



Transforming **U**nsustainable
management of soils in key
agricultural systems in EU and China

Developing an **i**ntegrated platform of
alternatives to reverse soil degradation

Soil erosion in Bulgaria



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Introduction

Soil erosion is a phenomenon associated with the separation and transport of soil particles by wind, rain and irrigation water during natural and/or anthropogenic processes. Soil erosion is recognized as one of the most serious global problems of the natural environment. According to the world map of anthropogenic soil degradation, water erosion is the most significant degradation process, representing 53% of total soil degradation. According to data from the National Statistical Institute, for a period of 30 years between 1960 and 1990 the area of agricultural land in Bulgaria has gradually decreased for various reasons, the main one being soil erosion, by about 8000 ha per year. The main causes of erosion are still improper agricultural techniques, deforestation, excessive grazing and construction work on sloping territories.

The use and structure of agricultural lands can significantly reduce soil erosion losses, but can also lead to its significant acceleration.

According to data based on satellite imagery and mapping of land cover classes, agricultural lands in Bulgaria occupy 51.6%, forests and semi-natural areas - 39.8% of the total area, meadows and pastures - 11.6%, permanent crops - 1.9%.

Factors influencing erosion processes

Soil loss has a significant impact on the ecological and economic functions of the soil, both at the site of erosion and in the surrounding areas. Soil erosion leads to a decrease in the depth of the root zone, the amount of nutrients and soil moisture reserves; depletion of the buffer and filtering capacities of the soil; a decrease in the content of soil organic matter; loss of biodiversity; degradation of the soil structure; formation of a soil crust, etc. While the relief, precipitation and soils create the natural prerequisites for erosion, the use and structure of agricultural and forest areas can significantly reduce soil losses from erosion, but can also



Eroded lands.

lead to its significant acceleration. Since climate is one of the key factors for erosion, its intensity is very likely to increase significantly under the predicted climate changes. The development of sustainable agricultural systems that preserve soil functions in the long term requires knowledge of the limitations and potential for the use of soil resources.



Plantations on sloping terrain.

Natural conditions (relief, climate and soils), the way of land management and the ineffective implementation of legislation define erosion as the most serious threat to the soil cover on the territory of Bulgaria. About 3,730,000 ha (65% of the area of managed land) in the country are affected by water erosion, and about 1,350,000 ha (24% of the area of managed land) by wind erosion.

Long-term studies show that the country experiences an average of 70 rainfall events from April to October, with nearly 14% of the rainfall events being erosive. The average annual number of erosive rainfall events in different parts of the country is from 2 to 10.

Regarding soil cover, it has been established that due to differences in the composition and properties of soils, the values of their susceptibility to water erosion vary widely. Soils on 60.1% of the country's territory are medium to strong, strong and very strong susceptibility to water erosion. The most susceptible to water erosion are the shallow light gray (pseudopodzolic) soils, followed by the shallow and eroded cinnamon-podzolic (pseudopodzolic) and yellow earth-podzolic soils, and to deflation - the shallow brown forest soils, leached cinnamon forest, rendzin and eroded gray forest soils.

Methods for combating water erosion

To reduce the impact of erosion processes in Bulgaria, a number of measures are proposed, recommended by the Rural Development Program, implemented in the period 2007-2014 (measure 214 "Agri-environmental payments" - Soil erosion

control). It recommends establishing soil protection crop rotations, clear crop rotation, grass buffer strips, drainage furrows, terracing, complete grassing, improvement measures in pastures and sowing of winter pre-crops.

When designing, implementing and building various anti-erosion practices and facilities, additional production costs are incurred, which increase the cost of the produced product, but preserve the soil and its productivity. The real effect of the implementation of anti-erosion practices is difficult to establish, since a significant period of time passes between the start of the operation of the anti-erosion practice and the time when the actual effect manifests itself. The implementation of anti-erosion measures requires initial investments for their construction and annual additional costs for their maintenance.

To protect soil from erosion, certain measures can be applied, briefly described below:

- **Soil conservation crop rotations** - include a larger number of crops with a fused surface (wheat, barley, rye, oats, etc.) and grasses, mostly perennial;
- **Strip crop rotation (strip farming)** - growing different crops in strips of a certain width across the slope;
- **Grass buffer strips** - are built along the contour or across the slope. Grassing is done with suitable perennial grasses or grass mixtures, for which the necessary care is taken during cultivation;
- **Drainage furrows** - they carry away the surface runoff formed on the slope. They are laid with a slope of



Soil conservation crop rotations.



Strip farming



Terracing.

0.5-3% simultaneously with or after sowing the cover crops;

- **Terracing** - it is applied by forming arable ramp or stepped terraces. The latter are built on steeper terrain slopes - over 20%. They are expensive facilities and are only suitable for perennial crops and vineyards;
- **Complete grassing** - it has a high soil protection effect and is one of the most effective ways to use sloping and heavily eroded lands. It is carried out by destroying natural grasslands

and creating artificial grasslands from suitable grass species and mixtures, tailored to the soil and climatic conditions in the area of creation. In pastures, improvement measures can also be applied such as: basic improvement of eroded pastures by plowing and fertilizing; surface improvement of pastures by partial seeding of bare, devoid of grass areas; early spring harrowing; cleaning from stones and bushes, including sanitary mowing to destroy inedible weeds, etc.; increasing moisture storage and productivity of pastures by cutting



through the grasslands, combined with underground drainage or laying ditches and embankments (in this way, surface runoff is converted into subsoil runoff, which increases soil moisture storage);

- Soil protection pre-crops - compaction with pre-crops in crop rotations has a high soil protection effect. Pre-crops protect the soil during the winter and winter-spring period, when it is highly vulnerable to erosion. Suitable for such crop rotations are rye, winter peas and winter vetch, as independent crops, or in a mixture with a winter wheat crop with a merged surface. Pre-crop crops can also be used for green manure, plowed in with the spring tillage before sowing the crops.

In Bulgaria, as an EU member state, a Handbook for the practical application of the standards for maintaining land in good agricultural and environmental

condition has been prepared, which also presents measures to reduce the impact of erosion on land. It is intended for farmers to guide them in their daily work. It can also be used by specialists in the agricultural system when consulting farmers. Farmers are obliged to maintain land in good agricultural and environmental condition (GAEC) in order to receive full support for the various types of interventions included in the Strategic Plan of Bulgaria for the Development of Agriculture and Rural Areas in the period 2023–2027.

From January 1, 2023, GAEC standards in Bulgaria are determined and implemented by an order of the Minister of Agriculture, which is published on the website of the Ministry of Agriculture and Food.

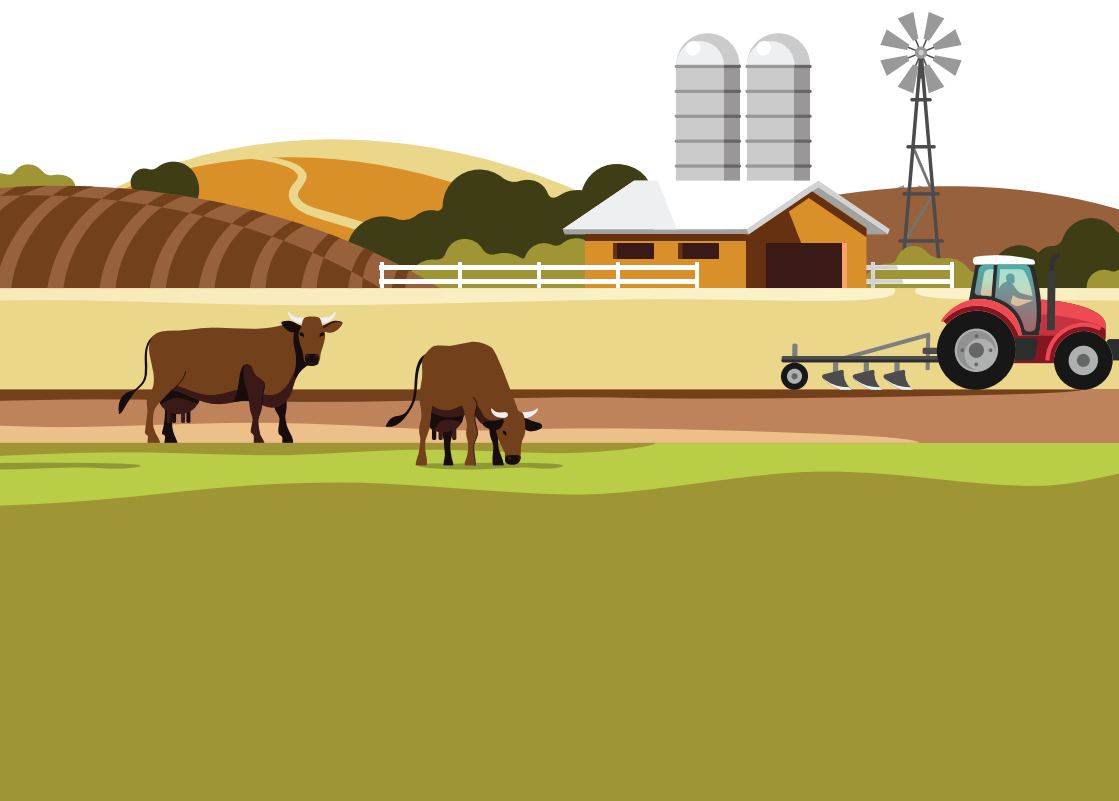
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More literature

Ruseva Sv., et al. 2010. Risk of soil erosion in Bulgaria and recommendations for soil conservation use of agricultural lands. Part I. Northern Bulgaria. *Publishing House "PublishSaySet-Eco"*, Sofia, p.303.

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Consortium

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