

EFFECTS OF NUTRIENTS POLLUTION – PUBLIC AWARENESS CAMPAIGN

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Nutrient pollution originated from agricultural or household activities, is one of the main issues our modern world has to deal with. Due to the specific aspects this type of pollution implies - the uncertain nature of pollution source, the relative continuous character of the pollution process, the complex environment system implied (soil, surface and ground waters), these issues are difficult to manage and presume an integrated approach and a strategic perspective. Another aspect that gives this phenomenon a special status is the transborder pollution character.

Romania, as an EU member, has committed to accomplish the compelling liabilities derived from European Directives. Integrating the two directives in Romanian legislation - 2000/60/CE and 91/676/CEE – was achieved by amending the Law 107/1996 and elaboration of GD 964/2000. These obligations regard achieving a balanced ecological and chemical status of waters through measures that concern important water management issues: organic substances, nutrients and hazardous substances pollution. In a specific approach included in the process of implementing the 91/676/CEE Directive, Romania has been initially assigned nitrate vulnerable areas (NVZ) for 255 regions, representing 8.64% of the total surface of the country and, respectively, 13.93% of the total agricultural surface.

Meeting the aforementioned Directives requirements imply technical, administrative and social proceedings. These arise from the main targets drafted in the project mainframe „Integrated Control of Nutrient Pollution”, as follows: (i) reducing nutrients discharge in water bodies; (ii) promoting behavior shifts at regional level; (iii) providing support in strengthening regulation and institutional capacity.

Theoretically, the educational segment - formative and promoting, objectified in the project through component 3, defined as “Strategy for public informing and replication of project interventions”, is designed to provide the necessary set of knowledge in the field, according to specific particularities of a complex target group - authorities, population from the rural environment, of different ages and occupations. The public awareness program, as part of the „Integrated Control of Nutrient Pollution” project, is structured in two major directions: providing of appropriate training services for target audience sections and media coverage - promoting shows, materials, and press appearances. By combining these instruments, the knowledge delivered directly to the targeted audience becomes nationally available.

Introduction

Danube hydrographic basin it is the subject of an eutrophication process that is extended over the western shelf area of the Black Sea. During the period 1988 - 2005, the Danube River brought a medium amount of 35 000 tons of phosphorus and 40 000 tons of inorganic nitrogen, every year. Among the 14 countries covered by the hydrographic basin of the Danube River, Romania has the biggest drained surface (29% out of the total surface of the basin), and the largest population (27%).

The EU legal frame to manage the issue consists of the Water Framework Directive 2000/60/CE, Nitrate Directive 91/676/CEE, and Drinking Water Directive 98/83/EEC. Romania as an EU Member State, committed to enforce the requirements of these Directives by their transposition into the national legislation (Law 107/1996, GD 964/2000, and Law 458/2002). The Romanian Authorities are supported along the enforcement process of the Nitrate Directive by technical assistance programs financed by a World Bank's loan, a Global Environmental Fund grant, National Administration of Romanian Waters' (ANAR) budget, and contributions from local administrations. In 2003 Romania assigned nitrates vulnerable zones in 255 localities, representing 8.64% from the total surface of the country, and respectively 13.93% from the total agricultural land. The assignment was based on soil and climate characteristics, and hydrology affecting the nitrates transfer into ground and surface waters, and the nitrogen equilibrium (manure's nitrogen content vs. nitrogen assimilated by crops). According to these criteria there were identified 3 types of areas:

- *Potential vulnerable areas*: conditions for nitrate transfer to water bodies are favorable, but a positive nitrogen balance of the area is unavailable and the nitrate concentration of ground waters measured in ANAR network is lower than 50 mg/l;
- *Vulnerable areas with actual sources*: conditions for nitrate transfer to water bodies are favorable and a positive nitrogen balance of the area is available;
- *Vulnerable areas from historical sources*: conditions for nitrate transfer to water bodies are favorable, a positive nitrogen balance of the area is unavailable, past zoo technical complexes have existed and the nitrate concentration of ground waters measured in ANAR network is greater than 50 mg/l.

The designation of NVZ carried out in 2008, has considerably increased the number of these areas, reaching 1963 communes, representing 60% of the entire Romanian territory. Considering the situation, it is compulsory to apply an "Integrated Control of Nutrient Pollution", that was initiated by the project „Public Awareness Campaigning at the level of River Basin - 01/FBS/2011”, targeting the following issues: (i) reducing nutrients discharge in water bodies; (ii) promoting behavior shifts at regional level; (iii) providing support in strengthening regulation and institutional capacity.

Methodology

The methodology aims to develop and implement a *Strategy for public information and replication of project's interventions*, designed to provide the necessary set of knowledge in the field, according to specific particularities of the target groups: authorities and, rural population at the river basin level and rural localities located in the nitrate vulnerable zones. The public awareness program, as part of the „Integrated Control of Nutrient Pollution” project, is structured in two major directions: providing of appropriate training services for target audience, and media coverage - promoting shows, materials, and press appearances. By combining these instruments, the knowledge delivered directly to the targeted audience becomes nationally available.

This paper focuses on the activities carried out in a representative sample of rural localities situated in risk areas (NVZ), for the improvement of practices/behavior related to hygiene, sanitation, water resources use, both at individual, domestic, and institutional level. The training sessions were based on presentation, discussions, demonstrative tests, and visits conducted to locally representative objectives.

Results

The public awareness program was carried out during the period 18.10–26.11.2012 in 87 rural localities from 34 counties.

The issues discussed during the local seminars included the followings: the benefits of the project „Integrated Control of Nutrient Pollution” implementation; nutrients pollution sources (figures 1 and 2) and their fate into environment; water resource protection against pollution with nitrates – EU and national legal frame, and practical control tools such sanitary inspection and authorization of activities that could generate pollution; analysis of nitrates in water samples; health risks associated with a poor quality of drinking water; possible solutions like those promoted by the project – investments for sewage networks and waste water treatment plants, manure storage platforms, domestic waste disposal, forest curtains; action plans to protect the nitrate vulnerable zones against pollution from agricultural sources, Code of good agricultural practices, and local action plans.



Fig.1 Vadu Izei - manure disposal directly on soil



Fig. 2 Gârleni – pit latrine

In order to check the seminars' efficiency there were used questionnaires, applied before and after the presentations and discussions. The questionnaire included 8 questions with multiple choice answers: 1) What does it mean nitrate vulnerable zones (NVZ)? – a. Zones with agricultural pollution sources, b. Zones with industrial pollution sources, c. Zones with agricultural pollution sources, and particular soil and climate characteristics – the correct answer is c; 2) Which are the nitrates pollution sources with high risk for human health? – a. Chemical fertilizers, b. Manure, c. Pit latrines, d. Others – the correct answers are b and c; 3) What is the correct manure disposal? – a. Directly on soil, b. Water proofed manure storage platforms, c. Both, d. Others – the correct answer is b; 4) Water with high concentrations of nitrates is it dangerous for children health? – a. Yes, b. No, c. I don't know – the correct answer is a; 5) Water boiling removes the nitrates? – a. Yes, b. No, c. I don't know – the correct answer is b; 6) Are you familiar with the requirements of the Good Agricultural Practices Code? – a. Yes, b. No - the correct answer is a; 7) Who has to put into practice the requirements of the Good Agricultural Practices Code? – a. Big farmers on the entire country surface, b. All breeders, including individual households, c. Big farmers from NVZ, d. All breeders in NVZ, including individual households – the correct answers are a, b, c, d; 8) What is the maximum amount of nitrogen coming from manure or chemical fertilizers than can be applied annually? – a. 120 kg N/ha, b. 170 kg N/ha, c. 230 kg N/ha – the correct answer is b. A correct answer is quoted with 1 point and a wrong answer with 0; the whole questionnaire has a maximum score of 12 points. The seminar efficiency (figures 3 and 4) was calculated using the followings formulas:

a. Questionnaire:

$$E_{SEMCHES\ T} = \frac{N_{CD} - N_{CI}}{N_{CD}} \times 100 \quad (\%) \quad (1)$$

Where:

$E_{SEMCHES\ T}$ – seminar efficiency for the entire questionnaire

N_{CD} – participants' knowledge level after the seminar (average score for questionnaire 2);

N_{CI} – participants' knowledge level before the seminar (average score for questionnaire 1).

b. Question:

$$E_{SEMINT} = \left(\frac{P_2}{Nr.TPChe_2} \times 100 \right) - \left(\frac{P_1}{Nr.TPChe_1} \times 100 \right) \quad (\%) \quad (2)$$

Where:

E_{SEMINT} – seminar efficiency per question

P_2 – question score in questionnaire 2

$Nr. TPChe_2$ – total score for the question in questionnaire 2

P_1 – question score in questionnaire 1

$Nr. TPChe_1$ – total score for the question in questionnaire 1.

Questionnaire 1 was completed by 2670 persons, and questionnaire 2 by 2537 persons.

An evaluation scale from highly positive efficiencies to highly negative ones (table 1), and a matrix (table 2) were used to quantify the seminar’s efficiency. To quantify the participants knowledge after the seminar, it was used a scale shown in table 3, and a matrix shown in table 4.

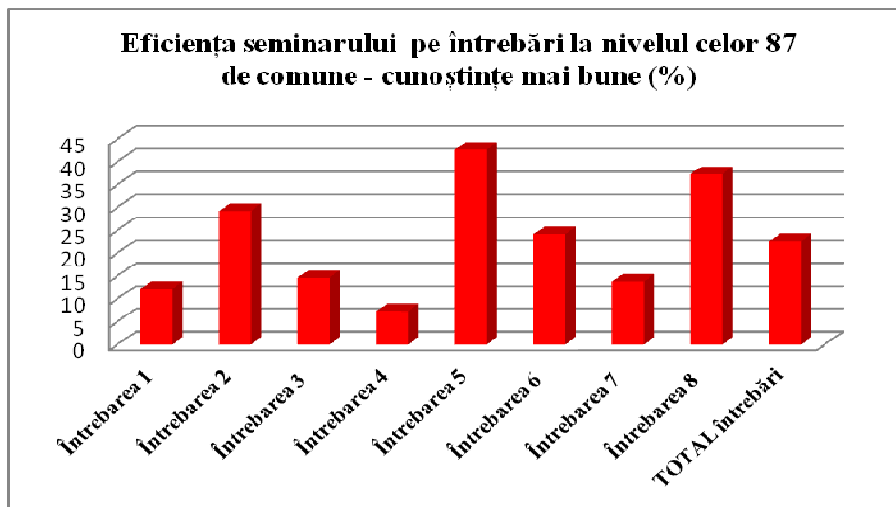


Fig. 3 Seminar’s efficiency per question – improved knowledge (%)

Table 1 Quantification of seminar’s efficiency

Category	Efficiency	%
I	Very high positiv	>31
II	High positiv	21 ÷ 30
III	Average positiv	11 ÷ 20
IV	Low positiv	0 ÷ 10
V	No influence	0
VI	Low negative	0 ÷ -10
VII	Average negative	- 11 ÷ -20
VIII	High negative	- 21 ÷ -30
IX	Very high negative	> - 31

Table 2 Matrix of seminar’s efficiency

Efficiency Question	I	II	III	IV	V	VI	VII	VIII	IX
1.	22%	18%	23%	17%	2%	10%	6%	2%	-
2.	44%	29%	17%	9%	-	-	1%	-	-
3.	11%	18%	20%	31%	5%	14%	1%	-	-
4.	4%	7%	22%	31%	13%	18%	4%	1%	-
5.	76%	16%	4%	2%	1%	-	1%	-	-
6.	32%	28%	19%	10%	3%	8%	-	-	-
7.	22%	15%	17%	39%	2%	4%	1%	-	-
8.	64%	10%	13%	9%	1%	3%	-	-	-
Total	47%	39%	12%	2%	-	-	-	-	-

Table 3 Quantification of knowledge level

Category	Knowledge level	%
I	Excellent	91 – 100
II	Very good	76 – 90
III	Good	61 – 75
IV	Average	46 – 60
V	Poor	30 – 45
VI	Low	16 – 29
VII	Very low	0 – 15

Table 4 Matrix of participants’ level of knowledge after the seminar

Efficiency Question	I	II	III	IV	V	VI	VII
1.	6%	13%	30%	25%	17%	8%	1%
2.	6%	26%	40%	22%	6%	-	-
3.	67%	24%	7%	2%	-	-	-
4.	65%	32%	3%	-	-	-	-
5.	49%	38%	9%	3%	1%	-	-
6.	4%	27%	34%	22%	10%	3%	-
7.	3%	6%	16%	23%	44%	8%	-
8.	35%	31%	18%	11%	1%	4%	-
Total	1%	23%	50%	25%	1%		

Considering the total number of seminars and questions, the distribution of the knowledge level is: 1% excellent, 23% very good, 50% good, 25% average, 1% poor.

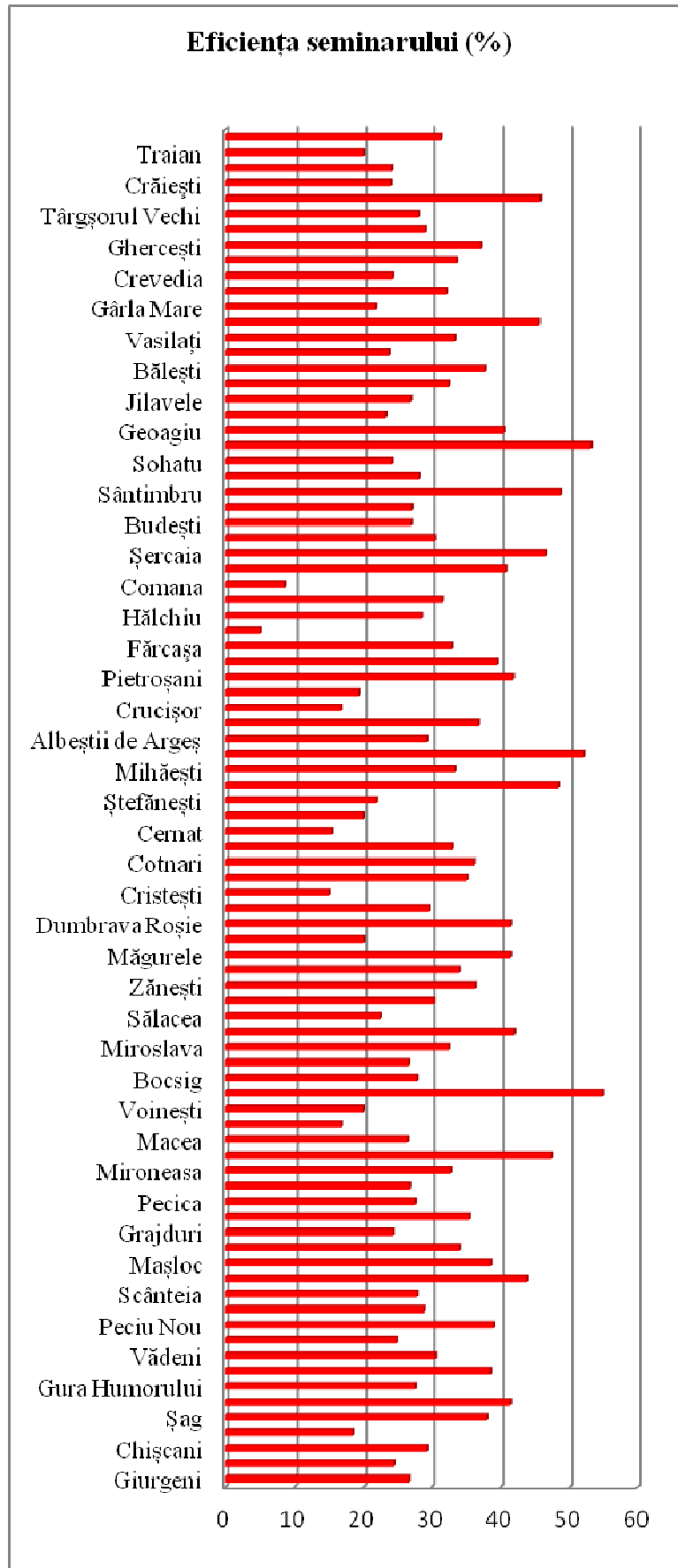


Fig. 4 – Seminar’s efficiency in 87 rural localities – improved knowledge (%)

Conclusions

The public awareness campaign carried out at this stage by seminars organized in rural localities located in NVZ reached its purpose to inform, raise awareness and educate the population on issues related with Integrated Control of Nutrient Pollution.

The results of the completed questionnaires highlight the following aspects:

- The highest number of correct answers before the seminar was given for the question no. 5 - Water boiling removes the nitrates? - 76%
- The lowest number of correct answers before the seminar was given for the question no. 4 - Water with high concentrations of nitrates is dangerous for children health? - 4%
- The highest number of correct answers after the seminar and discussions was given for the question no. 3 - What is the correct manure disposal? - 67%
- The lowest number of correct answers after the seminar and discussions was given for the question no. 7 - Who has to put into practice the requirements of the Good Agricultural Practices Code? - 3%
- The question for which it was registered the highest percent (%) of improved knowledge level was no. 5 - Water boiling removes the nitrates? – an average of 40%, meaning that the information provided by short, and clear question, and concise answer is the most successful
- The question for which it was registered the lowest percent (%) of improved knowledge level was no. 4 - Water with high concentration of nitrates is dangerous for children health? – an average of 5%, due to the fact that being a sensitive issue, most of the participants have already been informed.

The seminars carried out in 87 rural localities covered by the project, had a positive efficiency of different degrees, generating an improvement of population level knowledge, as following:

- 47% very high positive efficiency
- 39% high positive efficiency
- 12% average positive efficiency
- 2% low positive efficiency.

In conclusion, although the projects activities related with population awareness campaign carried out in 87 rural localities from NVZ had a positive impact on the knowledge level, this is only a starting point and further efforts and actions have to continue for:

- Educating civic conscience, and building a participative culture within the community
- Strengthen the education on hygiene and health related risks
- Emphasize on the medium and long term benefits of using manure storage platforms, and stimulating this practice
- Emphasize the benefits of adopting a form of sanitation that prevent the human fecal material to pollute the aquifer used as the main drinking water source in rural areas.

Bibliografy

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