lei, or 47% and 100 million lei or 1.9%.

Chart 1. Total cost of envisaged actions



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