

# **Research on the Influence of Soil Structure and Amendments on Surface Water Quality from Cervenía Village, Teleorman County**

**Dana Popa<sup>1</sup>, Victoria Niculescu<sup>2</sup>, Cristiana Diaconescu<sup>1</sup>, Livia Vidu<sup>1</sup>, Răzvan Popa<sup>1</sup>,  
Marius Maftel<sup>1</sup>, Nicoleta Işfan<sup>1</sup>, Carmen Nicolae<sup>1</sup>**

<sup>1</sup> *University of Agricultural Sciences and Veterinary Medicine Bucharest, 011464, Marasti Blv. No. 59, Romania*

<sup>2</sup> *Soil and Agrochemical Studies Office Teleorman, 140002, Dunarii street, no.2, Romania*

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## **Abstract**

This study is part of a research project on the influence of agro-livestock activities on surface water quality in Teleorman County. The paper presents structure, quality and measures to prevent and combat soil erosion in relation to agro-livestock activities in this area. The research has been done in the whole locality, and took soil samples to determine the type and soil texture and soil supply status with major nutrients (N, P, K). Based on these results and knowing the soil amendments at Cervenía village level, recommendations were made about avoiding the risks of pollution of surface water by nitrates from agricultural and livestock activities.

**Keywords:** amendments, soil structure, surface water.

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## **1. Introduction**

Town territory falls within the geographical unity of the Romanian Plain, Plain Burnazului subdivision. The mapped area was delineated following geomorphological units: the high plain, river terrace saw, saw the river floodplain. In this area, groundwater occurs at depths of 25-30 m on the plain, and alluvial terrace and the close values at depths of 16-20 m or 0.50 to 5.0 m. In terms of heat, the average annual temperature is 10.5<sup>0</sup>C. Average monthly temperatures have gone upward since January (the coldest) when the lowest temperatures recorded by July saw an annual average of 22.1<sup>0</sup>C. Average annual values, are starting to fall again in December reached 0.4<sup>0</sup>C in February to 0.0<sup>0</sup>C.

## **2. Materials and methods**

From the official statistics of the Directorate registers Agricultural District, were taken the dates to determine the proportion for each category of land use in the village Cervenía.

Labs for Soil and Agrochemical Studies Office Teleorman, determine the type of soil and arable land area appropriate for the village. Studies focused on determining the level of soil nutrient supply (supply at high, medium or low). Determination of nitrogen supply was made by Kjeldahl method, determining the level of phosphorus supply was made by extracting it with a solution of ammonium acetate-lactate at pH 3.7, and determined by spectrophotometric method as molybdenum blue. To determine the level of potassium supply, extract using the same solution was used to extract phosphorus, but potassium was dosed with flame photometry.

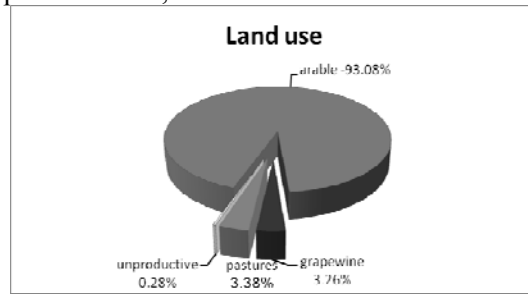
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\* Corresponding author: Popa Dana, Email: [danasandulescu@yahoo.com](mailto:danasandulescu@yahoo.com)

**3. Results and discussion**

In the areas mapped land use is as follows (figure 1.): arable - 4108, 47 - ha grapewine - 143, 75 ha

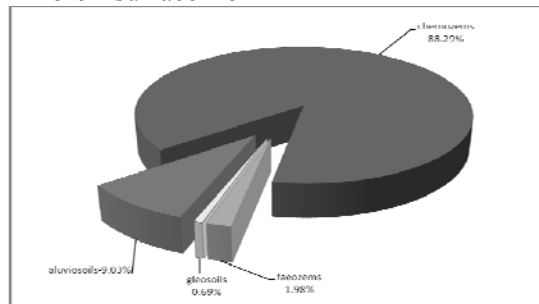
grassland - 149, 32 - ha total agricultural - 4401, 54 ha unproductive - 12, 46 - ha, total - 4414, 00 ha.



**Figure 1.** Land use (%)

In the figure 2 are presented the types of agricultural land soils. The faozem and chernozem type have the more surface of

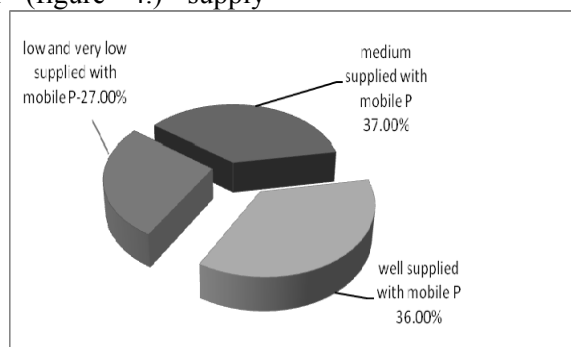
agricultural land (3897.33 ha and 398.62 ha, respectively).



**Figure 2.** Types evidence of agricultural land soils (%)

Status of soil phosphorus (figure 3.) supply digestible (P Mobile) - is considered very weak and poorly supplied 27% of the area (1192 ha), medium in 37% of the area (1633 ha) and well and very well stocked on 36% of area (1589 ha). Status of soil potassium (figure 4.) supply

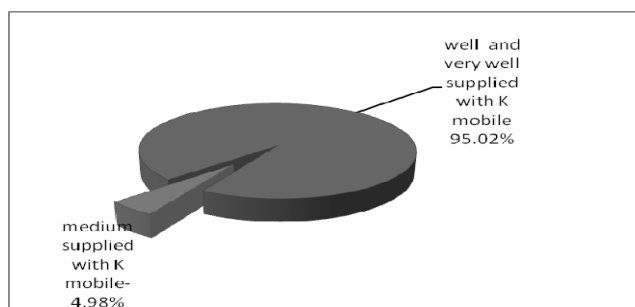
digestible (K cell) - considered the middle of the area supplied by 5% (220 ha) and well and very well supplied with potassium on 95% of the area (4194 ha).



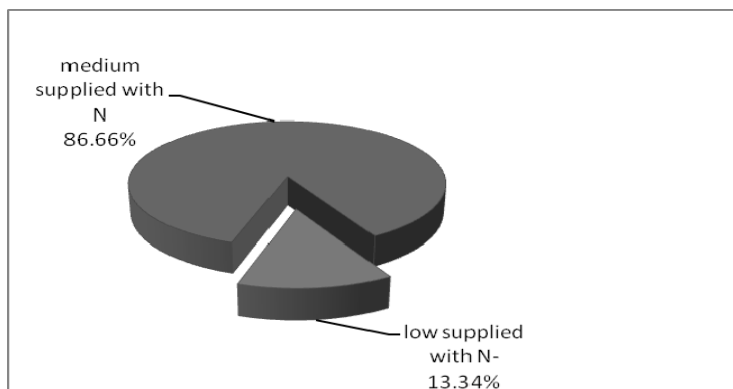
**Figure 3.** Ground-state supply of assimilable phosphoru

Nitric natural fertility status (figure 5) - assessed using indices of nitrogen, which were obtained by correlating the degree of humus content in base

saturation [1] is considered low on the 13% of the area (589 ha) and average supplied 87% of the surface ( 3825 ha).



**Figure 4.** Ground-state supply of assimilable potassium



**Figure 5.** Nitric natural fertility status

The location field is in an area with average annual temperature of 10.5<sup>0</sup> C and average rainfall of 575 mm, distributed unevenly throughout the year. Groundwater varies from 0.50 m to 5.00 m in floodplain, terrace fields and reaching depths of 10.1 m.

The content of mobile phosphorus is considered very weak and poorly supplied 27% of the area (1192 ha), medium in 37% of the area (1633 ha) and very well stocked and well on 36% of the area (1589 ha).

Mobile potassium content is considered medium supplied to 5% of the area (220 ha) and well and very well supplied with potassium on 95% of the area (4194 ha).

Nitrogen content is considered low on the 13% of the area (589 ha) and average supplied 87% of the area (3825 ha).

Compared to the above, given the peculiarity of the landscape and the main physico-chemical properties of soil pedogenesis process generated by the particularities of these restrictive elements that affect the production potential soil coverage is imposed following ameliorative measures including amendment to calcium, fertilization ameliorative, scarification [2].

Amendment of the calculation is all work and optimization of reaction condition acidic soil base saturation to obtain the highest yields, maximum efficiency in terms of maintenance and continuous enhancement of soil fertility. Amendment not made, nor is it advisable to carry out the work alone but in complex with other works such as organic and mineral fertilization.

Ameliorative fertilization - is an agricultural soil improvement work to be carried out in order to restore, maintain and increase production capacity of soils that have suffered natural or anthropogenic degradation processes of fertility.

Aerohidric scarification involves correcting the characteristics of the soil to eliminate the limited nature of agricultural production. The job means loosening deep, all agricultural work aimed at increasing the area of incomplete soil horizons.

In the table 1 are summarizes the categories of farm animals exploited and the amount of nutrients which they produce annually. To obtain annual nutrient content were used the literature data's for daily average nutrient content [3].

From the data presented in table 1, notice that for Cervenja village was obtained 40,734 tonnes of N/year; 9,0625 tonnes P/year and 27,742 tonnes K/year.

**Table 1.** Annual nutrient content depending on the category of farm animals exploited [3]

Category of farm animal exploited	No. of farm animals	Weight (kg)	Annual nutrient content (kg/year/farm animal category)		
			N	P	K
Cows+heifers	190	250-400	10450	3800	8170
Calves 0-6 months	108	50-150	8748	1620	5832
Donkeys	60	50-200	2700	480	1680
Horses	2	450	90	16	56
Sheep	1300	45-70	9100	1300	6500
Goats	830	45-50	5810	830	4150
Sows	10	120-170	380	130	250
Hens	7150	1-2	2574	500.5	715
Turkeys	1300	3-5	468	234	234
Gees	650	4-6	234	117	65
Duks	500	2-3	180	35	90
<b>TOTAL</b>			<b>40734</b>	<b>9062.5</b>	<b>27742</b>

Knowing the total arable land that could be fertilized with manure from animals of economic interest, we conclude that these amounts of nutrients from livestock manure is not enough for fertilization. For example, in the case of nitrogen, if it is fertilized with 170 kg N/ha, the amount of nitrogen we would get to 195.68 ha, when the surface with low intake of nitrogen is 589 ha. On the other hand, the amounts of nutrients in table 1,

are calculated for the fresh manure, which can not be applied as such in the field.

We know that through composting, to lose a significant percentage of nitrogen, due to fermentative processes occurring in manure mass [4]. The results of chemical analyze for surface water samples from determine area, are presented in table 2, before and after amendments application.

**Table 2.** The chemical analyze results for water samples

Surface water sample	Before amendments application					After amendments application				
	N-NH <sub>4</sub>	N-NO <sub>3</sub>	N-NO <sub>2</sub>	N <sub>inorg</sub>	P	N-NH <sub>4</sub>	N-NO <sub>3</sub>	N-NO <sub>2</sub>	N <sub>inorg</sub>	P
	mg/l					mg/l				
1	0.38	45.7	0.082	46.162	0.12	0.47	45.9	0.084	46.454	0.13
2	0.41	50.8	0.086	51.296	0.13	0.41	52.0	0.091	52.501	0.13
3	0.54	52.4	0.091	53.031	0.11	0.56	54.2	0.094	54.854	0.11
4	0.54	55.6	0.086	56.226	0.21	0.54	56.1	0.090	56.73	0.20
5	0.50	53.3	0.087	53.887	0.14	0.52	55.8	0.090	56.41	0.15
6	0.52	56.9	0.089	57.509	0.10	0.54	57.5	0.093	58.133	0.09
7	0.50	49.5	0.078	50.078	0.94	0.49	50.7	0.082	51.272	0.97
8	0.49	47.2	0.066	47.756	0.20	0.51	51.4	0.075	51.985	0.19
9	0.47	43.9	0.072	44.442	0.19	0.49	49.9	0.084	50.474	0.20
10	0.31	48.1	0.064	48.474	0.14	0.39	49.4	0.074	49.864	0.15
11	0.38	44.6	0.063	45.043	0.10	0.41	44.6	0.071	45.081	0.08
12	0.41	46.7	0.058	47.168	0.16	0.43	48.5	0.068	48.998	0.15
13	0.40	51.9	0.081	52.381	0.12	0.42	52.1	0.087	52.607	0.11
14	0.44	51.3	0.049	51.789	0.11	0.47	52.4	0.064	52.934	0.09

The analysis of surface water samples, there is a noticeable increase in the concentration of ions analyzed after application of amendments, in the case of nitrogen, phosphorus and if differences are not noticeable at first glance. The data obtained

were compared with maximum allowable concentrations: 0.5 mg/l N-NH<sub>4</sub>, 50 mg/l NO<sub>3</sub>-N, and 0.02 mg/ l for N-NO<sub>2</sub> and 0.2 mg /l for phosphorus [3]. Maximum allowable concentrations for ammonium ion are outdated in

three collection points before applying the amendments and five points in the harvest after application of amendments. In both samplings, the concentration is above the maximum allowable nitrite, and phosphorus in normal concentrations.

In all cases, Student test was applied for testing significance of differences in ion concentrations before and after application of amendments (table 3).

**Table 3.** Results of Student test for comparison for analyzed ions concentration before and after amendments application

Specification	N-NH <sub>4</sub>	N-NO <sub>3</sub>	N-NO <sub>2</sub>	N <sub>inorg</sub>	P
T calculated	1.0786 <sup>NS</sup>	0.1047 <sup>NS</sup>	1.5446 <sup>NS</sup>	1.1140 <sup>NS</sup>	0.0171 <sup>NS</sup>
T table to $\alpha=0,05$ (26 FD)	2,056				
T table to $\alpha=0,01$ (26 FD)	2,779				

The analysis of Student test results, it is apparent that there aren't significant differences in concentration of ammonium ions, nitrite, nitrate and phosphorus in surface waters after application of amendments. This can be explained by the accuracy of their application or by applying them only in certain areas, which have been in local government (not the private property). However, exceeding the concentration of nitrate in surface waters at the commune level advertising mapped close monitoring of the area, both in terms of soil fertilization, and application of amendments.

#### 4. Conclusions

Moisture deficit in recent years, due to a reduced rainfall had a negative effect on land productivity directly influences pedogenesis processes occurring in soils, mainly by altering the sense of soil moisture regime.

In soils without groundwater input is where the mapped area, during the drought atmospheric place significant weight reduction in the liquid phase of soil mass, which leads to slowing or termination in most cases of physical, biological and biochemical soil. Territory belonging to the village is filled with fine-textured soils in general and rough tamped and compacted artificially (by executing the same deep plowing) requires scarification work, executed in complex with the application of ameliorative fertilization. It also requires the application of agrophytotechnical measures, such as monoculture and the rigorous exclusion of culture technologies [5].

From a functional perspective, deep loosening causes a more rapid deployment and better soil aeration, a shift in the chemical processes taking place in conditions of compaction. Carried out under optimal conditions, deep loosening, is able to determine for a period of 4-6 years, 7-8 years, sometimes a structural shift in position to

eliminate the drawbacks caused by compaction and compaction. Following the merger and expansion of their agricultural land in lowland areas that have caused the reduction of spontaneous vegetation, with adverse effects on biodiversity and the balance of agroecosystems (depopulation of earthworms and soil dramatic increase of attacks by rodents, insects and fungi). Lack of agrochemical studies led to unwise application of chemical fertilizers and organic, having adverse effects on soils and surface water quality.

#### Acknowledgements

This work was cofinanced from the European Social Fund through Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/89/1.5/S/63258 "Postdoctoral school for zootechnical biodiversity and food biotechnology based on the eco-economy and the bio-economy required by eco-san-genesis"

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