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REGULATORY AND TECHNOLOGICAL PREREQUISITES FOR THE USE OF SEWAGE SLUDGE FOR ORGANIC FERTILISER PRODUCTION

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According to an analytical report [1] by the National Institute for Strategic Studies of Ukraine, soil depletion is one of the key problems in Ukraine's agricultural sector that needs to be addressed as a matter of priority. The total loss of humus due to soil mineralisation and erosion amounts to 32-33 million tonnes annually, which is equivalent to 320-330 million tonnes of organic fertilisers [1]. The crop harvest removes significantly more nutrients from the soil than fertilisers (the negative balance reaches 100 kg/ha) [1, 2].

At the same time, the rapid decline in the number of cattle and pigs in Ukrainian agricultural enterprises has led to a significant reduction in the use of organic fertilisers over the past 30 years, from an average of 10 tonnes/ha to 0.4 tonnes/ha. Among the available sources of organic raw materials, it is worth highlighting sewage sludge from sewage and water treatment systems in settlements - according to various sources [3], about 1 billion tonnes of this sludge has been accumulated in Ukraine today, while sewage treatment plants produce about 25-30 million m^3 of sewage sludge annually.

The use of organic raw materials of non-agricultural origin as organic fertilisers entails the need to take into account their characteristics, hazards and risks that may be caused by their use. Ukraine’s course towards joining the European Union also requires taking into account European rules and regulations on the handling of such raw materials. In view of this, it is necessary to analyse the EU and Ukrainian regulatory frameworks for the use of organic waste of various origins, in particular, sewage sludge as organic fertiliser.

To this end, we have analysed the existing regulatory documents and identified the main ones that should be taken into account when developing technologies for the production of organic fertilisers based on this raw material.

The legislation of Ukraine in the field of waste management consists of a number of legislative acts and regulatory documents, the main of which are the Law of Ukraine “On Environmental Protection”, the Law of Ukraine “On Waste”, the Law of Ukraine “On Drinking Water, Drinking Water Supply and Sewage”, the Water Code of Ukraine, Resolution of the Cabinet of Ministers of Ukraine dated March 25, 1999 No. 465 “On Approval of the Rules for the Protection of Surface Waters from Pollution by Return Waters”, Orders of the Ministry of Regional Development,

Construction and Housing and Communal Services of Ukraine dated December 1, 2017 No. 316 "On Approval of the Rules for Accepting Wastewater to Centralized Sewage Systems and the Procedure for Determining the Amount of the Fee Charged for Excessive Discharges of Wastewater to Centralized Sewage Systems" and dated December 12, 2018. No. 341 "On approval of the Procedure for the reuse of treated wastewater and sludge subject to compliance with the standards for maximum permissible concentrations of pollutants" and other documents.

Regulatory, technological, environmental and sanitary requirements are contained in the national standard of Ukraine DSTU 7369:2013 'Wastewater. Requirements for wastewater and its sludge for irrigation and fertilisation', DSTU 8727:2017 'Wastewater sludge. Preparation of organo-mineral mixture from sewage sludge', other standards of group 65.080 "Fertilizers" according to the state classifier of normative documents DK 004, DBN B.2.5-75:2013 'Sewage. External networks and structures. Basic design provisions', as well as in the departmental norms of technological design VNTP-APK-09.06 "Systems for the removal, treatment, preparation and use of manure", approved by the Order of the Ministry of Agrarian Policy and Food of Ukraine No. 29 dated 1 February 2006. It should be noted that the departmental norms VNTP-APC-09.06 are of a recommendatory nature and contain practical requirements for the removal, accumulation, transportation, treatment, processing, storage and use of organic fertilisers based on animal manure.

The regulation of sludge treatment and disposal in the European Union is mainly based on Directives that are incorporated into the national legal systems of EU member states. From a regulatory perspective, Framework Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives is the main legal act establishing the procedure for the management of all types of waste, including sewage sludge, and obliges EU Member States to take measures to prevent and reduce the generation of waste and its potential harmful effects. In EU countries, sewage sludge is considered waste. However, there are some differences in the interpretation of the legal status of compost and fertilisers derived from sludge.

Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture is the most important legal act at EU level regarding the use of sewage sludge as organic fertiliser. Sludge from domestic and municipal sewage, septic tanks or other similar facilities may be used in agriculture only in accordance with the requirements of this Directive. The Directive states that sewage sludge treated by biological, chemical or thermal methods, or under conditions of long-term storage, or any other appropriate process that will significantly decontaminate, reduce the degree of fermentation of the sludge and the health hazards resulting from its use, may be used in agriculture. Untreated sludge may only be used if it is incorporated into the soil. Council Directive 86/278/EEC regulates the use of sewage sludge in agriculture by setting maximum permissible levels of six heavy metals: Cd, Cu, Hg, Ni, Pb and Zn. However, in recent years, some European countries have introduced stricter requirements and monitor a more extensive list of heavy metal concentration limits.

In Ukraine, for example, the content of ten heavy metals is regulated in accordance with the requirements of DSTU 7369:2013.

The development of sewage sludge management technologies requires taking into account the provisions of Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (which understands the term "fertilizers" to mean, in particular, "sewage sludge"), Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as well as EU Regulation 2019/1009 laying down rules for the placing of fertilizing products on the EU market.

Also, when developing technologies for the production of organic fertilizers based on sewage sludge, it is advisable to take into account the content and requirements of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as well as the Convention on Cooperation for the Protection and Sustainable Use of the Danube River.

And most importantly, the development of technologies for the production of organic fertilizers based on sewage sludge meets the main goals and objectives of the European Green Deal, the EU's strategic document aimed at achieving climate neutrality by 2050. The European Green Deal emphasizes the need to reuse resources, including biogenic materials, to minimize waste and increase the efficiency of their management. The use of sewage sludge as organic fertilizers contributes to the reduction of the use of mineral fertilizers, which reduces greenhouse gas emissions (especially N_2O) and improves the condition of soils, allowing nutrients (nitrogen, phosphorus, potassium) to be returned to the soil instead of being lost in waste.

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