

Reflections on the Phenomenon of Desertification and Its Influence on the Natural Ecosystems in Romania

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Abstract

The concern of humanity for prevention of degradation of agricultural land, dates from ancient times. Whatever the nature of the factors causing desertification of the land: natural or anthropic (man-made), the consequences of this phenomenon are the same: reducing the resilience of land, decreased productivity of soil, destruction of vegetation and the threat on food production. In Romania there are over 400000 ha of land affected by desertification, the largest land areas are to be found in the southern part of Oltenia, Dobrogea, southern Moldavia and the West Plain. These arid areas, in the absence of coherent strategies and of appropriate measures to combat the evolution of this phenomenon, extend, at a rapid pace, thus recovery of the affected land requires long periods of time, and a high expenses.

Key words: deforestation, ecosystem for agriculture, erosion, intense exploitation, climate changes

J.E.L. classification: N53, Q13, Q20, Q54

1. Introduction

For a people, the land is the support of life and its development. From an economic point of view, the land is the essential element of natural capital –The base of economic and social activities. From this perspective, Romania owns, due to the structure of its territory, an uncommon natural resource. Trends in the field of agriculture during the years of communism in Romania were characterized by: increase of agricultural production, the pursuit of mechanized farming, the extension of the irrigation system, excessive use of fertilizers. These represented a few factors which caused the degradation of the land. Climate change, felt more and more compulsive, in the last few years, lack of intervention for countering and mitigate land degradation, represents premises which were taken as a basis for the evolution of the desertification phenomenon in Romania.

2. Material and method

This article is meant to present and to analyze the causes at the basis of the evolution of desertification in Romania, but also the methods for combating the evolution of this phenomenon. Research was made based on analyzing and interpreting statistical data provided by The Ministerium of Environment of Romania. For analyzing facts that favoured evolution of desertification, a series of scientific thesis were consulted on the subject, as for the methods for combating the desertification phenomenon specific strategic documents were studied and analyzed and so important information were obtained for realising the research.

3. Results and discussions

Desertification is defined as the degradation of the land in the arid, semi-arid and dry zones, due to climatic changes and human activities. The process of desertification is accompanied by reducing the potential of the land and the depletion of water resources (Convention to Combat Desertification 1994). Causes of desertification area series of unfavorable natural conditions and anthropical actions, which often degrades, irreversibly, the natural environment. Thus, phenomena that facilitates the aparition of desertification are:

- Climate changes
- Unsustainable use of agricultural land
- Overexploitation of agricultural land and grazing land
- Deforestation
- Woods fires
- Unsustainable agricultural practices

Climate changes have as effects a series of extreme meteorological events, manifested in droughts, floods, heat waves and powerful winds, phenomena that bring about the disappearance of several species of animals and plants, mostly affecting the productivity of farming lands. Extreme meteorological phenomena determine a drop in the annual agricultural production with 30-50%. Analysis of climate data over the last century reflects a tendency of progressive heating of the atmosphere and a significant diminishing of rainfall, all these leading up to intensification and extension of dry periods. The drought, is a severe imbalance of pluviometric regime, which generates a combination of imbalances with negative impact on the environment factors. These imbalances refer to the hydrological regime of flowing water and groundwater, to the severe imbalance of the hydrological regime of the soil, having the effect of reduction in yield of agricultural crops, reducing the amount of humus in soil, diminished soil porosity, soil compaction, unstructuring of the ground. In Romania, in the recent years, have been found negative pluviometric deviations (100-125 mm), in comparison with the normal annual, monthly rainfall distribution is also unfavorable, there was also a reduced pluviometric regime in the warm months. The annual temperatures have also recorded significant increases from the normal values, with a range of 1-3 degrees Celsius difference, pedological drought and atmospheric heat have destructive effects on plants and agricultural yields. (F. Bran, 2002)

In Romania, the most affected areas by the drought and more exposed to desertification are situated in Dobrogea, southern Romanian Plain, southern Moldavia and the west part of the Tisa Plain. These areas have a dry climate, semidry and underhumid and they cover 30% of Romania's total surface (fig.1), 80% of these lands being used for agriculture.

Figure no. 1 Areas affected by drought in Romania

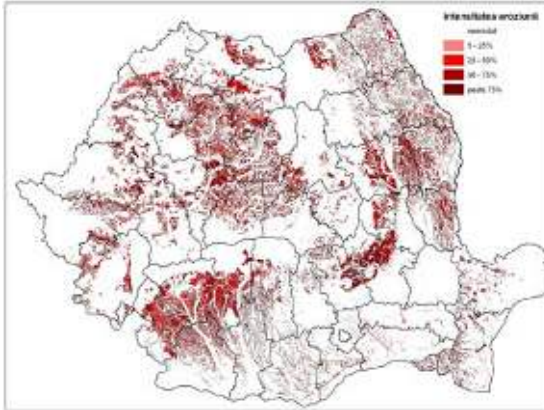


Source: The National Strategy for the prevention and combat of the effects of drought, Degradation of land and Desertification

Soil degradation is another factor that has a major contribution to the development of the phenomenon of desertification. Soil degradation consists in a drop and the loss of biological productivity of land as a result of soil erosion and overexploitation of the land. Soil erosion occurs under the action of natural and anthropic factors. In the category of natural factors which produce

erosion are: the climate, topography and the characteristics of the ground. The erosion of the manifests itself on the surface of the terrestrial bark, by removing the vegetation which ensures the stability of the ground. The effects of soil erosion are: decrease of fertility of the ground by diminishing of nutrients in the soil: nitrogen, phosphorus, potassium and reduce the amount of humus in the soil (Demeter T., 2007). In Romania, the area of land exposed to the erosion is of 7 million ha, the most affected areas (figure 2) being, the central zone of Transylvania, the area of the Bending Subcarpathians and the Plateau of Bârlad.

Figure no. 2 The land exposed to the erosion in Romania



Source: The National Strategy for the prevention and combat of the effects of drought, Degradation of land and Desertification

Soil chemistry, due to their role in increasing the productivity of crops, practicing modern agriculture, it is unthinkable without the use of fertilizers and pesticides. Excessive use of fertilizers with nitrogen basis (Max. 170kg/ha, in exceptional situations can reach up to 210 kg N/ha in accordance with the Nitrate Directive) determines the accumulation of nitrate (NO₃), in particular in the vegetables and fodder plants, crops that can accumulate nitrites, exceeding the maximum limits provided by the law. Excessive quantities of nitrogen result in pollution of the groundwater, which is used as drinking water, the maximum limit of nitric ion admitted being 50 ppm. Another substance which has a negative impact on the natural environment is phosphorus which, if used in excessive amounts, promotes algae growth and eutrophication of lakes and rivers.

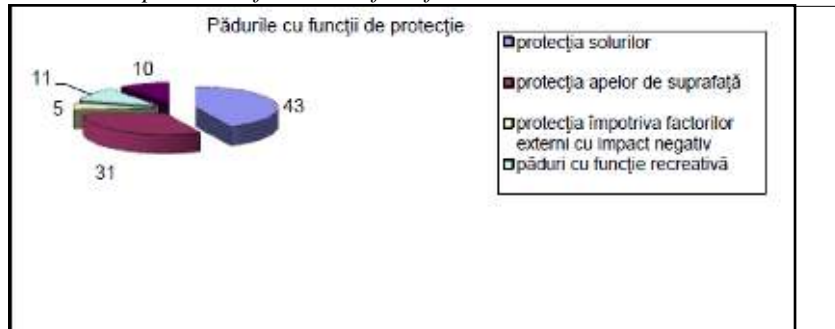
As regards the excessive use of pesticides, due to their residual effect, they influence negatively the biocenosis and the physic-chemical properties of the soil. Some categories of pesticides as chlorine compounds sum up in the soil, from where they are absorbed by the fodder crops (0.1-0.3 in the beet) 2 and other vegetable ones.

One of the anthrop factors which favour the emphasizing of desertification is grazing abusively using that instead of grazing meadows located on a plot of land on a slope, overcrowding pasture grazing. Abusive grazing deteriorates soil structure by compaction, firing the erosion processes both at the surface and in depth. Such lands eroded due to the abusive grazing may be encountered in The Transylvania Plain, in the Moldavian Central Plateau and Muntenia Subcarpathians.

Another factor of major anthropogenic origin, which contributes to the development of the phenomenon of desertification is deforestation. Deforestation of land is made by cutting out of forests or forests arson. Cutting out of the forests means that all trees in a given area are removed completely. Fire forests can be carried out in a number of different ways: Ground fire that burns the humus layer on reduced thickness; forest fire at the surface, through which younglings are burned and the forest litter and forest crown is set on fire.

This factor has serious consequences with adverse environmental, economic and social results, determines the acceleration of phenomena of erosion of the soil, contributes to reducing the storage capacity of water through the clogging of the trough of rivers, lakes and tanks for irrigation. After the actions of deforestation soils are becoming less favourable to agriculture, in the absence of protective woody vegetation, leakage of surface rainfall, wash the top layer of the soil, the richest layer in humus. Forests have a major role in the protection of soil, as shown in figure 3.

Figure no. 3 The protective functions of the forest



Source: The National Strategy for conserving biodiversity

The forest acts as a *reservoir of water producing the vapours necessary for the formation of rain clouds* (Bran F., 2002) and the reduction of forest areas encourages the intensification of drought, which results in an increase in facilities for irrigation. The irrigation system, insufficient, due to insufficient investments, high cost per cubic meter of water and last but not least because of the lack of interest on the part of the authorities. If before 1990 Romania had a vast network of irrigation systems, which irrigated an area of 3.2 million hectares, currently, the irrigation system covers 8 percent of the 10 million of agricultural land.

4. Areas threatened with desertification in Romania and the combating of the evolution of the desertification phenomenon

Long periods of drought, climatic imbalances, the decrease in the areas covered by the forest vegetation and soil conditions specific to Romania, located among the 110 countries that are potentially affected by desertification. The areas, most affected by this phenomenon in Romania are:

Desertification in Dobrogea is determined by climatically and pedological conditions of drought, soil erosion and the torrential nature of rainfall that annually uncovers 20 tonnes/ha. The soil in this region is very poor in nutrients, showing the compaction and cementing phenomena. Another important aspect that contributes to the installation of desertification in this area is agricultural practices, such as setting stubble fields on fire and lack of crop rotation;

Oltenia Field is an area characterized by a volume of precipitation, high temperatures and sandy land, aeolian deflation, conditions which favour the drying of the ground. In Dolj county, due to deforestation in the past few years, 105000 hectares of land were turned into arid land. The most affected areas are contained in the area located between villages Sadova Calafat-Poiana Mare--Dabuleni and the Danube.

Plateau of Moldova (the central-southern part), soil deterioration extends over 49% of the surface of the latter. The causes of the degradation of the soil is due mainly to the characteristics of the relief, the climate regime prevailed of rainfall to wash the ground, slipping of land, areolar and linear erosion of the soil and to a lesser extent the phenomena of compaction, deflection and landslips.

West Plain holds land areas affected by the phenomenon of desertification, in the area of the Beba Veche - Gaiu Mic and along the borders with Serbia and Hungary. The causes of desertification is due to rotatory periods of arid climate, with the periods in which the volume of precipitation exceeds normal limits causing floods and destruction of the topcoat chernozem layer and the conversion of fertile land into sandy soil. Another factor which favours the desertification in Timis county is the lack of groundwater.

In the areas affected by desertification, as a result of factors which favour this phenomenon, biodiversity and natural ecosystems are deeply affected.(Ioniță I., 2000). Biodiversity is represented by the diversity of ecosystems, species and genes, is an integral part of the natural capital, is essential for maintaining the green capital, by providing support capacity of natural and artificial ecosystems .

The loss of biodiversity manifests through the destruction and fragmentation of habitats. In the areas marked of drought, fauna migrates to areas which have a suitable pluviometric regime, where they can find rich and diversified food resources. In the areas affected by drought, the production of grass is greatly reduced, so there shall be a superficial rooting of gramineas and vegetables, are threatened with extinction because of this poor rooting, being replaced by weeds. The hydrologic drought has a negative impact on the aquatic fauna, species of fish in the areas affected - cypirinidae go up waters stream, in the area of salmonids (Oprea R., 2007)

Deforestation on large areas and illegal cuts, are actions which threaten the balance of the forest ecosystem, and the agricultural system. These activities adversely affect the biodiversity, are carried out frequently in the retroceded forests. The uncontrolled cuttings of the forests contribute to the fragmentation of the habitats of several species of plants and animals. A negative impact on the natural ecosystem has the overgrazing, causing a drop in plant biomass and reduce the species of plants with nutritional value. (Lal R., Steward B.A., 1990)

The combating of the evolution of the desertification phenomenon through sustainable measures. The concept of sustainable development was elaborated within the period of the world crisis between the years 1920-1933, further development and strengthening of this concept has a holistic approach, including all aspects of social, economic and ecological life. Sustainable development represents the solution to the resource penury determined by economic growth and the continue damage to the quality of the environment. The directions of action in respect of sustainable development, and in particular the part referring to preventing and combating desertification, are specified in the specific documents and strategies, as: *The Strategy of Sustainable Development of Romania Horizon 2013-2020-2030*, *The National Plan to Fight Desertification in Romania* and *The National Strategy to reduce the effects of drought, the prevention and combat desertification and land degradation on short, medium and long-term*. Measures to combat the evolution of the desertification phenomenon in Romania, shall provide for a series of actions of legislative order, political and social fields, measures for the development of infrastructure, rural development and to stimulate the programs of scientific research in the field of desertification.

Relating to the operations of the *legislative* framework, they have as their purpose:

- granting incentives of economic nature, for the implementation of the Combat Desertification Programme;
- promoting a set of rules in respect of the grazing land with a risk of desertification and erosion;
- completing the legislation with special rules relating to the management of water in areas with risk of desertification;
- the enforcement of regulations in respect to the granting of facilities for the use of irrigation water;
- promotion of a special insurance system for areas with risk of desertification.

The National Plan to fight desertification in Romania, provides for the implementation, by the year 2025, some concrete measures concerning:

- the diversification of agricultural production and the implementation of drought resistant varieties;
- combating erosion and soil degradation by: settling 5000 km of water courses, out of which 500 km in desertificated areas; afforestation on eroded soil on an area of 700000 ha, out of which 115000 in desertificated areas;
- creating forest curtains and the afforestation of an area of 15000 ha;
- rehabilitation by planting of grass on land strongly polluted on an area of 15000 ha;

Regarding the shortage of forest vegetation, in particular in the area of the plain and hill areas of the grasslands, but also arable land, will be implemented the following measures:

- ensuring of water resources in the areas with risk of desertification by: activities for the rehabilitation of the irrigation systems on an area of 200.000 hectares, the completion and finalisation of the irrigation system on the Siret - Baragan Plain, on a length of 189km;
- regularisation of watercourses and dragging artificial lakes for local consumption;
- optimizing the water distribution network for household consumption

5. Conclusions

The phenomenon of desertification has multiple consequences on the national economy. The seriousness of this phenomenon is worrying both for losses which they shall determine, as well as for its progressive broadening. Desertification of agricultural land cannot be fought against only through the quantitative summing of some actions to combat desertification, it represents a dynamic process which creates more and more powerful conditions for development. The existence of programs and measures to combat the desertification phenomenon in Romania does not constitute a guarantee for reducing the effects of this phenomenon! The lack of coherence in the application of the measures provided in strategic documents, by the administrative organs, changes in the anti-desertification strategies with the change of the ruling party and further development on stimulating productivity by practicing intensive agriculture, but weak financing for programs to combat climate change, all represent a few aspects, as they are remedied, bring the expected effects provided by the strategies of sustainable development.

6. References

- Bran F., 2002, *Degradation of Ecosystems – Economic Implications*, Bucharest, Publishing House ASE, Bucharest, pp. 42-44.
- Bran F., 2002, *Ecology and Ecological Politics*, Bucharest, Publishing House ASE, pp.61-64.
- Demeter T., 2007, *Protection and Improvement of Soil*, Bucharest, University Publishing House, pp. 89-90.
- Ioniță I., 2000, *Applied Geomorphology. Degradation processes of Hilly Regions*, Iași, University Al. Ioan Cuza Publishing House, Iași, pp 57-58.
- Lal R., Steward B.A. 1990, *Soil Degradation, Adv.in Soil Science*, vol.11, New York, Springer Verlag Publisher, pp.131-132.
- Oprea R. 2013, *Soil Science Compendium*, Bucharest, University Publishing House, pp.121-122.
- United Nations to Combat Desertification, 1994, *Convention to Combat Desertification* [online], available at, <http://www.un-documents.net/a-ac241-27.pdf>, accessed 1may, 2018.
- The Ministerium of Agriculture and Rural Development, 2008, *The National Strategy for the prevention and combat of the effects of drought, Degradation of land and Desertification*, [online], available at http://old.madr.ro/pages/strategie/strategie_antiseceta_update_09.05.2008.pdf, accessed, 25.04.2018.
- Ministry of the Environment, 2000, *The National Strategy for conserving biodiversity*, [online], available at <http://www.mmediu.ro/img/attachment/32/biodiversitate-54784ffea5918.pdf> accessed 28.04.2018
- The Ministerium of Environment and Forests, 2013, *The National Strategy for Climate Change 2014-2020*, [online], available at <http://mmediu.ro/categorie/strategia-nationala-privind-schimbarile-climatice-rezumat/171>, accessed 27. 04. 2018.
- Ministerium of the Environment, 2012, *The Strategy of Sustainable Development of Romania Horizon 2013 - 2020 - 2030*, [online], available at http://www.mmediu.ro/beta/wp-content/uploads/2012/06/2012-06-12_dezvoltare_durabila_snddfinalromana2008.pdf accessed 28.04.2018.