

# Research on nutrient losses by runoff to various crops in Tarina Vale experimental polygon, Perieni

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# **INTRODUCTION**

**The inventory carried out within the framework of the National Soil Quality Monitoring System shows that:**

- ✓ Water soil erosion is present on 6300 thou. ha (26.4% of the total country area), including to 702 thou. ha with severely degraded land (gully erosion and landslide).**

- ✓ **The specific soil loss from arable land by water erosion ranges from 3.2 to 41.5 t/ha/year, the nation-wide average being 16.28 t/ha/year, while the allowable limit is 4-6 t/ha/year.**
- ✓ **The total amount of soil loss in Romania by water erosion reaches about 126 mills. t/year.**
- ✓ **The humus loss caused by the removal of the topsoil ranges from 45 to 90 percent of the total organic matter reserve.**

- ✓ **At the country level the total humus loss is about 0.5 mill. t/year.**
- ✓ **Wind erosion affects sandy soils on 378 thou.**
- ✓ **The wind-eroded soil area is increasing as consequence of intense deforestation made in the last years on sandy soils located in the warm climatic zone of the country.**

# **METHODS**

- This paper is dealing with the experimental results obtained, in 1995-2003 period, on standard plots for runoff and erosion control, located in the Tarina Vale subcatchment.
- The experimental polygon is located at 232 m altitude on a 12-14 % slope of land with moderately eroded cambic chernozem soil.
- The measurements were carried out regarding humus, N, P, and K losses, for 9 year period, in 10 standard plots (each plot having an area of 100-150 m<sup>2</sup>).

- **The experiments including different crops in rotation: winter wheat-maize-bean-soybean-bromus sp., the control being represented by bare fallow.**
- **Each standard plot was provided with 3 basins of 1000, 200 and 50 liters to retain the water and soil.**
- **On the basis of data regarding the collected soil and water the liquid and solid losses per hectare have been estimated.**









# RESULTS

**Total and monthly level of rainfall and the number of the rainfall events which caused runoff during a period of 9 years (1995-2003)**

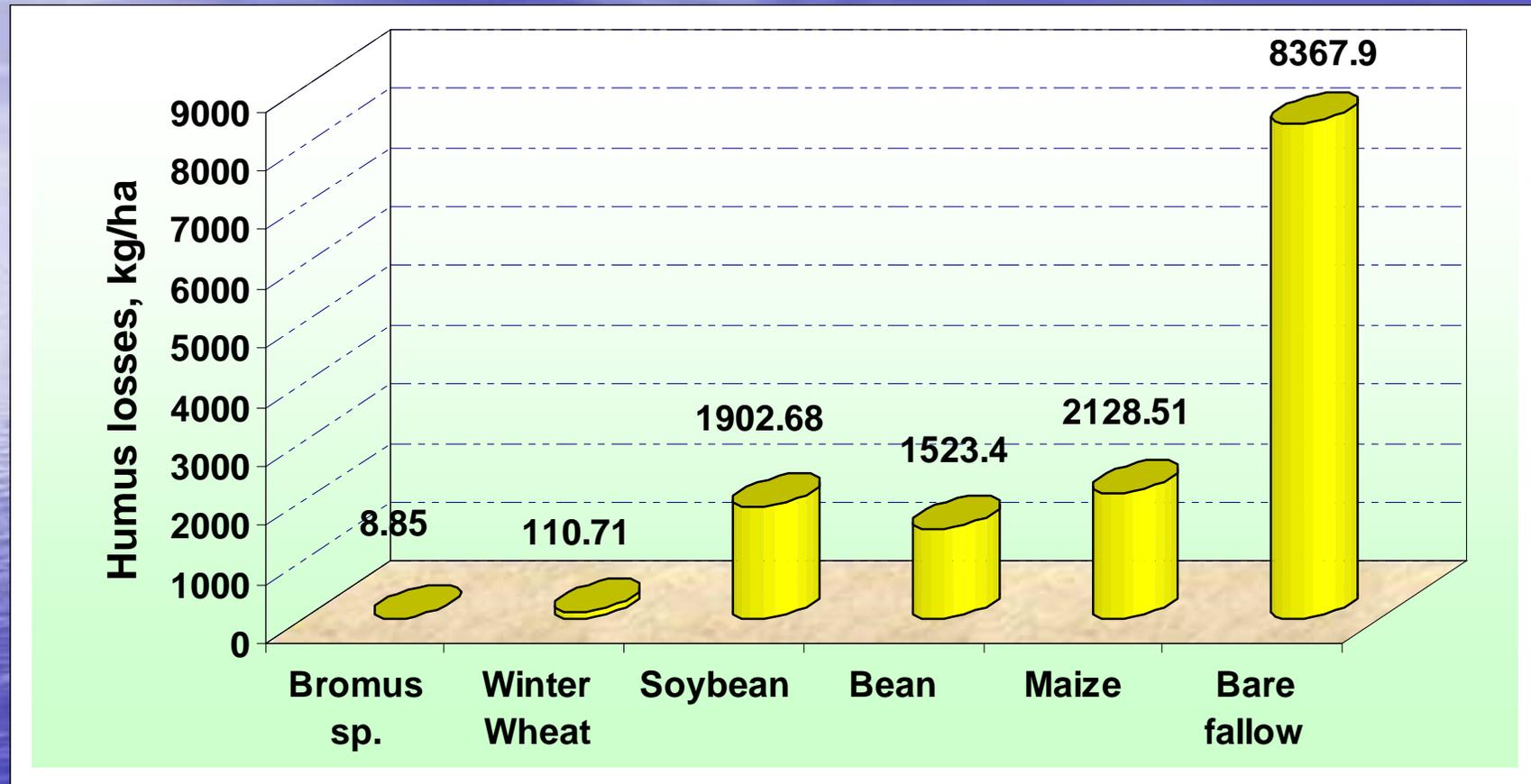
Month	April		May		June		July		August		September		October		Total	
	mm	No. of events	mm	No. of events	mm	No. of events	mm	No. of events	mm	No. of events	mm	No. of events	mm	No. of events	mm	No. of events
Bromus sp.	6.2	1	0.0	0	136.5	2	0.0	0	0.0	0	60.2	1	0.0	0	202.9	4
Winter Wheat	0.0	0	0.0	0	0.0	0	135.9	7	101.8	3	0.0	0	0.0	0	237.7	10
Soybean	0.0	0	0.0	0	295.8	11	158.7	8	142.3	5	35.7	2	0.0	0	632.5	26
Bean	0.0	0	0.0	0	268.4	9	153.2	8	142.3	5	19.2	1	91.4	1	674.5	24
Maize	0.0	0	9.5	1	337.0	12	222.2	12	237.4	9	136.7	5	14.4	1	957.6	40
Bare fallow	0.0	0	9.5	1	315.3	13	322.8	18	291.5	15	138.9	6	32.3	2	1110.3	55

# Total and monthly runoff and eroded soil during a period of 9 years (1995-2003)

Month	April		May		June		July		August		September		October		Total	
	R.	E.	R.	E.	R.	E.	R.	E.	R.	E.	R.	E.	R.	E.	R.	E.
Crop	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha	m <sup>3</sup> /ha	t/ha
Bromus sp.	5.5	0.024	0.0	0.000	165.0	0.230	0.0	0.000	0.0	0.000	5.5	0.011	0.0	0.000	176.0	0.265
Winter Wheat	0.0	0.000	0.0	0.000	0.00	0.000	243.5	2.812	83.5	0.504	0.0	0.000	0.0	0.000	327.0	3.316
Soybean	0.0	0.000	0.0	0.000	831.2	36.584	277.5	4.883	498.0	15.456	66.5	0.781	0.0	0.000	1673.2	57.704
Bean	0.0	0.000	0.0	0.000	844.0	34.271	231.5	3.321	341.5	4.310	30.5	0.179	46.0	0.159	1493.5	42.240
Maize	0.0	0.000	10.0	0.066	729.1	51.191	572.5	17.080	477.0	8.856	104.0	0.640	12.0	0.088	1904.6	77.921
Bare fallow	0.0	0.000	3.8	4.840	1116.5	192.201	1147.2	86.850	797.5	57.960	284.0	5.590	47.0	0.736	3396.0	348.177

- R. runoff
- E. erosion

# The humus losses recorded in standard plots by runoff in 1995-2003 period



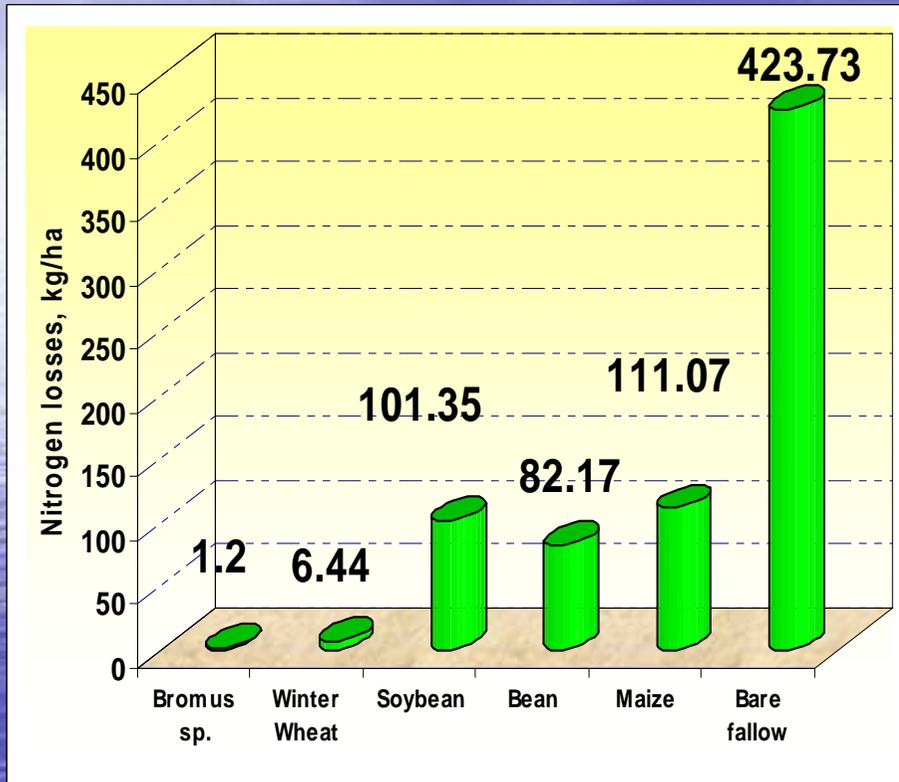
## Humus losses:

-8.85 to 110.71 kg/ha with good protective crops (bromus sp. and winter wheat);

-1523.4 to 2128.51 kg/ha with low protective crops (maize, bean, soybean);

-8367.9 kg/ha with bare fallow.

## The nitrogen losses recorded in standard plots by runoff (1995-2003 period)



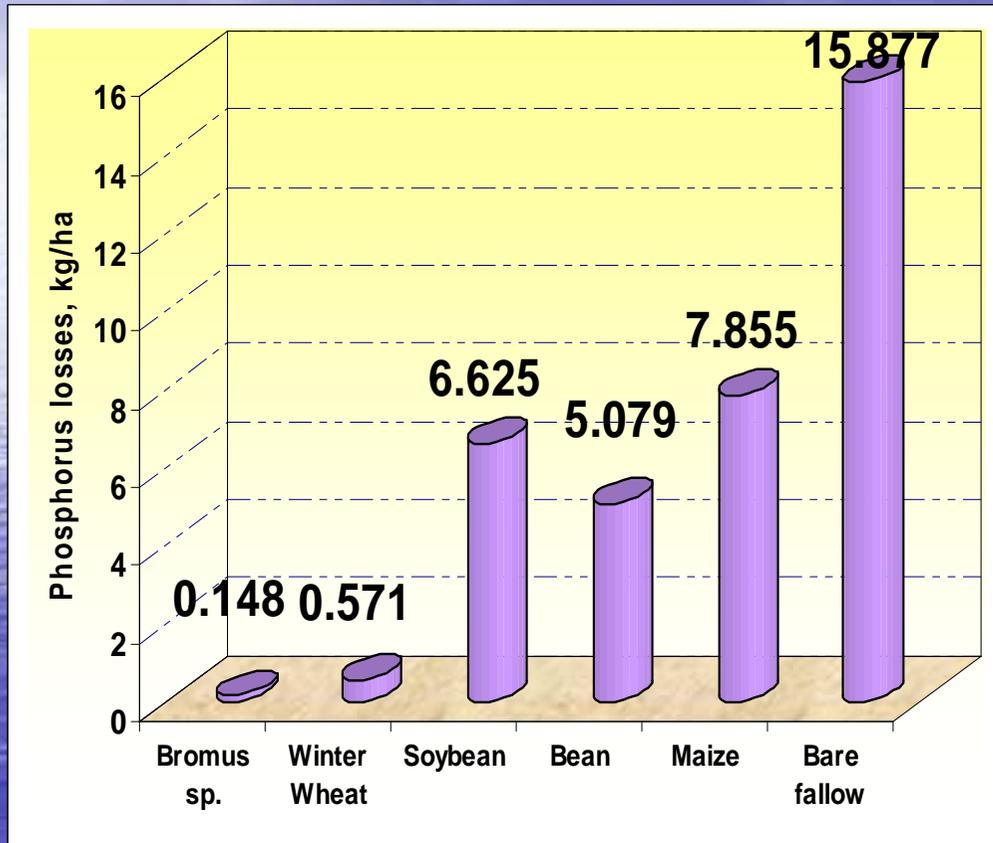
## The percentage distribution of the nitrogen losses in water and soil (1995-2003 period)

Crop	Nitrogen losses	
	water	soil
	%	%
Bromus sp.	62.46	37.54
Winter Wheat	12.13	87.87
Soybean	3.95	96.05
Bean	4.06	95.94
Maize	3.96	96.04
Bare fallow	1.46	98.54

### Nitrogen losses:

- 1.2 to 6.44 kg/ha with winter wheat and bromus sp., of which 62.46% in runoff water with bromus sp. and 12.13% with winter wheat;
- 82.17 to 111.07 kg/ha with low protective crops, of which 3.95-4.06% in runoff water.
- 423.73 kg/ha with bare fallow, of which 1.46% in runoff water.

## The phosphorus losses recorded in standard plots by runoff (1995-2003 period)



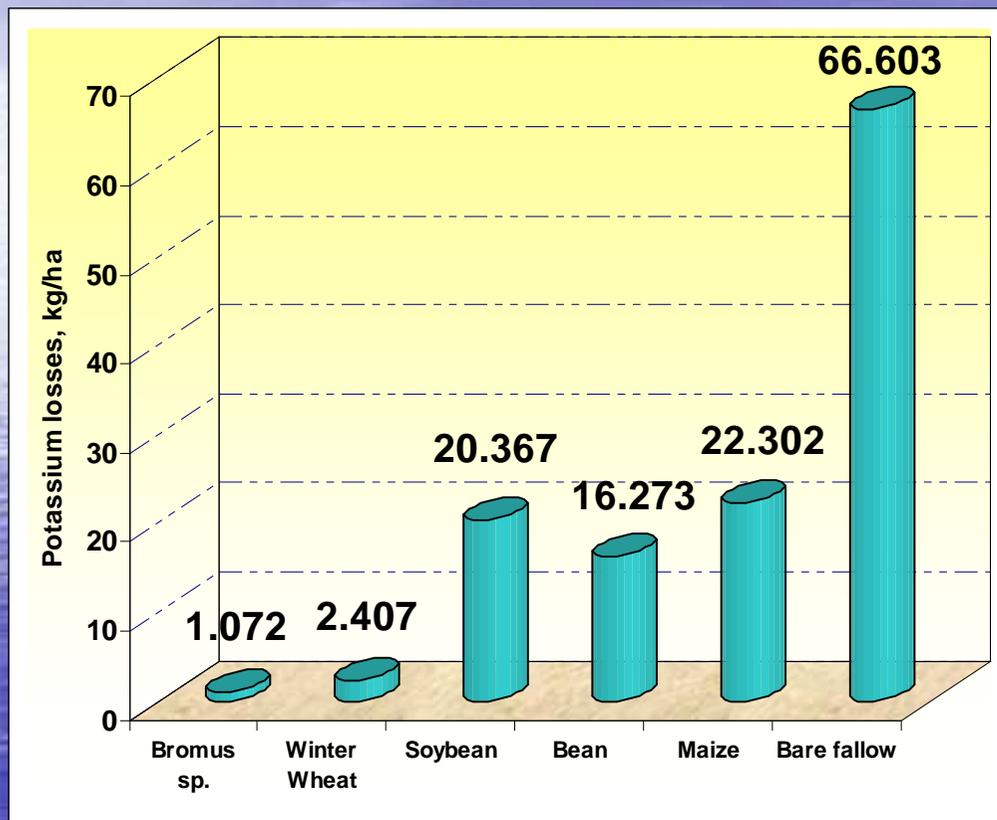
## The percentage distribution of the phosphorus losses in water and soil (1995-2003 period)

Crop	Phosphorus losses	
	water	soil
	%	%
Bromus sp.	83.78	16.22
Winter Wheat	39.48	60.52
Soybean	13.60	86.40
Bean	14.39	85.61
Maize	16.56	83.44
Bare fallow	15.25	84.75

### Phosphorus ( $P_2O_5$ ) losses:

-0.146 to 15.877 kg/ha, of which 39.45-83.78 % in runoff water with good protective crops; 13.60-16.56 % in runoff water with low protective crops and 15.25 % in runoff water with bare fallow.

## The potassium losses recorded in standard plots by runoff (1995-2003 period)



## The percentage distribution of the potassium losses in water and soil (1995-2003 period)

Crop	Potassium losses	
	water	soil
	%	%
Bromus sp.	94.22	5.78
Winter Wheat	65.79	34.21
Soybean	35.13	64.87
Bean	35.54	64.46
Maize	30.71	69.29
Bare fallow	19.69	80.31

### Potassium ( $K_2O$ ) losses:

-1.072 to 66.603 kg/ha, of which 65.74-94.22% in runoff water with good protective crop; 30.71-35.51% in runoff water with low protective crops and 16.69 % in runoff water with bare fallow.

# The ratio of the recorded nutrient losses by effective erosion refer to the nutrient losses by allowable erosion of 8 t/ha/year

Crop	Erosion		Humus		N		P <sub>2</sub> O <sub>5</sub>		K <sub>2</sub> O	
	t/ha	%*	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	%
Estimation	72.00	100	2138.40	100	108.00	100	7.50	100	16.16	100
Bromus sp.	0.26	0.37	8.85	0.41	1.20	1.11	0.15	1.97	1.07	6.63
Winter Wheat	3.31	4.61	110.71	5.18	6.44	5.97	0.57	7.61	2.41	14.91
Soybean	57.70	78.76	1902.68	88.98	101.35	93.84	6.63	88.31	20.37	126.00
Bean	42.24	58.67	1523.40	71.24	82.17	76.09	5.08	67.70	16.27	100.67
Maize	77.92	108.23	2128.51	99.54	111.07	102.84	7.85	104.70	22.30	137.97
Bare fallow	348.17	483.58	8367.90	391.32	423.73	392.34	15.88	211.63	66.60	412.05

\*% from estimation

# CONCLUSIONS

**-the good protective crops, as winter wheat and bromus sp., proved the higher efficiency in runoff and erosion control, by reducing the impact of rain drops and the possibilities of soil particles transport;**

**-the low nutrient and soil losses recommend the bromus sp. crop for strips and versants;**

- reporting the nutrient losses to the calculated allowable erosion of 8 t/ha/year the following conclusions can be mentioned:
- the nutrient losses with the bromus sp. and winter wheat are 0.41-14.91% of the calculated losses;
- in the case of maize the nutrient losses oscillates between 99.45 and 137.97 % of the calculated losses;

- the nutrient losses with the annual leguminous are between 67.7-100.67% of the calculated losses;
- in the case of bare fallow the nutrient losses exceed the calculated losses by 2-4 times.

An aerial photograph of a rural landscape. The foreground shows a grassy hillside. In the middle ground, there are several fields of varying colors, including green and brown, with a prominent curved path or road. A dense line of green trees runs across the background. The sky is light blue with some clouds.

**THANK YOU FOR YOUR ATTENTION**