Scientific registration n$^{o}$ : 2613
Symposium n$^{o}$ : 31
Presentation: poster

# Soil Erosion Control under Conditions of Private Agriculture in Bulgaria
# Lutte contre l'érosion du sol après réforme agraire en Bulgarie

**KROUMOV Victor, DOCHEV Grozyu**

N. Poushkarov Institute of Soil Science and Agroecology, 7 Shosse Bankya, 1080 Sofia, P.O. Box 1369, Bulgaria

## Introduction

Soil erosion control in Bulgaria has been carried out since 90 years now in forest lands and over 40 years in agricultural lands (Daskalov, Y et al. 1995).

Studies concerning land resources status in our country showed that over 80% of the arable lands and 15% of the forest lands are subjected to water erosion, while 37% are subjected to wind erosion. The irrigation erosion potentially can affect 0.5x $10^{6}$ha, which represents 50% from the irrigated land in the country. It was established that the erosion is observed at territories with slopes steeper than 2% at gravitational irrigation and at sprinkling irrigation at 8% slops.

The total mean annual lose as a result of erosion, according Krasteva V. (1984) are 15x $10^{6}m^{3}$ and 100x $10^{6}$ $m^{3}$ irrigation water, which was not absorbed in the soil but was lost with the runoff.

The mean annual loses of soil due to water erosion was 170t/ $km^{2}$, which is 1.5 times higher as compared to the average intensity of the Global surface erosion (Biolchev A. et al. 1977).

As a result of erosion 2000 small and 32 big lake dams are damaged due to the runoff sediments (Bakwel A., A. Shmith et al. 1995).

Erosion prevention activities in some semi- mountain and mountain regions on slopped terains include conservation of the existing field boundaries and terraces.

The formation of small plots in the process of agricultural lands redestribution (at land restitution) will create possibilities of partial reduction of the erosion processes but this is not a radical solvation of the soil erosion problem.

The purpose of this study is to stress on the preservation of the agricultural lands from erosion trough the aquainting of the future and the present land users with the activities aiming at soilving of this problemin the different regions of Bulgaria.

## State of agricultural resources in relation to soil erision

We made a general survey of the fields size in the districts that are subjected to medium and strong erosion.

The data concerning these fields are shown on Fig. 1 and 2.
It was established that the highest number fields, subjected to water erosion, are located in north Bulgaria ( Varna, Lovech, Russe and Burgas districts) and the affected territory is between 0.55 and 0.65x $10^6$ha. The biggest medium and strongly eroded territories are in Sofia, Lovech and Haskovo districts 0.19x $10^6$ ha, 0.13x$10^6$ ha, and 0.11x$10^6$ ha respectively.
The wind erosion affected between 0.32x $10^6$ ha and 0.50x $10^6$ ha from the arable lands of Varna, Lovech , Montana and Russe districts. Only in Sofia district wind erosion is not manifested.
This information alowed us to suggest differentiated erosion preventing activities for soil conservation, respectively for preserving soil fertility.

**Projects for soil erosion control**
Soil erosion control activities must begin with the manegment-structural activities in the beginning of the land redistribution process. Plots of the separate landusers (private or co-operative) have to be positioned perpendiculary to the slops. Roads and boundaries of the separate plots to follow the direction of the horizontals or to deviate from those with 1 to 2 %.
From the well known soil protection activities for soil conservation in our country the agricultural practices are the most easy to apply. They are not connected with additional capital investments and can be caried out with the existing agricultural equipment.
The land users after receiving their land must determine the optimal crop structure according the soil and climatic condition of the region.
In the semi-mountain and mountain regions on slopping terrains, over 3%, it is compolsary the crops to be grown in soil conservation croprotations.
The choice of crops for these croprotations must consider soil conservation ability dependin on the overground plant parts and the root mass, the lenght of the vegetation period and the requirements of the crops in relation to tillage. The perennial grasses possess the highest soil protection abilities, they are followed by the cereals and on the last place are the row crops.
Appart from the right choice of the soil protective crops for the rotations in them can be included suitable intermediate annual forage crops. They will decrease soil erosion lose up to 4-5 times and will increase farmers profite (Kroumov V., 1995).
The contour cropping organisation is also easy to apply. At it all agricultural activities - plouing, sawing, tillage etc.) are carried out by the horizontals of the slope.
A variety of the contour cropping is the contour strip cropping. It can be applied on bigger massifs, managed by agricultural co-operatives. This agriculture is characterised with an alternation of row crop strips and cereal strips or with buffer strips from perenneal grasses, arranged by the horizontals of the terrain. The width of the strips depends on the length and steepness of the slop. The land owners can set up buffer grass strips between two neighbouring estates, which can be used not only as a boundary, but also will prevent soil erosion.
Appart from preventing water erosion the strip agriculture is highly effective against wind erosion. In this case the strips are positioned perpendiculary to the predominant direction of winds.
Anther crop protection practice, which can be suggested is the subsurface ploughing, carried out after remouving of the plough upturning planks, or with cultivator scarifier. It

is advisable to apply furrow-ridged ploughing. This is performed following the horizontals of the terrain. Its soil conservation effect is established by the agricultural science and practice. It prevents formation of surface runoffs. In addition it has water-storing effect. It was determined that this cultivation secures an increase of spring crops yield of about 6 to 8%. It also prevents wind erosion.

The runoff leading furrows are also effective soil protection constructions. They can be applied with cereal crops. These furrows are used successfully by the farmers in the mountain regions. Imediately after sowing, on a distance 20 to 30m (depending on the steepness of the terrain) the furrows are made with the aim for the runoff to be directed out of the cultivated land. The length of these furrows must not exceed 200m.

In the case of the row crops very effective are the runoff retaining furrows. Their function is to detain the formed surface runoff on the arable lands and with that the erosion will be totally prevented. Apart from the soil protective effect they play also moisture- storing role for the row crops: maize, suflower, soyabean etc. The furrows are made by machine or formed by hand at the process of tillage in every interaw space or trough 1-2 interraw spaces depending on the steepness of the terrain.

To prevent the irrigation erosion at sprinkling or gravitational irrigation some effective and in the same time economical activities are applied. At gravity irrigation along the furrows it is advisible the irrigation to be carried out at erosion safe water runoff parameters (q= 0.2 to 1.0 l/sec$^{-1}$ )on slopes with i=3 to 5%. At erosion hazard, due to sprincling, it is advisable the last to be made with alowed intensity of the sprincling ($i_{add}$ 180mm.min$^{-1}$).

Another effective method for protection of soil from irrigation erosion is sprincling with splitting of the irigation norm to two portions and the second irrigfation to be applied 24 hours after the first irrigation (Dochev G., 1994).

The runoff retaining furrows in the interrow space, formed by hand at tillage, can reduce the amount of both the liquid and the hard runoffs 2 to 3 times ( Neshkova M, Dochev G., Dimitrov P., 1995)

In the end we will mention some engeneer- technical and hydro-technical activities for gully erosion prevention.

They are:

- grassed runoff retaining collectors (at well expressed watershed)
- grassed runoff leading collectors for slopping plots.
- stabilization of gullies with handy materials (fascines, small rock walls, small stone rapids, barages etc.).

Because these activities require additional funds and labour, it is necessary to combine the efforts of the landusers with goverment financing.

**Conclusion**

In conclusion we have to point out that we deliberately described only easy appliable erosion- preventing activities, having in mind the present state of affairs in our country - the difficulty in the economics and especially in the agriculture.

We showed part of these activities, which can be limitting factors for futher soil degradation.

**References**

1. Bakwel, A., Smith, A. et al. 1995. Reform in the agriculture farming. Sofia, 157-158.

2. Biolchev, A. et al. 1977. Methods for working out a national longterm programme for soil erosion control in Bulgaria. Sofia.
3. Daskalov, Y. et al. 1995. 90 years soil erosion control in Bulgaria. Sofia, 8-12.
4. Dochev, G. 1994. Soil erosion under spray irrigation of corn. 15th world congress of Soil Science , Mexico, v.2b, 23-24.
5. Krasteva, V., 1984. Soil erosion control under spray irrigation in Bulgaria., Sofia, v.1, 211.
6. Kroumov, V., 1995. Soil erosion protection afforded by growing different crops before oriental tobaceo on severely degraded lands in south-western Rhodops region. PhD thesis, N.Poushkarov Institute of Soil Science and Agroecology, Sofia, Bulgaria.
7. Neshkova, M., Dochev, G., Dimitrov, P. 1995. Study of some soil protective measures from the erosion in case of splinkling irrigation of corn and soya on Calcareous Chernozem. In " 90 years of soil erosion control in Bulgaria", Sofia, 219-222.

Keywords : soil erosion control, water erosion, wind erosion, agricultural projects
Mots clés : contrôle de l'érosion du sol, érosion hydrique, érosion éolienne, réforme agraire

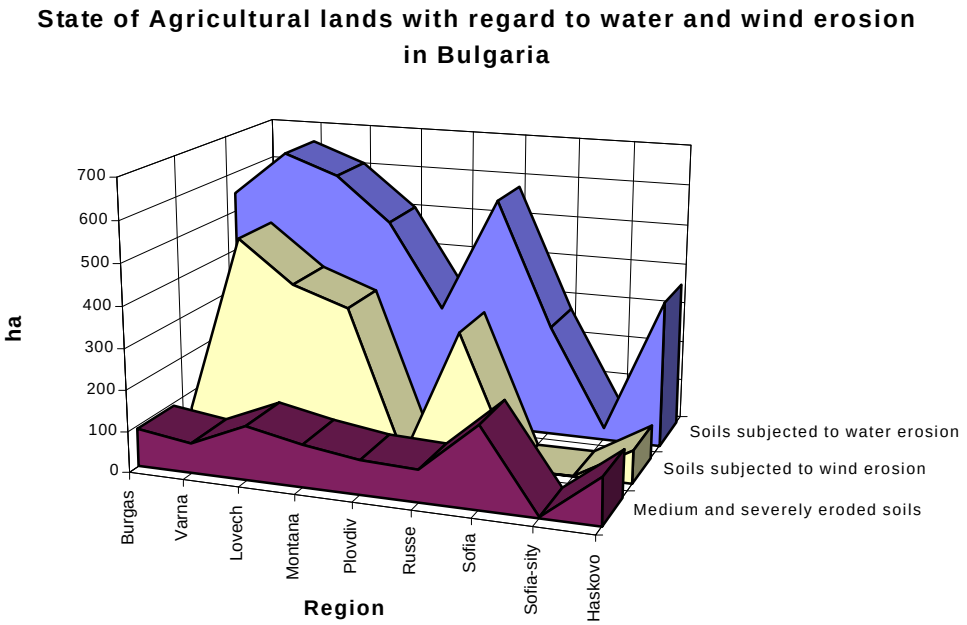


Fig. 1

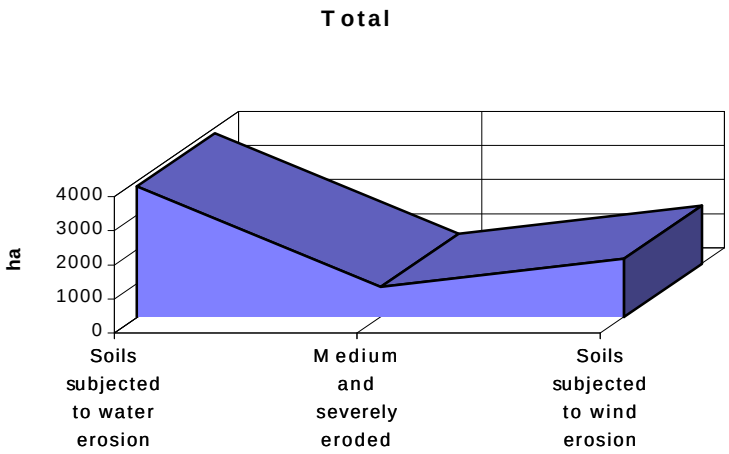
Total
ha
4000
3000
2000
1000
0
Soils subjected to water erosion
Medium and severely eroded
Soils subjected to wind erosion

Fig. 2