

7. MANAGEMENT OF WASTEWATER AND WASTES

7.1. WASTEWATER

The following wastewater is formed on a farm: household wastewater, milking and cooling systems wastewater. Household wastewater is a big problem for new-founded farms as well as for earlier founded ones, because proper treatment of the wastewater is not cheap.

7.1
Wastewater may be discharged to natural environment only when its pollution does not exceed norms approved by the Lithuanian Ministry of Environment.^{1, 2, 3}

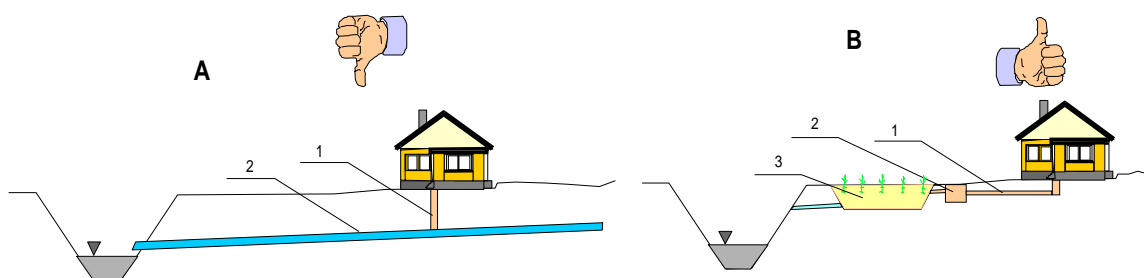


Fig. 7.1. Wastewater discharge: A – it is prohibited to discharge untreated wastewater to drainage pipes; B – wastewater has to be treated prior to discharge to a drainage pipe or a rivulet. 1- sewerage pipe; 2 – septic tank; 3- wastewater treatment fields

It is the best if this wastewater is directed to the existing sewerage network. Then all the business is to pay the determined taxes. If the network is unavailable it is recommended to install inexpensive wastewater treatment plant of two steps. This is a facility of simple construction that does not require constant maintenance and electricity. Farmers can install the facility themselves or buy it (Fig. 7.1).

Septic tank is usually arranged for primary treatment of wastewater. Decomposition of wastewater takes place in the septic tank. The septic tank is made of reinforced concrete or plastic. The septic tank consists of a few chambers connected by gaps. The septic tank should contain wastewater of not less than 7 days if the small amount of wastewater is present (0,5-5 m³/day), and it may contain wastewater of 3-5 days when the amount of wastewater is bigger.

Pollutants that are large and heavier than water settle down in the septic tank and lighter pollutants come to the surface. Accumulated in the septic tank sludge is removed in autumn once in two years.

7.2
Choice of biological wastewater treatment facilities of second step is determined by local conditions (relief, ground, distance to outlet to rivulet, etc.) and valid sanitary environmental restrictions.⁴

The secondary wastewater treatment plant may consist of infiltration well or trench, equipment for wastewater filtration through grounds, biological pond or wastewater collector with watering equipment.

¹ Republic of Lithuania. Law on water 1997 10 21. No. VIII-474. V. 31 article.

² Wastewater pollution norms (LAND 10-96) (Lithuanian). V. 1997

³ Environmental rules on design and exploitation of domestic wastewater filtration facilities (LAND 21-97) (Lithuanian). V. 1997

⁴ Special conditions of forest and land use. LRG 1992 05 12 resolution No. 343.

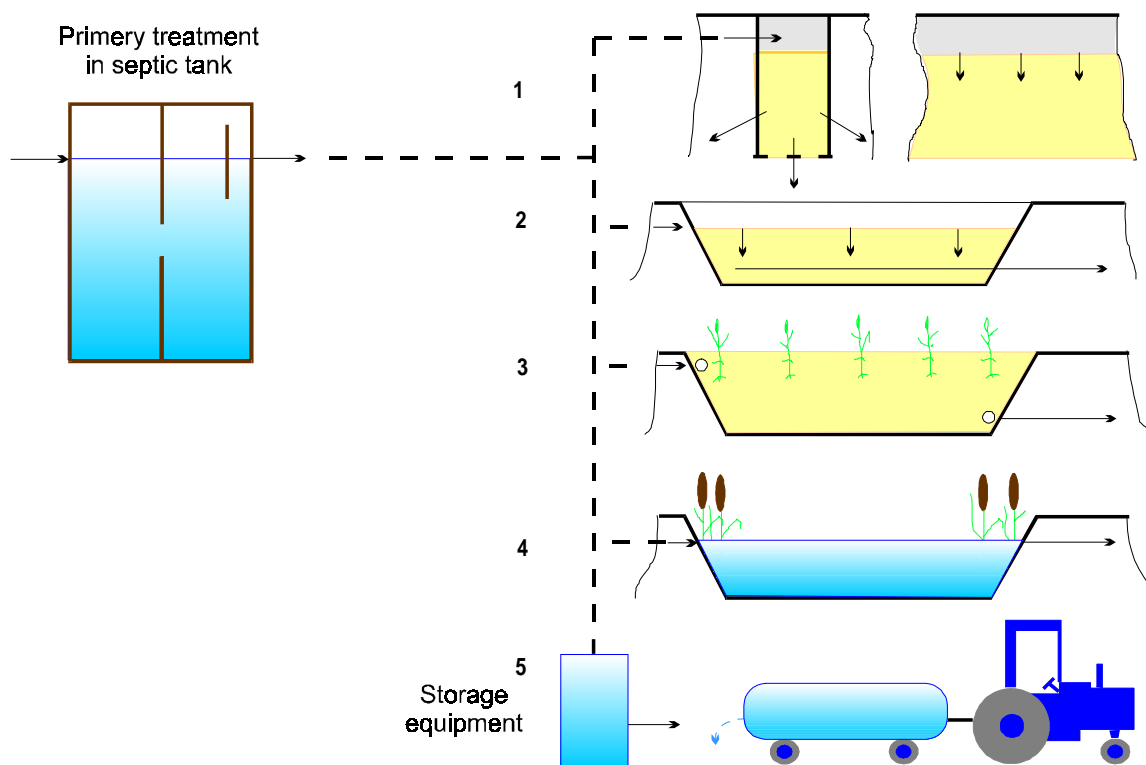


Fig. 7.2. Wastewater treatment types: 1- infiltration well or trench; 2 and 3- wastewater filtration through ground; 4- treatment in pond; 5- use of wastewater for watering of fields

- 1. Infiltration well, filtration trench.** Infiltration well is assigned for the small amount of wastewater – till $1.5 \text{ m}^3/\text{d}$ and filtration trench for more than $1.5 \text{ m}^3/\text{d}$ of wastewater. They are arranged on sand and sandy loam grounds when groundwater level (GWL) is always 1 m below of the bottom of filtration well or wastewater spreading pipe of the infiltration trench. The diameter of infiltration well is of such size that not more than 150 l/d of wastewater would be spread over 1 m^2 area. The total length of filtration trench is such that not more than 25 l/d of wastewater would infiltrate through one rectilinear meter of the spreading pipe.
- 2. Sand filters.** Sand filters are installed in trenches with polyethylene film. Such filters are very effective (when sand layer is 500 mm - 50, and when 700 mm - 70 l/m² per day); therefore, they occupy small area.
- 3. Sand-reed filters.** Sand-reed filter treats wastewater very well and it occupies a little space. In 1 m^2 area of sand-reed filter it is possible to treat 30-50 l of wastewater per day. Sand and sand-reed filters are arranged when there is a risk to pollute drinking water, when soils are not suitable for wastewater infiltration (gravel or heavy clay) and when there is an acceptor of partly treated wastewater. Silty and clay sand can not be used for these filters.
- 4. Biological pond.** Biological pond is effective and cheap equipment, but wastewater stays open there. Therefore, hygiene specialists do not suggest to install the biological ponds in densely populated areas. The wastewater amount of at least 40 days should fit in the pond. The pond has to be not deeper than 0.7-1 m. Surface wastewater can also be directed to such pond.

7.3

Sludge from biological treatment facilities may be used for fertilisation of fields if the sludge meets the requirements of environmental norms.⁵

⁵ Norms for sludge use (LAND 20-96) (Lithuanian). 1997, V.

- 5. Effluents storage.** On a farm there is always very highly polluted wastewater: effluent from wet silage, wastewater formed during feedstuffs preparation, milking and livestock slaughtering, and also colostrum, whey and buttermilk.

7.4

Effluents from wet silage, wastewater formed during feedstuffs preparation, milking and livestock slaughtering, and also colostrum, whey and buttermilk have to be discharged to urine reservoir, slurry storage or separate reservoir or it may be used in compost production. Then the wastewater is spread on the fields with help of mobile spreaders or watering equipment. Single and annual watering norms are restricted according to the fertilisation value of the wastewater. It is strictly forbidden to discharge this wastewater to biological wastewater treatment plant.⁶

Under Lithuanian climatic conditions it is recommended to use the wastewater for watering of perennial grasses. Other plants can also be watered by the wastewater if special veterinary-hygiene requirements are satisfied.

7.5

By wastewater treatment plants there should be installed sanitary protective zones restricting economic activity; besides, minimal sanitary distances to other objects have to be kept.⁷

Table 7.1. Minimal sanitary distances to various objects

Wastewater treatment plant	Sanitary protective zone	Other requirements
Septic tank	5 m	
Infiltration well-trench	8 m	to well, river (along groundwater flow): 50 m when wastewater amount is till 1 m ³ /d 100 m when wastewater amount is 1-5 m ³ /d 200 m when wastewater amount is 5-50 m ³ /d
Various sand-gravel filters	25 m	
Biological ponds	50 m	
Fields watered by wastewater		to settlements, car roads, railways from 30 to 200 m depending on wastewater spreading type; to open water bodies and open drainage filters from 5 to 200 m depending on wastewater spreading type

Biotoilets are used for collection and composting of faeces if sewerage network is absent in a dwelling house. Faeces are composted in the biotoilet without any water. This enables to save drinking water and to reduce pollution of household wastewater. Various biotoilets can contain content of 60-200 uses. Filled closet pot is brought to compost site or manure storage for further composting. Compost becomes sanitarly safe after 6 months of composting.

⁶ Environmental requirements for manure and sewage handling on livestock-farms (Lithuanian). LAND 33 – 99. V., - 1999.

⁷ Special conditions of forest and land use. GR 1992 05 12 resolution No. 343. V.

7.2. COMPOSTING OF ORGANIC WASTES

Prevailing wind direction has to be taken into consideration when installing compost sites. It is suggested to fence in the territory by a wire netting. It is not allowed to compost medical wastes, livestock carcasses, and residues of plants that have been treated by chemical plant protection measures.

7.6

Wastes should be sorted on a farm. Organic wastes have to be used for compost production. The proper ratio of composted materials has to be chosen in order to produce valuable compost.

Soil micro-organisms, earthworms are involved in transformation of organic wastes into compost. Special ratio of carbon and nitrogen in the wastes is needed for better microbial decomposition. The most suitable living conditions for soil micro-organisms is when the ratio is between 15:1 and 30:1, i.e. 15-30 carbon portions for one nitrogen portion. The material for compost has to be mixed well.

Table 7.2. Carbon and nitrogen ratio of some of the organic wastes

Ratio of carbon and nitrogen	Organic material
High (50-150 : 1)	Little decomposed peat, tree leaves, sawdust, paper and straws
Optimal (15-30 : 1)	Animal excrement, fresh dung and beet tops
Low (1-10 : 1)	Urine, faeces, animal blood and green matter of leguminous plants