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EU4Environment
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EXECUTIVE SUMMARY

Action Program of the Nitrate Directive for Moldova

Chisinau, 2024

Programme Funded by the European Union EU4Environment Water and Data in Eastern Partner Countries Activity implemented by OiEau Austrian Development Cooperation OIKUMENA

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Project:	**EU4Environment – Water resources and environmental data**
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1. Introduction

The agriculture is one of the major branches of the economy of the Republic of Moldova, where the agricultural lands represent approximately 74% of the total area of the country. The application of fertilizers (nitrogen) in excessive quantities and without necessary precautions leads to the pollution of surface and underground water with nitrates and to the development of eutrophication in surface water bodies – rivers, lakes, as well as underground ones.

The Republic of Moldova has taken priority steps in the transposition of the Directive 91/676/EEC on the protection of waters against nitrate pollution from agricultural sources, including by including the general rules in the Water Law Nr. 272/2011. Later, through the adoption of the Code of Good Agricultural Practices of the Republic of Moldova, by the Order of the Ministry of Agriculture, Regional Development and Environment Nr. 160 of July 27, 2020, the basic provisions regarding the method, application periods of fertilizers were established.

Also, by the Government Decision Nr. 736/2020, the Methodology for the identification and designation of areas vulnerable to nitrates was approved, a document that currently serves as the basis for the identification and designation of areas.

To continue harmonizing the national regulatory framework with the provisions of the Directive 91/676/EEC, the aim is currently to reduce water pollution caused by nitrates from agricultural sources, as well as to prevent such pollution in the future by harmonizing and adjusting the specific actions mentioned in Directive 91/676/EEC, described in detail in the draft Action Program regarding the protection of waters against nitrate pollution from agricultural sources.

The **Action Program** mentioned above must also include all the measures adjusted and provided for in the Code of Good Agricultural Practices, as well as specific measures regarding:

1. the periods during which the spreading of certain types of fertilizers is prohibited;

2. the capacity of the basins intended for the storage of effluents from zootechnical complexes;

3. limiting the spread of fertilizers, according to good agricultural practices and considering the characteristics of the respective vulnerable area, in particular:

(a) condition of the soils, their composition and slope;

(b) climatic conditions, rainfall and irrigation;

(c) use of soils and agricultural practices, in particular crop rotation systems, and based on a balance between:

(i) the predictable nitrogen requirement of crops and

(ii) the nitrogen added to soil crops and fertilizers and representing:

— the amount of nitrogen present in the soil when the crops start to use it in important proportions (remaining amounts at the end of winter).

— nitrogen supply through the net mineralization of organic nitrogen reserves in the soil.

— intakes of nitrogenous compounds from animal manure/ waste.

— inputs of nitrogenous compounds from chemical fertilizers and other compounds.

The Action Program will also focus on the statement of principles, which will guide the establishment of specific measures, considering agronomic concepts, pedoclimatic areas and local conditions. It must consider and apply the latest relevant scientific and technical data on nitrogen emissions, agricultural practices and environmental and climatic conditions.

The Action Program establishes specific responsibilities for the central public authority in the field of the environment and in the field of agriculture, for public authorities subordinated to such structures, as well as for local public administration authorities.

The provisions of the Action Program shall be mandatory for all farmers who own or manage agricultural holdings in areas vulnerable to nitrates, established in accordance with the methodology approved by the Government Decision Nr. 736/2020.

2. Areas vulnerable to nitrates from agricultural sources

The areas vulnerable to nitrates presented in this document have been identified and designated based on the natural conditions of the soil, terrain/ land, climate and hydrogeology, regarding the transfer of nitrates to underground and surface water bodies and based on the nitrogen balance according to the provisions of the Methodology regarding the identification and designation of areas vulnerable to nitrates approved by the Government Decision Nr. 736/2020. These vulnerable areas are to be revised every 4 years. The territorial distribution of vulnerable areas is presented in the figure 1.

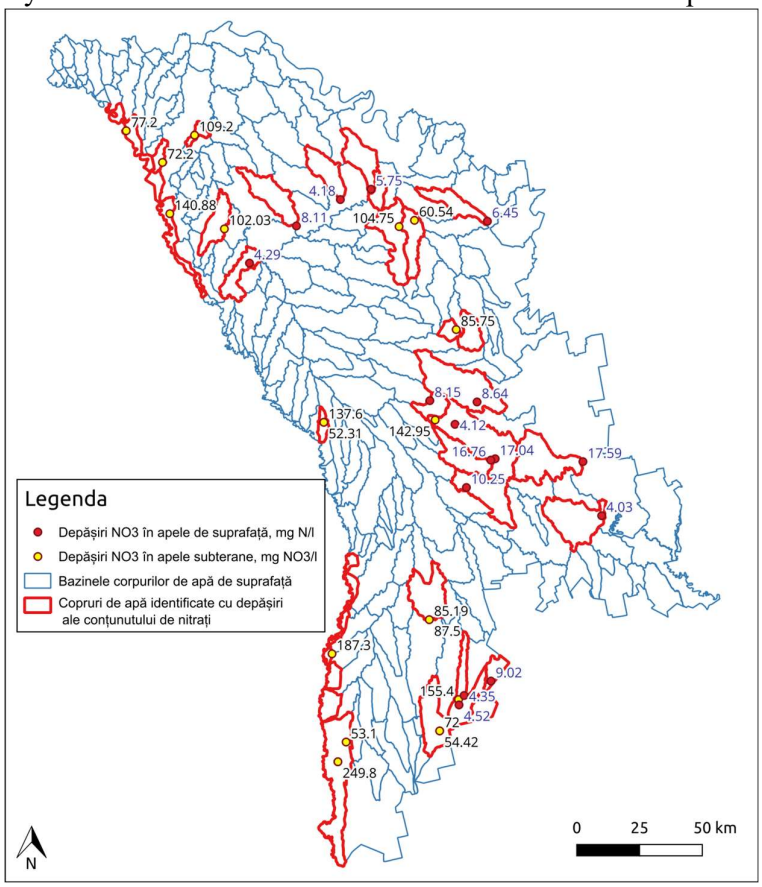


Figure Nr. 1. Water bodies for which nitrate concentration exceedances from agricultural sources have been identified

2.1 Land use in Nitrate Vulnerable Areas

The land use in the areas designated as vulnerable to nitrate pollution, evaluated based on the 2023 cadastral data, is presented in the table Nr. 1.

Table 1. Areas corresponding to different forms of land use in areas vulnerable to nitrate pollution

Land use	Surface – ha
Arable lands	374302
Forests	48038
Pastures	58086
Urban areas	66885
Wetlands	210
Lands under water	10007
Areas without vegetation	195
TOTAL	557722

Source: calculated based on land use/ land cover map, 2022
https://livingatlas.arcgis.com/landcoverexplorer/

In 2023, the area of agricultural land in the Republic of Moldova was approximately 2.5 million hectares (73.6% of the total area). Arable land represented approximately 1.9 million hectares or 55.1% of the total area (according to the Land Cadastre of the Republic of Moldova on 01.01.2023).

Of the approximately 1.9 million hectares of arable land, 374.3 thousand hectares (or 19.7%) fall under the nitrate vulnerable areas. In total, there are 432.4 thousand hectares of agricultural land (17.3% of all agricultural land) within the limits of nitrate-vulnerable areas.

2.2 Soil texture in Nitrate Vulnerable Areas

The soil texture (fig. 2) influences most of the physical properties and some chemical properties of soils and requires the adaptation of cultivation technologies, including fertilization technologies, to the granulometric composition (texture) of each type of soil.

Thus, the texture of each type of soil in nitrate vulnerable areas is described in detail in the draft Action Program, as well as it is presented in figure nr. 2

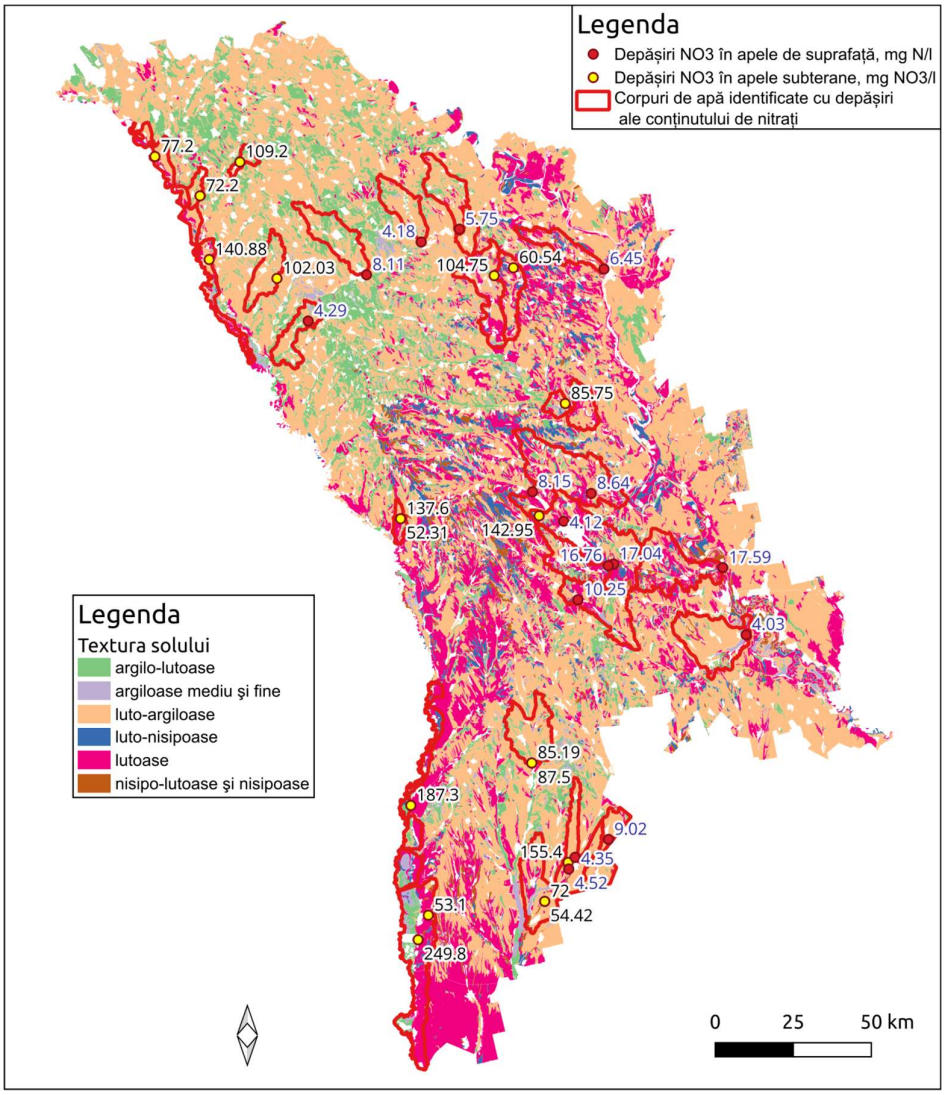


Figure Nr. 2. Soil texture in Nitrate Vulnerable Areas

2.3 Pressure induced by the number of animals in livestock complexes and individual farms

The livestock sector in the Republic of Moldova is relevant in the development of agriculture and food systems.

The small, family cattle farms in the Republic of Moldova own about 90% of the registered cattle herds. The organic waste produced by such herds is mostly improperly stored, thus leading to the pollution of water sources, surface and underground, through nitrogen washing and/ or leaching.

The livestock production in the Republic of Moldova develops predominantly in individual households. On January 01, 2023, the effective cattle herds were about 74,5% and 94,5% of sheep and goats maintained within the households of the population in the inner city (respectively, about 76 thousand and 528 thousand heads). A major consequence is the accumulation in large quantities of residual organic materials of solid, liquid and semi-liquid consistency – animal droppings/ waste in rural localities.

Although such droppings/ waste, rich in nutrients and with a biological value of organic fertilizers, are produced in large quantities in rural areas, they remain very little used for fertilizing agricultural lands and generate increased risks of environmental pollution.

In the Republic of Moldova, the livestock of about 800 thousand animals annually produce over 2.25 million tons of manure, which can provide a value of about 580 thousand tons of organic material and about 15.14 thousand tons of nitrogen (N), about 5.41 thousand tons of phosphorus (P_2O_5), approx. 14.37 thousand tons of potassium (K_2O).

The manure is predominantly used in the gardens around the house and less for the crops in the field. Very few households currently use compost for garden fertilization, and even fewer use it for field crops.

The litter from birds, including ducks and geese, is difficult to collect because most animals are kept in open spaces and in sheds/ stables without floors.

In approximately 90% of localities in vulnerable areas, the manure is stored mainly in open spaces and on unprotected ground.

3. General principles regarding the dynamics of application of fertilizers in the soil and transfer thereof to the aquatic environment (underground and surface)

Depending on environmental restrictions and economic aspects, the nitrogen may be applied in quantities that ensure the economic minimum, the economic optimum or the technical optimum for achieving harvests.

In all cases, when determining the amount/ quantity of nitrogen to be applied, the **available nitrogen from certain sources** (soil, irrigation water and/ or atmosphere, biological activity, residues from previous crops, organic fertilizers) and the **nitrogen subject to productive losses or temporary immobilizations** (consumed for harvesting, immobilized by bacteria, organic matter, etc.) or to definitive losses will be taken into account, the consequence of which is soil, subsoil and water body pollution (volatilized and/ or denitrified, lost through surface runoff and leaching, etc.).

In the sense of these specifications, the nitrogen dose will be corrected using the following relation/ ration (Code of good agricultural practices, 2020):

$$\textbf{Dose of N, kg/ha} = N_C - (N_s + N_a + N_b + N_r + N_g) + (N_i + N_{v,d} + N_l)$$

where:

N_C – nitrogen required for the expected harvest, kg/ha;
N_s (E_s) – nitrogen available from the soil, kg/ha;
N_a – nitrogen from irrigation water and from the atmosphere, kg/ha;
N_b – nitrogen from the activity of symbiotic bacteria, kg/ha;
N_r – nitrogen from the previous crop, kg/ha;
N_g – nitrogen from organic fertilizers, kg/ha/year;
N_i – nitrogen immobilized by soil microorganisms, kg/ha;
$N_{v,d}$ – nitrogen lost through volatilization and denitrification, kg/ha;

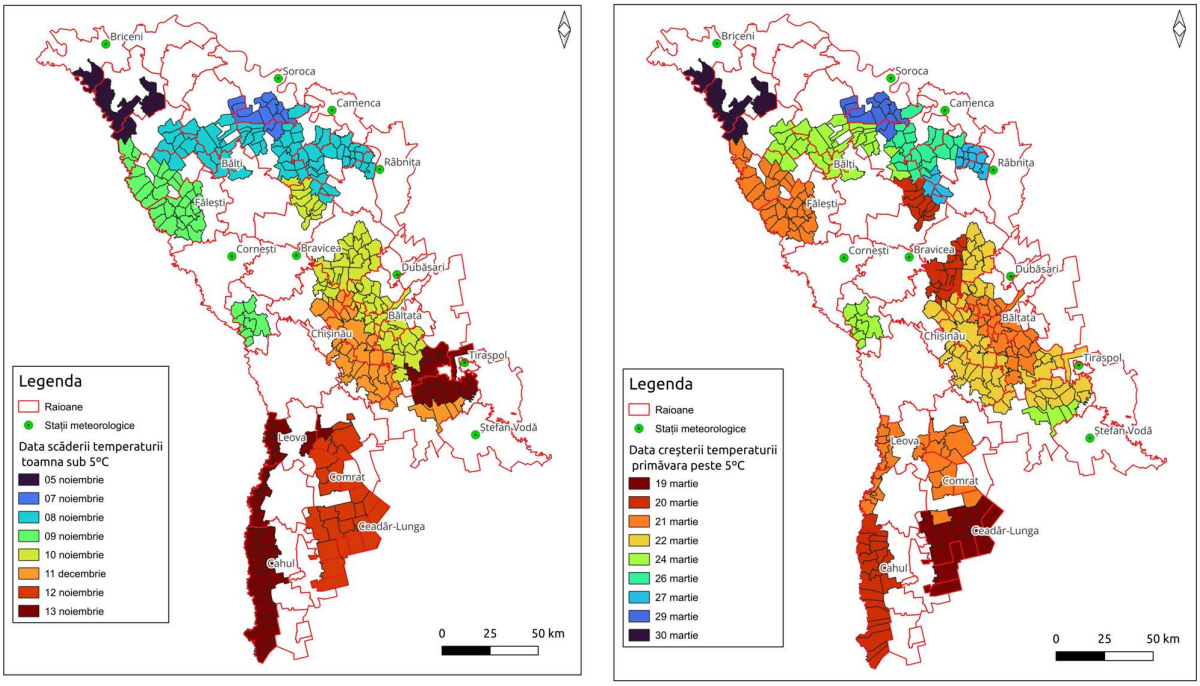
N_l – nitrogen lost through leaching and surface runoff, kg/ha.

During the natural and technological processes to which the nitrogen in the soil is subjected, in addition to nitrogen intakes, immobilizations or losses also occur, often in significant quantities that become sources of soil, groundwater and surface pollution and implicitly of plant origin products.

4. Prohibition periods in the application of fertilizers on the agricultural land

The prohibition periods for field application of solid and liquid organic and chemical fertilizers are defined by the time interval in which the requirements of agricultural crops for nutrients are reduced and the risk of percolation/ runoff to the surface is high. In the pedo-climatic conditions of the Republic of Moldova, the periods with a high risk of percolation or leakage from the cold interval (autumn-spring) are included in the time interval in which the average air temperature is below 5^0C (Figure 3a), based on the climatic data series from period 1990-2020. Thus, taking into account the multi-annual temperature values, the beginning of the prohibition period for the application of solid and liquid organic fertilizers was chosen as the date from which the average air temperature drops below 5^0C (Figure 3a), and the end of the prohibition period for the application of solid organic fertilizers and liquids – the date from which the air temperature becomes higher than 5^0C (Figure 3b).

For the crops in greenhouses and solariums, the prohibition periods do not apply if the temperature inside them is higher than 5^0C.



3a. Autumn **3b. Spring**

Figure Nr. 3. Framing of Territorial Administrative Units according to the prohibition periods for the application of organic and chemical fertilizers in Nitrate Vulnerable Areas

5. Manure storage

The organic fertilizers from agricultural holdings have a very varied physical condition and composition. However, they are managed (in an extensive system – by small farms, or intensively – by large ones), the goal of reducing and preventing nutrient pollution must be pursued.

The proper management of manure shall be done by setting up storage systems that may be individual (household/ agricultural holding level) or communal. The farmers who store manure at the communal platforms must, before the manure is transferred to the platform, shall store it accordingly at the holding/ household level. Also, it is recommended to be found a mechanism regarding the

drawing up a contract between a farmer and the administrator of the communal platform, where the terms and quantities of garbage expected for storage to be specified.

Both at the already existing farms, as well as at those in the stage of farm design and of construction of manure storage capacities, the greatest attention will be paid to the prevention and protection of waters, against nitrate pollution, based on the requirements and practices identified and described in the draft Action Program, considering the following:

- location outside areas with a high risk of pollution and far from water sources.
- sufficient storage capacity.
- appropriate construction, which includes all safety and protection systems.
- safe, optimal and efficient operating conditions.
- appropriate ways of access.
- fire protection.
- protection against possible leaks from hydrants.

The warehouses must have a capacity to ensure storage for a period longer than one month than the prohibition interval for the application of organic fertilizers on land.

The storage capacity depends mainly on the species of animals kept on the rearing system (intensive or extensive, but especially on the type and amount of litter used) and on the duration of the period of prohibition of spreading (Code of Good Agricultural Practices, 2020).

The storage capacities must be constructed in such a way as to avoid any risk of pollution. To estimate the space required depending on the number of animals, it is recommended to be used the values presented in (Code of Good Agricultural Practices, 2020**)**.

The conversion of the number of animals into Livestock Units (LUs) is used to establish constructive solutions regarding the required manure storage capacity. The coefficients for the conversion of livestock to LUs from the point of view of the manure storage capacity are indicated (Code of Good Agricultural Practices, 2020**)**.

6. Rules regarding the application of fertilizers on agricultural land

The maximum amount of nitrogen from organic fertilizers that may be applied to agricultural land cannot exceed 170 kg/ha/year.

For holdings/ famers that practice agriculture in an irrigated system, it is recommended, drawing up and recording **the annual fertilization plan** based on agrochemical studies for irrigated lands (according to the research carried out in accredited laboratories).

For the fulfillment of a fertilization plan, at the level of an agricultural holding/ farm where organic fertilizers from animals are used, it shall be particularly important to evaluate the amount of nutrients from the manure produced at the level of the farm.

It shall be recommended to measure the nutrient content of the manure produced on the farm to be applied to agricultural lands. If no measurements are made of the nutrient content of the farm waste, their values may be evaluated based on average coefficients established by methodologies based on the generalization of experimental data obtained under controlled conditions (Code of Good Agricultural Practices, 2020**)**.

The total amount of nitrogen calculated in this way at the farm level, added to that corresponding to inputs of organic fertilizers from other farms, shall be divided by the land surface on which the organic fertilizer is applied. The resulting value must be lower than the maximum application limit of organic fertilizers on agricultural land (170 kg N/ha/year). This method shall be applied for the calculation of nutrient pressure at the level of agricultural holdings/ farms and administrative-territorial units.

7. General requirements for the application of fertilizers

The optimal periods (April – August months) for applying nitrogen fertilizers are the periods when the culture's requirements for nitrogen are the highest, thus ensuring a maximum efficiency of this nutrient, but also a reduction of the amount of nitrogen released into the environment, respectively the risk of water pollution through infiltration in the soil or through surface runoff. The optimal periods for applying nitrogen fertilizers are also given by the climatic conditions' characteristic of the area, as well as by the chemical form in which the nitrogen in the fertilizer is found, as follows:

a) If the doses of mineral nitrogen are high, their fractional application is recommended, the first fraction being applied at sowing, and the second, during the vegetation period with maximum consumption. The localized application of mineral fertilizers is recommended to increase the nutrient utilization index.

b) When using nitrogen fertilizers in a predominantly organic form, such as manure, compost or other organic fertilizers, it must be taken into account that nitrogen, before being absorbed by plants, must pass into mineral form through a series of transformations in the soil. Therefore, these fertilizers are applied in sufficient time before the time of maximum crop absorption.

c) The liquid organic fertilizers, if not applied correctly, may directly produce pollution. Any rain that occurs shortly after their application will increase the risk of pollution.

d) The application of any type of fertilizer (organic or chemical) shall be prohibited during rain, snow, high temperature and on lands with excess water, flooded, frozen or covered with snow.

8. Obligations regarding the organic fertilizer application techniques

The organic fertilizers shall be applied as early as possible, outside the ban period, but during the crop growth period, to maximize nutrient uptake by crops and to minimize the risk of pollution. Every year, at least half of the amount of garbage stored during the winter must be spread before July 01, and the rest before the beginning of the prohibition period, if an autumn crop is established on the respective land.

During the periods defined as "prohibition periods" it shall be forbidden to apply organic fertilizers on agricultural lands. During the administration, it must be avoided that the administered material reaches the water sources through leakage, for this purpose it shall be necessary to avoid fertilizing the portions of land located in the immediate vicinity of canals, watercourses or other water sources, to take into account the meteorological conditions (absence of precipitation at the time of application) and the condition of soil moisture (dry soil reduces the water runoff). For watercourses, the width of riparian water protection strips is established, depending on their length, in the following sizes:

a) for streams/streamlets up to 10 km – at least 5 m.

b) for small rivers from 10 to 100 km – at least 20 m.

c) for medium rivers from 100 to 200 km – at least 50 m.

d) for large rivers over 200 km – at least 100 m.

The role of protective forest strips is enormous in reducing the surface water pollution. If there are no forested strips near the water collectors, the water runoff from the surface of the agricultural land represents 50-60%, if 10% of the territory is forested – 20-27%, if 30% – 15-20%, and if 50 % - water runoff from the soil surface is 13-15%.

Unloading or storing garbage near water sources, emptying or washing bunkers and fertilizer administration equipment of any kind into surface waters or near them shall be prohibited, leading to the environmental pollution and shall be penalized according to the law.

During the administration of liquid and semi-liquid natural organic fertilizers, good practices will be adopted to avoid their passage into water sources:

- taking into account the meteorological conditions and the condition of the soil; in the case of application to the soil surface, avoiding spreading during wind, high temperature, during rains.
- avoiding any accidental or intentional discharge of such liquids from the tank or cistern of the administration equipment near any water source or directly into it. For this purpose, it shall be necessary that the reservoir or cistern be protected or built from anti-corrosive materials; both in the transport and in the administration of such fertilizers, the technological losses or through the non-tightness of the machines must be completely reduced.
- under no circumstances repairs or other operations will be carried out apart from the technological ones if the machine is partially or fully loaded.

The uniformity of spreading, regardless of whether this operation is carried out manually or mechanically, must exceed 75%.

9. General obligations regarding the chemical fertilizer application techniques

Do not work with material with lumps or with a granulation greater than that of manufacture, and do not work if the air humidity is higher, in fog or drizzle. Dry fertilizers will be used.

The adoption of maximum prudence when the agricultural land presents the phenomenon of surface runoff. The risk is maximum when the land is saturated with water or frozen – which is why application in such conditions is prohibited.

Within the crops in the greenhouses, the irrigation water, which contains among other substances and fertilizers, will not be discharged outside of them. This requirement shall be achieved by recirculating the entire quantity of water resulting from the collection of drainage, condensate and irrigation water.

10. Obligations regarding the application of fertilizers on steeply sloping lands (more than 12%)

- The soil works, including sowing, on arable land with a slope more than 12%, cultivated with creeping plants, shall be carried out along contour lines.
- During the winter, the arable land must be covered with autumn crops and/ or remain fallow after harvesting on at least 20% of the total arable surface of the farm.
- The existing terraces on the agricultural land shall be maintained.
- No organic or chemical fertilizers shall be applied if intense precipitation is forecast.
- On lands with a slope of over 12%, the fertilization must be done only by incorporating fertilizers into the soil (no later than 24 hours from the time of application).

11. Obligations regarding the application of fertilizers on lands adjacent to watercourses and in the vicinity of drinking water intakes

- The width of the protection areas shall be established depending on the width of the water course, type and destination of the water resource or hydrotechnical arrangement.
- On lands adjacent to watercourses the protection areas and buffer strips (protection bands/ strips) are established where the application of fertilizers of any kind is prohibited.
- Buffer strips (protection bands/ strips) are established, in which the application of fertilizers of any kind is prohibited. The minimum width of the protection strips varies depending on the slope of the land as follows:
  - 3 m for lands with a slope of up to 12%
  - 5 m for lands with a slope over 12%.

- The width of the buffer strips (protection bands/ strips) shall be considered from the limit of the physical block adjacent to the protection area (established by the Water Law) towards its interior. Land slope means the average slope of the physical block adjacent to the watercourse.

The use of fertilizers of any kind is prohibited in the protection areas established around the catchment works, constructions and installations intended for drinking water supply, drinking water sources intended for bottling, mineral water sources used for internal treatment or for bottling, as well as of therapeutic lakes and sludges/ muds, in accordance with the nature and size of the sanitary and hydrogeological protection areas.

12. Application of chemical and organic fertilizers with nitrogen on permanent meadows (pastures and hayfields/ meadows)

The application of organic fertilizers on permanent meadows (pastures and hayfields) shall be subject to the condition of not exceeding the dose of 170 kg N ha/year and not to be applied during the prohibition periods.

13. Record documents of the agricultural holding/ farm

The record documents of the agricultural holding/ farm must be drawn up and fulfilled in in such a way as to allow the inspection and control authorities to ascertain:

- surface of the farm.
- a simplified fertilization plan that includes for each plot of land within the farm:
    - type and quantity of any chemical fertilizer applied to the land, the quantity of nitrogen contained and the date of application.
    - type and quantity of any organic fertilizer applied to the land (other than that left by grazing animals) and the date of application.
    - for organic fertilizers applied, other than those left by the animals themselves, their type will be mentioned (compost, manure, urine, manure must, liquid manure, semi-liquid-pasty manure, liquid organic fertilizer, sewage sludge, etc.) and the animal species from which it originates.
- type of any agricultural crop, the date it was sown and the date of harvest.
- farm's livestock, by species and categories of animals, identification and registration thereof, the livestock records, as well as the period of time during which the animals are kept on the farm (stable).
- nitrogen pressure from organic fertilizers of animal origin at the holding/ farm level calculated according to the excretion coefficients from the Table No. 15.
- quantity and type of animal fertilizers applied on agricultural land, as well as those delivered/ purchased, date of delivery/ purchase, name and address of recipient/ supplier.
- system for the collection and storage of animal waste (at the farm level and/ or on communal garbage platforms, permanent/ non-permanent deposits) correlated with the minimum requirements imposed by the periods of prohibition in the application of fertilizers.

The models of these sheets are presented in the Appendix nr. 3 of the draft Programme (tables nr. 1 - 5).

Any record document of the exploitation, from the category of those provided, shall be kept for a period of 5 years from the last registration made in the document.

14. Monitoring of the Action Program

In accordance with the provisions of Government Decision nr. 145/2021 regarding the organization and operation of the Ministry of the Environment, the ministry's mission is established: to analyze the situation and problems in the areas of activity managed, to develop effective public policies, to monitor the quality of policies and normative acts and to propose justified interventions of the state, which are to provide effective solutions in the areas of competence, ensuring the best ratio between the expected results and the expected costs. Thus, the Ministry of the Environment, jointly with the subordinate authorities, as well as the Ministry of Agriculture and Food Industry are responsible for the monitoring of the Action Program implementation, as well as the evaluation of the results regarding its implementation, is carried out every 4 years.

Also, the Inspectorate for Environmental Protection and the National Agency for Food Safety will be responsible for controlling the implementation of some measures from the Program, through their attributions.

The monitoring and evaluation indicators will quantify the effectiveness of the measures provided for in the Action Program and are established considering the commitments undertaken by the Republic of Moldova in order to harmonize the Directive 91/676/EEC.

15. Control of the application of the Action Program

The control of compliance with the Action Program for the protection of waters against nitrate pollution from agricultural sources will be carried out by the Inspectorate for Environmental Protection, jointly with the National Agency for Food Safety and local public authorities, based on the monitoring indicators established in the draft Action Program.

16. Informing and training of farmers and agricultural producers

The Ministry of the Environment, together with its subordinate institutions, as well as in partnership with the Ministry of Agriculture and Food Industry, the National Agency for Food Safety ensures continuous information and training of farmers regarding the need to comply with the provisions of the Program of Actions. It also organizes trainings, as well as provides informational support, when necessary, to farmers and agricultural producers on this subject.

17. Cost analysis for implementing the Program of Actions

The economic analysis of the implementation cost of the Action Program regarding the protection of waters against nitrate pollution from agricultural sources is developed in accordance with the provisions of the WATECO Guide of the Directive establishing a community policy framework in the field of water No. 2000/60/EC regarding the methodology for evaluating the costs of water use and recovery mechanism thereof, based on the “beneficiary and polluter pays” principles. The quantification of the available and potential financial capacities for the implementation of the priority measures stipulated in the Directive and ensuring the compliance of agricultural enterprises.

To recover the costs of the measures associated with the development and implementation of the Program regarding the protection of waters against nitrate pollution from agricultural sources, this

analysis shall estimate the financial resources necessary to comply with the restrictions and recommendations applicable in areas declared vulnerable to nitrates.

For the evaluation of the costs of the works required for the construction of the communal platforms, there have been used the data of the National Bureau of Statistics on the total livestock and for households, the existing and the calculated data on the existing and required storage capacities, the prices for the necessary categories of materials, equipment and works for such purposes. Also, when estimating the costs for the implementation of the respective measures, the Best Practices Guide for Animal Excrement Management[1] was used, considering the inflation and price increases (by approx. 30% in the years 2021-2023) for the necessary goods and services.

1. Evaluation and monitoring measures.

1.1. *Development of a study on the current condition of warehousing/ management/ storage of manure and mineral fertilizers in nitrate-vulnerable areas*, as well as identification of optimal locations and technologies for the warehousing/ processing thereof.

The existing information on this subject has a fragmentary character and significant differences in the chronological data series, especially at the territorial level. In addition, along with the shortcomings of existing statistical data and analytical studies in the field, there is no modern digital cartographic support that represents the areas vulnerable to nitrates and the main indicators for the characterization thereof at the present time.

1.2. *Extending and strengthening the monitoring system of surface and underground water pollution with nitrates from agricultural sources*. Completion period – 2026-2029. Responsible authorities: Environment Agency, Ministry of Environment, Geology and Mineral Resources Agency, Environmental Protection Inspectorate, Ministry of Agriculture and Food Industry, LPA. Monitoring indicators: total required number of monitoring points, including newly installed ones/ frequency of monitoring, number of samples taken annually.

This measure will be carried out within the limits of the annual budget allocated by the state budget. This measure is a priority in the current conditions of surface coverage with water quality monitoring stations in small and medium river basins.

2. Regulatory measures (norms, standards, restrictions, regulations)

2.1 *Restriction of grazing*, including the optimal number of animals relative to a certain area of pasture and the limitation of grazing within riparian water protection strips. Despite multiple reductions in household livestock, including sheep and goats, the condition of pastures continues to deteriorate, being caused, to a large extent, by the non-compliance with the Regulation on grazing (Government Decision No. 667/2010), especially the prohibition period and the use of lands, with the significant limitation of grazing (river strips, young forest plantations). The costs of such measure are estimated at approximately MDL 500 thousand, the control of compliance of this aspect by the Environmental Protection Inspectorate (EPI) together with the Local Public Authorities (LPA) of level I and II.

2.2. *Regulation, recordkeeping and strict control of the use of fertilizers in agriculture* in accordance with the provisions of the Action Program and the recommendations of the Code of Good Agricultural Practices. The fragmentary recordkeeping and superficial control of agricultural fertilizer use are some of the main causes of alarming diffuse pollution and deterioration of surface water

[1] Fala A., Masner O., Busuioc C. et al. Animal manure management best practice guide. Practical guide for agricultural producers. Consolidated Unit for the Implementation of IFAD Programs Chisinau: Bons Office 2021. 80 p.

quality, and the existing data are not sufficient for a comprehensive analysis in this context. This situation considerably reduces the effectiveness of the promoted measures for the protection of water resources and significantly delays the achievement of the established objectives regarding the prevention and reduction of pollution from diffuse sources. Responsible authorities: Ministry of Environment, Inspectorate for Environmental Protection, Ministry of Agriculture and Food Industry, National Agency for Food Safety, Local Public Authorities, Associations of agricultural producers, Agricultural and Rural Advisory Center. Indicative cost of the measure: MDL 500 thousand.

2.3. *Promotion of nutrient management planning in agricultural practices for the efficient use of fertilizers*. This measure provides for the planning of the program and regime for the administration of nutrients on agricultural fields, especially organic fertilizers from animal farms, as well as activities related to the record, control and evaluation of the efficiency of the actions undertaken for this purpose. Responsible authorities: Ministry of Environment, Ministry of Agriculture and Food Industry, National Agency for Food Safety, Agricultural and Rural Advisory Center. Completion period: 2026-2028. The costs of this measure will depend on the annual budget allocated to the institutions through the CBTM (Medium-term Budgetary Framework).

2.4. *Development of the standardized form of the Annual Fertilization Plan applied by the agricultural producer*. The respective measure is a complementary and imperative one necessary for the implementation of measures 2.2 and 2.3, for the effective management of the use of organic fertilizers. Also, by applying the standardized form, the necessary data will be accumulated regarding the stocks and flows of organic fertilizers from the livestock sector, the degree of valorization of the animal waste and their impact on environmental factors and health of the population, increasing the sector's resilience to current climate changes. Similar to measure 2.3, the costs of this measure 2.4 will be determined according to the annual budget allocated to the institutions through the CBTM (Medium-term Budgetary Framework).

3. Measures to promote and apply the Code of Good Agricultural Practices

3.1. *Training of economic agents (farmers) regarding the requirements of the Code of Good Agricultural Practices regarding the protection of waters against nitrate pollution from agricultural sources, in terms of the management of animal manure*. The fulfillment of such measure is imperatively necessary in the first cycle of the implementation of the Action Program for all categories of animal breeders (agricultural enterprises and households) both for areas vulnerable to nirats and at the national level. The target groups of this measure must be the livestock enterprises of large capacity, as well as the associations of animal breeders in the individual sector (households and small farmers) for the presentation and promotion of the best practices in the field, lessons to be learned from the experience of other countries. Completion period: 2026-2029.

Responsible authorities: Ministry of Environment, the institutions subordinated to the Ministry of Environment, Ministry of Agriculture and Food Industry, National Agency for Food Safety, the LPAs. Monitoring indicators: number of organized trainings, number of trained persons. Indicative cost: MDL 200 thousand identified.

3.2. *Implementation of measures to prevent leakage (washing) and leaching of nitrogen through the creation of intercropping, forest strips, etc*. It is a very important preventive measure for the reduction of nitrate pollution and the sustainable utilization of agricultural lands, conservation of nutrients in the soil and protection thereof, obtaining harvests and high incomes in agricultural production. Completion period: permanent.

3.3. *Delimitation of riparian protection areas and planting of forest strips in their perimeter*. This is one of the basic measures that will contribute significantly not only to mitigating the harmful impact on water quality and the stability of meadow ecosystems, but also to reducing the loss of water resources in riparian areas and preserving the biological diversity of those ecosystems. In total, there are 2,188.4 km of rivers within the perimeter of nitrate vulnerable areas. Out of these, the most problematic (either due to chronic pollution or total lack of protective strips) are approximately 500 km of sectors in Glodeanca, Camenca, Răut, Căinar, Bâc, Ciorna, Lunga, Botna, Işnovăţ, Ichel and Ialpug river basins, which have an estimated total area of 1500 ha. The estimated costs for these areas (according to the current provisions of the National Forest Extension and Rehabilitation Program of 92,155.00 MDL/ha) are MDL 138.2 million. A priority for the first 4-year cycle can be the Bâc (107.4 km), Răut (62.3 km), Botna (60.3 km), Lunguţa (33.4 km) and Ialpug (16.1 km) basins with an estimated area of 870 ha and an indicative cost of MDL 77.3 million.

4. Construction and modernization of complex animal waste management platforms.

4.1. *Construction of communal manure management platforms*.

At the first stage, it is very important for this purpose to know the experience of some European countries, such as Romania, in which Governmental Programs for the complex management of animal waste and financial assistance to LPAs in the execution of the necessary works are implemented, but in compliance with the predetermined conditions of accumulation, transportation, processing and use of animal waste within communal or inter-communal systems. Term of execution/ Deadline: 2026-2029, but it will be also extended in the following management cycles. Responsible authorities: Ministry of Agriculture and Food Industry through the Agency for Interventions and Payments in Agriculture, IFAD and other existing funds, LPAs of 1st level. Monitoring indicators: Number of platforms (60 for sheep and goats, 30 for cattle) and built storage capacities; volume of accumulated and transferred waste, number of beneficiaries, livestock by species. Indicative cost: MDL 520 per effective animal for sheep and goats.

4.2. *Construction of the complex platform for the management of animal manure*. Completion period: 2026-2029. This measure is a priority in the areas vulnerable to nitrates. Thus, it is necessary to organize seminars/ trainings to raise the awareness of agricultural producers/ farmers with reference to the importance of this measure, as well as the identification by the competent authorities of funds and programs to provide financial support, based on subsidies for the implementation of the respective measure. Thus, given the fact that the zootechnical complexes generate a significant impact on the environment (emissions of greenhouse gases, discharges of harmful substances with waste water, etc.) and on the health of the population, it is necessary to implement this measure in all areas declared vulnerable to nitrates.

The cost recovery is proposed to be ensured both by subsidizing construction works, expansion and modernization of complex animal waste management platforms (cycle I), as well as by the competitive advantages that the livestock enterprises involved will obtain by being included in the value chains and international commercial networks in this field and the significant increase in the revenues obtained.

In addition, the implementation of this measure will significantly contribute to the achievement of the Sustainable Development Goals (SDGs) in the environment and health compartments, to the successful implementation of the Green and Circular Economy Promotion Program, National Environmental Strategy, National Waste Management Strategy, with complex benefits for a medium and long term.

4.3. *Modernizing and expanding the capacities of complex animal waste management platforms*. It is a complementary measure to the one described above (4.2), particularly important both for cycle I of the Program and especially for cycles II-III.

Monitoring indicators: Number of modernized and expanded platforms (20 at national level and 1 in the pilot area); volume of waste accumulated and processed, including with increased harmfulness.

Cost: approx. MDL 4,170 lei per effective cattle animal, including MDL 500,000 for the CAR Lunguta 2 pilot area and approx. MDL 10 million at the national level for the modernization and expansion of the capacities of 20 complex platforms for the management of animal manure at zootechnical enterprises.