

## GROUND'S DEGRADATION, CAUSES AND FORMS OF MANIFESTATION

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### Abstract

*Soil degradation in its various forms is a fundamental and persistent problem. The situation in Europe is reflected and amplified in many parts of the world. It is also a matter of global development as land degradation, poverty and migration determine each other, but this is often ignored largely because the observed effects appear gradually. This paper presents forms of land degradation, processes and causes that must be considered to limit the effects of environmental degradation.*

**Key words:** excessive pasture, forest operation, grounds degradation, landslide, mineral substances exploitations

### INTRODUCTION

Grounds degradation is a major issue of the 21<sup>st</sup> century due to its negative impact on the agriculture productivity, on the environment, as well as on life quality and food safety.

Grounds degradation is caused by enhancing human activities such as: irrational agricultural and forest exploiting, industrial activities, tourism, urban space extension and constructions.

Soils and grounds degradation processes are due to their faulty management applied to the two complex systems which are interacting: natural ecosystem and social and human system (Mărăcineanu Fl., 2011).

### MATERIALS AND METHODS

Grounds degradations are negative alterations of physical and chemical properties of soils and lithological masses (substratum rocks, cover deposits), of landscape dimensional and form aspects due to geomorphologic and pedologic processes, having as consequence the reduction or temporary or definitive suppression of optimal using possibilities of the Agricultural Real Estate.

Pressure more and more intense exercised by degradation and pollution on grounds has as

effect the partial or total loss of their production capacity, as a consequence of the reduction process, in a variable measure, of the specific potential ecologic functions.

These functions refer to the biomass production – nutrients provision, water and air provision, plants roots support – to the filtration, retention, deposit and transformation processes of some soil products, to zoocoenoses and specific genetic reserves. Thus the soil current or future capacity to produce goods and services is diminishing because of degradation.

Degraded areas are those which by erosion, pollution or destructive action of anthropic factors lost definitively the agriculture production capacity, but which may be improved:

- grounds very strong and excessive surface erosion;
- Deep erosion grounds – gullies, gulches, torrents;
- Grounds affected by active landslide, falls, tearing down and muddy overflows;
- Sandy grounds exposed to wind or water erosion;
- Grounds with stones, rocky valley, detritus, rocks and torrent alluviums deposits;
- Permanent excess humidity grounds;
- Highly salty or acid soils;

- Grounds polluted with chemical, oil substances or nox;
- Grounds occupied by hillocks, industrial or household wastes, holes for rent;
- Non-productive grounds, if they are not constituted as natural habitats;
- Mobile sands grounds, which need afforesting activities for their fixture;)
- The grounds of any of the above-mentioned category, which were improved by forest plantations and the vegetation has been removed from.

The main causes determining the grounds degradation and their effects (Table 1): **deforestation**, which leaves the soil exposes to the erosion processes; **the excessive pasture**, which finally determines the installation of the erosion processes in depth; **forest operation** (cutting, forest ways, logs transfer) followed by streaming, gullies, landslides etc.

The deforestation effects remain in the landscape much time and sometimes they guide the linear erosion; **grounds cultivation** by practicing some inadequate rotations and monoculture; **inadequate use of the irrigation systems**; useful **mineral substances exploitations** (coal, oil, and natural gases) on which there are made huge excavations or, on the contrary, sterile mountains or other

degradations; **urbanisation extension** and traffic infrastructure to the detriment of fertile soil grounds; **desertification** generates the continuous decline of natural and agricultural biotic productivity. By this process, productive geosystems arrive to nude physical geosystems. At present, one appreciates that 4500 millions of hectares are pending for the risk of desertification, and 950 millions of hectares have already been severely affected by this degradation, Figure 1.

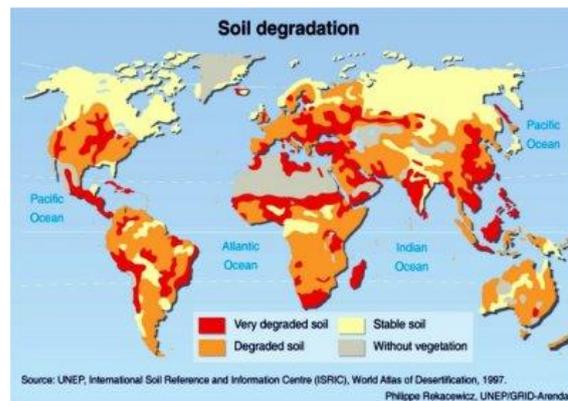


Figure 1. Soil degradation map

Table 1 Grounds degradation types (millions of ha) and degradation causes (UNEP, 1992)

Degradation type	Causes				
	Deforestation	Forest overexploiting	Excessive pasture	Agriculture	Industrial activities
Hydrological erosion	471	38	320	266	-
Aeolian erosion	44	85	332	87	-
Chemical egradation	62	10	14	133	22
Physical degradation	1	-	14	66	-
<b>Total on the Globe</b>	<b>578</b>	<b>133</b>	<b>680</b>	<b>552</b>	<b>22</b>

## RESULTS AND DISCUSSIONS

Grounds degradations due both to natural and anthropological causes have different forms of manifestation in the soil, as the upper layer of the ground, but also in the landscape, formed of the ground and of the biological and anthropological structures covering it.

**Destructuring** constitutes the reduction or loss of soil structural aggregates stability under water and agricultural tools action, being one of the most important physical processes of soil degradation. Additionally,

destructuring is the cause generating a lot of other negative processes or the enhancement of the existent ones. Thus, structural aggregates quality deterioration, that is: their form, porosity, hydrologic stability, especially the arable use soils, is of great importance because it influences the hydrological characteristics, water and air permeability of soil, stability and configuration of the macroporous space. Among other negative processes caused by destructuring which are extremely important we may enumerate: crust formation, puddly surfaces, dusting and

cogging of the porous layer, erosion, compacting etc.

**Soil life degradation.** It is considered that the soil houses 2-5 t/ha of living organisms which ensure soil structure, mineral elements recycling and plants nutrition. Soil working deepness increasing and works frequency, as well as the use of agricultural tools with rotating accessories determine the removal of a great part of them. Superficial horizon aeration and fragmentation determine an intense mineralization of the humus which overpasses the formation capacity, also diminished because of the absence of vegetal layer determined by the crop removal and the vegetal wastes, as well as by the non-compliant crops rotation. **Altering the grounds usage** by transforming several surfaces covered by forests and pastures in arable fields generates complex changes in the soil carbon dioxide retention by strongly diminishing the gas volume stored, with severe effects on the carbon cycle in nature, and the change of vegetal layer characteristics contributes to supporting the climate changes by modifying the local albedo and exhausting greenhouse effect gases in the atmosphere (methane, nitrous oxide etc.).

**Anthropological compacting**, irrespective of the origin, has many negative effects on the soil. Thus, it decreases the water and air permeability of the soil and increases water excess risk, it reduces water retention capacity and accessible water content, it damages soil aeration, it increases the penetration resistance and inhibits the roots system developing, it increases the ploughing resistance and the fuel consume, it degrades the soil structural aggregates (form, size and stability), the agrotechnical works have a precarious quality.

**Soil salinisation** is due to excessive increasing of soluble salts concentration on the profile by accumulating salts of sodium, potassium, magnesium and calcium, chlorides, carbonate sulphates and bicarbonates.

By salinisation, soluble salts are accumulating in the upper horizons of the soil profile forming solonchak soils, in which the sodium content does not overpass 12 – 15% of the cationic exchange capacity and solonetz soils,

if it is higher than 12-15%. Soluble salts concentration in the soil solution is of 20-60 g/l, but it may increase to much higher values in arid areas, comparatively to non-salinised soils, where soluble salts concentration is of 3-15 g/l. (Mărăcineanu Fl., 1994).

**Alkalinisation** means the exchangeable sodium content increasing in the soil.  $\text{Na}^+$  ion is accumulating in the solid or liquid stage of soil as efflorescence (crystals) and penetrates the soil adsorptive complex, producing the solubility of soil colloids. Salinisation and alkalinisation processes are frequently associated with irrigated fields where precipitations are reduced, potential evapotranspiration has high values and the textural soil characteristics prevents soils washing, which accumulates in the upper soil layer.

**Acidification.** Acidity of a soil is expressed by Ph. At a Ph lower than 6, the soil is very acid for the greatest part of plants cultivated, which generates the biological activity limitation, the structure degradation, nutrients and dietary minerals assimilation faults by the plants. Soil reaction, that is the acidity or alkalinity degree of soil solution is assessed as follows: lower than 6.80, acid reaction; 6.81 – 7.20, neutral reaction; higher than 7.21, alkaline reaction.

Erosion is a natural and continuous process. Soils have been formed by parental material erosion, its transport and deposits. This mass transport of soil particles is only a part of the degradation process, at which we also add soil quantitative changes processes: nutrients, organic materials loss, biological activity reduction and structure degradations (Ballayan D., 2008).

By hydrological erosion it is removed step by step the upper soil layer until the complete removal of the soil profile. According to the manifestation intensity of the erosion agents, there are removed the upper soil horizons, rich in humus and nutritive elements and can be highlighted horizons of the profile subsoil, much less fertile or non-fertile rock layers. The soil profile modification according to its characteristics determines the degradation of the soil fertility status and so the decreasing of the agricultural fields production (Constantin E., 2010).

Desertification is the degradation process of arid, semiarid and sub-humid areas grounds, resulting from different causes, including climatic causes and human activities. There are considered as desertification danger areas those areas where the precipitations / evapotranspiration ratio (aridity index, R) has values between 0.05 and 0.65, which represents 2/5 of the total midland surface and affects 20% of the world population. There is no desertification danger in the territories with  $R > 0.65$ , which constitute the humid areas, as well as those with  $R < 0.05$ , that is the hyper-arid areas, covering 7.5% of the midland surface (Dumitru M., 2005).

**Landslides** are movements of the ground masses, different origin phenomena, natural or anthropological, which comprise an assembly of more or less brutal movements of the soil or subsoil. The ground volumes submitted to movement have a variable size comprised between some cubic meters and some millions of cubic meters, which determine important economic, ecological and social damages. Ground mass movement can be slow (some mm/year) or very rapid (hundreds of m/day).

## CONCLUSIONS

Grounds are submitted to permanent action of environmental factors and under their action, they suffer a permanent modelling.

The grounds modelling under the effect of natural factors has no destructive character as long as the effects it determines do not produce damages of the natural and social-economic environment.

Anthropological activity has as side effect the favour of ground degradation activated by the natural factors.

The main causes producing the grounds degradation are: erosion by water and wind, landslides, water and salts excess, agriculture and specific techniques used, change of the grounds usage category, soils pollution, overpasturing, forests overexploiting, deforestation, industrial activities and ground arrangement works.

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