Implication of the Manure Management at the Environment

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Abstract
The research was made for evidenced the animal exploitation activities with negative potential for environment. For this reason were located the following work point: on the Ialomiţa river course, Călăraşi county – dairy cow farm; upstream of the farm a group of cows households. At the level of the each work point were taken fresh and fermented manure samples (before field application), liquid manure samples (the sample was taken in the field application moment), water and sediment samples. The water and sediment samples were taken among a latitudinal degree, in flow river sense, for each season (March and September-October).

Keywords: environment, dairy farm, household, manure, sediment, water

1. Introduction

The organic fertilizers assure the important contribution for nutrients in soil, the plants developments and increase the soil quality and biological activities [1]. The vegetal cultures have the positive reaction to the organic fertilizers. The fresh manure and mud contents a bigger percent of N-NH_3 than semi-fermentative manure and its have a good efficacy in the first year of application [2]. The fermentation manure (compost) has a superior effect for increase the soil quality, because it has good nutritive and power values [3]. The fresh manure applied into the soil or input of the fermented manure more is necessary have important consequences to environment health [4].

2. Materials and methods

We analyzed the water quality of the river Ialomita from Calarasi County and the influence of manure application at environment.

For this reason were located the following work point: on the Ialomiţa river course, Călăraşi county – dairy cow farm; upstream of the farm a group of cows households. At the level of the each work point were taken fresh and fermented manure samples (before field application), liquid manure samples (the sample was taken in the field application moment), water and sediment samples. The water and sediment samples were taken among a latitudinal degree, in flow river sense, for each season (March and September-October).
The dairy cow farm has 284 cows from BNR breed. whereby 126 are milking cows. The cows are exploited in three stables, free stable system. The stables have space for rest. movement and feed and size are 60 x 11 m.
The solids manure evacuation is made by Ifron and for each stable exist a septic tank for collecting the purine. The sizes of the septic tank are 2.5 m x 20.5 m x 3 m, the solids manure are stockpiled 6 months in concrete platform. whereupon are applied to field as well as liquid manure.
The farm has 155 ha field for agriculture. whereby 60 ha property and 95 ha for rental. The structure for vegetable culture is: 50 ha irrigable, 40 ha

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maize for silo, 58 ha maize for grains and 7 ha pasture near the farm [5].

Upstream of the farm is a group of cow households. The group of households were analyzed has average of 6.8cows.

3. Results and discussion

Table I. Quantity of solids and liquids manure resulted in dairy cow farm and households [5]

Number of cows	Solids manure (kg)	Liquids manure (l)	Solids manure (kg)	Liquids manure (l)
	24 hours		1 year (average. 200 days free stable system)	
Farm - 284	6713	4026	1342600	805200
Households - 34	690	454	124200	81720

Quantities presented in table 1 fertilized the surfaces described above. In the following tables we will see that those quantities are too much for the vegetable culture, because it exists in water a concentration which can induce an organic loading of waters. In households the cows were kept on pasture, near the river almost all the time.

The results obtained for qualities of solids and liquids manure are presented in table 2.

Table II. Chemical composition of fresh and stable and liquids manure from dairy farm and households

Manure type	N %	P_2O_5 %	$N\text{-}NH_4$ mg/kg	$N\text{-}NO_3$ mg/kg
Fresh manure	1.5	1.03	13	-
Stable manure	2.4	1.58	2460	700
Half-fermented stable manure	0.61	0.45	280	70

The surface which was fertilized with these nutrients is 50 ha, in comparison with 131 ha which is the correct surface, according to Good Agricultural Practices Code, where is recommended a fertilization with 20-25 kg fermented stable manure for 1 ha of silo maize [6]. In our case, the correct surface will be 198 ha. comparison with 98 which are in reality. The excess of nutrients was washing by rain waters and arrived in river water.

In table 3 are presented the main nutrients concentrations for surface waters, near the dairy farm and households also, for spring and autumn samples of waters.

Table III. The main nutrients concentrations for surface waters in sample points for dairy farm and households

Date	Sample point	Water µg/ml			
		$N\text{-}NH_4$	$N\text{-}NO_3$	N_{anorg}	P
Spring	P 1	0.004	0.362	0.366	0.004
	P 2	0.236	2.061	2.297	0.246
Autumn	P 1	0.000	1.000	1	0.003
	P 2	1.123	0.636	1.760	0.232
Spring	P 1	0.002	0.160	0.162	0.002
	P 2	0.120	1.034	1.154	0.020
Autumn	P 1	0.000	0.580	0.580	0.001
	P 1	0.002	0.160	0.162	0.002

From the table 3 we observed that in spring, the surface water is dominating the nitric form of N, very accessible for plants and this is a potential real danger for water, because it can become eutrophyc river. Beside, in autumn we observed that inorganic N is increase and is possible to assist of self-cleaning process of surface waters or were transformed in other chemical forms.
In table 4 we will se that a part of this nutrients arrived in sediment where are recycled by bental fauna.

Table IV. The main nutrients concentrations for sediment in sample points for dairy farm and households

Date	Sample point	Sediment µg/g			
		$N\text{-}NH_4$	$N\text{-}NO_3$	N_{anorg}	P
Spring	P 1	-	-	-	-
	P 2	0.496	0.052	0.548	0.011
Autumn	P 1	0.045	1.957	2.002	3.062
	P 2	7.499	0.828	8.327	13.41
Spring	P 1	0.090	1.020	1.110	0.013
	P 2	0.380	0.052	0.432	0.011
Autumn	P 1	0.030	1.750	1.780	6.062
	P 2	3.898	0.828	4.726	13.41

Regarding the sediment, we observed that in spring, the dominate concentration form is for ammoniacal nitrogen and phosphorus, also. In autumn, concentration form of ammoniacal nitrogen increased 7 times and for phosphorus, 13 times. Considering that in autumn the samples were taken in same time with manure spreader activities we consider that in this sector are an intense bental fauna activity for cycling this nutrients [5].

4. Conclusions

On the basis of the original researches, pointing the main conclusion of the work.
The increasing of main nutrient concentrations in surface water and sediment at the points work followed the river course being increased at the farm level, comparison with households group located upstream of farm.
The differences between main nutrient concentrations in spring and autumn were derived from bad agricultural manure practices, because at the farm level was fertilized a small surface with to much half-fermented manure and at household level the fresh manure was used for fertilization the pasture or for fertilized the very small surface cultivated with vegetables.
Those are the reasons for pollution of surface waters with organic nutrients derived from agricultural and animal exploited activities.
Moreover at the farm level, the liquids manure is spread in field without prior monitoring of this. The general conclusion is that surface water qualities must be monitories continuous without neglect the farms and small household nutrient contribution in field, water, sediment.

References

Reference to a journal publication:
1. Man. C. - Cercetări privind potenţialul poluant al dejecţiilor şi reziduurilor provenite din ferme şi complexe zootehnice, Lucr. Simp. "Realizări şi perspective în zootehnie şi biotehnologii", 1995, Cluj-Napoca.
2. Man. C. – Cercetări privind potenţialul poluant pentru mediul ambiant al unor ferme şi complexe zootehnice, Analele Universităţii din Oradea, 1997, vol III, Protecţia Mediului.
Reference to a chapter in an edited book:
3. Davidescu. D.. Velicia Davidescu – Testarea stării de fertilitate prin plantă şi sol, 1972, Ed. Academiei Române, Bucureşti, pp. 45-67.
4. Davidescu. D.. Velicia Davidescu. Agrochimia modernă, 1981, Ed. Academiei Române, Bucureşti, pp.125-274
5. Dana Săndulescu - Studii de proiect privind evacuarea, gospodărirea ecologică şi utilizarea dejecţiilor provenite din fermele de taurine, 2005, teză doctorat, Bucureşti.
Reference to electronic publications:
6. www.icpa.ro. Cod de Bune Practici Agricole, 2004 vol. 1.