USING PEDOLOGICAL AND AGROCHEMICAL INFORMATION FOR THE IMPLEMENTATION OF NITRATES DIRECTIVE IN THE ADMINISTRATIVE-TERRITORIAL UNIT CENAD

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Abstract : *Directive 91/676 / EEC on the protection of waters against pollution by nitrates from agricultural sources is transposed into Romanian legislation by HG. 964/2000 approving the Plan of Action for the Protection of waters against pollution by nitrates from agricultural sources. In accordance with art. 6. (1) of the annex to Government Decision no. 964/2000 approving the Plan of Action for the protection of waters against pollution by nitrates from agricultural sources in accordance with art. 2. (8) of the Rules of organization and functioning of the Commission and support group for protection of waters against pollution caused by nitrates from agricultural sources, approved by Order no. 425/105951/2001 of Water and Environment Minister and the Minister of Agriculture, Food and Forestry, Commission to implement the Action Plan for the protection of waters against pollution caused by nitrates from agricultural sources, issued Decision no. 21130/DC/14.10.2010 approval of the Action Program for vulnerable zones to nitrate from agricultural sources. The measures from this Action Programme regard to that holdings of more than 8 UVM, the spread manure annual amount not to exceed a specified amount per hectare over a year, one of the ways to exploit a liquid manure of animals farms consisting and their use as liquid organic fertilizer for crops. Physico-chemical properties of soil samples (texture, pH, humus and N, P, K, content etc..) and biochemical and microbial diversity of the samples were analyzed in the Research Laboratory of USAMVB-OSPA Timisoara after national norms and standards approved by the Standards Association of Romania (ASRO). Knowledge of these special features of the soil presents a theoretical and practical importance. Theoretical, because it provides to the expert the posibility to interpret the phenomena that occur in soil and to predict soil evolution in particular and the wider environment in terms of present and future health and warns the farmer what action should be taken to bring optimum soil conditions for growth and development of plants. Importance, originality and timeliness of work is the necesity of soil and environmental protection by implementing the Action Program for vulnerable zones to nitrate from agricultural sources, in Timis county, it being the focal point for monitoring the implementation of the Nitrates Directive for soil and crops, to ensure information for the country report on Nitrates Directive.*

Key words : fertilizer, cover crop, vulnerable area, livestock, monitoring

INTRODUCTION

Being a well-defined condition with a high variability in space but relatively stable over time, pedological factors, by the major components, are essential in characterizing certain areas of land surface.

The natural conditions of the area taken into account are generally favorable for the development of agro-food sector in all aspects, with a long tradition in cereals cultivation and their recovery, especially by livestock. (BORZA I AND ALL, 2001, CANARACHE A., TEACI D., 1980, CÂRSTEA S., 1995 DUMITRU M., ŞTEFĂNESCU S.L., 2000).

However, being located mostly in subsidence, ramble and accumulation plain of Mures, Timis and Barzava, geomorphological evolution of the space considered is related to

the time evolution of the marine area (Thetys) or lake (Pannonian) actually which generated the formation of soils which during a crop year shows two extreme situations, namely: excessive humidity in winter and lack of moisture during the warm season, both situations resulting in a number of stress forms with negative effects on productivity and quality of agro-ecosystems. (ȚĂRĂU D. AND ALL., 2002).

Also, intense drainage charged in NW corner of Banat, in the last decades of the twentieth century, led to lowering of groundwater ninvelului from 1-2 m to 5-7 m, which has generated the climate change, the emergence of dusty phenomena.

Based on these considerations, the authors try to present in this paper, based on themes drawn from scientific research conducted over several years and based on an impressive volume of data accumulated in the OSPA Timisoara archives the following:

- Nutrient management in areas vulnerable to pollution by nitrates
- Dissemination of information on nutrient management
- The average pressure of nutrients from manure (kg N / ha)
- Filling system for collecting and processing information to draft the report for Nitrates Directive.

MATERIAL AND METHODS

Coverage refers to an area of 8026 hectares, of which 7085 ha is agricultural land.

Research goal is to gather, process and interpret scientific information on the physical, chemical and hydro-physical of soils to provide specialized technical support for the government authorities to develop the administrative territory Cenad the action plan on pollution caused by nitrates from agricultural sources, it being focal point for monitoring implementation of the Nitrates Directive soil and to provide information on country report on the Nitrates Directive.

Research of ecopedological conditions, data ordering and processing was done in accordance with the Methodology of Elaboration of Pedological Studies; (vol. I, II, III), developed by the ICPA Bucharest in 1987 and the Romanian System of Soil Taxonomy (SRTS-2003).

RESULTS AND DISCUSSIONS

Located in north-western county of Timis and representing its extreme point ($46^0$11` north latitude), on the border with Hungary, on DN 6, Cenad lies at a distance of 72.6 km from the city Timisoara and at 8.8 km fron Sânnicolau Mare, the nearest town. Cenad village covers an area of 8026 hectares, of which 7085 ha is agricultural.

The area of the village is located in the Torontal Plain or Mures Low Plain, which is the lowest area of great dejection cone of the river Mures, forming a large area of subsidence, the form and characteristics is the result of combined action of the Mures, Aranca and Bega rivers.

From the morphologicallypoin of view, this plain is a flat relief unit, uniform appearance but complex in lithology and soil, flat surfaces are frequently separated by abandoned meanders, being able to distinguish two parts: the meadow of Mures and the Sânnicolau Mare plain.

The Meadow of Mures, has the latest areas of agriculture, following the work of regularization of rivers and draining from the western part of the country. In general, the land has a slope oriented N-NW, exceeding 0.2 m / km, as well as numerous positive and negative forms, varying between 80-90 m altitude surface-being twisted and crossed by frequent and abandoned meanders and small excavations.

Sânnicolau Mare plain, with a slope that occurs from south-east to north-west, with altitudes ranging from 80 to 85 m, is a fluvial-lacustrine form of subsidence, with shallow, with many abandoned and white rings which, after adjustment of water courses and drainage measures have remained prominent in terms of elongated or thread valley oriented on east-west direction.

The perimeter of the village is located in Aranca and Mures hidrographical basin, Mures river being in this sector, the natural border with Hungary. For the two mentioned streams are directed the excess water from rainfall, through a network of drainage channels, with a pumping stations served.

Moderately continental temperate climate with Mediterranean influence is manifested by weak mild winters and summers are not excessively hot, the average annual temperature is 10.8 ° C, and mean yearly rainfall being 536.3 mm (Sânnicolau Mare station).

Woody vegetation, except for a massive 279 hectares located in the premises which is a dammed and forest reserve, is represented by isolated specimens or small clusters of species such as *Populus alba* şi *P. nigra.*, *Fraxinus excelsior*, *Ulmus campestri*s, *Salix spp* and, more rarely, *Quercus frainetto*, *Aesculus hippocastanum*, but exists cultivated species are as *Morus alba şi M. nigra*, *Populus italica* and *Gleditschia triacanthos*. Usual fruit trees are peach, plum, apricot, walnut, apple.

In grassland and meadow are develop species and associations like: *Festuca pratensis*, *Poa pratensis*, *Lolium perenne*, *Trifolium repens*, *T. pratense*, *Lotus corniculatus*, *Achillea millefolium*, *Rubus caesius*, *Plantago media*, *Calamagrostis epigeios*, *Euphorbia spp.*, *Ranunculus spp.*

On pasture and grassland located on the lower places with groundwater at 1-2 m, plant associations are dominated by hydrophilic species such as *Festuca arundinacea*, *Lolium spp.*, *Trifolium hibrydum* şi *T. Fragiferum*, *Euphorbia spp.*, *Ranunculus spp.*, and on surfaces where stagnant waters are regularly or permanently present *Carex spp*, *Juncus spp.*, *Ranunculus spp.*, *Phrafmites communis*,. *Typha augustifolia*.

On saline soils are dominant species like *Hordeum hystrix*, *Lotus tenuis*, *Trifolium fragiferum*, *Euphorbia spp.*, *Statice gmelini*, *Mentha spp.*

Basic crops are wheat, barley, maize, sunflower, sugar beet, alfalfa and a wide range of vegetables.

In terms of rare and protected fauna point out the presence of *Merops apiaster*, *Egretta garzetta*, *Phalacrocorax carbo*.

By grouping of land units (UT) results in the following the dominant types of soils:

1. Fluviosols 1-42 (mollic, gleyed, salic,sodic), 37%;
2. Chernozems 43-54 (gleyed, salic, sodic, vertic), 7%;
3. Pelosols and vertosols, 55-91 (mollic, gleyed, salic, vertic), 43%
4. Gleysols, 92-94 (tipical, salic), 0,2%;
5. Solonetz, 95-96 (gleyed), 0,8%;
6. Asociation of fluviosols, chernozems, vertosols, solonetz, 701-706 (gleyed, pseudogleyed, salty) 12%.

The agricultural land of the village consists of the following use: arable 6657 ha (94.0%), grassland 280 ha (4.0%), meadow 2.85 ha (0.04%). vineyards0.15 ha and orchards 145 ha (2.0%).

Regarding the quality classes (fertility) for the category of use arable land, is as follows: class I 382 ha (5.4%), class II 2287 ha (32.3%), class III 2147-ha (30.3%), class IV 12 162 ha (30.5%) and class V 107 ha (1.5%).

The limiting factors that influence the quality of the soil cover is represented by

salinity (with severe limitations on 19.8%, moderate on 2.7%, lower on 3.2%), alkalization (extremely severe 1.2%, severe 24.5%, moderate 3.2%), acidity (moderate 0.1%, lower 2.1%), the reserve of humus (moderate 2.8%, lower 32.1%), coarse texture (severe 1.0%), fine texture (moderate 38.1%, lower 33.2%), compaction degree (severe 31.8%, moderate 53.3%), stagnant moisture excess (severe 1.6%) flooding by overflow (very severe 12.2%).

RESTRICTIONS

1. Soils
   - Vertosols: 43%
   - vertic subtyps : 10%

2. Soil texture and the hydroclimatic balance
   - soils with clay texture and hydroclimatic surplus balance: 61,32%
   - clay textured soils and land with poor hydroclimatic subdeficitar balance:10%

3. Compaction degree
   - moderately compacted: 31,80%
   - strongly compacted: 53,30%

4. Unevenness of the land
   - moderate to very strong uneven land: 72,28%
   - land with low slope and kneaded the microrelief: 37,20%

5. Groundwater Depth alone or associated with the oscillatory nature of groundwater or soil texture.
   - groundwater depth below 2 m: 40,50%
   - groundwater depth between 2 and 3 m: 17,20%

6. Excess surface moisture.
   - land surface excess moisture vigorously until marshy: 32,50%

To remove the effect of polluting waste products is necessary for soil and livestock waste products to be carefully managed as a single system.

The problem is the use of physical, chemical and biological properties of soil as an acceptor for these waste products with minimum adverse effects on plants to be cultivated and the soil characteristics and groundwater and surface water quality.

From economic reasons and environmental order, it requires proper management of fertilizers in the agricultural and agro-livestock farm. To achieve this goal is necessary to draw up a plan of nitrogen fertilizer and other nutrients for each crop, field or plot that occupied by a particular culture. For Cenad territorial administrative unit the nutrient production in individual houses is presented in the folowing table (1):

Depending on these factors, each soil has a maximum capacity to absorb and treat livestock waste. Potential mechanisms include the oxidation of biological soil treatment, ion exchange, chemical precipitation, absorption and assimilation by plants and animals.

Soil is a biological station with all stages of treatment and its ability to process complex organic substances depends on its properties and climatic conditions.

Selection of the manure management system depends on the location and circumstances in each complex, ideal for livestock farms is to be located in agricultural areas, on the wind direction from localitiesand to have sufficient land to allow for treatment and release waste products and allow easy control of leakage.

The factors that influence the functioning of soil as a scrubber system are: the cation exchange capacity, base saturation degree, biological status, infiltration rate, vegetation cover type, soil drainage, porosity, aeration, humidity, soil tillage.

Table 1

Nutrient production and their transfer for Cenad territorial administrative unit (in kg N / year)

Animal category	Average weight	Number of animals	Transfer coefficient for nitrogen	Nitrogen production
Baby Calves	0-50		20	0
Calves (0.3–1 year)	50-250	120	35	4200
Cattle (1- 2 ani)	250-600	60	55	3300
Cows	>400	150	81	12150
Pigs	98		13	0
Pigs for fattening	68		11	0
Pigs for fattening	90	1800	15	27000
Pregnant sows	125		10	0
Sows with piglets	170	150	38	5700
Pigs (males)	160		13	0
Sheep / goats	45	940	7	6580
Breeding Birds	1.8		0.36	0
Poultry fattening	0.9	15000	0.36	5400
Horses	450	180	45	8100
Total				**72430**

The administration of residues from livestock farms is making in agricultural doses (down to achieve maximum production and phenomena that do not cause pollution with nitrogen, salts) able to increase soil fertility.

The quantity per hectare over a year, is the amount of manure containing 170 kg of nitrogen (Code of Good Agricultural Practice for protection of waters against pollution caused by nitrates from agricultural sources).

CONCLUSIONS

Systematic pedological and agrochemical soil mapping conducted by the OSPA in our country provides valuable data on the evolution of soil quality, establish and implement differentiated culture technologies, land evaluation and determining suitability for various crops, foundation works and land reclamation ameliorative technologies, soil pollution prevention.

Polluting agents such toxic substances and/or harmful, can accumulate in amounts exceeding the maximum allowable limits in both ground and surface waters and groundwater. Among these pollutants may be considered: livestock waste, municipal sludge (sewage and water) provinte sludge from processing sugar beet, flax and hemp, cellulose, etc..

Then, a special attention must be given to drawing up a fertilization plan and in particular to the use of organic liquid and semi-liquid effluents from farm or outside, because they may contain some elements or noxious substances such as heavy metals, capable of accumulate in the soil and cause toxicity phenomena in food chain.

The amount of mineral and organic fertilizers applied per unit area should not exceed 170-210 kg N / ha/year. It must be included the liquid nitrogen from manure directly on the ground reached by the animals during grazing. For farms in areas vulnerable to water pollution by nitrates is not be exceeded these specified amounts.

This paper offers basic knowledge and methodological elements for evaluation and characterization of the natural and anthropogenic resources, in the hope that the information presented will arouse interest to the decision maker and in the near future the agricultural

research and practice with environmental protection, will strive for development interdisciplinary studies, not being able to talk about a healthy environment without a healthy soil.

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