PROGRESS IN THE USE OF WASTE AND ORGANIC RESIDUES IN AGRICULTURE

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Abstract
The paper addresses the problem of capitalization of semi-liquid manure as organic fertilizer, which is an issue of sustainable agriculture included in Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources.
It presents a case study on a swine farm with a herd of 23,000 head of Arges county, with an area of 1616 hectares that has been contracted for spreading semi-liquid manure twice a year, spring and autumn.
For upgrading and implementing new technologies in semi-liquid manure storage, pumping them over 4 km in the field of high pressure with automatic installations and the application directly on the ground, the company accessed EU funds for development.
Based on practical experience gained so far, it is estimated that the use semi-liquid manure fertilization of agricultural land is the most efficient solution from an economical and ecological point of view because it eliminates costs for construction and operation of treatment stations, to avoid water contamination of surface and underground water and reduces the amount of chemical fertilizer used, thus helping to ensure sustainable exploitation of mixed agro-livestock activities

Keywords: semi-liquid manure, organic fertilizer, European funds, sustainable development

1. INTRODUCTION

Environmental protection is an essential objective of sustainable development programs at the national and European level, which is expressed in Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources. At a national level this document was prepared as HG no. 964/13.10.2000 approving the plan of action for the protection of waters against pollution caused by nitrates from agricultural sources whose objectives are:

- reducing waters pollution caused by nitrates from agricultural sources;
- rationalizing and optimizing the use of chemical fertilizers and organic compounds containing nitrogen;

The action plan provides:

- the identifying, monitoring and characterizing of water polluted with nitrates from agricultural sources and vulnerable areas and the creation of a Register of these categories of water;
- developing a "Code of good agricultural practices" and implementing the necessary measures by farmers;
- creating an Action Plan on agricultural management methods to prevent excessive loading of surface and underground water by substances from agriculture, especially fertilizers.

The transition period is estimated at 7 years; the deadline for compliance is 2014.
In Romania, large livestock complexes represented distinct sources of pollution of soil, surface water, underground water and air.

2. MATERIALS AND METHODS

Farms and livestock are deficient in advanced storage of manure and liquid manure, much of the needed rehabilitation consisting in the modernization of treatment stations and the old installation or improper disposal of manure. To use them, technologies have been developed which replace chemical fertilization with organic fertilization, more friendly to the environment and more advantageous in many respects to organic farming as it promotes and

protects water quality report providing an optimal cost-efficiency.
In this context, we took in for study the Animal Farm SC Danbred Arges SRL with the following characteristics and production site: com Slobozia, jud Arges, Arges BH, river Negrişoara, total area of 11.6 ha farm. Maximum production capacity is 92,000 heads; the effective capacity is 23,000 heads.
Foundation of the complex system Slobozia in intensive animal swine growth was made in 1975 and worked at capacity until 1998.
During that time the collection and disposal method of liquid manure was found to be inappropriate, which led to their discharge into surface waters like river Negrişoara, Dambovnic and default river tributary, and implicitly to the contamination of these water courses.
Due to closure between 1998-2005, and more abundant rainfall in this range, no signal analysis emphasized the danger of pollution of these water courses.
In 2005, water samples were collected from the creek and river Negrişoara and Dambovnic and a physical and chemical analysis performed in 11 quality indicators.
Exceeding NO_2^+ indicators have been recorded (obtained 1,14 mg /l; max. limit 0,3 mg/l). [8].
From the lithologic profile of the land to 10.00 m depth of soil, the following results have been found: a layer of loess (impermeable layer), which resulted in polluted water leaking into surface water, without significant underground water impacts.
Physical and chemical analysis of underground water taken in 2005 recorded an exceeding concentration of the NO_3^+ indicator (obtained value 134.06 mg/l; a maximum limit of 50 mg/l)[8].
Analysis of soil samples taken in 2005 showed values below the alert to all indicators.[8]. In 2005, animal husbandry complex Slobozia is reinstated and so begins a new stage in the development of the livestock sector in full compliance with environmental legislation, in which resources have been accessed by pre-accession funds worth 2 million Euros and investigations also started to modernize to European standards of the swine farm Slobozia. From these funds 350,000 Euros were allocated to the wastewater discharge system and semi-liquid manure.

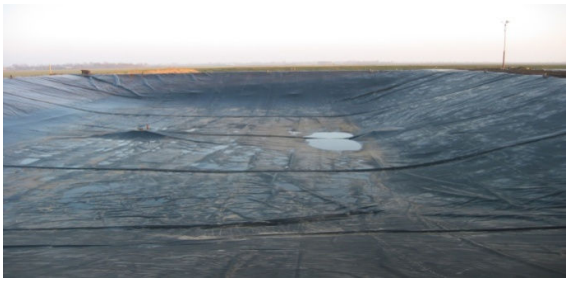

Fig.1 Storage tank of semi-liquid manure

Based on practical experience gained so far it is estimated that the use of semi-liquid manure fertilization of agricultural land is the best solution from an economical and ecological point of view. This is becasuse it eliminates significant costs for construction of treatment stations and their operation, avoids water contamination surface and underground water and reduces the amount of chemical fertilizer used by a total replacement.
Investment in the farm led to the redevelopment of two storage tanks of manure (V1 = V2 = 10,000 cubic meters) by sealing with three layers of membranes: geotextile, protection and basic protection.
Each river has a drainage system (Dn = 80mm) mounted between the protective membrane and the basis for the collection of sewage leakage that may occur in case of accidental damage to the first two membranes (geotextile and protection) and their disposal in a collection base.
On the platform of the two pools are two wells for observation and control
(H = 20m, Dn = 200 mm).

3. RESULTS AND DISCUSSIONS

Using semi-liquid manure in semi-organic fertilization of agricultural land has the following opportunities:

- high-potential agrochemical liquid; semi-liquid manure contains nutrients (nitrogen, phosphorus, potassium).

- fast fertilizer effect, due to its content of nutrients in soluble form with a high content of organic matter in suspension and intense microbiological activity.
- the elimination of complex storage systems, sedimentation and use of manure.

To use semi-liquid manure as a fertilizer on agricultural land the following components were required:

- pedological and agrochemical studies in order to know the attributes of morphological, physical and chemical properties of the soil and determining their degree of suitability of the fertilization with organic manure.
- the acceptance of landowners on semi-liquid manure fertilization (area owned and leased by the agricultural companies and individuals for which has approval for spreading manure is 1616 ha, within municipalities Slobozia and Stefan cel Mare).

For the spreading of semi-liquid manure a high pressure pumping installation of a type Agrometer is used, with a capacity of up to 200mc/h, pressure up to 12 bar, over a distance of 4 km.

Fig. 2. Sewage-pumping plant Agrometer

The plant is provided with a system which automatically stops pumping manure, a manure absorbing system in the collection basin from which the manure was pumped and with a remote control which can be operated from a maximum distance of 10km for different operations.

Manure is absorbed and pumped out of the manure storage tank by a high-pressure installation, to an intermediate storage mobile collection tank (V=75mc), using pressure hoses. These hoses have lengths of 100m and are equipped with clamping flange aluminum and rubber sealing ring.

Fig. 3 Intermediate collection storage mobile tank

From the intermediate basin cell collection the manure is pumped into tanks for sewage slam type SAMSON PG attached to tractors, and then spread on agricultural land in the recommended quantities of pedological and agrochemical studies[7].

Fig. 4 Manure spreading system - Samson PG

4. CONCLUSSION

The application of organic fertilizers (semi-liquid manure) solves the fertilization problem of agricultural land by exploiting existing nutrients in swine manure and waste management activity resulting from livestock to prevent environmental pollution.

The volume of fertilizer semi-liquid (economic optimum dose of nitrogen) which can be applied on land fertilization adapted to it, is calculated according to:

- the maximum allowable nitrogen application in the field without leading to nitrogen leaking in the soil profile and/or by surface water and underground water;
- average nitrogen content of liquid effluents that result;
- maximum load prevention elements in soil and reducing the polluting character limit to load levels considered tolerable;
- physical and chemical properties of soil;

For the "luvisol" and "pelisol" area of study, the dose of semi-organic fertilizer recommended for fine texture (clay) is of 42 cm/ha/year, which ensures the amount of nitrogen needed for soil fertilization (170 kg N/ha/year)[9], and falls within the provisions of the Directive of nitrates and Legislation in Romania.

The used dose is consistent with the provisions of the "code of good agricultural practices" for soil and water protection against pollution by nitrates from agricultural sources.

It is recommended that the fertilizer is applied uniformly over the entire surface to prevent some adverse effects on the environment (cleaning, accumulation in micro depressions, ammonia nitrogen loss by volatilization) and after the implementation is done, plowing within an interval of 24 hours[9].

The best period for implementation is Spring (March-April-May) and Autumn (September-October-November)[9].

It is recommended that on all land on which organic fertilizers are applied from the complex growth of pigs, the agrochemical and physical condition of soil be checked regularly (once every 2-3 years).

For the application of organic semi-liquid manure coming from the complex growth of pigs, the recommendation for the preservation and protection of water courses is at least 30 m, and for that of waters courses that have water attachments, 100 m respectively[5].

At a farm level, is recommended to keep a register in which it is recorded in each plot, the fertilization history, productions obtained, the type and dosage of fertilizer actually applied, the application methods and moments that have been applied, other relevant observations on technology fertilization applied.

It is recommended that this methodology be extended to use organic waste as it provides a better integration in the environment of initially pollutant products and provides a sustainable farming land.

5. REFERENCES

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