OVERALL REPORT

of the “Combating Desertification” working group
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Introduction

Soil is the main and the only natural resource of the Republic of Moldova. The share of black soils, the most fertile soils, constitutes about 75%. The economy of the country and implicitly, the standard of living, largely depend on the general condition of the Land Fund, namely on the productivity of soils. The influence of the anthropical factor over the environment increases and the consequences are more and more destructive. Desertification is one of the existing processes conditioned by human activities and has reached alarming proportions. Desertification is defined as land degradation in dry and arid areas, caused by the influence of different factors, including climate variations and human activities. As a result, the biological potential of the soil is reduced or destroyed and premises for the emergence of desert areas are created.

The South and the Centre of the Republic are part of the dry-low humidity zone and are exposed to the desertification processes. The draught is an unfavourable phenomenon and manifests itself on the overall territory of the Republic, and in the North – is an important indicator of the desertification processes as well.

The factors that cause desertification are both natural and anthropical. The main agents of desertification in the Republic of Moldova are: imbalance between natural and anthropical ecosystems caused by a high share of arable lands; soil erosion, including deflation; chemical dehumification and chemical degradation; active landslides; solonization and salinization; physical degradation; deterioration (destruction) of humid zones; excessive pasturage etc.

Within the last 10-15 years, the processes of physical, chemical and biological degradation of soils have intensified and draughts are a more prominent phenomenon. As a result, the productivity of soils decreases and the condition of the environment worsens.

The purpose of the „Combating Desertification” sector is to assess capacity-building needs at the national level in order to develop a set of actions and synergetic measures, which would contribute to accomplishing the objectives of three international conventions: „Climate Change”, „Biological Diversity”, and „Combating Desertification”.

The main tasks are:
• Assessment of the forms of soil degradation that lead to the desertification of landscapes;
• Calculation of the damages caused to the environment and to the national economy by different forms of soil degradation;
• Identification and assessment of the activities planned in the Republic of Moldova for minimizing the process of soil degradation and land desertification;
• Assessment of the extent to which the planned activities have been accomplished;
• Identification of the causes (barriers) for non-accomplishment or partial accomplishment of the planned activities;
• Definition of the needs at an individual, institutional and systemic level for combating soil degradation and land desertification;
• Identification and definition of the national needs of the RM, taking into consideration the individual, institutional and systemic level in capacity building for the integration within the European and global activities in combating desertification;
• Identification and definition of the national needs of the RM concerning capacity building for the creation and rational use of databases on forms of soil degradation and desertification processes.

Accomplishing the set of planned measures and activities will allow minimizing the consequences of the forms of soil degradation and desertification, enhancing the condition of the environment in the Republic of Moldova, and improving the health condition and standards of living of the population.

The report consists of two parts:
I. Assessment of factors and forms of soil degradation and the definition of national capacity building needs of the Republic of Moldova in the field of soil degradation and land desertification.
II. Assessment of the methods of collecting and processing data on forms of soil degradation and the definition of national capacity building needs for the creation and rational use of a database on factors of desertification.
1. Assessment of factors and forms of soil degradation and land desertification: environmental imbalance between natural and anthropical ecosystems, surface and deep erosion, active landslide, salinization and solonization, chemical degradation

1.1. Assessment of the present situation and production capacity of the Land Fund of the Republic of Moldova; identification of the factors of soil degradation and land desertification: environmental imbalance between natural and anthropic ecosystems, surface and deep erosion, landslides, solonization and salinization, improper anthropical activities, chemical soil degradation

1.1.1. Environmental imbalance between natural and anthropical ecosystems

The Land Fund of the RM (at 1.01.2003) constitutes 3384.4 thousand ha of land. Agricultural lands cover 2533.8 thousand ha or 74.9%, including arable lands – 1842.6 thousand ha or 54.4%, fallow grounds – 8.3 thousand ha or 0.3%, fruit-growing and viticulture plantations – 300.8 thousand ha or 8.9%, hayfields – 2.4 thousand ha or 0.1%, meadows – 379.7 thousand ha or 11.2% of the total land area. The indicator per capita constitutes only 0.51 ha of arable land, fruit-growing and viticulture plantations, including 0.43 ha of arable land.

Non-agricultural lands (850.6 thousand ha or 25.1%) are classified as follows: degraded in the amelioration stage - 3.2 thousand ha or 0.1%; forests, groves, brushes - 426.6 thousand ha or 12.6%, including forest belts - 31.0 thousand ha or 0.9%; swamps - 21.5 thousand ha or 0.6%; underwater surfaces - 76.0 thousand ha or 2.2%; roads, streets, markets, constructions and yards - 236.0 thousand ha or 7.0%; cliffs (ravines) - 12.2 thousand ha or 0.4%; surfaces affected by landslides - 29.8 thousand ha or 0.9%; damaged by anthropical actions (industrial and local quarries, abandoned silage-holes, uncovered land etc.) - 45.3 thousand ha or 1.3% of the total land fund.

Agricultural lands in state or private ownership used by economic agents occupy 1951.1 thousand ha or 57.7% of the total land fund.

According to the presented data, we may conclude that the share of agricultural lands (≈75%) in the RM is way over the acceptable level, and the share of the forest fund – 2-3 times under the optimal level. The environmental imbalance caused various forms of soil degradation and land desertification.

Thus, overall, the quality of land resources with an agricultural destination, according to the data of the pedological researches can be estimated as follows. To be noted that the weighted average of the bonitation grade for agricultural land equals to 65 points (table 1).

<table>
<thead>
<tr>
<th>Bonitation class</th>
<th>Land quality</th>
<th>Bonitation grade points</th>
<th>Surface, thousand ha</th>
<th>% of agricultural land surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Very good</td>
<td>81-100</td>
<td>689</td>
<td>27</td>
</tr>
<tr>
<td>II</td>
<td>Good</td>
<td>71-80</td>
<td>536</td>
<td>21</td>
</tr>
<tr>
<td>III</td>
<td>Satisfactory</td>
<td>61-70</td>
<td>382</td>
<td>15</td>
</tr>
<tr>
<td>IV</td>
<td>Average</td>
<td>51-60</td>
<td>382</td>
<td>15</td>
</tr>
<tr>
<td>V</td>
<td>Inferior</td>
<td>41-50</td>
<td>303</td>
<td>9</td>
</tr>
<tr>
<td>VI</td>
<td>Idem</td>
<td>21-40</td>
<td>153</td>
<td>6</td>
</tr>
<tr>
<td>VII</td>
<td>Extremely poor</td>
<td>&lt;20</td>
<td>178</td>
<td>7</td>
</tr>
<tr>
<td>National average</td>
<td></td>
<td>65</td>
<td>2556</td>
<td>100</td>
</tr>
</tbody>
</table>

Soils with a good and very good quality, with a weighted average of the bonitation grade higher than 70 points occupy 48% of the agricultural lands surface. These soils are either not affected by the degradation processes yet or are partially, slightly or very little affected.

Soils with a satisfactory and average quality (50-70 bonitation points) occupy 30% of the agricultural lands. They are little and moderately affected by degradation processes.
Soils of an inferior and extremely poor quality occupy 15% of the agricultural lands of the republic. These soils are exposed to medium and high intensity degradation processes. Having a low productivity in matter of filed crops, it is recommended to use these soils for viticulture plantations and as cultivated hayfields.

Unproductive soils of very low quality occupy 7% of the agricultural surfaces of the country. Given the fact that their amelioration and improvement requires heavy expenses, it is recommended to use them as sowed meadows or afforest them.

An obvious tendency in the decrease of the land quality can be distinguished lately in the republic. The fact that 52% of the land is low to highly degraded creates premises for the intensification of the degradation processes. If necessary measures for the protection and amelioration of the degraded lands are not taken, the quality of the Land Fund with agricultural destination can considerably worsen in the next 5-10 years.

The productivity of land fund can be increased not only through agro-technical, agro-chemical measures, but also by an adequate distribution of land resources within the national economy. Or, by creating an optimal proportion between natural and anthropical ecosystems (between arable lands, forests, hayfields and meadows, fruit-growing and viticulture plantations, protective forest belts, water resources etc. which would ensure a favourable ecological balance for the conservation of the environment and biodiversity) and by distributing agricultural crops according to their biological requirements for soil properties.

1.1.2. Soil erosion

Erosion is the main factor of land degradation in Moldova. According to the data presented in table 2, the extent to which agricultural lands in Moldova are affected by erosion has increased from 28.1% in 1965 to 39.8% in 1997, and constitutes about 40% today. The average annual growth of eroded lands in the indicated period (32 years) is 7.7 thousand ha or 0.36%.

The productivity of eroded soils decreases as follows: weakly eroded – 20%, moderately eroded – 40%, highly eroded – 50%, strongly eroded – 70% excessively (totally) eroded – by 90%. The existence of large surfaces with weakly eroded soils creates premises for a further intensification of the erosion process on agricultural lands.

The damage brought to the national economy because of soil erosion is tremendous. Annual weighted average losses of harvest on eroded plots constitute: on plough land (431.7 thousand ha) – 27%; on multi-annual plantations (139.6 thousand ha) – 30%; on pastures (134.4 thousand ha) – 37%.

The direct damages caused by erosion are estimated in losses of fertile soil. Annually, up to 30 tones of fertile soils are lost from 1 ha of eroded soils, that is 26 mln tones on the overall eroded surface of the republic, including the territory on the left bank of the Nistru River (840 thousand ha). This quantity of fertile soil contains 700 thousand tones of humus, 50 thousand tones of nitrogen, 34 thousand tones of phosphorus, and 587 tones of potassium.

In the Republic of Moldova (excluding the territory on the left bank of Nistru River), the losses of fertile soil constitute 21 mln tones, tantamount to the destruction of 1600 ha of black soils of normal profile, with a 100 points bonitation ratio, and the normative cost of 1 ha equal to 926496 MDL. Thus, the damage resulting from the loss of 21 mln tones of fertile soil amounts to 1 billion 482 million MDL. The total direct and indirect damages caused by surface erosion of land on the right bank territory of Moldova constitutes 2 billion 58 million MDL.

Besides the surface erosion, deep erosion is also widely spread in the republic. Between 1911 and 1965, the surface of ravines has increased from 14434 ha to 24230 ha (almost twice), and their number has tripled. After 1965, part of the land affected by ravines was withdrawn from the agricultural circuit and included in the forest fund, whereas on other surfaces works to level the ravines have been carried out. This led to a sharp reduction in the number and surface of ravines on agricultural land up to 8.8 thousand ha on the territory of the republic or 7658 ha excluding the territory on the left bank of the Nistru River.
**Table 2. Dynamics of the expansion of the surface of eroded soils in the total agricultural land of the Republic of Moldova**

<table>
<thead>
<tr>
<th>Degree of soil erosion</th>
<th>1965</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>thousand ha</td>
</tr>
<tr>
<td>Un-eroded</td>
<td>1517,4</td>
</tr>
<tr>
<td>Weakly eroded</td>
<td>302,4</td>
</tr>
<tr>
<td>Moderately eroded</td>
<td>195,6</td>
</tr>
<tr>
<td>Strongly eroded</td>
<td>96,2</td>
</tr>
<tr>
<td>Totally eroded</td>
<td>594,2</td>
</tr>
<tr>
<td><strong>Total agricultural land researched</strong></td>
<td>2111,6</td>
</tr>
</tbody>
</table>

Source: Land cadastre of the Republic of Moldova, from 1997 and 2003 (attached)
The damages caused by deep erosion tantamount to the cost of land surfaces destroyed by ravines. If we admit, the fact that, the initial land bonitation grade, before the destruction of the soil layer, was 50 points, than the cost of 1 ha of destroyed land is 463248 MDL. Thus, the damage caused by deep erosion will be:

- Annually, as a result of destruction of 180 ha of land – 83 mln MDL;
- In the gross, 7658 ha of land destroyed by deep erosion – 3 billion 475 million MDL.

The damage caused by erosion extends over other spheres of human activity as well, namely: silting lakes and other waters; pollution and warping of soil in hollows, of underground and surface waters with pesticides and chemical fertilizers, washed off from the slopes; destruction of ways of communication, hydrotechnical and infrastructure constructions.

Combating soil erosion in the Republic of Moldova is a problem that can be solved only at the state level. Anti-erosion protection of the land fund is one of the main factors for the improving of the economic and environmental situation in Moldova and for stopping the processes of land degradation.

1.1.3. Land deterioration as a result of landslides

The main characteristic of landslides is the separation of masses of soil having different sizes and at different depths and their movement along an inclined surface towards lower places. The process is accompanied by complete or partial deterioration of the soil layer, which leads to losses of agricultural lands, destruction of localities, roads and other socially oriented facilities.

The main factors that cause landslides can be either natural (gravitation, lithologic structure and the stratification of rocks, phreatic waters, earthquakes etc.) and artificial (unjustified clearing and deforestation, setting up of economic and hydrotechnic facilities without carrying out a thorough study in advance, terracing of slopes etc.).

The dynamics of areas affected by landslides extension in the republic is as follows: year 1970 - 21.2 thousand ha; 1980 - 48.6 thousand ha; 1990 - 79.3 thousand ha; 2000 (forecast) - 84 thousand ha (see annex). Over a period of 25 years (1970 - 1995), as a result of the anthropical impact, areas affected by landslides have increased by 62.6 thousand ha, registering an annual increase of 2.5 thousand ha. Ineffective terracing of slopes was the main factor that contributed to the intensification of the landslide processes within this period. At present, there is one landslide per every 200 ha of land. Lately, areas affected by landslides are extending annually by about 1000 ha. Considering the fact that the soil layer is completely deteriorated on only 20% of this surface (200 ha), the annual irreversible losses in monetary terms represent about 93 mln MDL.

According to the official data of the Land Cadastre, on January 1, 2003 the surface of landslides having a deteriorated soil layer constituted 29.8 thousand ha on the territory of the republic. The irreversible damage caused to the soil layer amounted to 46328 MDL for 1 ha of deteriorated land and 13 billion 804 million 850 thousand MDL, respectively, for the overall degraded area.

There are 31300 ha of landslide area, stabilized and semi-stabilized with partially degraded soils and 39560 ha of active landslide area with a partially destroyed soil layer (see annex 4) registered in the total agricultural Land Cadastre of the Republic of Moldova, excluding the territory on the left bank of the Nistru River. Active landslides with a completely destroyed soil layer occupy 13826 ha out of the mentioned territory, whereas the total irreversible damage amounts to 6 billion 405 million MDL.

The prevention and combating of landslides is possible only by researching the causal factors, reducing or eliminating their influence, drawing maps and developing a Cadastre of the affected areas, and by carrying out monitoring in order to forecast these processes.

1.1.4. Soil degradation as a result of solonization

Weakly solonized soils are formed at the initial stage of solonization, whereas at the final stage – highly solonized and solonetz – the maximum possible degree of degradation as a result of this process. The productivity of land according to the degree of soil solonization decreased as follows: weak surface solonization – 20%; moderate – 40%; high – 60%; very high – 70%; solonized under 30 cm: weak – 10%; moderate – 20%; high – 40%; very high – 60%.

The total surface of solonetz and solonized soils constitutes 107.5 thousand ha, out of which about 35% are arable lands and 65% are grazing fields. The average damage caused by solonization is calculated with regard to the weighted average productivity of unsalinized soils with the same destination as the solonized ones, which constitutes 1500 MDL in monetary terms. The weighted average land productivity reduction on the overall territory of solonized soils constitutes 27%, the average damage per ha in monetary terms – 400 MDL, and the total damage for the overall surface – 43 mln MDL. Solonized soils and solonetz require a costly chemical amelioration accompanied by drainage constructions in riversides.
1.1.5. Soil degradation as a result of salinization

The initial stage of land degradation as a result of salinization is manifested through weakly saline soils, whereas the final one – by highly saline soils and solonchaks. The reduction in the productivity of soils with different degree of salinization is presented as follows:

- Weakly saline on the surface layer – 20%, moderate – 40%, highly – 70%, very high – 90%;
- Weakly saline between 30 and 80 cm – 10%, moderate – 20%, highly – 30%, very high – 50%;
- Weakly and moderately saline between 80 and 150 cm – 0%, highly – 10%, very high – 20%.

The total surface of saline soils, solonchaks and solonchaks-solonetz is 112.2 thousand ha, out of which about 30% are arable lands and 70% - grazing fields. The proportion between saline soils on arable lands and grazing fields is about the same as for solonized soils and solonet. That is why the average weighted productivity of non-saline soils (un-degraded) with the same destination, in monetary terms, is also valued at 1500 MDL (benchmark for the calculation of damage). The decrease in the average weighted productivity of land on the overall surface of saline soils represents 25%, the average damage per ha in monetary terms amounting to 375MDL, whereas the total damage for the overall surface – 42 mln MDL.

1.1.6 Land desertification and soil degradation as a result of excessive grazing

Over the last years, on the gazing fields as a result of excessive grazing, the processes of destruction of grasses and disappearance of natural vegetation have intensified. This led to the degradation of these lands. Excessive grazing is caused by the considerable increase in the number of cattle in the private sector and lack of basic regulations of the process of grassland exploitation.

Unregulated grazing, starting early spring until late autumn, both on natural and artificial grasslands determines a reduction of about 40% in the productivity and grass quality for the next year. It leads also to an accelerated degradation of grasslands through rarefying and disappearance of plants, strong soil settlement and intensification of erosion on slopes.

Non-respecting the capacities, non-correlating the number of animals and the productivity of the grassland, overcharging leads to the degradation of the vegetal cover and to the insufficiency of food for many animals, causes weak utilization of green mass, plants ageing and decrease of their nutritional value. Thus, the optimal exploitation of grazing fields implies record-keeping and strict correlation between the necessities of animals and plants.

1.1.7. Chemical degradation of soil

Within the last 12-15 years, the volume of fertilizers applied in agriculture has suddenly reduced: the volume of organic fertilizers – 15-20 times, of mineral fertilizers – 25-25 times. Areas sown with yearly leguminous plants have reduced 2-3 times, and those sown with perennial plants – 4-5 times.

The balance of humus and nutrient elements (nitrogen, phosphorus, potassium) has become profoundly negative. Every year, there is a pronounced chemical degradation of soil, the phenomenon of drought intensifies, and the productivity of agricultural crops decreases. Chemical degradation of soil is accompanied by the intensification of the processes of land desertification.

Nitrogen Conditions

The main quantity of soil nitrogen exists in organic substances. Microorganisms form nitrogen accessible to plants in the process of humus decomposition.

As a result of long-term field experiences carried out throughout the country, it was established that every percent of the content of humus in the arable soil layer provides plants with 24 kg/ha of accessible nitrogen. That is why the nutritive nitrogen conditions of unfertilized soils depend on the content of humus. At the end of the XIXth century, the top layer of Moldovan black soils contained 5-6 percent of humus. Within one century of extensive soil exploitation, 2.5-3.0 percent of humus have been mineralized and lost. Assessment of the content of humus at any level (field, farm, district, and republic) became possible starting with 1964 through systematic researches (once in five years) on soil carried out by the State Agrochemical Service. In the further estimations the results of researches from the first (1965-1970) and the fifth (1986-1990) research cycles at the level of administrative districts were used.

According to the carried out calculations (tab.3), in 1970 the weighted average of the content of humus in the arable layer in the soils of the Northern region constituted 3.7 percent, in Centre – 2.8 percent, in the South – 3.0 percent, and on the whole in the country – 3.2 percent. It is forecasted that agricultural crops will be provided with 76 kg/ha of nitrogen yearly, with which it is possible to obtain up to 25 q/ha of autumn wheat and 32 q/ha of corn. The real yields of those crops constituted 20 and 33 q/ha (tab.4).

Chemicalization reached maximum quotas in 1986-1988, when on average 74 and 30 kg, respectively, of mineral and organic nitrogen were applied to one hectare. In black soils, plants absorb about 40 percent of applied nitrogen, 20 percent is immobilized by microflora, 15 percent is washed outside the rootlet layer, and 20 percent is denitrified in
the form of nitric oxides. Thus, plants assimilate about 40 kg from the applied 104 kg N/ha. Together with the reserve in the soil, this quantity constituted on average 114 kg N/ha. The corresponding level of nitrogen nutrition was sufficient for obtaining 36 q of quality autumn wheat, 47 q of corn, and 300 q/ha of sugar beet. The yields of the mentioned period were close to the forecasted ones and constituted 37.9, 39.3, and 287 q/ha, respectively (tab.4).

From 1970 until 1992, on average 1163 kg of mineral nitrogen and 492 kg of organic nitrogen were applied to one hectare of arable land, fruit growing and viticulture plantations. About 248 kg/ha out of that quantity were leached out of the rootlet layer, and about 330 kg were used by microorganisms.

During 1970-1990, the content of humus did not change. The average quantity of humus in the soil with agricultural destination constituted 3.1 percent.

After 1992, the application of fertilizers in the agricultural sector of the Republic of Moldova was considerably reduced. In 1994, on average only 4 kg of mineral nitrogen and 3 kg of organic nitrogen were applied to arable land, fruit-growing and viticulture plantations. Until 2000, the dose of nitrogen in fertilizers did not exceed 10 kg/ha. As a result, the nutritious nitrogen conditions have rapidly developed towards the reduced natural level. In 2000, the mentioned level included 74 kg of nitrogen provided by soil plus 4 kg from fertilizers. This level ensured obtaining about 26 q/ha of poor quality autumn wheat and 30 q/ha of corn. The real harvest figures of those crops within 1997-2001 constituted 25 and 29 q/ha.
Table 3. The Dynamics of the Changeable Content of Humus, Mineral Nitrogen, Mobile Phosphorus, Potassium in Soils of the Republic of Moldova (Weighted Average Data)

a) The Northern Region

<table>
<thead>
<tr>
<th>Location</th>
<th>Humus, %</th>
<th>Nitrogen accessible to plants, kg/ha</th>
<th>Mobile phosphorus, P$_2$O$_5$ mg/100g soil</th>
<th>Changeable potassium, K$_2$O kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briceni</td>
<td>3.6</td>
<td>3.7</td>
<td>86</td>
<td>89</td>
</tr>
<tr>
<td>Donduseni</td>
<td>3.4</td>
<td>3.8</td>
<td>81</td>
<td>91</td>
</tr>
<tr>
<td>Drochia</td>
<td>4.1</td>
<td>4.3</td>
<td>98</td>
<td>103</td>
</tr>
<tr>
<td>Edinet</td>
<td>3.8</td>
<td>3.9</td>
<td>91</td>
<td>93</td>
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**Source:** the monograph of I.Burlacu “Agrochemical Service Rendered to Agriculture”, Chisinau, 2001.
Table 4. The Dynamics of Yields of the Main Agricultural Crops in Moldova, q/ha

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Source: Statistical data of the Department of Statistics and Sociology of the Republic of Moldova
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*a.s. – active substance

**Source:** Statistical data of the Department of Statistics and Sociology of the Republic of Moldova
Under the conditions of zero reproduction with a negative balance of humus, the post effect of nitrogen fertilizers exhausts in 2-3 years. At present, the nutritious nitrogen conditions are almost completely determined by the content of humus. Yearly, soil provides agricultural crop with 88.67 and 69 kg/ha of nitrogen in the Northern, Central and Southern zones, respectively. This level constitutes only 60 percent of the amount necessary for obtaining the forecasted yield. For example, in early spring, in order to obtain 40 q of high-quality autumn wheat, the reserve of nitric acid in 1 m of soil layer must constitute 100-140 kg/ha. According to the latest data, the weighted average reserve in 1989 constituted 115 kg/ha and corresponded to the optimum level. At present, only 2 percent of the investigated grounds corresponded to this level. The reserve of N-NO₃ of 34 kg/ha in the spring of 2002 was 4 times less than the necessary quantities.

**Phosphorus Conditions**

The quantity of phosphorus accessible (mobile) to plants, as well as that of mineral nitrogen, in the soils of the Republic of Moldova is minimum.

According to the data of the Agrochemical Service, in 1970, when not much phosphorus fertilizers were administrated, almost 70 percent of the arable soil of Moldova was characterized by a very reduced and reduced content of mobile phosphorus. The weighted average content of P₂O₅ determined according to Ciricov’s method, in the soils of the Northern and Central regions constituted 8.1 and 8.8 mg in 100 g of soil and corresponded to the reduced level (tab.3). In the soils of the Southern region, this indicator, according to Macighin’s method, was equal to 1.6 mg and corresponded to a reduced level as well, according to the existing classification.

Within 1971 - 1992 on average 1143 kg of P₂O₅ were incorporated into each ha of agricultural land, out of which 888 kg were in mineral form and 255 kg – in organic form (tab.3). The yields of agricultural crops grew proportionally to doses of fertilizers. Along with the additional yields of crops exported within that period, 106 kg or 12.1 percent of the introduced phosphorus transformed into hardly soluble compounds, and 33 percent remained in mobile form. Thus, plants managed to assimilate 44 kg/ha out of the 297 kg/ha of residual mobile phosphorus. Along with the natural fund of 22 kg/ha, the potential export of phosphorus constituted 66 kg/ha. This quantity was sufficient to obtain a yield of autumn wheat at the rate of 50 q/ha and of corn of 66 q/ha. At the current prices of fertilizers, the reserve of mobile phosphorus accumulated in soil in 1990 would cost about 4 billion lei. However, the accumulated potential has not been accomplished. In order to increase the yield for every kg of P₂O₅, plants need 2.5-3.0 kg of nitrogen. Because of a sudden reduction of the quantity of nitrogen fertilizers incorporated after 1992, the accumulated reserve of phosphorus has not been used. At the same time, chemical processes of reduction and transformation into inaccessible forms has continued. After 1992, the systematic agrochemical research of the soil has not been carried out, that is why we do not know the exact situation of nutritious phosphorus conditions. In order to assess it, other estimation methods can be applied. The coefficient of reduction of mobile phosphorus reserve is known – it is 10 percent per year. Out of the reserve of 297 kg of P₂O₅ accumulated in 1990, there are only 70-90 kg/ha left. In 5-6 years (2008-2010), the residues of phosphorus will exhaust, and the nutritious conditions will come back to the level of unfertilized soils.

**Potassium Conditions**

The Potassium conditions are determined by the mineralogical composition of soils rich in potassium. Agricultural crops use great quantities of potassium. A ton of sugar beet consumes 6 kg, vine cultures 6-7 kg, autumn wheat and corn 24 kg, and sunflowers 85 kg de K₂O. Along with the average yields, up to 120 kg of K₂O / ha are being exported every year. Long-term experiments carried out on different subtypes of black soils and forest soils have proved the stability of the reserve of changeable potassium under the conditions of intensive soil exploitation. In addition, it is
clear that systematic removal of potassium from the soil without compensating these loses leads to gradual exhaustion of this compound.

In 1970 out of the 1.92 million examined hectares, 3.6 percent of soils contained a reduced quantity (less than 10 mg in 100 g of soil) of changeable potassium. 18.7 percent of soils had a moderate level (10-20) and 15 percent – an optimal level (20-30 mg). About 62 percent of soils contained over 30 mg of K₂O, including 22 percent over 40 mg in 100 g of soil.

15-18 mg of changeable potassium is sufficient for a normal growth of plants. Potassium-loving cultures (sugar beet, vine, potato, etc.) are an exception. They require 25 mg of changeable potassium in 100 g of soil.

Potassium fertilizers in doses of K₂O·120 often increased the yields, but, usually, the growth remained within limits of an experimental error. From 1970 to 1992, 1940 kg of K₂O were applied to one hectare of arable land, fruit growing and viticulture plantations, including 666 kg in mineral form and 674 kg in organic form (tab.6). Even if only the mineral form of introduced fertilizers was estimated, it would be sufficient to increase the quantity of changeable potassium by 22 mg in 100 g of soil. Potassium is not very mobile in soil, i.e. it does not migrate outside the rootlet layer, being fixed in an unchangeable form.

In 1970, the weighted average quantity of changeable potassium in the arable layer of the soils of the Republic of Moldova constituted 31 mg of K₂O in 100 g of soil (tab.1). The soils of the Northern region contained 35 mg, and in the South of the republic the level of potassium was lower (28 mg), but it corresponded to the optimal provisions. In 1990, when during 20 years about 1270 kg of K₂O have been introduced into one hectare, the weighted average content of changeable potassium did not change and constituted 33 mg in 100 g of soil, on average for the entire country.

The systematic applying of fertilizers allowed reducing the surface of moderately provided soils (10-20 mg in 100 g of soil) from 18.7 percent in 1970 to 4.7 percent in 1990. Thus, ten years ago potassium conditions were quite favourable. The stable effectiveness of potassium fertilizers was at the level of 5-10 percent in arable lands.

A forecast shows that by 2015 on 90 percent of soils of the Republic of Moldova, for the majority of crops, the potassium conditions will not limit obtaining high yields. For potassium-loving cultures, vegetal residues and moderate doses of organic fertilizers can compensate the deficit.

At present, among the examined nutritious conditions, nitrogen conditions are a required factor. For the most part, it limits obtaining the desirable yields. The content of mobile phosphates is close to the natural one, i.e. it is reduced. Without fertilizers, in 5-6 years, the phosphorus conditions will become a required factor. In 90% of the soils, the potassium conditions are favourable. In order to stabilize it within the following ten years, it is necessary to use local organic fertilizers in recommended doses.

**Prognosis of yields of agricultural crops, depending on soil bonitation grades**

The yields of agricultural crops depend on soil fertility and conditions of water supply. In general, soil fertility is expressed in bonitation points. A point of bonitation constitutes – 0.40 q/ha of autumn wheat; 0.48 q/ha of corn; 0.23 q/ha of sunflowers; 2.92 q/ha of sugar beet. According to the Land Cadastre of the Republic of Moldova of 01.01.03, the average bonitatoin grade for the entire country is 64 points, which allows obtaining of 25,6 q/ha of autumn wheat, 30,7 q/ha of sunflowers. The average bonitation grade at the level of administrative region varies from 78 (Edinet) to 48 (Calaras), table 6. Yields of the main agricultural crops vary within the same limits. Indicators of potential yields are close to real ones, which have obtained within the last years under the conditions of a sudden reduction of the quantity of fertilizers.

**Table 6 Potential yields of the main agricultural crops**

<table>
<thead>
<tr>
<th>District</th>
<th>Bonitation grade</th>
<th>Multi-annual precipitation (mm)</th>
<th>Autumn wheat</th>
<th>Cornbeans</th>
<th>Sugar beet</th>
<th>Sunflower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aneni Noi</td>
<td>60</td>
<td>548</td>
<td>24,0</td>
<td>28,8</td>
<td>-</td>
<td>13,8</td>
</tr>
<tr>
<td>Basarabeasca</td>
<td>59</td>
<td>528</td>
<td>23,6</td>
<td>28,3</td>
<td>-</td>
<td>13,6</td>
</tr>
<tr>
<td>Briceni</td>
<td>71</td>
<td>600</td>
<td>28,4</td>
<td>34,1</td>
<td>208</td>
<td>16,3</td>
</tr>
<tr>
<td>Cahul</td>
<td>57</td>
<td>526</td>
<td>22,8</td>
<td>27,4</td>
<td>-</td>
<td>13,1</td>
</tr>
<tr>
<td>Cantemir</td>
<td>58</td>
<td>526</td>
<td>23,2</td>
<td>27,8</td>
<td>-</td>
<td>13,3</td>
</tr>
<tr>
<td>Calarasi</td>
<td>48</td>
<td>650</td>
<td>19,2</td>
<td>23,0</td>
<td>-</td>
<td>11,0</td>
</tr>
<tr>
<td>Causeni</td>
<td>60</td>
<td>506</td>
<td>24,0</td>
<td>28,8</td>
<td>-</td>
<td>13,8</td>
</tr>
<tr>
<td>Cimislia</td>
<td>62</td>
<td>528</td>
<td>24,8</td>
<td>29,8</td>
<td>-</td>
<td>14,2</td>
</tr>
<tr>
<td>Criulenii</td>
<td>68</td>
<td>548</td>
<td>27,2</td>
<td>32,6</td>
<td>-</td>
<td>15,6</td>
</tr>
</tbody>
</table>
The potential yields can also be calculated according to the water provision of plants. The coefficients of precipitations productive utilisation by plants equals to 0.8 in the North of the republic, 0.7 in the Centre, 0.6 in the South, out of the quantity of annual precipitation. Data provided by the State “Hidrometeo” Service were used for this calculation. The quantity of water necessary for the cultivation of a quintal of basic production represents: 82 – for autumn wheat, 64 – corn, 133 – sunflower, 10.9 t – sugar beet. Based on these estimations, the yields calculated according to the level of water provision of the main agricultural crops is almost twice greater than the ones determined by the indices of soil natural fertility (table 7).

**Table 7. Forecast of the yield according to the bonitation grade and atmospheric precipitations**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average bonitation grade</th>
<th>Multi-annual precipitations (mm)</th>
<th>Yield (q/ha) according to the quantity of precipitation</th>
<th>The difference (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn wheat</td>
<td>68</td>
<td>584</td>
<td>48,9</td>
<td>27,2</td>
</tr>
<tr>
<td>Corn</td>
<td>62,6</td>
<td>32,6</td>
<td>30,1</td>
<td>15,6</td>
</tr>
<tr>
<td>Sugar beet</td>
<td>367</td>
<td>198</td>
<td>332</td>
<td>172</td>
</tr>
<tr>
<td>The Central region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn wheat</td>
<td>59</td>
<td>568</td>
<td>44,1</td>
<td>23,6</td>
</tr>
<tr>
<td>Corn</td>
<td>56,5</td>
<td>28,3</td>
<td>27,2</td>
<td>13,6</td>
</tr>
<tr>
<td>Sugar beet</td>
<td>332</td>
<td>172</td>
<td>37,8</td>
<td>23,6</td>
</tr>
<tr>
<td>The Southern region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn wheat</td>
<td>59</td>
<td>517</td>
<td>37,8</td>
<td>23,6</td>
</tr>
<tr>
<td>Corn</td>
<td>48,4</td>
<td>28,3</td>
<td>23,3</td>
<td>13,6</td>
</tr>
<tr>
<td>Sunflower</td>
<td>23,3</td>
<td>13,6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This proves that the nutritive conditions of soil, especially of nitrogen and phosphorus ones are in the first minimum. In order to obtain an increase of 40-50% of the yields, it is necessary to compensate the deficit of nutritive substances by applying fertilizers.

It should be mentioned that, under the current conditions there are farms that, depending on their economic situation, apply either the moderate or the optimal level of fertilisation of main agricultural crops, and thus obtain the corresponding yields.

According to the integrated analysis of the factors that cause soil degradation in the Republic of Moldova, we can ascertain that the quality of intensely exploited soil layer for a 30 years period has worsened. Because of landslides, actions of anthropical factor and as a result of natural disasters, salinisations and solinisations, as well as irrigation, wrapping with low humified and sloppy deposits, etc the surfaces of eroded soils have advanced. As a consequence of agrotechnical works, the process of soil structure deterioration and its compaction has intensified. In the conditions of the existing deficit of mineral and organic fertilizers, the balance of humus and of nutrients became negative. Overall, all of these factors generated the continuous decrease of soil resources fertility and the degradation of pedodiversity.

At present, the direct and indirect annual losses determined by the influence of different restrictive factors that tend to reduce the production capacity of soil, on the Moldovan land used for agricultural purposes (excluding the territory on the left bank of the Nistru River), in monetary value represent 3 billion 66 million lei, including:

- 1 billion 482 million lei – irreversible losses as a result of the 21 million tones of fertile soil being washed away from the slopes;
- 176 million lei - irreversible losses as a result of complete destruction of the soil layer by landslides, ravines and by excavations for social purposes;
- 1 billion 419 million lei – the cost of agricultural production losses.

The total irreversible losses as a result of the complete destruction of the soil layer by landslides, ravines and excavations for a 30 years period represent 10 billion 340 million lei.

1.2. Identification and assessment of the activities planned in the Republic of Moldova (programs, regulations, action plans, scientific provisions, local researches) on diminishing soil degradation by combating erosion and the process of solinization, stabilizing landslides, carrying the necessary organizational and soil amelioration measures, implementing a system of soil fertilization in order to reduce droughts.

Actions taken in order to combat soil degradation and desertification in the Republic of Moldova, as a component of the national strategy focused on this direction, are developed and represented in the following special programs:


Overall, the above-mentioned programs foresee the following major groups of measures to combat soil degradation, land desertification and increase agricultural production.

- Improving the institutional framework
- Improving the legal basis for regulating land relations, this would contribute to the sustainable utilisation of land, combating soil degradation and land desertification.
- Implementing an integrated system of actions and measures to combat soil degradation, land desertification and facilitate the continuous growth of agricultural production.
- Providing a scientific approach to the set of actions taken in order to combat soil degradation and land desertification.

These major groups of actions result from the objectives of the strategy to combat desertification, being focused on the creation of favourable premises in order to promote an efficient policy in the field and to conduct successfully social activities. The latter should be oriented towards the re-establishing of the ecological balance, anti-erosion planning of the territory based on landscape principles, preventing and combating all possible types of erosion and landslides, improving saline and degraded soils as a result of anthropical impact, excluding improper social activities by implementing a system of sustainable agriculture etc.

The objectives of combating soil degradation and land desertification can be accomplished only through legal, regulation, administrative and financial measures. First, it is necessary to develop and implement certain political and economic mechanisms that would provide a better turnover of production in agriculture. Price and market policy changes that would be supported by the entire society are a premise for the fundamental reorganization of the agricultural production system and protection of the soil layer from degradation and desertification. Only a profitable agriculture can financially provide the accomplishment of the necessary actions for combating soil degradation and land desertification.
Assessment of the capacity of the legislative framework to combat soil degradation and land desertification is presented in the appendix 1. The laws and the main Decisions of the Government that regulate land relations, pedological enhancement for the creation of an informative system on soil quality, actions and the measures taken in order to combat soil degradation and land desertification, as well as the responsibility of the public administration and economic agents involved in agriculture for solving the above cited problems:

- CONSTITUTION OF THE REPUBLIC OF MOLDOVA ADOPTED ON JULY 29, 1994
- LAW OF THE REPUBLIC OF MOLDOVA on Land Property Control, Cadastre and State Land Monitoring no.1247-XII of 22.12.92
- LAW OF THE REPUBLIC OF MOLDOVA on Environmental Protection no.1515-XII of 16.06.93
- LAW OF THE REPUBLIC OF MOLDOVA “FORESTRY CODE” no.887-XIII of 21.06.96
- LAW OF THE REPUBLIC OF MOLDOVA on Natural Resources no.1102-XIII of 06.02.97
- LAW OF THE REPUBLIC OF MOLDOVA on Amelioration of Degraded Land through Afforestation no.1041-XIV of 15.06.2000
- LAW OF THE REPUBLIC OF MOLDOVA ON Normative Price and the Procedure of Purchase and Sale of Land no.1308-XIII of 25.07.97
- LAW OF THE REPUBLIC OF MOLDOVA on Peasant Farms no.1353-XIV of 03.11.2000
- DECISION OF THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA on the Approval of the Regulation on the Contents of Land Cadastre Documentation no.24 of 11.01.95

The Action Plan on the preservation and enhancement of soil fertility, as well as objectives setting, the volume of works that need to be done, spacing out the completion dates and the costs include:
- improvement of the legislative and institutional framework; scientific support; agrotechnical and agrochemical measures; training, education, expanding and propaganda.

The main complex measures taken to create a favourable humus and nutrients (nitrogen, phosphorus, potassium) balance, which would contribute to the growth of agricultural crops yields, are the following:
- implementing scientifically motivated crop rotations;
- applying a processing system for soil preservation;
- using and applying organic fertilizers;
- application of biological nitrogen at most;
- applying mineral fertilizers.

The legislative framework for combating chemical degradation and land desertification is presented in appendix 1. The strategies, laws and decisions of the Government of the Republic of Moldova on the increase of the efficient soil fertility through agrotechnical, agrochemical, and microbiological measures are as follows:
- Improved methodical instructions for the determination and regulation of biophile elements in the soil of Moldova, Chisinau, 2001.
- Improved recommendations for the application of organic fertilizers during the establishment of fruit growing plantations and vineyards. Chisinau, 2001.

1.2.1. Assessment of the institutional, legislative, managerial etc. frameworks concerning the integration of the Republic of Moldova in the process of stopping and combating desertification at European and global level at present

Institutional and legislative framework of the Republic of Moldova
In 1992, the problem of desertification was thoroughly discussed at the United Nations Conference on Environment and its Development, which took place in Rio de Janeiro. According to the decision taken within the Conference, a special committee that developed the convention to combat desertification was formed, an instrument to which the Republic of Moldova has adhered in 1998 as well, along with other 138 states.

In the context of the institutional integration of the Republic of Moldova in the process of stopping and combating desertification at the European and global level, up until present, the following actions have been undertaken:

- Organizing a Working Group based on the National Committee, in order to respect the obligations of the Republic of Moldova within the Convention.
- Developing the National Program of actions to combat desertification.
- Developing the strategy to combat desertification.
- Developing the plan of strategic actions to combat desertification and their financial assessment.
- Organizing the ecological fund that, along with the projects dealing with nature protection, would sustain the works carried out to combat soil degradation.
- Unrolling the projects of bringing up the legislation of the Republic of Moldova to the legislation of the European Community.
- Coordinating the Action Plan with the plans and programs, which are currently in the process of execution and tangentially deal with the problem of combating soil degradation.
- Engaging nongovernmental organisations in activities to stop and combat desertification.

The current institutional framework of the Republic of Moldova in the field of combating desertification corresponds to the provisions and requirements stated by the Convention and by other international documents.

The legislative framework of the Republic of Moldova contains a set of laws aimed at regulating land relations and the way land resources are exploited.

The Constitution of the Republic of Moldova through the provisions of the art.37 ensures the right to a healthy environment, and the soil layer is a part of it. The Land Code (art.5) directly refers to soil protection, stipulating that it represents a space of vital importance where all objectives of human activities are located and protected by state. According to this normative act, the ecological protection of land has priority over other forms of activity.

The legislation that pursues environmental protection providing concrete stipulations for the perseverance of the soil layer has been developed in the Republic of Moldova during the last ten years, and mainly in the 1995 – 2000 period.

- The Waters Code (no.1532 – XII of 22.06.93).
- The Law on Environmental Protection (no.1515 of 16.06.93).
- The Forestry Code (no.887 of 21.06.96).
- The Law on Rivers and Water areas Protection (no.440 of 27.04.97).
- The Law on Hazardous Substances and Product Management (no.1235 of 3.07.97).
- The Law on Wastes (no.1397 of 9.10.97).
- The Law on Natural Resources (no.1102 of 6.02.97).
- The Law on Air Protection (no.1422 of 17.12.97).
- The Law on Fund of State Protected Territories (no.1538 of 25.02.98).
- The Law on Degraded Land Afforestation (no.1736 of 13.10.00)

In order to protect and combat soil layer degradation in the 2000-2004 period, the Government has developed and approved the following strategies and programs:

- National Program of Actions to combat desertification (2000).
- National Complex Program to increase soil fertility for the years 2000-2020 (2000).
- The Program to capitalize new land and to increase soil fertility, part I (2001).
- The Program to capitalize new land and to increase soil fertility, part II, (2003)

In accordance with the Law on environmental protection and the Law on environmental pollution, the Government of the Republic of Moldova approved the provisional Regulation on the estimation of the compensations for the damages caused to the environment where the soil issue is of a particular interest.

European institutional and legislative framework
In the European Union, the problems dealing with environmental protection, including the soil layer protection, are regulated by the Directives of the Council of the European Community, whose provisions are compulsory for all member-states that adjust their legislation to the respective Directives. The essential directives from the point of view of environmental and soil layer protection are the following:

- Directive 86/278/ECC of the Council of June 12, 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture
- Directive 91/676/ECC of the Council of December 12, 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources
- European Union Directive-frame on water 200/60/ECC.

Degradation of soil layer has become such an important problem that the European Council and the European Parliament organized a special Committee charged to develop a report on soil protection strategy. The European Community Committee presented the report to the European Council and Parliament, to the economic and social committee, and to the regional committee on April 16, 2002.

The report is based on the political commitments provided in the Conventions of the United Nations, being focused on the protection of soil from erosion and pollution and on the promotion of sustainable development.

The above-mentioned document qualifies the desertification phenomenon as a final stage of the degradation process, when soil loses its capacity of self-protection. Among the main factors that cause degradation are the following: erosion, organic matter reduction, local contamination on large scale, imperviousness, settling, biodiversity reduction and soil salinization.

The report emphasizes that the development of a reasonable soil protection policy takes time. Therefore, it is necessary to establish a legislative basis for long-term soil supervision.

During 2002, the Committee has initiated a set of environmental measures in order to prevent soil contamination. Certain legislative provisions on wastewater, mud resulted from filtering domestic waters, and composts were issued. A special report on these activities was to be drawn by the middle of 2004. Meanwhile, the Committee will prepare “the ground” for the application of legislative measures on soil supervision set by the member-states. At the same time, a presentation on erosion, organic matter reduction and soil contamination is foreseen to be prepared; this will include recommendations on permanent actions to solve these problems.

The Committee considers that, in order to ensure a proper soil protection, a certain strategy should be implemented based on:
1. all initiatives that are being implemented at present within the policies of environmental conservation;
2. integration of the topics on soil protection in other environmental policies;
3. soil supervision (monitoring);
4. new actions depending on the monitoring results.

According to the Committee, these actions represent the basis of the soil protection strategy, which is first of all supported by the current, accumulated knowledge.

1.3. The extent of the implementation of activities planned in the Republic of Moldova on soil degradation and land desertification reduction by combating erosion, salinization processes, landslide stabilization, organizational measures and soil amelioration works, optimizing nutrient conditions.

The extent to which the planned activities, as part of the programs to combat land desertification and soil degradation approved by the Decisions of the Government, have been implemented is presented in appendix 1.

Improvement of the institutional framework

In order to regulate land relations in the Republic of Moldova, according to the DECISION OF THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA on the reorganization of the State Agency for Cadastre, Land Resources and Geodecsics no.429 of 08.06.2001, the State Agency for Land Relations and Cadastre was organized. Within this Agency, the State Service for Land Property Regime and General Land Cadastre carries out its activity. This subdivision plans and coordinates land improvement works carried out by the Republican State Association for Soil Protection organized according to the DECISION OF THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA on reorganization of the specialized state cooperative Association for soil protection and construction projects no.694 of 09.10.95.

In order to regulate land relations at the district level within the district agricultural directorates the positions of Cadastre Engineer and Chief Pedologist have been introduced.

In order to coordinate testing/demonstrating works and regulate the importing system and the rational use of fertilizers, a specialized institution was founded – State Centre for Testing Chemical, Biological Products and Plant Cultivation (1995). In the same context of imports regulation, selling and rational use of fertilizers, within the Ministry of Agriculture and Food Industry the Soil Fertilization Directorate was created (2000). This state institution...
coordinates the activity of fertilizers importing companies, scientific researches, organizes trainings for farmers and
for agricultural experts by publishing specialized literature, carries out seminars, sets demonstrative plots of land, raises
population awareness through radio and television programs.

Within the District Agricultural Directorates the positions of Cadastre Engineer and Chief Pedologist were
introduced, in their authority lays the promotion of environmental policies and the implementation of a set
of technological measures on rational soil utilisation and increase of its fertility (2002). In the last 8-10 years, private
companies specialized in importing and commercializing fertilizers as well as conducting agrochemical analysis of soil
have been created.

**Legislative framework improvement**

From a general perspective, the existing land legislation (appendix 1) corresponds to the above-mentioned
requirements. The fundamental law – the Land Code – is currently being improved. At the same time, a project on the
Regulation on training and monitoring the land fund and on the Law on soil protection is being developed.

In 2000, the Ministry of Ecology, Construction and Territorial Development adopted a provisional Regulation on
estimating the damage caused to the environment as a result of soil degradation, including on nutritive elements
imbalance.

**Technological, managerial measures**

The integrated system of the measures undertaken to combat soil degradation, land desertification and to increase
agricultural production is presented in the action plans of the National Action Plan to Combat Desertification approved
by the Decision of the Government no. 367 of April 13, 2000 and of the Program to Capitalize New Land and Increase
Soil Fertility approved by the Decision of the Government no.636 of may 26, 2003. The information presented in
appendix 1 confirms that the annual implementation of the established system of measures represents 5-10% out of the
necessary volume. Overall, actions that do not require major expenses – organizational measures, agrotechnical and
phyto-amelioration works are carried out.

In the last 2-3 years, the quantities of fertilizers introduced in soil have doubled in comparison to the previous
years. It would be beneficial if the surfaces cultivated with biologic nitrogen fixing from the atmosphere leguminous
crops were extended.

The Program to Capitalize New Land and Increase Soil Fertility, approved by the Decision of the Government of
the Republic of Moldova no.636 of May 26, 2003, provides the implementation of crop rotations that would be
scientifically motivated depending on the pedoclimatic zone, carrying out of anti-erosion works, minimizing losses of
fertile soil and of nutritive elements by combating erosion and introducing chemical improvements in the steep
solonet.

According to the Decision of the Government of the Republic of Moldova no. 728 of June 2003, the Institute for
Research in Pedology and Agrochemistry „Nicolae Dimo” in collaboration with the State Agency for Land Relations
and Cadastre and other Education and Research Institutes developed a set of technological measures, which include:

- utilisation of local fertilizers;
- incorporation of mineral fertilizers;
- accumulation of biological nitrogen from the vegetable crops;
- implementation of crop rotations;
- spreading of big and small irrigations.

The set of measures is presented in the Increasing Soil Fertility Program, which has been approved by Ministries
and is currently under examination by the Government of the Republic of Moldova.

**Scientific support**

In spite of the insufficient financing, the scientific support of the set of actions to combat soil degradation and land
desertification is carried out at a satisfactory level. During the last ten years, the following practical recommendations
have been developed:

- instructions on establishing the extent of soil erosion;
- classification of cumulative soil;
- methodology of land investigation and soil map-drawing in the Republic of Moldova;
- methodology of pedological monitoring establishment and carrying out;
- methodology of establishing land monitoring in the Republic of Moldova;
- methodology of rectifying big scale pedological maps, at village level;
- methodology of carrying out detailed peodological studies and peasant farms land bonitation for land and fiscal
  Cadastre;
- methodology of generalizing materials of big scale soil map-drawings, at the level of administrative districts;
- the information system on the quality of soil layer in the Republic of Moldova (data base);
- anti-erosion band crops system, which represents an alternation of bands;
- anti-erosion crops system with grassed parcels seeded with soil protecting plants, created from a mixture of
  herbs;
• capitalisation of strongly eroded slope land by sowing the soil with perennial and annual herbs;
• introducing large doses of organic and mineral fertilizers on eroded soils in order to increase the production of agricultural crops;
• discontinuous fissuration and furrowing of soil in spaces between the weeding crops and grapes-vine lines and the constructive development of installations for carrying out of these works.
• system of working soloniozed soils on a differential basis;
• fractional introduction of the necessary gypsum dose;
• system of applying optimum doses of organic and mineral fertilizers;
• chemical method for ameliorating meadow alkaline salty soils;
• method for constructing intercepting drainage against landslides;
• capitalization of sliding land by setting tree and bush plantations;
• method for constructing anti-sliding drainage;
• inoffensive soil fertilizing systems;
• recommendations on the application of fertilizers on different types of soil in the field crop rotations;
• methodological instructions for identifying and regulating the balance of biophile elements in the soils of the Republic of Moldova;
• methodological instructions for identifying the humus balance in arable soils;
• recommendations for the utilisation of organic fertilizers while establishing fruit and vine growing plantations;
• recommendations on the coverage of the eroded soil with a fertile layer.

It should be mentioned, that for various reasons, the scientific developments are partially implemented in production.

1.3.1. Assessment of the extent of bringing (implementation) the legislative and institutional framework in the field of combating land desertification in the Republic of Moldova up to the international level

The bringing up of the legislative framework to the international one implies a strong coordination of the Moldovan legislation with the legislation of the European Community member-states.

As it was mentioned before, the European Union has a comprehensive legislation on environmental protection. A part of the developed directives refers to soil protection against pollution with heterogeneous chemical substances.

Up until present, there have not been adopted directives or other juridical norms providing special stipulations for combating soil degradation considering the main factors like erosion, organic matter reduction, contamination, settling, soils salinization and biodiversity reduction. However, as an exception we could mention the Directive of the European Council of June 12, 1986 on environmental protection, especially on the protection of soil, when sewage sludge is used in agriculture.

During the last years, soil degradation has become an actively debated problem within the European Community. The first document of great importance in this matter is the Report of the European Community Committee on „Soil protection strategy” presented to the European Council, European Parliament, to the economic and social Committee, and to the regional Committee on April 16, 2002.

During 2002-2004, the Committee has planned certain activities for the integration of the ecological legislation of the Community in the area of soil protection. In the middle of 2004, a report on accomplished work was presented to the European Council and European Parliament. In the same year, the legislation on soil supervision (monitoring) was developed.

The Republic of Moldova, similar to the member-state of the European Community, has developed an ecological legislation in the last ten years, which is generally speaking, close to the European one due to the adhering of our country to the international and European conventions on environmental protection. Likewise the European Community states, the Republic of Moldova does not have laws which would refer directly to soil protection, stopping and reducing erosion, preservation of organic matter and biodiversity, combating physical, chemical and biological soil degradation.

It should be mentioned that the Republic of Moldova has a provisional Regulation on the estimation of compensations for the damages caused to the environment with 9 legislative acts dedicated directly to soil protection, adopted by the Decision of the Government on September 5, 2000.

Development and adoption of the provisional regulation is the first attempt to protect agricultural land and to reduce their degradation rates. However, a considerable part of the stipulations of this normative act are imperfect, being either too complicated to be applied into practice or outdated. As a result, the provisions of the regulation are not put into practice.

In the future, the norms provided in the provisional regulation will have to be brought up to the specialized legislative acts of the European Community.
1.4. Identification of causes (barriers) of non-accomplishment or partial implementation (legislative, institutional, organizational, socio-economic, financial reasons) of planned activities (actions) concerning the reduction of soil degradation and land desertification by combating the processes of erosion, salinization and solinization, landslides, and increasing the efficiency of organizational measures and agrochemical works for soil improvement.

The causes (reasons, barriers) for non-accomplishing or partial implementation of certain activities are listed in appendix 1. These causes can be divided into the following major groups.

**Legislative reasons:**
- articles having almost the same content recur in several laws;
- the programs to combat soil degradation and land desertification are developed without taking into consideration the financial possibilities of the state for their implementation;
- lack of regulations approved by the Government in order to regulate soil upheaval in the post-privatization period, soil and land bonification, creation of analytical databases on soil properties and a computerized informational system on soil quality, training and implementing land monitoring, establishing land cadastre, organizing and arranging the communal territory, drafting, creating, maintaining, repairing and registering land improvement arrangements, economic motivation for soil amelioration actions, preservation of degraded lands (norms, indicators), control over land utilisation, calculating losses caused as a result of violating land legislation, etc.
- lack of an incorporated legislative document, for example the Law on "SOIL"
- lack of a state promoted program on cyclical agrochemical soil mapping accompanied by the development of corresponding recommendations form the implementation in production.

**Institutional reasons:**
- reduced efficiency of the created system for land resources management and control;
- management of some aspects of land relations by several departments or agencies;
- lack of a managing and financing system of the programs approved by the Government on soil degradation and land desertification;
- lack of a pedological Service within the State Agency for Land Relations and Cadastre;
- strengthening the capacity of this subdivision within the Ministry of Agriculture and Food Industry on the coordination and intensification of agrochemical service works;

**Organizational reasons:**
- implementing land reform and creating a polysystemic agriculture at rapid pace, without a proper scientific motivation of the reform, theoretical and a practical testing of the farming models and forecasting their activity;
- parcel out the agricultural land fund into more than 2 million private plots, fact that makes the protection, improvement and sustainable utilisation of soil, as well as the creation of several specialized and profitable peasant farms, impossible;
- distributing land plots without a prior territorial reorganization of the estates of communes, reconstruction of the soil protecting “green shell”, removing the degraded land out of the agricultural circuit and creating the communal system of off takes for rapid evacuation of water excess in case of torrential rains;
- carrying out land reform and practising agriculture based on an improper soil quality Cadastre;
- transition from large-scale production to the small one, practising the property right on land without taking into consideration the availability of material and cultural resources and the possibility to use them in a small-scale production process;
- incognizance of landowners of rational cultivating methods of the soil layer on small plots in the conditions of market economy;
- lack of farmers’ interest in financing territory development works, in maintaining soil fertility and combating soil degradation.

**Socio-economic and financial causes**

The lack of financial resources for the implementation of measures to combat soil degradation and land desertification is determined by the main macroeconomic trends, which characterize the regression of the agricultural sector in the post-privatization period. This implies:
- practicing a subsidizing agriculture instead of the commercial and performance one;
- reducing the yield and the productivity by hectare;
- absence of an exchange equivalent between the industrial production, the agricultural one and inflation, the decrease in furnishing agricultural techniques, fertilizers and fuel;
- liberalizing foreign trade without ensuring the protection of the local producer;
- decreasing the volume of exports for agricultural food products;
• improper structure of prices for agricultural production;
• decrease in the consumption of food products and the simultaneous increase of resources spend by population for these products;
• reduced level of taxes collecting in the agricultural sector, in spite of the relatively mild fiscal pressure;
• inefficient system of agricultural subsidizing, based on short-term objectives;
• lack of a set of economic and fiscal mechanisms in order to regulate and stimulate actions to combat soil degradation and land desertification;
• lack of a program on agrochemical services rendered to landowners, especially in the field of agrochemical investigation of soils and developing an agricultural crops fertilizing system;
• lack of resources required for the construction of communal platforms for the storage of stable garbage;
• lack of financial resources of landowners to acquire and incorporate the optimum doses of fertilizers in soil.

Scientific suggestions:
• improve the national system of pedological researches taking into account the situation of the land fund in the post-privatization period in order to develop a proper regulation approved by the Government;
• improve the system of soil classification and bonitation in order to amend the appendix 3 of the Decision of the Government no. 24 of 11.01.95 for the approval of the Regulation on the content of land Cadastre documentation;
• develop a methodology on systematization, generalization and creation of an analytical data base on qualitative features of the soils of the republic;
• develop a methodology in order to create a computerized informational system on soil quality at the level of plots of land (land sector), agricultural exploitation, commune, district, republic to develop and approve a proper regulation;
• to study better the factors that cause soil degradation and land desertification in order to take the proper actions;
• activate the Extension Centres within the Institutions of Scientific Research and Education;
• establish demonstrative plots of land on rational utilisation of local and industrial fertilizers in every district.

1.4.1. Identification and presentation of barriers that have stopped the implementation of provisions of international acts and treaties at the local and European level in the Republic of Moldova

Republic of Moldova declared European integration as a political priority and it would have much to gain, if it brought its legislative framework on combating soils degradation up to the legislation of the European Union member-states.

With regard to present achievements in combating soils degradation and desertification, one can establish that they are more than modest, if we compare them with the provisions of the National Plan of Actions to Combat Desertification adopted by the Decision of the Government of the Republic of Moldova no.367 of 13 April 2000.

Barriers, which limit full implementation of the actions plan provided for the 2000-2009 period are to a large extent determined by the unfavourable socio-economic factors, and namely:

• Excessive fragmentation of the land fund, fact that does not allow its rational exploitation and protection against physical, chemical, and biological degradation.
• Prevalence of an agriculture, which on large areas comes into contradiction with the fundamental agronomic laws because the majority of landholders are under the poverty line.
• Lack of agricultural and environment protection knowledge or superficial knowledge of a great part of agricultural landholders.
• Limited access of agricultural producers to agricultural technologies and practices for soils and environment conservation.

A number of secondary obstacles that restrain promotion of an agriculture oriented towards combating soil degradation derive from the above-mentioned barriers.

Also for various socio-economic reasons, the programs adopted by the Government of the Republic of Moldova aiming at improving the situation in agriculture and stopping soil degradation are unsettled.

Thus, „The National Complex Program to increase soil fertility during 2001-2020“ is unsettled because of the lack of funding.

Programs for the capitalization of new lands and for increasing soil fertility has a reduced funding, and the works performed do not have a considerable impact on the emerged situation. Programs of this kind, which provide for works oriented towards the prevention of soil degradation are easily adopted, however their funding is not provided or is provided to a small extent because of the lack of budgetary, local, and economic agents’ resources.

It must be mentioned that though the situation is unfavourable, during the last 5-6 years it has barely improved.
We can conclude that the barriers, which restrain the implementation of the provisions of international acts and treaties at a local and European level on combating soil degradation in the Republic of Moldova, are predominantly of a socio-economic nature, and to a less extent of legislative one, though there is much to do in this field.

1.5. Analysis, identification and definition of national needs of the R.M. (related to desertification factors: ecologic imbalance between natural and anthropical ecosystems; surface and in depth erosion; landslides; solinization and salinization; improper human activities, chemical degradation) taking into consideration individual, institutional and systemic levels, related to the strengthening of the country’s capacity in the field of combating soil degradation and land desertification.

National needs in the field of legal framework improvement

Land relations is an area where land legislation is applied; consequently, problems regarding the sustainable use and combating soils degradation are the main elements of these relations. National needs of the R.M. related to the improvement of the legal framework in the field of combating soil degradation and land desertification are the following:

- Improvement of the Law on Land Cadastre of the Republic of Moldova;
- Development of the Law on soil;
- Improvement of the Law on Land Property Control, Cadastre and State Land Monitoring;
- Development of the following regulations:
  - on control over land utilization;
  - on land monitoring;
  - on land cadastre;
  - on economic motivation of persons, who carry out soil amelioration works;
  - on performing soil surveys;
  - on territory improvements;
  - on calculating soil bonitation grade;
  - on creating and running an informational centre for soil quality;
  - on creation of an analytical database on soil properties;
  - on creation of a computerized informational system concerning the situation of soil quality;
  - on drafting, creating, supporting, repairing, registration of arrangements for land improvements;
  - on calculation of damages caused as a result of violating land legislation;
  - on carrying out of agrochemical research;
  - on maximum admissible norms for application of chemical, biological, bacteriological, radioactive, fuel and other substances on soil;
  - on conservation of lands with degraded soils (norms, indicators);
  - adopting the law on fertilizers;
  - adopting the regulation on testing/demonstration of fertilizers;
  - improving the regulation on determining damages caused as a result of non-observance of balanced equilibrium of nutrients in soil;
  - adopting the regulation on carrying out agrochemical research, storage, keeping and utilisation of information on actual fertility and agrochemical indices of soil.

National needs in the field of institutional framework improvement

At present, local public authorities and a number of ministries, departments, agencies, involve in and perform the management of land resources in Moldova, fact that leads to a decrease in management efficiency. The problem lies in the creation – at country, rayon and commune level – of a single hierarchic system of management, control, regulation and protection of land resources with special institutions for running land research and scientific and terrestrial prognosis, cadastre works, monitoring, drafting and land improvement.

The basic objectives of such a system are:

- regulation of land relations;
- management and distribution of the land fund within the national economy;
- providing state control and management of land fund aiming at rational use and protection of the soil layer;
- establishment and updating of land cadastre and monitoring;
- creation and running of an informational centre on soil quality;
- creation of an analytical data base on soils properties;
- creation of a computerized informational system on the level of soil quality;
• improvement of the national research system: carrying out of soil surveys, agrochemical and drafting works in order to organize and arrange territory and land arrangements;
• organization of a scientific basis on cadastre and land monitoring, researches and drafting for the arrangement of the agricultural territory, protection and sustainable utilization of soil;
• management, funding and regulation of topographic, pedological, agrochemical surveys of drafts and land improvements for the protection and increase of soil fertility;
• organization and funding of researches within pilot-projects for the development of sustainable agricultural systems and creation of optimal size standard-farms;
• promotion of merging policy for small privatized plots of land for optimal size agricultural exploitation, legislative regulation of land merging system;
• regulation of land legal circulation (buying-selling, mortgage rental, legacy, pledging, etc.), creation of land market;
• solving problems concerning: calculation or determination of land tax, land price, rental payment, tax on land operations; accumulation method and distribution of means collected from land payments; determination of the form and limits of state supervision in relation to the realization of land transactions, contractual relations and responsibility for these relations;
• improvement of the legislative base on land relations;
• strengthening the capacity of the corresponding direction of the Ministry of Agriculture and Food Industry on agrochemical servicing of agriculture;
• setting up a single, vertical system, at the level of agricultural landowner, commune, rayon, country with respect to agrochemical servicing of agricultural landholders.

National needs in the organizational field:
• consolidation of lands in profitable agricultural exploitations of optimal size, which would enable implementation of crops rotation and modern technologies;
• eliminate mistakes: in the agricultural reform, in the organization of production processes, in the implementation of new technologies, in the utilization of new breeds and hybrids of plants, animal races;
• elimination of gaps and inefficiency in the application of legal, economic and financial, institutional and managerial mechanisms in relation to the functioning of the agro-industrial complex and regulation of land relations;
• avoidance of obstacles and negative elements in the promotion of measures on internal and external markets, protection of the local agricultural producer;
• creation of the infrastructure for servicing the agro-industrial complex (equipments, seeds, fuel, fertilizers, pesticides etc.), and communication, consultancy, training and recycling networks;
• scientific and technological staff provision, developing an extension system and research-drafting in agriculture;
• identification of causes generating the mentioned problems, establishing and analyzing negative effects;
• development and adoption of ecological standards and norms for a sustainable agricultural land exploitation within landscapes;
• organization of the agricultural territory, structuring of landscapes, so as to invigorate natural processes for recovering soil fertility, for biodiversity maintaining, for self-purification and revitalization; limitation of land pollution;
• promoting and stimulating researches within pilot-projects aiming to form models for agricultural exploitations, maintaining natural balance and soil charging capacities in every agropedoclimatic zone and landscape system;
• successful combination of traditional practices and experience with modern technologies for sustainable soil utilization;
• state regulation of activities of economic agents through laws, standards and exclusive norms for environment and soil resources protection;
• put into practice a set of legal, political and economic mechanisms and measures in order to regulate and stimulate activities on the protection, improvement and sustainable utilization of soil, first through fiscal and economic measures (reduction of land taxes or tax exemptions, providing loans with low interest and with grace periods) at national and local level;
• creation of an infrastructure for technical and material agricultural basis (equipments, fuel, fertilizers, pesticides);
• creation of a corresponding infrastructure for training, educating and propaganda, which would enable the population to adopt the necessary skills for preventing and combating soil degradation, soil protection and sustainable utilization.

Socio-economic and financial needs:
• protection of the local agricultural producer;
establishing a favourable budgetary framework both, for the socio-economic wellbeing of the population, and for the protection of environment and soil resources;

state regulation of the activities of economic agents through laws, standards and exclusive norms for the protection of environment and soil resources;

modification of market and price policy, which would provide means for soil layer protection;

put into practice a complex of economic mechanisms and measures for the regulation and stimulation of activities on protection, improvement and sustainable use of soils, in the first place, through fiscal and economic measures (reduction of land taxes or tax exemptions, offering low interest loans and grace periods) at national and local levels;

establishing, implementation and follow-up of measures for preventing and combating different forms of soil degradation, along with providing for technological and financial responsibility;

funding topographic, soil, agrochemical surveys and drafting and implementing works on land improvements for the protection and increase of soil fertility;

funding researches within pilot-projects for the development of sustainable agricultural systems and creation of optimal size farming-models;

promotion of merging policy for small privatized plots of land for optimal size agricultural exploitation, legislative regulation of land merging system;

regulation of legal circulation of land (selling-buying, mortgage rental, legacy, pledging, etc.), creation of a land market;

solving problems concerning: calculation or determination of land tax, land price, rental payment, tax on land operations; accumulation method and distribution of means collected from land payments; determination of the form and limits of state supervision in relation to the realization of land transactions, contractual relations and responsibility for these relations;

creation of a viable economic mechanism, which would ensure the improvement of price policy, loaning and taxation, and which would enable implementation of special agro-industrial complex oriented programs, especially in the field of protection, improvement and sustainable exploitation of soil;

state financial support for agricultural landholders for the acquisition and incorporation of fertilizers (financial facilities);

coverage by the state of expenses related to cyclic agrochemical research (once in ten years) carried out on agricultural lands.

National needs in the field of ecologic balance conservation:

development and adoption of ecological standards and norms for a sustainable agricultural exploitation of land within landscapes;

structuring of landscapes, so as to enable invigoration of natural processes for the recovering of soil fertility, maintenance of biodiversity, self-purification and revitalization; limitation of land pollution;

promotion and stimulation of researches within pilot-projects aiming to establish models for agricultural exploitations, maintaining natural balance and soil charging capacities in every agropedoclimatic zone and landscape system;

successful combination of traditional practices and experience with modern technologies for a sustainable soils use;

structuring and reconstruction of landscapes, extension of forest covered surfaces and of slope meadows for maintaining the ecological balance between natural and anthropical ecosystems, biodiversity conservation, protection of the environment, soil and aquatic resources;

integration of field cultures sector within the zoo-technical and horticultural one to create a more complex, more stable agricultural system with an advanced biological diversity, in which the internal resources are fully used, substance circuit is more complete, production costs – more reduced, the labour force is used at maximum capacity, with a maximum stability of rural population.

National needs in the field of scientific backup:

studying factors and processes of soil degradation, land desertification and draught, development of adaptation measures and technologies, combating and minimizing consequences;

develop a system of absolute and relative soil standards for zonal soils of the country, assessed in different hydrothermal circumstances (value of the hydrothermal coefficient from 0,5 up to 0,9), carry out map drawing for degraded lands based on standard-soils system and develop projects to combat soil degradation;

definition of inoffensive ecological balance of mineral substances applied on soil and of ecologically safe systems on soil fertilization;

create a scientific basis for sustainable and ecological agricultural system which would ensure obtaining ecological agricultural products and would exclude land degradation and pollution of soil and aquatic resources;
• perform researches within pilot-projects aiming at establishing new models for agricultural exploitations, in which, along with the growth of production, ecologic balance and soil regeneration capacity would be maintained; test and implement new models of agricultural exploitations in different pedoclimatic zones of the country;
• develop programs for sustainable use, protection and improvement of soil at district and commune level;
• develop methodology on systematization, generalization and creation of an analytical database for the quantitative characterization of the properties of country soils;
• develop methods for establishing a computerized informational system on quality condition of soils at the level of plots (sector of land), agricultural exploitation, commune, district, country for the creation and adoption of a corresponding regulation;
• develop framework-programs at the level of commune on increasing soil fertility and rational use of fertilizers;
• training, awareness raising and educating population towards the observance of agricultural standards, including with respect to the formation of balanced equilibrium of biophilic elements in soil.

1.5.1. Identification and definition of national needs of the Republic of Moldova, taking into consideration individual, institutional and systematic levels regarding the fortification of country capacity in the field of its integration in activities related to combating the process of land desertification at European and global level

Soil degradation affects all European countries, particularly the ones that are situated in the Southeastern part of the continent, of which the Republic of Moldova is part. Resolution of this extremely grave problem requires urgent and complete integration within global activities and especially within continental ones.

European Community countries have carried out large-scale activities, especially, during the last 4-5 years, against degradation of soil layer and environment in general. Considerable efforts are made in developing community policies, strategies, actions to reduce and stop the processes of soil degradation.

The legislative framework for the implementation of these activities is largely in the process of being developed. It is important for the Republic of Moldova to bring the adopted legislation and legal acts, which are now being developed and adopted up to the regulations of the European Community countries. In this context, we would like to point to the following national needs:

• Adjustment of the soil classification system to the one adopted by FAO/UNESCO. This would enable the integration within the European network coordinated by the European Soil Bureau, institution that deals with collection, systematization and distribution of information on soil and developing of national and community policies in the this field.
• Bringing methods of soil research up to the European ones to cooperate in the process of developing indicators on soil monitoring and management. Such actions are in full progress within the European Community.
• Participation in the development of international norms in the mentioned field within the European Committee for Standardization and International Organization for Standardization. This important step is determined by the necessity of the entire Europe to become aware of the problems related to soil degradation and of the need to ensure data comparability.
• Joining the European strategy for sustainable use of pesticides, which is in the process of being developed.
• Joining community’s agricultural policies on soil protection. This policies aim at organic matter accumulation, biodiversity improvement, and reduction of erosion, contamination and physical soil degradation.
• Coordination of agricultural practices with the provisions of article 3 of the European Community Regulation no.1259/1999 for soil protection within the Good Agricultural Practices.
• Founding of the National Soil Monitoring System according to the community legislation, which is under the process of being developed.
• Development of the national Law on soils providing norms on its protection brought up to the European level.
• Improvement of the provisional regulation on estimation of compensations for damages inflicted on the environment and adjustment of standard acts to the European legislation.
• Coordination of research programs in the field of soils protection with the similar ones of the European Community countries.

Close cooperation in the above-mentioned fields with the member-states of the European Community would enable the Republic of Moldova to solve gradually its problems related to soil protection and sustainable development.
### 1.5.2. Assessment of institutional capacities
Assessment of the institutional framework in the field of combating soil degradation and land desertification of the Ministry of Ecology and Natural Resources

<table>
<thead>
<tr>
<th>Institution</th>
<th>Responsibilities of the institution in the framework of:</th>
<th>Assessment of capacities for implementation and activities analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Ecology and Natural Resources</td>
<td>Responsible for the implementation of the provisions of Convention to Combating Desertification</td>
<td>Responsible for the implementation of the National Plan of Actions to Combat Desertification</td>
</tr>
<tr>
<td>State Agency for Land Relations and Cadastre</td>
<td>Responsible for problems related to combating soil degradation</td>
<td>Responsible for the implementation of the New Land Capitalization and Increasing Soil Fertility Program, part1, Complex program to combat soil degradation</td>
</tr>
<tr>
<td>Ministry of Agriculture and Food Industry</td>
<td>Responsible for the implementation of provisions of Convention on soil fertility conservation</td>
<td>Responsible for conservation and increasing soil fertility, proper use of fertilizers</td>
</tr>
</tbody>
</table>

- The Ministry has a clearly defined mission with regard to the provisions of the Convention; however, it does not have administrative, technical and financial possibilities for the implementation of foreseen activities.
- The structure of the Ministry complies with the Decision of the Government being efficiently managed.
- The Ministry applies compulsory such instruments as planning, quality management, monitoring and assessment, however, for the implementation of the activities provided by the convention these instruments, because of insufficient technical and financial possibilities, are applied sporadically for the implementation of small projects in the field.
- There are qualified human resources, which are used in a proper way.
- There are not provided special financial resources for the implementation of the provisions of the Convention in the State Budget for the Ministry of Ecology and Natural Resources. Certain actions in this respect are financed by the Ecologic Fund and from the grants offered by developed countries.
- The information demanded in the field of combating desertification is available, efficiently disseminated and properly managed.
- Computers, offices, Internet network and other material means are available.
Within the Ministry of Ecology, the Head Directorate for Natural Resources bears the responsibility for the implementation of the provisions of the Convention. This direction has the following basic functions:

- Regulation of activities in the field of natural resources utilization, performing researches on the ecological impact;
- Assessment, adoption and implementation, when needed, of standards and standard documents in its areas of activity;
- Coordination and conduction of scientific studies in the field of environmental protection, as well as implementation of new equipment and technologies in its spheres of activity;
- Carrying out of environmental monitoring, as well as meteorological, hydrological, agro-meteorological observations as to provide meteorological information to population, economy, national security, as well as authorities of public administration.

State Agency for Land Relations and Cadastre takes part in the practical implementation of the provisions of the Convention indirectly, by running the activities provided by the Program for new land capitalization and increasing soil fertility, part1, “Complex program for amelioration of degraded land”. Objectives of the program to a major extend fall in with the provisions of the Convention to Combat Desertification.

- The Agency does not have a clearly defined mission regarding the provisions of the Convention, however, having in its structure the State Republican Association for Soil Protection, it has a number of administrative, technical and financial possibilities for partial implementation of activities on combating soil degradation.
- The structure of the Agency complies with the Decision of the Government being efficiently way. For the administration, coordination, regulation and control over soil researches, assessment of the necessary package of methodological and normative documents in the field, correct running of cadastre on the quality of land fund, forming of a database and informational system on soils quality it is necessary to establish a separate subdivision - Directorate of Pedological Service.
- The Agency uses compulsory such instruments as planning, quality management, monitoring and assessment, however, for the implementation of activities provided by the Convention because of insufficient technical and financial possibilities these instruments are partially applied.
- There are qualified human resources, which are used in a proper way.
- There are provided special financial resources for the implementation of the provisions of the Convention in the State Budget for the Agency. Activities provided for by the Program for new land capitalization and increasing soil fertility, part1, and “Complex program for the amelioration of degraded land” are partially funded from the Extra-budgetary Fund and from the grants offered by developed countries.
- Information demanded in the area of combating soil degradation is available, efficiently disseminated and properly managed.
- Computers, offices, Internet network and other material means are available.

Within the State Agency for Land Relations and Cadastre, the Directorate on Land Monitoring and Soil Protection is responsible for problems concerning soil protection and combating degradation. This Directorate has the following basic functions:

- Organizes carrying out of land monitoring according with the regulation in force;
- Plans annually the volume and financing of pedological researches implemented by the department of Pedological Researches of the Designing Institute for Territory Organization.
- out of the budgetary sources;
- Drafts the annual plan of pedomelioration works, which shall be implemented by the Republican Association for Soil Protection out of the extra-budgetary sources and it passes for approval to the Government;
- Manages, develops, approves funding and runs control over the use of funds for the implementation of annual programs on new lands capitalization and increasing soil fertility implemented by the State Republican Association for Soil Protection and other organizations;
- Systematizes and publishes the annual Bulletin of Land Monitoring;
- Develops and promotes national programs and plans of actions in the field;
- Contributes to the implementation of land reform;
- Contributes to the development of land market;
- Performs state control by granting, suspension or withdrawal of licenses, authorizations, by developing instructions and recommendations;
- Ensures observance and implementation of the provisions of legislative and standard acts in the field of land relations and monitoring;
- Examines and solves, according to the legislation, citizens’ petitions related to areas of land relations;
- Develops standard acts, which determine the cost of pedological researches, pedomelioration works, financed from the State Budget, and of disbursement processes between the beneficiary and entrepreneur for these works;
Develops schemes for the rational use of land at the national, district, municipal, city and communal scale, concrete programs for land improvement and protection;

Runs testing of specialists in the field;

Adopts, within the limitations provided by law, standard-documents, which are used in carrying out soil researches, and in works related to monitoring etc.;

Ensures, in the proper way, application on the territory of the Republic of Moldova of international standards and norms in its areas of activity;

Contributes to the international cooperation in fields of land relations and monitoring.

Within the Ministry of Agriculture and Food Industry the Directorate on Agro-chemistry and Ecology along with the State Inspectorate, created by the Decision of the Government, partially implements activities on combating chemical degradation of soil. The Ministry of Agriculture and Food Industry participates indirectly in the implementation of the provisions of the Convention, through the implementation of works to increase soil fertility.

The Ministry does not have a clearly defined mission concerning the provisions of the Convention; however, having in its structure the above-mentioned direction, it may partially take part in the implementation of activities on combating chemical degradation of soil.

The structure of the Ministry of Agriculture and Food Industry meets the provisions of the Decision of the Government in this respect and is efficiently managed. For the administration, coordination, regulation and control over supplying and utilization of fertilizers, carrying out agro-chemical researches, developing the necessary set of methodological and normative documents in the field, the corresponding Directorate was established.

For the implementation of the provided activities, the Ministry uses compulsory, such instruments as planning, quality management, monitoring and assessment.

There are experienced human resources, which are used in a proper way.

There are not provided special financial resources for the implementation of the provisions of the Convention in the State Budget for the Ministry.

Demanded information in the field of soil fertility is available, efficiently disseminated and properly managed.

Agro-chemistry and Ecology Directorate along with the State Inspectorate is at the stage of being organized and is divided in two directorates: agro-chemistry and ecological agriculture.

Agro-chemistry Directorate is composed of three persons: a consultant and two main specialists. The basic functions of this Directorate are the following:

- Keeping records, coordination, regulation and control over deliveries and use of mineral and organic fertilizers;
- Evaluation of the needed amount of fertilizers based on the information of agro-chemical researchers;
- Organization and funding of agro-chemical mapping of agricultural lands;
- Organization and funding of scientific researches in the field;
- training, raising awareness and education of population concerning the observance of basic agricultural principles, including the establishing of a balanced equilibrium of biophilic elements in soil.

1.5.3. Assessment of capacities at the individual level

The assessment was carried out based on the interrogation of officials in decision-making positions from ministries and departments.

Ministry of Ecology and Natural Resources.

- There are three staff members within this direction: head of the Ministry and two coordinating specialists.
- The responsibilities are properly defined.
- Regretfully there is no permanent process of the proper training, within the ministry and subordinated institutions.
- There are perspectives for professional growth due to the fact that the ministry is at the stage of being organized and professional growth of the specialists.
- Responsibilities are efficiently delegated; however, there have not been undertaken measures to assess the skills of the staff because the direction is at the stage of being organized.
- Access to any type of information on the soil quality condition of is granted, and the system of measures developed in this regard was implemented.
- The relations of collaboration among all directories of the ministry and subordinated institutions are highly efficient. Information sharing is necessary.
- As a rule, the obtained results are adequately assessed, but regretfully, these results are insufficient for the implementation of the provisions of the Convention.
- Spirit of initiative is viable, however, often, because of financial reasons, is not promoted and encouraged.
For the successful carrying out of basic functions, it is necessary to ensure the ministry with up-to-date computers, scanner, software, methodologies, etc.

- There are five staff members within the corresponding directorate of the State Agency for Land Relations and Cadastre: head of the directorate, a consultant, two main specialists and a coordinating specialist.

- The functions and responsibilities of the staff are properly defined; however, the required qualifications are not sufficient to coordinate the works related to applied pedology. The majority of the staff members have the qualification of cadastral engineer, but not the one of pedologist. It is necessary to involve a group of specialists in pedology to establish the Pedology Service.

- Regretfully, a permanent process of training is not carried out within the Agency and subordinated institutions.

- Due to the fact that the direction is at the stage of being organized there are perspectives for professional growth of the specialists.

- Responsibilities are delegated efficiently; however, there were not undertaken measures on assessment of the staff because the direction is at the stage of being organized.

- Access to any type of information on the quality condition of soil is provided, and the system of measures developed in this regard was implemented.

- The cooperation relations among all the directions of the Agency and with the subordinated institutions are most efficient. Information sharing is compulsory.

- As a rule, the obtained results are adequately assessed, however, regretfully; these results are insufficient for the implementation of the provisions of the Convention.

- Spirit of initiative is viable, however, often, because of financial reasons, is not promoted and encouraged.

Assessment of capacities at the individual level was carried based on the questionnaires filled in by the officials from the Ministry of Agriculture and Food Industry.

- There are three staff members within the corresponding section: head of the section and two coordinating specialists.

- Functions and responsibilities of the staff members are properly defined, the required qualifications are in the position to coordinate works related to applied agro-chemistry.

- Regretfully, there is no a permanent process of training within the Ministry of Agriculture and subordinated institutions.

- There are perspectives for professional growth of specialists due to the fact that the direction is at the stage of being organized.

- Responsibilities are delegated efficiently; however, there were not undertaken measures for staff assessment because the directorate is at the stage of being organized.

- Access to any type of information on the quality condition of the soil is ensured, and the system of measures developed in this regard was implemented.

- The cooperation relations between the relevant directorate and the subordinated institutions are most efficient. Information sharing is compulsory.

- As a rule, the obtained results are adequately assessed, however, regretfully; these results are insufficient for the implementation of the provisions of the Convention because of the insufficient utilization of fertilizers. The unstable financial situation does not allow agricultural producers to procure fertilizers in sufficient amounts.

- Spirit of initiative is viable, however, often, from financial reasons; it is not promoted and encouraged.

For the successful carrying out of basic functions, it is necessary to provide the corresponding directorate with up-to-date computers, software, methods, etc.
2. Assessment of procedures for collection and processing of information on forms of soil degradation and definition of national needs of the Republic of Moldova on strengthening of the country’s capacities in the field of creation and rational use of the database on desertification factors

2.1. Identification and presentation of methods of collecting and processing (systematization and generalization) of data on the ecological imbalance between natural and anthropical systems (surfaces of arable, fallow lands, lands under forest plantations, swamps, waters, eroded, salted soils, lands destroyed by excavations)

Ecosystems of the Republic of Moldova (RM) are grouped in natural ones (forest, steppe, water meadows, aquatic and swamp) and anthropical or agricultural ones (lands occupied under cereals, legumes, fruit-growing and grapes plantations etc.). Ecologic imbalance between these systems may be avoided both, by anthropical and by natural factors. Identification of the ecological imbalance may be presented as: a result of an unfavourable correlation between natural and anthropical ecosystems or as a result of the destabilization of a specific natural or anthropical ecosystem.

A situation of concern emerged both, between the natural and agricultural ecosystems, and within these systems, caused by excessive exploitation of the territory of the RM.

Correlation between natural ecosystems and agro-ecosystems that exist in the country is approximately 1:3 (917.5 thousand ha: 2533.8 thousand ha). Irrational extension and exploitation of agricultural lands has accelerated the processes of degradation, surfaces overgrown by grass and lands temporarily processed have increased considerably.

Materials on ecological balance are collected from the general cadastre records-keeping of lands, current records-keeping of changes taking place annually, are generalized and are presented in the Land Cadastre of the RM, developed and published annually. Materials, which reflect ecological balance, are necessary for land monitoring, environment monitoring and assessment of the ecological situation for each basic administrative-territorial unit.

For the assessment of the ecological imbalance between natural and anthropical ecosystems it is necessary to analyze changes on different ecosystems during a specific period, as well as within each system separately. This enables identification and assessment of negative and positive tendencies in the evolution of ecosystems. Alongside with quantitative measures of land surface categories, the quality condition of the components of each system and of the systems overall is assessed – in order to have a clear vision on the balance prognosis. This assessment is carried out for the territory of each commune, then the information is generalized for each district, and finally – at the country level. The completely generalized information is presented in form of tables, and then stored in the computer. The tables with generalized information in electronic version are transmitted to the State Agency for Land Relations and Cadastre (SALRC), where the information is studied and assessed by specialists, who then develop a single version of the information, which shall be presented to relevant specialized institutions and interested persons.

Standard acts, which serve as a basis for keeping records on surfaces of different land categories, are presented in annex 1. State registration of land sectors and of rights on them is provided by art. 6/1 of RM Law Land Code (no. 828-XII of 25.12.91). This Law mentions as well the contents of land cadastre, procedure for keeping the land cadastre and land documentation, contents of the land property regime regulation, organization and procedure for fulfilling the regulation on the property regime, change of the destination of agricultural lands, responsibility for violating land legislation etc.

Collection of information on the surfaces of arable, fallow lands or the ones, which host forest plantations, swamps, waters, etc., is done according to the Regulation on the contents of land cadastre documentation, adopted through the DECISION OF THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA no.24 of 11.01.95.

Cadastre documentation provided by the Regulation is official, mandatory, and necessary for developing and keeping the state cadastre according to the requirements of the village (commune), district, town/city, municipality, country. Organization, coordination and control over the quality of cadastre works, at the country level, are carried out by the State Agency for Land Relations and Cadastre. Based on the above-mentioned Regulation, bodies of local public administration, service for the regulation of land property regime carry out field works on updating the cadastre documentation, which is presented to the Agency in the volume and established deadlines. Legal and technical-economic information, is systematized in the Cadastre Register of Landholders and in the Cadastre Register of Lands (centralized cadastre form), cadastre plans are annexed.

Cadastre Register of Lands comprises quantitative and qualitative information on all lands situated between the borders of village, commune, and town/city.

Cadastre plan is a graphic representation of the territory, containing data on the placement, borders and cadastral numbers of land sectors, as well as other information.

Cadastral number of the land sector is an individual, unique number on the territory of the country, which is granted according to the legal procedures. The procedure for drafting and updating cadastral plans is established by an instruction, approved by the Agency.
Cadastre register of lands (centralized cadastral form) is drafted according to the situation as of January 1 containing information on all lands situated within the borders of the administrative-territorial unit. Mayor’s offices of villages, communes, towns/cities draft and approve the cadastral register of lands (centralized cadastral form), and then present it to the hierarchically superior authorities until January 10. The State Agency for Land Relations and Cadastre drafts and presents to the Government of the Republic of Moldova the cadastral register of lands (country centralized cadastral form), information on the modifications of land surfaces according to the exploitation categories and on the modifications that have intervened within lands with agricultural destination, until March 30. Mayor’s offices of villages (communes, towns/cities) inform individuals and legal persons on contents and deadlines for the presentation of cadastral information to the relevant service, depending on the contents and deadlines for the presentation of the cadastral register of land (centralized cadastral form), to the hierarchically superior authorities. Process of accurate, sufficient data collection for the assessment of changes affecting the ecological balance between anthropical and natural systems, requires a period of at least ten years. Implementing unit for these works is the Territorial Development Designing Institute.

2.1.1. Identification and presentation of procedures for the creation and management of databases on soil degradation and land desertification

Record keeping of land surfaces destroyed by ravines, affected by landslides and deteriorated because of human economic activities is carried out after developing the land cadastre, as well as record keeping of agricultural land surfaces. The Territorial Development Designing Institute carries out field studies, the relevant information being presented to “Cadastre” Office of the State Agency for Land Relations and Cadastre. Law and regulations based on which the studies necessary for the creation of the database on deteriorated lands are performed, are presented in annex 1. Information on surfaces of deteriorated land is shown in table 1.

Ravines, landslides, excavation works take out of the agricultural circuit lands with fertile soils, destroy objectives of social and cultural destination, living houses, road networks etc. First inventory on ravines was carried out in 1911. Adjusting its data to the present pedogeographical classification of Moldova, it was established that the hillside region from Centre and the Plains from South and Southeastern part of Moldova have been most affected by ravines.

The following inventories carried out in 1965 and 1982 gave the possibility to perform a comparative analysis on the desolation of in depth erosional formations during a 90 years period.

Materials on the intensity of ravines extension over the agricultural lands during the last 90 years have forwarded the geographical modifications and the dynamics of their evolution. Thus, if in 1911 the number of ravines was 9543 on a surface of 14434.2 ha, in 1965 it grew by 3.5 times on average, and in Southern regions – by 10 and more times.

The multi-annual average growth of ravines varies within a wide range – from 0.53 m on the Nistru Plateau up to 1.48 m on the Plain of the Southern Moldova. Following the extension of linear erosion, annually, the overall area of ravines grows by 300 ha, and the overall area of destroyed lands – by 450-500 ha.

At present, according to the data of the last land cadastre, surface of lands affected by ravines makes 12.2 thousand ha or 0.4 per cent of the overall surface of the land fund.

We should mention that there was no documentary record keeping on areas affected by landslides until 1970. Only approximate data, which relatively characterized the degradation of slopes depending on the results of selective investigations, were available. After 1970, slopes affected by landslides started to be recorded by a number of institutions among which the Section of Geography of the Academy of Sciences of the RM. Using the method of aerophotography interpretation, AP “AGeoM” carried out systematic geological mapping of lands affected by landslides. After 1970, in the balance of land lands affected ravined and landslides started to be recorded annually in the inter-household cadastral plans. This practice allowed following the dynamics of landslides in agricultural areas from 1971.

According to the data of studies as of 1990, there were 55.5 thousand ha of agricultural lands destroyed by active landslides and 350 thousand ha affected by ancient landslides in Moldova. The Codri region where the most considerable neotechtonic movements take place is most affected by landslides. Activization of landslides occurs usually during the autumn-spring period, when massive precipitations with intervals of 3.7-9 years take place. Landslides monitoring has a separate, specific character, and demands special methodological indications, which do not correspond to the existent methodology of ecopedological monitoring. According to the data of land cadastre as of 2003, the surface of lands destroyed by ravines makes 29.8 thousand ha or 0.9 per cent of the overall surface of the land fund.

Surfaces of lands destroyed because of human economic activities are relatively large. Destruction of soil layer through excavation works takes place during the process of open-pits exploitation. In Moldova, until 1990, works on exploitation of open pits were carried out without developing projects on the recultivation of destroyed lands. As a result, there are 5000 ha of lands having the soil layer destroyed through excavations, which could be called “industrial deserts” (3600 ha large open pits, 1400 ha small open pits with area of 1-3 ha) registered at present.
According to the present cadastral register, because of human activities, the soil layer is destroyed partially or fully on a surface of 45.3 thousand ha or 1.3 per cent of the overall surface of the land fund.

Returning of these lands in the economic circuit is possible through special researches, drafting and recultivation. Through the recultivation of destroyed lands, we mean an entire complex of special measures and technical, hidroameliorative and agroameliorative works for the accomplishment of new optimal landscapes, which would allow re-establishing the soil layer and vegetation.

Re-establishing of the lands destroyed by landslides, ravines, or by different economic activities demands a number of costly amelioration works. That is why the supervision within the monitoring of these processes development and their prevention has a considerable importance.

Initial information on surfaces of ravines, landslides, and destroyed lands may be obtained during the implementation of works in the field – pedologic or topographic researches, when these manifest themselves in nature, may be measured and drawn on the map. Measurement data are included in special tables and are noted on pedologic or topographic map. Besides this, special studies on landslides and ravines are periodically carried out, after that, the qualitative characteristics of similar processes are assessed and their degree of development is indicated. After carrying out the researches, the necessary measures depending on the “architecture”, shape of ravines and landslides are developed, as well as methods for their liquidation and for land regeneration. The relevant indices are entered into tables, which show the locality, mayor’s office, number of the landslide or ravine, their surface and degree of development. After this, the data are entered into the computer.

Based on the pedologic or topographic map the “Scheme of landslides and ravines” is developed, to which are assigned numbers according to the table data. Specialists of the Territorial Development Designing Institute carry out all the works related to the land cadastre accomplishment. The obtained data and the scheme are passed to the section of Land Monitoring of the State Agency for Land Relations and Cadastre.

In case of land deterioration caused as a result of the anthropic impact (construction of objects having industrial and social destination, living spaces), according to the Land Code, the humid layer must be removed selectively. The layer of fertile soil removed in the process of such works must be used for the recultivation of eroded, poorly productive, deteriorated lands. The State Ecological Inspectorate carries out control over such works; the Inspectorate shall as well check the documentation on the project that provides measures for compensating damages as a result of soil deterioration.

In case of open pits uncovering, the fertile layer of soil shall be kept to be further used for the recultivation of land after exploitation. For this reason, special pedological researches are carried out. Results of researches and locations of pits are entered into the scheme, in which the measures necessary for land restoration (recultivation, removal of fertile soil layer etc.) are also indicated.

In order to identify more precisely the surfaces of ravines, landslides, open pits and other lands with deteriorated soil layer special researches in the process of monitoring these objectives are necessary.

The process of data collection and creation of databases on deteriorated lands comprises several stages:

1. Collection of initial data - tables, maps on surfaces and location of degraded lands.
2. Data generalization – tables, generalized maps.

In the process of eroded lands mapping, it is recommended to use aerophotographies. Reflecting the precise image, reduced to small dimensions, of a specific territory, it facilitates orientation on the ground, and especially it helps to mark accurately the limits of different deteriorated land plots and the exact location on maps of the studied objectives.

The main source of information on surfaces of eroded, salinized, solonized soils and surfaces of lands destroyed by excavation are materials of pedological researches and topographic surveys carried out for running of the cadastre and monitoring on the quality of the land fund.

Large-scale pedological researches are carried out starting with 1957 according to a special Decision of the Council of Ministers of the S.S.R.M. This Decision provided for drafting of soil maps for all farm of the republic, their generalization and development of soils maps for districts and the entire republic, as well as development of recommendations on the proper exploitation of lands, erosion combating and use of organic and chemical fertilizers.

At present carrying out of large-scale pedological researches for cadastral and monitoring purposes is regulated by the following Laws and Regulations: LAW of the REPUBLIC OF MOLDOVA Land Code no.828-XII of 25.12.91; LAW of the REPUBLIC OF MOLDOVA on Land Property Control, Cadastre and State Land Monitoring no.1247-XII of 22.12.92; DECISION OF THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA on adoption of Regulation on the contents of land cadastre documentation no.24 of 11.01.95.

According to art. 67 of the Land Code, the procedure for keeping the land cadastre and cadastral documentation shall be established by the legislation and shall be ensured through the implementation of topographic, aerophotogeodesic, cartographic, pedologic, geobotanic, geomorphologic as well as other kinds of researches and prospects, through the registration of landholders, through records-keeping on and estimation of land value.
According to art. 14 of the LAW of the REPUBLIC OF MOLDOVA on Land Property Control, Cadastre and State Land Monitoring no.1247-XII of 22.12.92 pedological researches necessary for developing the economic part of the land cadastre shall be carried out once in 10-15 years, and the agro-chemical – once in four years. As to lands where amelioration works were carried out or where soil degradation processes took place the specifications shall be done whenever needed.

According to art. 15 of the same Law, monitoring of the land fund, as a component part of the general monitoring of nature, represents a system of permanent supervision over changes in land resources, of their analysis and prognosis of these changes. Monitoring works shall be carried out on the entire surface of the land fund and these provide for:
- permanent supervision over quality changes in land resources and soil, calculation of surfaces where changes took place;
- systematic implementation of pedological, agro-chemical, geobotanical, geomorphological, climatic landscape researches and other kinds of studies necessary for timely and proper assessment of occurred changes. In the achievement of the quality aspect, the land monitoring is based on soil monitoring as a component part of it. Land monitoring is served by an informational system, which ensures creation of the database on land resources and is an integral part of the national informational system of the republic.

The informational system of land monitoring and land cadastre is developed by a unique method including data on the quantitative and qualitative changes within the country, district, town (city), village (commune), and household. The Government shall adopt information contents and deadlines for its presentation to the relevant authorities. Access to information on the condition of land resources is provided, as established, to all interested individuals and legal entities.

In conclusion, it is necessary to mention that the process of data collection comprises:
2. Data generalization – generalized tables on soil taxonomical units.
3. Mathematical data processing – tables with statistically processed data.
4. Presentation of data in the form of generalized tables and graphical form – generalized tables, definitive maps according to administrative units, graphics, charts for electronic version of the information.

2.2. Identification and presentation of barriers that do not allow creation and efficient management of databases on ecological imbalance between natural and anthropical systems (surfaces of arable, fallow lands, forest plantations, swamps, waters etc.), surfaces destroyed by ravines, affected by landslides and deteriorated as a result of human economic activities, as well as eroded, oversalted soils or soils destroyed by excavations

Causes (reasons, barriers) for non-accomplishing or partial accomplishing of the mentioned activities are presented in annex 1. These causes are the following:
1. Lack of a regulation approved by the Government on the creation of a database on ecological imbalance between natural and anthropical systems (surfaces of arable, fallow lands, forest plantations, swamps, waters etc.), surfaces of lands destroyed by ravines, affected by landslides and degraded as a result of human economic activities.
2. Failure to carry out monitoring of degraded lands because of the action of natural and anthropical factors.
3. Lack of an instruction concerning research, classification, registration of destroyed lands, processing, generalization and storage of information in databases.
4. Lack of scientific developments for the creation of table standard-forms for the electronic version of the database on degraded lands.
5. Lack of an administrative entity responsible for keeping records on lands destroyed by ravines, landslides, excavations etc. and for combating these negative phenomena.
6. Insufficient studying of factors, which lead to destruction of lands by ravines, landslides, or excavations.
7. Lack of financial resources required for regular carrying out of photopogeodesical works, realization of measures and activities on combating soil destruction processes and agricultural lands desertification.
8. Lack of a scientific argumentation of the optimal correlation between the surfaces of natural ecosystems and agroecosystems, which is favourable, both, for maintaining the ecological balance, and for restabilising natural resources and long-term preservation of soil productive capacities.

Barriers that do not allow implementation of activities related to the condition of eroded, salinized, solonized soils and lands destroyed by excavations are the following:
1. Lack of an organization having possibilities to implement these activities.
2. Insufficient endowment of modern computers.
3. Insufficiency of financial resources.
4. Lack of scientific developments for the creation of table forms-models for the electronic version.
5. Lack of legislative acts providing for such activities.
The state has different sanctions, which may be applied to prevent reduction of soil quality on lands held in private property. However, in order to assess the extent of the damages and, implicitly, structure’s size, it is necessary to develop criteria (parameters) for the estimations of soil properties that reflect the extent to which the fertile layer of soil was destroyed.

2.3. **Identification and definition of the national needs of the RM for strengthening the country’s capacities, taking into consideration individual, institutional and systematic levels in the field of creation and rational use of national databases on ecological imbalance between natural and anthropical systems (surfaces of arable, fallow lands, forest plantations, swamps, waters etc.), surfaces of lands destroyed by ravines, affected by landslides and anthropical impact, as well as eroded, oversalted soils or soils destroyed by excavations**

**Legislative measures**

National needs of the R.M. related to the improvement of the legislative framework in the field of creation of a database are the following ones.

**Developing regulations:**
- On carrying out of soil surveys and special studies on degraded lands;
- On land cadastre (amendments to the Decision of the Government no. 24 of 11.05.1995)
- On land monitoring;
- On creation of the database on lands destroyed as a result of economic activities and natural disasters;
- On conservation of lands with soils destroyed by ravines, landslides, excavations (norms, indicators);
- On recultivation of deteriorated lands;
- On economic motivation of works on land improvements;
- On creation and functioning of the informational centre for soil quality within the State Agency for Land Relations and Cadastre (SALRC) or of Territorial Development Designing Institute for (TDDI);
- On implementation of pedological surveys;
- On creation of a computerized informational system on soil quality condition;
- On creation of an analytical database on soil properties.

**Institutional measures which comprise:**
- Creation of pedological service within the State Agency for Land Relations and Cadastre.
- Creation of an Informational System (database, including tables, charts, maps) on quality condition of the soil layer in the Republic of Moldova.
- Organization within SALRC of an infrastructure for establishing and updating the land cadastre and monitoring;
- Creation within SALRC of an infrastructure for servicing the informational centre on soil quality.

**Scientific activities**
- developing system for collection, storage, processing, systematization and generalization of information for the creation of specialized databases on soil quality condition;
- developing forms for the presentation of the necessary information;
- developing software for the electronic versions of databases on soils quality condition.

2.3.1. **Assessment of capacities at the institutional level**

Database on surfaces of arable, fallow, afforested lands, lands under water, destroyed by ravines, landslides, and as a result of human economic activities is necessarily created within the process of land cadastre implementation by the relevant direction of the State Agency for Land Relations and Cadastre.

**Assessment of the institutional framework within the creation of the database of the State Agency for Land Relations and Cadastre**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Responsibilities of the institution in the framework of:</th>
<th>Assessment of the capacity for measures implementation and analysis</th>
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<tr>
<td>Convenion</td>
<td>National Reports on Combating Desertification</td>
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<td>Legislative</td>
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State Agency for Land Relations and Cadastre

| State Agency for Land Relations and Cadastre | – | – | Responsible for problems on carrying out land cadastre | Capacity to collect, systematize and analyze data is at the appropriate level. Capacity to carry out land cadastre once in 20 years through field land survey works is |

Structure of the State Agency for Land Relations and Cadastre

- State Service for Regulation of Land Property Regime (having the status of main directorate)
- Directorate for Land Organization and Consolidation
- Directorate for Land and State Control
- Directorate for Land Monitoring and Soil Protection
- Main Cadastre Directorate
- Real Estate and Land Cadastre Directorate
- Directorate for Real Estate Evaluation
- Main Directorate for Geodesy and Cartography
- Cartography and Geodetics Fund (service status)
- State Inspectorate for Geodesic and Technical Supervision (section status)
- Main Section for Economy and Finances
- Legal Section
- Administrative Section
- Human Resources Service

Directorate for Real Estate and Land Cadastre is a component part of the Main Cadastre Directorate. Functions of this Directorate in the field of land cadastre are the following:

- Coordinates works related to cadastre creation, development of annual and general land cadastre;
- Examines and solves, according to the legislation, citizens’ petitions related to land relations and cadastre;
- Adopts, within the limits provided by law, standard-documents which are used for the carrying out of cadastral works, works related to territorial organization, land relations, topogeodesic, cartographic, stereophotogrammetric, gravimetric works and technical prospective;
- Ensures, according to the established procedure, application on the territory of the Republic of Moldova of international standards and norms in its spheres of activity;
- Supports and undertakes measures for the acceleration of the process of engaging foreign investments in the field;
- Coordinates scientific researches in the fields of land relations, cadastre and implementation of new techniques and technologies in its spheres of activity;
- Coordinates activity on training, improving and evaluation of specialists from mayor’s offices of villages (communes), districts, towns (cities) in the field of land relations and cadastre, according to the legislation in force;
- Provides methodological support to land relations and cadastre service subordinated to the District Council and to the specialists from mayor’s offices of villages (communes), districts, towns (cities) for the regulation of the land property regime;
- Develops standard acts determining the cost of works values (topographic-mapping, geodesic, land reform etc.), financed from the State Budget, and of processes of payments between the beneficiary and provider of the relevant works;
- Carries out evaluation of specialists, acting in the field of geodesy and cadastre through granting, suspension and withdrawal of qualification certificates;
- Coordinates pay rolls within the institutions and organizations subordinated to the Agency.

The State Agency for Land Relations and Cadastre does not have a clearly defined mission regarding the provisions of the Convention; however, having in its structure the Main Cadastre Directorate, it implements works related to keeping records on arable, fallow, afforested lands, lands underwater, destroyed by ravines, landslides and because of human economic activities.

- The structure of the Agency corresponds to the Decision of the Government in this regard being efficiently managed. For proper realization of the quality cadastre on land fund, creation of a database and of an
informational system on soil quality it is necessary to create the Directorate for Pedological Service as a separate subdivision.

- As a rule, the agency applies as a mandatory condition such instruments as planning, quality management, monitoring and assessment to carry out the measures provided by the Convention. However, because of insufficient technical and financial resources, these instruments are partially applied.

- There are appropriate, qualified human resources, which are used correspondingly.

The State Budget does not provide special financial resources for the Agency for implementation of the provisions of the Convention. The actions for the creation of a database on keeping records on arable, fallow, afforested lands, lands underwater, destroyed by ravines, landslides and as a result of human economic activities are financed from the Budget.

- Requested information in the field of recordkeeping of surfaces of arable, fallow, afforested lands, lands underwater, destroyed by ravines, landslides and because of human economic activities is accessible, being managed at the corresponding level.

Computers, offices, Internet network and other material resources are available. At the same time, the Main Cadastre Directorate needs special modern equipment for information storage.

The database on surfaces of eroded, salinized, solonized soils and lands destroyed by excavations is created based on the information gathered within pedological researches. The initial information is stored in the archive of the Research Institute for Territorial Development. The generalized information on surfaces of eroded, salinized, solonized soils and lands destroyed by excavations in Moldova excluding the territory on the left bank of the Nistru river is presented in the New Lands Capitalization and Increasing Soil Fertility Program, part I, „Complex Program for Degraded Lands Improvement”.

### Evaluation of the institutional framework in the field of combating soil degradation and land desertification of the State Agency for Land Relations and Cadastre

<table>
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<td>Convent. National Reports on Combating Desertification National Strategies Other legislative acts</td>
<td>Responsible for problems on carrying out the monitoring of the land fund quality Capacity to collect, systematize and analyze data is at the proper level. Capacity to carry out land cadastre quality monitoring once in 20 years through field</td>
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- The Agency does not have a clearly defined mission related to the provisions of the Convention, however, having in its structure the Directorate for Land Monitoring and Soil Protection, as well as the Directorate for Real Estate and Land Cadastre, it has a number of real - technical and financial - possibilities for the creation of a database on soil quality.

- The structure of the Agency corresponds to the Decision of the Government in this regard being efficiently managed. For the administration, coordination, regulation and control over pedological researches, development of the necessary set of methodological and normative documents in the field, proper running of the cadastre on the quality of the land fund, creation of a database and an informational system on soil quality it is necessary to establish the Directorate for Pedological Service as an independent subdivision.

- The agency applies as a mandatory condition such instruments as planning, quality management, monitoring and assessment to carry out the measures provided by the Convention. However, because of insufficient technical and financial resources, these instruments are partially applied.

- There are appropriate, qualified human resources, which are used correspondingly.

- The State Budget does not provide special financial resources for the Agency for the implementation of the provisions of the Convention and for the creation of a database.

- The requested information in the field of quality condition and combating soil degradation is available and managed at the corresponding level.

- Computers, offices, Internet network and other material resources are available.
2.3.2. Assessment of capacities at the individual level

It was carried out based on the interrogation of the officials in decision-making positions, who can contribute to the implementation of the provisions stipulated by the corresponding Convention.

- There are six staff members within the Directorate for Real Estate and Land Cadastre: head of the Directorate, a consultant, two main specialists and a coordinating specialist.
- Staff positions are properly defined: according to the qualifications, the majority of staff members are cadastre engineers. There is a need in one specialist in pedology to perform accurately land fund quality cadastre.
- Regretfully, within the Agency and subordinated institutions is not carried out a permanent process of training.
- There are perspectives for professional growth due to the fact that the Directorate is at the stage of being reorganized.
- Personal responsibility is efficiently delegated; however, there were not undertaken measures on staff evaluation because the Directorate is at the stage of being reorganized.
- Access to any type of information on land cadastre is provided.
- Cooperation relations among all Directorates of the Agency and subordinated institutions are most efficient. Information sharing is necessary.
- The obtained results are properly assessed and used according to the financial possibilities.
- Spirit of initiative is viable, however, often, from financial reasons, is not promoted.

For successful carrying out of basic functions, it is necessary to provide the relevant Directorate with modern computers, rotational scanner for entering the cartographic information into the computer, software, methodologies etc.

These conclusions were formulated and generalized based on the interrogation of the persons in decision-making positions, who can contribute to the implementation of the provisions stipulated by the corresponding Convention and to the creation of the database.

- There are five staff members within the Directorate of Land Monitoring and Soil Protection: head of the Directorate, a consultant, two main specialists and a coordinating specialist.
- The positions are properly defined, however, in our opinion, the required qualifications are not sufficient to coordinate the works related to applied pedology and creation of database. The majority of the staff members have the qualification of cadastre engineer, not the one of specialist in pedology. It is necessary to train a group of specialists in pedology in order to establish the Pedology Service.
- Regretfully, within the Agency and subordinated institutions is not carried out a permanent process of training.
- There are perspectives for professional growth due to the fact that the Directorate is at the stage of being organized and professional growth of the specialists.
- Personal responsibility is efficiently delegated; however, there were not undertaken measures on staff evaluation because the Directorate is at the stage of being organized.
- Access to any type of information on the quality and soil condition is provided, while the measures developed within a system were implemented.
- The cooperation relations among all Directorates of the Agency and subordinated institutions are the most efficient. Information sharing is necessary.
- The obtained results are adequately assessed; however, regretfully these results are insufficient for the implementation of the provisions of the Convention.
- Spirit of initiative is viable, however, often, from financial reasons, is not materialized in specific activities.

For successful carrying out of basic functions is necessary to provide the relevant Directorate with modern computers, rotational scanner for entering the cartographic information into the computer, software, methodologies etc. For the creation of a database on the soil quality, it is necessary to form a subdivision of specialist in pedology, equipped with modern techniques within the Directorate.