

ASSESSMENT OF THE ECOLOGICAL SITUATION AND THE STATE OF THE DRINKING WATER QUALITY IN RURAL AREAS OF THE DNIESTER RIVER BASIN

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Key words: rural areas, drinking water, ecological stability, anthropic impact, animal wastes.

Abstract. This work represents an interdisciplinary study about the research of the drinking water quality opposite to the general ecological situation of the rural area, the agricultural degree of land utilization (plowing degree), the index of the ecological balance, degree of afforestation, degree of erosion, and the natural compounds of ecological stability of the territory. A special attention has been paid to the identification of the local sources of pollution of the ground waters, animal wastes, calculation of their volumes, highlighting of the dangerous chemical components that exceed maximum admissible concentrations for drinking water provided by the standards and regulations in force in Republic of Moldova. As a local object of reference the village of Lencauti, Ocnita County was investigated. The studies have shown that the quality of water from the wells is directly dependent on the anthropic sources of pollution, the volume of the animal wastes from the rural area, and is significantly influenced by the erosion degree and the general ecological stability of the grounds.

Introduction

The situation of the environment compounds has a direct influence on the population's life quality and health. The impact of the anthropic activities over the natural ecosystems causes their imbalance that may lead to irreversible changes.

The reform of all the branches in the national economy imposes the necessity of a change of attitude towards the use of natural resources, of promotion of a durable economical and social development. The research of the quality of the drinking water as a resource and a component of the environment compared to the ecological situation and factors of anthropogen impact is actual in the framework of the priorities of ecological security in the rural area. The population's health and sanitary-epidemiologic level depends on the quality and quantity of drinking water,

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as well as on its permanent monitoring. To know the situation in the villages and also to explain the causes of phreatic waters pollution that undoubtedly has an emphasized anthropic and an intersystemic character is a topical subject. It is known that water quality is mainly dependent on the sources of anthropic pollution and especially on the household, animal, production waste etc. (Andries, 2005).

The purpose of the researches was to study the quality of the mine-type wells and examination of the ecological stability and instability components. A special attention was given to the sources of anthropogen impact that have pollutant effect on the waters in the wells.

1. Material and method

During the researches, the possible sources of pollution were studied and analyzed and we calculated the volumes of the created wastes and the quality of drinking water of 21 districts of Ocnita County, the rural area situated in the basin of the superior flow of the Dniester River. As a detailed subject of local reference, Lencauti village was examined; it is located on the Northern Moldova Plateau, in the forest steppe area, with predominant altitudes of 220-240 m, slightly rough nature, characterized by spread plains and hills, plateaus. Geological formations that come out are clayey Sarmatia's clays.

The index of the ecological balance, the degree of afforestation and the degree of plowing were calculated on the basis of the data of the Land Cadastre (year 2009) and they were assessed according to the approved methodology in the Republic of Moldova (Ungureanu, 1995; Andriuca, 2008, 2009).

The coefficient of the ecological stability of the landscapes is calculated as per the formula:

$$K_{ec.st} = \frac{\sum K_{li} P_i}{\sum P_i} \cdot K_r$$

Where, K_{li} – stability coefficient of some types of land;

P_i – the area of the land category;

K_r – coefficient of morphological stability of the relief ($K_r = 1$ for stable areas, $K_r = 0,7$ for unstable territories).

If the value of $K_{ec.st}$, calculated this way, is less than 0,33, then the landscapes are considered ecologically unstable, if it is between 0,34 – 0,50 - uncertain stability, 0,51 – 0,66 – average stability and more than 0,67 – ecologically stable landscapes (Boboc N., Bejan I., 2006). According to these authors, the assessment coefficients of the ecological situation of different categories of lands were evaluated (tab. 1.)

Tab. 1 - Assessment coefficient of the ecological situation of different categories of lands

| <i>Land Category</i> | <i>Coefficient of ecological stability of the territory</i> |
|-------------------------------------|---|
| Land for constructions And roads | 0,00 |
| Arable | 0,14 |
| Vineyards | 0,29 |
| Forest strips | 0,38 |
| Orchards and bushes | 0,43 |
| Gardens | 0,50 |
| Hayfields | 0,62 |
| Pasture | 0,68 |
| Lakes and natural swamp | 0,79 |
| Natural forests | 1,00 |

Accumulation of stable waste was calculated according to the quantitative indices and the number of animals (average for 2006-2007), according to D. Davidescu, V. Davidescu, 1969, Lixandru and others, 1990, taken in accordance with the methodology of the Institute of Pedology, Agrochemistry and Soil Protection “Nicolae Dimo” (Management of organic wastes, nutrients and soil protection, 2005). The amount of stable waste accumulated in private households during one year from one animal was calculated according to table 2.

Tab. 2 - Amount of stable waste that is accumulated in private households from one animal

| Species | Solid droppings, kg/day | Liquid droppings, kg/day | Total waste, kg/day | Total waste in one year (365 days), kg | Time of animals presence in the households, days/year | Waste accumulated from one animal, t/year | |
|---------|-------------------------|--------------------------|---------------------|--|---|---|--------------------------------------|
| | | | | | | Total | Taking into account the loss of 30 % |
| Cattle | 25 | 12 | 42 | 15330 | 270 | 11,3 | 7,9 |
| Horses | 18 | 5 | 27 | 9855 | 270 | 7,3 | 5,1 |
| Sheep | 2 | 0,8 | 3,6 | 1314 | 180 | 0,7 | 0,5 |
| Swine | 1,9 | 3,5 | 6,9 | 2519 | 365 | 2,5 | 1,8 |
| Fowl | 0,1 | - | 0,2 | 73 | 365 | 0,07 | 0,05 |

The evaluation of the ecological danger was accomplished on the bases of the system of indices that include the natural component (natural parameters of the

ecological risk), more stable group (rigid) and indices that characterize anthropic activities (more dynamic group) (Andriuca, 2009).

Sanitary-chemical parameters were investigated by the Center of Preventive Medicine, and the quality of drinking water was appreciated according to the normative in force, STAS 2874-82, used in the monitoring of drinking water.

3. The characteristics of the land fund regarding the possible influence over the quality of drinking water

For the localities in Ocnita County, we studied the areas of land resources, goods of agricultural use, the degree of the arable land, afforestation, natural and natural-anthropic ecosystems, agroecosystems that directly influence the quality of the drinking water.

The comparative analysis of the villages of Ocnita County shows significant differentiation of plowing degree that varies from 29-41% to 74-78% (tab. 3).

Data of the ecological stability coefficient attest that all locations of Ocnita County are ecologically unstable. The study of the improvement degree and of the area of eroded lands of Ocnita County (table 4) shows that soils have an average degree of improvement of 71 points, being thus a good object for agricultural use. Farmlands are characterized by a different level of erosion, maximum parameters (41%) are attributed to villages Girbova and Birnova (33,6).

4. The quality of the drinking water in Ocnita County

Quality of drinking water is a major problem for Ocnita County. In many places, the quality of the drinking water does not correspond to the norms. Analysis of the data demonstrates that there are 6301 wells and 99 springs registered, 6243 of them are arranged and 58 not arranged (year 2005). According to studies, of 397 wells examined, only 22% correspond to qualitative hygienic indexes, 78% do not correspond to the qualitative normative stipulated by the standards in force – Drinking water (tab. 3). As per analysis of the Service of Preventive Medicine, the sources of anthropic pollution are the household waste, including animal waste. It is imperatively necessary at the present moment to scientifically eloquently demonstrate the direct influence of the animal waste on the quality of drinking water, its pollution with various chemical compounds, decreasing the risk of animal waste, including the calculation of the platforms necessary for storage of the animal waste in the rural area. The rules of pollution of groundwater with nitrates, chlorides, sulfates, mineralization of some counties may be used in the prevention of other types of rural pollution – pesticides pollution, plant protection substances, active chemical elements used in the rural area, which lacks central canalization system.

In table 3, villages Birladeni with 67% of wells that do not correspond to sanitary-hygienic parameters, Calarasovca – 86%, Dingeni – 80%, Grinauti-Moldova – 85%, Lipnic – 71% and many others are emphasized.

Results show that in some places (Girbova, Dingeni, Grinauti-Moldova, Lipnic, Sauca, Verejeni, Rediul-Mare, Lencauti) the water of the wells does not correspond to the quality norms for drinking water covering about 95-100%. The situation in the villages Sauca and Grinauti-Moldova is aggravated, as more than 50% of the wells do not correspond to the requirements of microbiological parameters and they are a danger for health, they have increased concentrations of nitrates and general hardness over the limits of admissible concentrations.

3. The influence of the animal wastes' impact on the quality of drinking water

In the specialized literature, there is not enough data about the direct influence of the impact of animal waste on the quality of underground waters, especially the correlation between the number of animals and the level of direct influence through livestock. It is very difficult to find the component parts that influence the degree of water pollution, considering the fact that the sources and factors of pollution in the rural area are diverse and complex. The condition of the wells will directly depend on the animal pressing through their wastes and their leakage into the waters, on the potential of the lands' tilt and others. We have to mention that the perfect situation would be to take out the livestock of the rural areas, but this encounters at the moment many obstacles. The awareness of the alarming situation in the country side should play an important role.

That is why for the entire Ocnita District and its villages, we examined the influence of the plowing degree, afforestation, coefficient of ecological stability, and storing of animal waste in rural areas on the quality of water of the wells (table 3).

We can see in the table that Birladeni village has a very high level of pressing the animal waste (560 t/km²), high level of plowing. 11 of 20 examined wells do not correspond to the hygienic requirements, and the water in 5 wells represents a risk for health. The same in Grinauti-Moldova, where 19 of 20 examined wells have low quality drinking water, and water of 12 wells is dangerous for consuming. The situation in Lencauti is critical, 15 of 20 examined wells do not correspond to hygienic requirements. We can clearly see in table 3 that in villages with maximum amount of animal waste, with a high quota of eroded lands and ecological instability, the situation of drinking water is

Tab. 3 - Quality of water of wells and ecological factors of influence (year 2009)

| № | Locality | G _{stable} land, % | G _{afforestation} , % | I _{ecologic balance} , % | Coefficient of ecologic stability, K | Eroded lands, % | Animal wastes | | Quality of water corresponds to requirements | Do not correspond to hygienic requirements | Water is a danger for health |
|----------------------------------|--------------------------|-----------------------------|--------------------------------|-----------------------------------|--------------------------------------|-----------------|---------------|-------------------|--|--|------------------------------|
| | | | | | | | total, t/year | t/km ² | | | |
| 1 | Erladeni village | 69,2 | 7,0 | 25,4 | 0,16 | 8,9 | 9012 | 560 | 4 | 11 | 5 |
| 2 | Calareşova village | 55,9 | 16,6 | 33,9 | 0,22 | 21,0 | 1206 | 33 | 6 | 8 | 6 |
| 3 | Corăşti village | 75,8 | 4,2 | 23,6 | 0,13 | 9 | 5069 | 191 | 4 | 16 | 3 |
| 4 | Dingeni village | 57,0 | 23,3 | 37,7 | 0,20 | 19 | 7461 | 275 | 1 | 19 | 2 |
| 5 | Grinăuţi-Moldova village | 68,5 | 13,9 | 26,0 | 0,16 | 16 | 6540 | 346 | 1 | 19 | 12 |
| 6 | Lerăuţi village | 64,6 | 11,3 | 28,5 | 0,16 | 18,6 | 3769 | 234 | 2 | 15 | 3 |
| 7 | Lipnic village | 68,6 | 9,5 | 25,2 | 0,15 | 29 | 8292 | 249 | 1 | 19 | 6 |
| 8 | Mihăleşeni village | 73,8 | 10,6 | 21,1 | 0,14 | 15,6 | 5056 | 182 | 6 | 14 | 2 |
| 9 | Ocuşa village | 60,2 | 24,6 | 34,5 | 0,20 | 12,1 | 7482 | 238 | 6 | 14 | 4 |
| 10 | Vălcineţ village | 60,2 | 17,3 | 30,2 | 0,18 | 29,0 | 2380 | 107 | - | 18 | 2 |
| 11 | town of Fruză | 29 | 18,9 | 17,6 | 0,33 | - | 583 | 583 | - | - | - |
| 12 | town of Ocniţa | 41,3 | 6,4 | 20,7 | 0,09 | 6,4 | 1231 | - | - | - | - |
| 13 | town of Otaci | 43,1 | 15,2 | 27,3 | 0,15 | - | 426 | - | - | - | - |
| 14 | town of Eftova | 69,6 | 11,1 | 22,5 | 0,15 | 33,6 | 6198 | 308 | - | 13 | 7 |
| 15 | Clocuşna village | 79,5 | 2,9 | 14,7 | 0,12 | 22,5 | 6413 | 212 | 4 | 16 | 8 |
| 16 | Gârbova village | 51,7 | 27,5 | 43,7 | 0,23 | 40,6 | 6309 | 160 | - | 20 | 7 |
| 17 | Hăişăuţi village | 78,1 | 4,6 | 19,5 | 0,14 | 8,7 | 6715 | 221 | 3 | 17 | 2 |
| 18 | Mineştea village | 58,4 | 20,8 | 34,7 | 0,19 | 18,0 | 3785 | 235 | 9 | 9 | 2 |
| 19 | Naslavea village | 65,7 | 16,2 | 25,9 | 0,33 | 8,4 | 2189 | 67 | - | - | - |
| 20 | Sanca village | 66,1 | 15,6 | 29,5 | 0,18 | 33,2 | 5036 | 188 | 1 | 8 | 11 |
| 21 | Unguri village | 67,1 | 11,9 | 23,4 | 0,14 | 24,7 | 1279 | 95 | 9 | 8 | 3 |
| Total for Ocniţa district | | 65,5 | 13,9 | 27,3 | 0,17 | 19,3 | 9082,2 | Average | | | |

Tab. 4 - Data regarding degree of improvement and area of eroded lands in Ocnița district, (2008)

| № | Name of the territorial-administrative units | Total of agricultural land (ha) | Of which pedologically examined (ha) | Average degree of improvement (points) | Eroded lands | | | | | | | |
|----|--|---------------------------------|--------------------------------------|--|--------------|-------------|-------------|-------------|-------------|------------|------------|------------|
| | | | | | Total | | Low | | Moderate | | Strong | |
| | | | | | ha | % | ha | % | ha | % | ha | % |
| 1 | Bălănești County | 4625,38 | 4358 | 78 | 414 | 8,9 | 305 | 6,6 | 81 | 1,8 | 28 | 0,6 |
| 2 | Calăraș County | 1761,40 | 1461 | 67 | 370 | 21,0 | 203 | 11,5 | 125 | 7,0 | 42 | 2,3 |
| 3 | Conești County | 2281,67 | 2009 | 75 | 207 | 9 | 185 | 8,1 | 13 | 0,56 | 9 | 0,3 |
| 4 | Dumbrăveni County | 2374,42 | 2129 | 73 | 451 | 19 | 219 | 9,2 | 164 | 6,9 | 68 | 2,9 |
| 5 | Gîrnăuți - Mîndrova County | 2956,72 | 2616 | 78 | 472 | 16 | 324 | 11,0 | 119 | 4,0 | 29 | 1,0 |
| 6 | Lecăeni County | 2508,64 | 2342 | 70 | 468 | 18,6 | 360 | 14,3 | 83 | 3,3 | 25 | 1,0 |
| 7 | Lipnic County | 3005,3 | 2309 | 63 | 869 | 29 | 344 | 18,1 | 286 | 9,5 | 39 | 1,3 |
| 8 | Mihăileșeni County | 2454,5 | 2185 | 75 | 383 | 15,6 | 312 | 12,7 | 63 | 2,6 | 8 | 0,3 |
| 9 | Ocnii County | 3277,6 | 3001 | 76 | 388 | 12,1 | 284 | 8,7 | 95 | 2,9 | 19 | 0,6 |
| 10 | Vălceni County | 2229,4 | 2010 | 78 | 645 | 29,0 | 346 | 15,5 | 238 | 10,6 | 61 | 2,7 |
| 11 | town of Fruză | 1262,3 | 2 | 57 | - | - | - | - | - | - | - | - |
| 12 | town of Ocnița | 2782,2 | 66 | 59 | 18 | 6,4 | 18 | 6,4 | - | - | - | - |
| 13 | Town of Ocni | 321,2 | 154 | 78 | - | - | - | - | - | - | - | - |
| 14 | Bimova village | 2667,8 | 2342 | 66 | 897 | 33,6 | 641 | 24 | 219 | 8,2 | 37 | 1,4 |
| 15 | Cloușova village | 2828,3 | 2496 | 63 | 637 | 22,5 | 338 | 19 | 99 | 3,5 | - | - |
| 16 | Gîrbova village | 1788,6 | 1559 | 63 | 727 | 40,6 | 417 | 23,3 | 291 | 16,2 | 19 | 1,1 |
| 17 | Hădărăni village | 2730,0 | 2373 | 67 | 237 | 8,7 | 156 | 5,7 | 63 | 2,3 | 18 | 0,7 |
| 18 | Mîneștea village | 1433,0 | 1222 | 68 | 238 | 18,0 | 221 | 15,4 | 37 | 2,6 | 0 | - |
| 19 | Măslareva village | 2103,9 | 1883 | 80 | 176 | 8,4 | 168 | 8,0 | 8 | 0,4 | - | - |
| 20 | Sauca village | 2612,3 | 2216 | 65 | 866 | 33,2 | 327 | 20,2 | 218 | 8,3 | 121 | 4,6 |
| 21 | Ungureni village | 1528,0 | 1268 | 62 | 377 | 24,7 | 283 | 18,5 | 62 | 4,1 | 32 | 2,1 |
| | TOTAL | 45897,52 | 40201 | 71 | 8870 | 19,3 | 6051 | 13,2 | 2264 | 4,9 | 555 | 1,2 |

Tab. 5 - Chemical compounds of water of the wells in Lencauti, Ocnita District

| No source of water | Quality indexes | | | | | | | | | | | | | Coliforms total | Wastes on well's area, t/year |
|--------------------|-----------------|----------------|----------------|-------------------|-----------------|-----------------|----------------------|-------------------------|-------------------------|------|-------------------|---------|-----------------|-----------------|-------------------------------|
| | Turbidity | Nitrites, mg/l | Nitrates, mg/l | Residue sec, mg/l | Sulphates, mg/l | Chlorides, mg/l | Total hardness, me/l | Ca ²⁺ , mg/l | Mg ²⁺ , mg/l | Na+K | Mineralization, g | F, mg/l | Coliforms total | | |
| 034 (graveyard) | 1,08 | < 0,003 | 57 | 807 | 54 | 38 | 10,5 | 103 | 64 | 120 | 1,1701 | 0,98 | - | - | |
| 001 | 1,21 | < 0,003 | 60 | 512 | 52 | 45 | 8,0 | 122 | 23 | 33 | 0,7021 | 1,01 | - | 0,7 | |
| 083 | 0,96 | < 0,003 | 150 | 2208 | 823 | 162 | 36,0 | 470 | 152 | 64 | 2,7006 | 1,28 | - | 26,5 | |
| 058 | 1,21 | < 0,003 | 117 | 914 | 126 | 50 | 16,0 | 140 | 109 | 24 | 1,2380 | 1,07 | - | 54,6 | |
| 018 (church) | 1,08 | 0,002 | 193 | 967 | 197 | 148 | 17,1 | 124 | 133 | 12 | 1,1848 | 1,04 | - | - | |
| 061 | 1,0 | < 0,003 | 70 | 924 | 99 | 61 | 18,0 | 104 | 156 | 18 | 1,3508 | 0,96 | - | 47,3 | |
| 059 | 1,21 | < 0,003 | 87 | 724 | 40 | 78 | 10,3 | 104 | 62 | 73 | 0,9807 | 0,75 | - | 33,0 | |
| 069 | 1,33 | < 0,003 | 243 | 999 | 60 | 141 | 16,7 | 160 | 106 | 23 | 1,2523 | 1,08 | - | 7,5 | |
| 057 | 0,96 | 0,007 | 269 | 1182 | 164 | 157 | 18,3 | 162 | 124 | 52 | 1,4297 | 0,77 | - | 31,5 | |
| 109 | 1,08 | < 0,003 | 121 | 837 | 59 | 49 | 12,0 | 136 | 66 | 67 | 1,1122 | 1,1 | - | 11,9 | |
| 031 | 1,21 | < 0,003 | 472 | 2766 | 830 | 136 | 40,0 | 621 | 109 | 118 | 3,2625 | 1,25 | - | 31,2 | |
| 064 | 1,33 | < 0,003 | 120 | 927 | 199 | 61 | 15,9 | 102 | 131 | 32 | 1,2192 | 1,02 | + | 13,0 | |
| 070 | 1,33 | < 0,003 | 248 | 1053 | 137 | 140 | 18,1 | 132 | 140 | 30 | 1,3447 | 1,07 | + | 23,9 | |
| CMA | 1,5 | < 0,003 | 45 | 1000 | 300 | 350 | 8,0 | 100 | 80 | 200 | 1,000 | 1,2 | - | - | |

catastrophically dangerous for health. Probably the mineral fertilizers used on the farming lands also increase the number of pollutants that get into water.

In Girbova, the degree of arable lands represents 52%, the index of ecologic equilibrium represents 44%, the coefficient of ecologic stability is of 0,23 and the eroded lands – 41%. These are favorable conditions for 6309 t/year animal waste to get into waters, which explains the 100% ration of the district wells that do not correspond to hygienic conditions, and in 7 wells water represents a serious danger for health. The wells are polluted with nitrates, calcium, magnesium and others (tab. 5).

The mathematical-statistical analysis shows a high correlation between the degree of agricultural use of land and the low quality of drinking water ($R=0,63$).

Tab. 6 - Comparative parameters of the quality of drinking water, Râșcani, Moșeni (2010)

| Indicator | Well with impact | Drinking water without impact (Vartic) | CMA |
|-----------------------------------|------------------|--|-----------|
| 1 | 2 | 3 | 4 |
| Fixed residue, mg/dm ³ | 806 | 644 | 1000 |
| Calcium, mg/dm ³ | 98 | - | 100 |
| Magnezium, mg/dm ³ | 43,8 | - | 80 |
| Sodium, mg/dm ³ | 103,8 | 53,0 | - |
| Hydrocarbons, mg/dm ³ | 490,4 | 570,2 | Unlimited |
| Sulphates, mg/dm ³ | 123,8 | 61,4 | 500 |
| Chlorides, mg/dm ³ | 61,9 | 31,0 | 350 |
| Nitrates, mg/dm ³ | 82,5 | 48,4 | 45 |
| Nitrites, mg/dm ³ | 0 | - | 0 |
| Ammonium, mg/dm ³ | 0 | - | 0,05 |
| Phosphates, mg/dm ³ | 0 | - | 0,1 |
| Flourides, mg/dm ³ | 0,12 | - | 1,5 |
| Hardness, me/dm ³ | 9,2 | 9,0 | 8,0 |
| pH | 7,8 | - | 6,5-8,5 |

The ecological danger for Lencauti, Ocnita District was measured according to a special methodology (Andriuca, 2009). Results show a critical level of the anthropogen impact on the agro-landscapes. In 2010 (May), in Lencauti, Ocnita District 13 wells were examined where the chemical quality of underground water was known. Researches meant to find out the annual quantities of wastes that accumulate around wells' perimeter. Results are shown in table 5. Data show that there are wells where a large amount of animal wastes accumulate annually. In

table 5, we can see that only in 2 of 13 wells (F/p nr 001 and F/p nr 069) the quantity does not exceed 1 t/year. Most of the wells have an impact of 20-30 t/year, but there are also water sources where more than 40 t/year of animal wastes accumulate (F/p nr 061 and F/p nr 058) in the zone of well's strict protection (50m).

Comparative analysis of the lab chemical data of the quality of wells water of Lencauti and the amount of animal wastes of the perimeter of protection show that the rural impact through wastes significantly affects the level of pollution of water with nitrates. In all examined wells, the content of nitrates exceeds CMA (45 mg/l). In 10 of 13 examined wells, the level of NO_3 is 2-9 CMA. Seeing the table, we may conclude that wells have a very high nitrate pollution level (>200mg/l). The chemical analysis of the waters shows that in two wells (F/p nr 083 and F/p nr 03) CMA for sulfates (CMA = 500 mg/l) is exceeded, reaching high concentrations of 823 and 829 mg/l.

In all researched wells, water has an increased hardness, except one well (F/p nr 001), which is situated on a slope and possibly may have a good lateral leakage. In the rest of the wells, the hardness of water exceeds CMA (10 me/l) 3 to 4 times.

Table 6 confirms the negative influence of the impact of animal wastes over the quality of drinking water; the table represents two sources of drinking water, one with impact of wastes and another without rural impact, situated at 1,5 km outside the village (area Vartic, Moseni village). The studied objects are located in Rascani District, Moseni village, within Northern Moldova Plateau.

Conclusions

During this research, the possible sources of water pollution in 22 rural locations of Ocnita District were studied and analyzed.

The situation of the land fund of the district is characterized by a high level of plowing degree, and the degree of afforestation is average and low.

According to the coefficient of ecological stability, all the examined locations are unstable.

Annual quantity of animal wastes in year 2009 – 96882 t or 202 t/km². Maximum pressing was discovered in Barladeni – 560 t/km².

The results of the study show that natural conditions and lands' degree of erosion significantly influence the ecological situation of the regions.

The quality of water of 20 wells of each examined village does not correspond to hygienic conditions. Chemical analysis of water shows that in most wells we traced excesses of CMA according to the following indices like: nitrates, mineralization, hardness, dry residue, magnesium, calcium etc.

As a detailed reference object, we examined the Lencauti village that has as a major ecological problem the quality of the drinking water, formation of animal wastes, their placement, non authorized dumps, and sanitary level of some lands.

The level of the anthropogen impact on the agro landscapes in Lencauti is critical, the ecological risk is 1,368.

Analysis of the data shows that the drinking water of Lencauti, Ocnita District has low quality, seriously affected by the impact of animal wastes of the private sector.

Comparative results of the chemical analysis of laboratory of water quality of wells of Lencauti and animal wastes of the protection perimeter show that rural impact through wastes does significantly influence the pollution degree of waters with nitrates, fluorine, sulphates, calcium, magnesium.

In all examined wells of Lencauti, water has an increased hardness, except a well (F/p nr 001), which is placed on the slope and possibly may have a developed lateral leakage. In the rest of the wells, the hardness of water exceeds CMA (10 me/l) 3-4 times.

There is an urgent necessity to find alternative sources of drinking water in the researched location.

Among the easy ways of protection, we recommend cleaning of wells, monitoring of water quality and avoiding the sources of pollution.

It is necessary to minimize the anthropogen impact, to create protection zones for waters and to permanently monitor their quality, including informing the community, taking the decision not to use water of some wells until the quality of water will not be improved.

One of the efficient methods of minimizing the impact of animal wastes from around Ocnita District would be to deposit animal droppings on special platforms and their centralized evacuation.

The most affected villages that need urgent intervention in this matter are the villages of Barladeni, Lipnic, Dingeni, Ocnita, Lencauti etc.

Bibliography:

- Andrieș, S.** (2005), *Managementul deșeurilor organice, nutrienților și protecția solului*. Chișinău. p. 42-43.
- Andriuca, Valentina** (2009), *The ecological state's evaluation and the reducing of the anthropogenic impact in the rural area*. In: Present environment and Sustainable Development. vol. 3. Iași. p. 55- 64
- Andriucă, Valentina** (2006), *Problemele de mediu și utilizarea rațională a resurselor naturale în localitățile rurale*. „Eu și Dunărea”. Chișinău. p. 59.
- Andriuca, Valentina** (2006), *Evaluarea situației ecologice a teritoriului. „Starea actuală, problemele utilizării și protejării solurilor”*. *Lucrările conferinței științifico-practice*. Chisinau p. 127-130.

Boboc N., Bejan I (2006), *Considerații privind evaluarea gradului de stabilitate ecologică a peisajelor din Republica Moldova*. „Ecologie și protecția mediului – cercetare, implementare, management”. Materialele Conferinței Jubiliare – INECO 15 ani. Chișinău, p. 4 – 7.

Cadastru funciar al RM la 1 ianuarie 2009. Chișinău, 2009. 986 p.

Sandu, Maria. (2006), Apa în natură. In: *Eu și Dunărea*. Chișinău. p. 5-18