

RESEARCH ON THE LEVEL OF PRODUCTION OBTAINED, LIQUID AND SOLID SOIL LOSSES IN THE EXPERIMENTAL CENTER FOR THE STUDY OF EROSION PREAJBA-GORJ

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RESEARCH ARTICLE

Abstract

Erosion has a significant effect on the absorption, decomposition and transport of soil carbon, the carbon stock (organic and inorganic) in the soil is approximately three times greater than the atmospheric carbon stock. The objective of this study is to quantify nutrient losses from agriculture on the environment, in the Preajba experimental point. The experiments were located on the luvosoil from Preajba-Gorj County, with a slope of 5% containing 9 variants in 5 repetitions. From the results obtained, it is found that the lowest liquid runoff is found in the variants cultivated with sown meadows (1.96-2.46 m³/ha), and the highest in the variants cultivated with corn (3.43-4.74 m³/ha). Soil analysis was also performed at the end of the growing season and liquid runoff analysis was performed.

Keywords: erosion, carbon, soil and water runoff

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INTRODUCTION

Erosion has an important effect on soil carbon uptake, decomposition, and transport in river systems. The main processes in the organic carbon cycle that maintain the carbon balance between land and atmosphere are organic carbon synthesis (photosynthesis) and decomposition (respiration) (Hilton & West, 2020).

The carbon stock (organic and inorganic) in the topsoil is approximately three times greater than the atmospheric carbon stock (Lal, 2004a).

Mild disturbance of the soil carbon stock through erosion has the capacity to induce a distinct fluctuation in atmospheric carbon levels (Houghton, 2003).

Water-related erosion affects carbon exchanges between soil and atmosphere because it reduces soil fertility and reduces its

capacity to sequester atmospheric carbon in soil and vegetation.

In Romania, during the period 2012-2020, the soil erosion phenomenon affected over 260,000 ha (Chiurciu et al., 2022; Chiurciu et al., 2023, Chiurciu et al., 2024; Voicu et al., 2022).

In the current context of global warming, the expansion of photovoltaic panels over agricultural lands, permafrost degradation, soil erosion has increased in intensity (Chereji et al., 2022; Dana et al., 2024; Dana et al., 2025; Zheng et al. 2025).

In this situation, finding agricultural methods that increase the fertility of eroded soils and the level of production obtained represents an important way to fix atmospheric carbon (Ruosteenoja et al., 2011; Rosegrant et al., 2013; Bechmann et al., 2014; Dana et al., 2024; Dana et al., 2025).

The objective of this study is to quantify nutrient losses from agriculture on the environment in the Preajba-Gorj County experimental site.

MATERIAL AND METHOD

Climatic conditions

According to the Targu-Jiu climatic station, the climate is temperate-continental, with obvious Mediterranean influences.

The multiannual average temperature is 10.3°C, and the precipitation regime is 753 mm. The precipitation regime is percolative, unevenly distributed, causing a drought period in the months of July-August-September. It is estimated that only in one year out of 10, a normal distribution of precipitation is achieved.

Temperature

The average temperature over 34 years (1921-1955) was 10.2°C, and the temperature during the grassland vegetation period (March-September) was 17.2°C.

The winter months record low temperatures 1.2°C in December, -2.0°C in January, 0.2°C in February. The highest temperatures are recorded in July, 20.9°C and August 20.3°C.

During the experimental period, higher temperatures were recorded, both in the winter months and in the spring and summer months.

Thus, in December there was a deviation from the average of +1.2°C, in January -1.6°C, in February +1.6°C, in March +1.3°C, April +2.2°C, May +1.6°C, and in July and August +2.1°C and +2.7°C.

Precipitation

The average multiannual precipitation (as an average over 34 years) records an average value of 798 mm, being distributed somewhat evenly during the vegetation period 56.9-65.7 mm in the winter months, 47.1 to 89.2 mm in the spring months, 72.1-98.7 mm in the summer months and 48.4-69.0 mm in the autumn months.

During the experimental period, the average annual precipitation was only 746.5 mm, 51.5 mm lower than the multiannual average.

Soil

To identify the type of soil on which the experiments were located, two soil profiles were carried out: one at the top of the slope, and the second at the bottom of the slope. The experiments were located on the luvisol from the Experimental Center for Culture of

grasslands Preajba - Gorj County, with a slope of 5% containing 9 variants in 5 repetitions.

Experiment scheme

Each experimental plot had the dimensions of 4/25 m, and the surface of 100 m².

In order to avoid the influence of leaks from one plot to another, each plot was delimited on all its sides using plastic plates that were inserted into the ground at a depth of 100 cm.

In the downstream part of the plot, a system was built to collect leaks from each plot consisting of a concrete triangle ending with a collector tube, which drains into a collection vessel. At the end of the collector tube, a sheet metal divider with a row of 7 holes was installed, each hole being divided into 7 other parts in such a way that the collected leak represents only the 49th part of the total amount of liquid and solid leaks from the 100 m²plot.

To determine the level of nutrient supply, soil samples were taken from the upstream and downstream of the standard plots for nutrient leakage control. The following methodology was used to characterize soil resources (Methodology for Elaboration of Pedological Studies, 1987):

- soil reaction (pH), potentiometric method with a glass-calomel electrode pair, in aqueous suspension, determined at a soil-water ratio of 1:2.5 (STAS 7184/13-88);
- determination of mineral forms of nitrogen (N-NO₃), using ion-selective electrodes;
- mobile phosphorus (P_{AL}) and mobile potassium (K_{AL}), Egner-Riehm-Domingo method, in ammonium acetate lactate extract at pH 3.7 (STAS 7184/19-82, Soils);

To determine nutrient losses, water samples were taken from each standard plot, and for its qualitative characterization the following methodology was used:

- pH - potentiometric with a mixed glass-calomel electrode;
- ammoniacal nitrogen - colorimetric with Nessler reagent;
- nitric nitrogen - colorimetric with phenol 2-4 disulfonic acid;
- phosphorus - colorimetric as molybdenum blue;
- potassium - photometric in flame;

The scheme of the leak collection installations is presented in Figures 1 - 4.



Figure 1 Solid and liquid spill collection system (Source: PENSOL Project)



Figure 2 Unfertilized and corn-fertilized variants (Source: PENSOL Project)



Figure 3 Fertilized and unfertilized variants of sown meadows (Source: PENSOL Project)



Figure 4 Fertilized and unfertilized variants of natural grassland (Source: PENSOL Project)

RESULTS AND DISCUSSIONS

The level of production obtained in the Preajba experimental center, Gorj

The hay production obtained in the natural meadow is shown in Table 1. As can be seen from the data in this table, the hay production in the natural meadow during the experiments varied between 1,480-4,000 kg/ha.

In the unfertilized control, the hay production was very low, 1480 kg/ha.

The application of chemical fertilizers leads to significant increases in hay production in this meadow, with production doubling or even tripling. Thus, as a result of the application of the dose of N_{138} (urea), the hay production reaches 3,080 kg/ha with an increase of 1,600 kg/ha, respectively 108%.

The mixed application of nitrogen, phosphorus and potassium fertilizers in the dose of $N_{162}P_{81}K_{100}$ the hay production obtained reaches the highest value of kg hay/ha with a production increase of 2,520 kg/ha or 170%, so the production is 2.7 times higher than in the unfertilized control. The production increases are very significant, being statistically assured.

Table 1
Hay production from the natural meadow obtained in Preajba, Gorj (PENSOL Project)

Variant	Hay production, kg/ha	Relative production, %	Difference, kg/ha	Significance
Unfertilized control	1,480	100	-	-
N_{138}	3,080	208	1,600	xxx
$N_{162}P_{81}K_{100}$	4,000	270	2,520	xxx

LSD 5% = 744 kg/ha

LSD 1% = 1,049 kg/ha

LSD 0.1% = 1,428 kg/ha

In the sown meadow, the yields obtained depending on the doses of fertilizers used are listed in Table 2.

According to the data in this table, hay production increased significantly as a result of the use of different doses of fertilizers.

In the unfertilized control, hay production was quite low, 1,440 kg/ha. The application of fertilizers in the form of urea at a dose of N_{138} led to an increase in production to 3,440 kg/ha, being 2,000 kg/ha higher than in the unfertilized control, respectively with a production increase of 138%.

The application of fertilizers with nitrogen, phosphorus and potassium led to the

highest production of 4,374 kg/ha, a higher production by 2,934 kg/ha higher than the unfertilized control, respectively with a production increase of 204%.

Table 2
Hay production obtained in plots with sown meadow in Preajba, Gorj (PENSOL Project)

Variant	Hay production, kg/ha	Relative production, %	Difference, kg/ha	Significance
Unfertilized control	1,440	100	-	-
N ₁₃₈	3,440	238	2,000	xxx
N ₁₆₂ P ₈₁ K ₁₀₀	4,374	304	2,934	xxx

LSD 5% = 810 kg/ha
LSD 1% = 1,140 kg/ha
LSD 0.1% = 1,600 kg/ha

In corn cultivation, applied fertilizers played an essential role in increasing production per ha (Table 3), in some manner as for hay production.

Table 3
Corn production obtained under the influence of different fertilizer doses in Preajba, Gorj (PENSOL Project)

Variant	Production, kg/ha	Relative production, %	Difference, kg/ha	Significance
Unfertilized control	1,081	100	-	-
N ₁₃₈	1,762	163	681	x
N ₁₆₂ P ₈₁ K ₁₀₀	3,265	302	2,184	xxx

LSD 5% = 646 kg/ha
LSD 1% = 912 kg/ha
LSD 0.1% = 1,253 kg/ha

The data show that corn production increased with increasing fertilizer doses. In the unfertilized control, the corn production was 1,081 kg/ha. The application of the dose of N₁₃₈ in the form of urea increased the production to 1,762 kg/ha, obtaining a higher production by 681 kg/ha and a production increase of 63%. This increase is significant.

The dose of N₁₆₂P₈₁K₁₀₀ determined the highest corn production per hectare 3,265 kg. In this situation, the production obtained is 2,184 kg higher than the unfertilized control, obtaining a production increase of 202%, the production increase being 3.03 times higher than in the unfertilized control.

These significant effect on fertilization yields show that the soil has small reserves of nutrients to support production.

Total volume of liquid and solid leakages during the experimental period (June-October)

Monthly, 49th part of the water drained from the plot and the soil carried by it was collected in the collection vessels. The volume of water collected was filtered in the laboratory, retaining the soil carried by the water that flowed down the slope or the eroded soil on the filter pad. This was weighed in the laboratory (after drying at 105°C) and the soil loss per plot was determined and then reported per hectare.

Summing the values in the values from each month of observation, we obtain the total value of leakages during the observation period June-October. These are recorded in Table 4.

Table 4
Total volume of liquid and solid waste from Preajba, Gorj (PENSOL Project)

Variant	Liquid runoff		Solid runoff		Precipitation
	Liters/plot	m ³ /ha	g/plot	t/ha	
Corn-NPK	23.70	4.74	168.00	0.31	June– 64.2 mm July – 50.8 mm August – 41.1 mm September– 0 mm October – 46.5 mm Total 202.6 mm
Corn-N	18.39	3.68	159.95	0.30	
Corn-unfertilized control	17.11	3.43	159.50	0.30	
Natural meadow-NPK	13.38	2.68	85.20	0.20	
Natural meadow-N	9.39	1.88	88.70	0.21	
Natural meadow-unfertilized control	10.28	3.94	89.85	0.22	
Sown meadow-NPK	10.45	2.09	86.80	0.20	
Sown meadow-N	9.85	1.96	89.35	0.21	
Sown meadow-unfertilized control	12.26	2.46	85.75	0.21	

It can be seen from the data contained in this table that the volume of precipitation in 4

months of observation was 202.6 mm, 2,026 m³/ha.

From this volume of water, an amount of 1.96-4.74 m³/ha flowed down the slope. The highest liquid runoff is found in the variants cultivated with corn 3.43-4.74 m³/ha and the lowest 1.96-2.46 m³/ha in the variants with sown meadows.

Total soil losses during the observation period are between 0.20-0.31 t/ha, lower in the natural and sown meadows and higher under the corn crop.

The doses of fertilizers used did not directly influence the liquid or solid runoff.

Soil analyses at the end of the vegetation period

In the experimental variants, soil analyses were carried out at two points at a depth of 0-20 cm, the top of the slope and the base of the slope. The results obtained are listed in Table 5.

Analyzing the data contained in this table, it results that the agrochemical nitric nitrogen indicator NO₃⁻ had quite low values, considering two aspects, namely: the nitric nitrogen in the soil due to the temperature and its leaching from the soil up to this date is low, the nitrification processes being slow and secondly, the plants consumed the nitric nitrogen from the superficial horizon.

Higher values of this indicator are found in the variant sown with corn and fertilized with nitrogen and NPK, 18 and 9.6 ppm respectively.

Otherwise, in the other variants, the NO₃⁻ content is below 5 ppm, somewhat higher values being found where nitrogen and NPK were fertilized.

Thus, in the sown meadow variant fertilized with N at the top of the slope there is a low content of 2.8 ppm, and at the base of the slope the content is high 4.0 ppm, which occurs in almost all the variants tested.

The soil reaction is strongly acidic, moderately acidic and weakly acidic, the pH varying from 4.43 to 5.99. It is usually noted that at the top of the slope, the pH is lower, and at the base of the slope it is higher, which shows that the soil is washed on the upper horizon and brought to the base of the slope. Thus, in the sown meadow fertilized with nitrogen, the pH value is, at the top of the slope, 4.43 and at the base of the slope, 5.51.

The phosphorus content in the experimental variants has values ranging from 3.64 to 13.01 ppm, being usually higher at the top of the slope, which shows that it is less soluble and is less carried away by liquid runoff.

In the variants fertilized with NPK, a higher content of mobile phosphorus in the soil is found.

The potassium content was influenced primarily by the doses of potassium fertilizers applied, increasing in all variants where it was applied in the form of potassium sulfate.

Thus, in corn, in the variants where NPK was applied, the potassium content is 248 and 377 ppm, while in the unfertilized corn control, the potassium content is 98-154 ppm.

In the natural meadow in the NPK-fertilized version, the potassium content is 162-265 ppm, while in the unfertilized natural meadow, the potassium content is 161-198 ppm. It is also noted in all variants that the potassium content is higher at the base of the slope than at the top of the slope, which proves that it dissolves and drains with the water from precipitation.

Table 5
The main agrochemical indicators of the soil at the end of the growing season (PENSOL Project)

Variant	Specification	NO ₃ ⁻ ppm	pH H ₂ O	P ppm	K ppm
Corn-NPK	Base of the slope	4.2	4.97	9.88	377
	Top of the slope	9.6	5.06	9.88	248
Corn-N	Base of the slope	3.6	5.19	9.36	190
	Top of the slope	18.2	5.22	10.92	168
Corn-unfertilized control	Base of the slope	2.3	6.05	5.72	154
	Top of the slope	1.2	5.88	7.80	198
Natural meadow-NPK	Base of the slope	4.8	5.76	3.64	265
	Top of the slope	3.1	5.51	8.32	172
Natural meadow-N	Base of the slope	4.4	6.12	4.16	80
	Top of the slope	3.6	5.99	7.54	198
Natural meadow-unfertilized control	Base of the slope	1.8	5.95	8.06	161
	Top of the slope	1.1	5.60	13.05	144
Sown meadow-NPK	Base of the slope	3.8	5.38	9.36	106
	Top of the slope	2.6	6.13	7.28	120
Sown meadow-N	Base of the slope	4.0	5.51	5.20	106
	Top of the slope	2.8	4.43	7.29	100
Sown meadow-unfertilized control	Base of the slope	2.1	5.93	7.05	48
	Top of the slope	1.3	5.83	7.25	50

Analysis of water runoff

In June and July, the waters collected as a result of the runoff of precipitation falling on the slope of the land in all 9 experimental

variants were also analyzed. The results obtained are presented in tables 6 and 7. From the analysis of the data obtained, it can be seen that there is a tendency for the nutrient content in the runoff waters to increase, in the corn crop and sown meadow, in the variants fertilized on the ground, while in the case of the variant kept as natural meadow, the highest nutrient contents are recorded in the control variant.

For the months of August and October, the results obtained are presented in tables 8-9.

Analyzing the macronutrient content of the waters drained on the slope in the experimental variants in August, the following was highlighted:

Table 6
Nutrient content of June water runoff (PENSOL Project)

Variant	pH	NO ₃ ppm	K ppm	P ppm
Corn-NPK	5.52	15.00	12.90	2.51
Corn-N	6.48	4.30	13.20	5.80
Corn-unfertilized control	6.06	3.70	5.90	3.43
Natural meadow-NPK	5.57	10.00	4.30	3.52
Natural meadow-N	6.58	9.00	4.80	4.90
Natural meadow-unfertilized control	5.33	10.00	8.30	5.15
Sown meadow-NPK	5.96	8.00	9.20	3.80
Sown meadow-N	5.76	19.00	6.80	3.32
Sown meadow-unfertilized control	6.21	8.00	8.30	6.32

Table 7
Nutrient content of July water runoff (PENSOL Project)

Variant	pH	NH ₄ ppm	NO ₃ ppm	K ppm	P ppm
Corn-NPK	6.61	12.72	0.14	10.30	14.41
Corn-N	6.58	11.52	0.14	9.60	131.20
Corn-unfertilized control	6.39	14.56	0.13	5.80	59.47
Natural meadow-NPK	5.45	1.82	0.18	3.60	14.41
Natural meadow-N	6.52	3.64	0.17	5.08	14.41
Natural meadow-unfertilized control	4.82	5.46	0.20	8.08	37.51
Sown meadow-NPK	6.12	3.64	0.17	4.08	1.79
Sown meadow-N	6.59	13.95	0.14	7.90	45.89
Sown meadow-unfertilized control	4.74	1.21	0.16	3.42	1.79

Table 8
Nutrient content of August water runoff (PENSOL Project)

Variant	pH	NH ₄ ppm	NO ₃ ppm	K ppm	P ppm
Corn-NPK	6.38	-	0.13	6.08	5.98
Corn-N	6.37	14.56	0.13	4.75	10.22
Corn-unfertilized	6.28	7.28	0.13	3.25	10.22

control					
Natural meadow-NPK	6.83	-	0.13	2.30	1.79
Natural meadow-N	6.13	7.88	0.12	3.50	3.89
Natural meadow-unfertilized control	5.94	3.03	0.16	3.80	3.89
Sown meadow-NPK	6.32	7.88	0.12	2.75	5.98
Sown meadow-N	6.35	-	0.13	4.20	20.74
Sown meadow-unfertilized control	6.35	2.43	0.12	1.80	20.74

- the pH of the drainage waters is weakly acidic and neutral, the weakly acidic reaction is recorded in the waters that drained from the variants with a high dose of chemical fertilizers for corn, respectively N₁₆₂P₈₁K₁₀₀ - pH=6.28; natural meadow N₁₆₂P₈₁K₁₀₀ - pH=6.21.

- the nitric nitrogen content in the drainage waters on the slope is high in the variants that were fertilized with N₁₆₂P₈₁K₁₀₀ and N₁₃₈.

Thus, in corn fertilized with N₁₆₂P₈₁K₁₀₀ and corn fertilized with N₁₃₈, the collected waters contain 12 and 10 ppm NO₃, and in natural meadow fertilized with N₁₆₂P₈₁K₁₀₀ and N₁₃₈, the nitrate content of the waters is 13 and 6 ppm.

However, there is an exception in natural meadow, the control variant where the runoff water contained 42 ppm NO₃.

The potassium content in August runoff is usually higher in the variants fertilized with N₁₆₂P₈₁K₁₀₀, both in corn and in the natural sown meadow but also where potassium fertilizers were not applied, which proves that potassium consumption is lower in these crops and due to its solubility, it is entrained in the runoff.

Phosphorus is also entrained in the runoff but in smaller quantities than potassium, 0.73-7.14 ppm, higher values being recorded where phosphorus fertilizers were applied.

In October, the analysis of the collected waters (Table 9) highlights a decrease in the pH value to 5.52 - 6.58, weakly acidic reaction, compared to weakly acidic and neutral in August.

The nitrate content recorded almost the same values as in August, however, being higher in the variants in which N₁₆₂P₈₁K₁₀₀ and N₁₃₈ were applied.

Potassium was also entrained in the runoff waters in quantities of 4.8 - 12.9 ppm, values somewhat lower than in August.

Phosphorus accumulated in the runoff waters this month in quantities almost

equivalent to that accumulated in August, but these quantities are lower than those of potassium.

Table 9

**Nutrient content of October water runoff
(PENSOL Project)**

Variant	pH	NO ₃ ⁻ ppm	K ppm	P ppm
Corn-NPK	6.28	12.00	7.00	2.22
Corn-N	7.37	16.00	18.20	4.42
Corn-unfertilized control	6.72	5.00	3.70	4.02
Natural meadow-NPK	6.21	6.00	0.80	0.73
Natural meadow-N	7.26	13.00	8.70	4.70
Natural meadow-unfertilized control	6.25	41.00	4.20	3.46
Sown meadow-NPK	7.48	7.00	10.60	7.14
Sown meadow-N	7.16	4.00	12.60	6.35
Sown meadow-unfertilized control	6.49	32.00	3.50	4.48

From the data it can be seen that the runoff P is always lowest where NPK is added and the yield is highest for corn. The same is true for grassland, with one exception.

Based on the presented data obtained in the experiments at the Experimental Center for Meadow Culture Preajba – Gorj, it can be stated that on the luvisol here located on a 5% slope, the losses of soil and nutrients are evident.

The nutrients NO₃⁻, PO₄⁻³ and K⁺ are found both in the collected eroded soil and in the water runoff, with higher losses being recorded for NO₃⁻ and K⁺ and lower for phosphorus.

CONCLUSIONS

The application of nitrogen, phosphorus and potassium fertilizers determined statistically assured production increases in natural grassland, sown grassland and corn, compared to the unfertilized control.

During the observation period, total soil losses are between 0.20-0.31 t/ha, lower in the natural and sown meadows and higher under the corn crop, and the doses of fertilizers used did not directly influence the liquid or solid runoff.

Due to the high level of production ensured by the application of fertilizers, the rate of carbon fixation by vegetation increases.

In this case, fertilizing the soil to achieve a high yield also reduces the runoff P.

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REFERENCES

- Bechmann, M., G. Blicher-Mathiesen, K. Kyllmar, Iital, A., Lagzdins, A., Salo, T., 2014. Nitrogen application, balances and their effect on water quality in small catchments in the Nordic-Baltic countries. *Agriculture, Ecosystems & Environment*.
<https://doi.org/10.1016/j.agee.2014.04.004>.
- Chereji, A.I., Maerescu, C.M., Chereji, I.Jr., Chiurciu, I.A., Țuțui, D., Dana, D., 2022. Digital transformation in the agricultural field in the context of the new CAP 2023-2027, developments and perspectives, *Annals of the University of Oradea, Fascicle: Ecotoxicology, Animal Science and Food Science and Technology*, 2022, pp. 41 - 47, http://protmed.uoradea.ro/facultate/publicatii/ecotox_zooteh_ind_alim/2022B/Agri/07.%20Chereji%20OA.%201.pdf.
- Chiurciu, I.A., Dana, D., Chereji, A.I., Chereji, I.Jr., Voicu, V., Firațoiu A.R., 2022. Research on soil and nutrient losses through liquid runoff, in order to mitigate the climate risks to which Romania is exposed, in the context of CAP, *Earth*, 3, pp. 639–651. <https://doi.org/10.3390/earth3020037>.
- Chiurciu, I.A., Dana, D., Voicu, V., Chereji, I.Jr., Firațoiu, A.R., 2023. Characterization of the Chromic Luvisols profile from SC AGROTEHNIC SRL, Paulesti, Prahova, *Annales of the University of Craiova, series Agriculture - Mountainology - Cadastre (Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series)* Vol. 53/1/2023, pp. 340-344, <https://anale.agro-craiova.ro/index.php/aamc/article/view/1495>.
- Chiurciu, I.A., Dana, D., Krogstad, T., Chereji, A.I., Voicu, V., Firațoiu A.R., 2024. Study on nutrient losses in the standard erosion control plots from Preajba experimental point, Gorj, *Annales of the University of Craiova, series Agriculture - Mountainology - Cadastre (Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series)* Vol. 54/1/2024, pp. 355-359, <https://anale.agro-craiova.ro/index.php/aamc/article/view/1577/1492>
- Dana, D., Chiurciu, I.A., Krogstad, T., Chereji, A.I., Voicu, V., 2024. The impact of nutrient losses from agriculture on environment. Case study in VALEA ȚĂRNII, PERIENI, VASLUI COUNTY, *Annals of the University of Oradea, Fascicle: Ecotoxicology, Animal Science and Food Science and Technology*, 2024, pp. 30-35, https://protmed.uoradea.ro/nou/images/Publicatii/Ecotox/2024B/06._Dana.pdf.
- Dana, D., Tudor, M., Krogstad, T., Calin, A. M., Cegan, I. C., Dumitra, C.V.M., Fieraru, T.M., 2025. Characterization of the stagnant albic luvisol from the Preajba-Gorj experimental center, *Annals of the University of Oradea, Fascicle: Ecotoxicology, Animal Science and Food Science and Technology*, 2025, pp. 75-79, <https://share.google/d38MQhZtfoaDeXPoR>.
- Hilton, R.G., West, A.J., 2020. Mountains, erosion, and the carbon cycle, *Nature Reviews Earth &*

-
- Environment, 1 (6), 284–299,
<https://doi.org/10.1038/s43017-020-0058-6>.
- Houghton, R.A., 2003. Why are estimates of the terrestrial carbon balance so different? *Global Change Biology*, 9 (4), 500–509.
<https://doi.org/10.1046/j.1365-486.2003.00620.x>
- Lal, R., 2004a. Soil carbon sequestration impacts on global climate change and food security, *Science*, 304 (5677), 1623–1627,
<https://doi.org/10.1126/science.1097396>.
- Rosegrant, M.W., Ringler, C., Zhu, T., Tokgoz, S., Bhandary, P., 2013. Water and food in the bioeconomy, Challenges and opportunities for development. *Agricultural Economics* 44:139–150. <https://doi.org/10.1111/agec.12058>.
- Ruosteenoja, K., Raïsañnen, J., Pirinen, P., 2011. Projected changes in thermal seasons and the growing season in Finland. *International Journal of Climatology* 31: 1473–1487.
- Voicu, V., Chiurciu, I.A., Dana, D., Plopeanu, G., Filiche, E., Dodocioiu, A.M., 2022. Research on surface runoff for different crops in the Preajba experimental centre, Gorj county, *Journal of Environmental Protection and Ecology*, vol. 23, no. 6, Pages: 2360-2369, Printed by SciBulCom Ltd. (ISSN 1311-5065), WOS:000892174900011.
- Zheng, H., Miao, C., Huntingford, C., Tarolli, P., Li, D., Panagos, P., Yue, Y., Borrelli, P., Kristof Van Oost, V.K., 2025. The impact of erosion on the carbon cycle, *Advancing Earth and Spaces Sciences*, <https://doi.org/10.1029/2023RG000829>
- ***Methodology for Elaboration of Pedological Studies, 1987, Vol. I, II, III, I.C.P.A. Coordinating editors: Florea, N., Bălăceanu, V., Răuță, C., Canarache A., Ed. Propaganda and Agricultural Technical Editorial Office, Bucharest pp. 226.
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