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DEFINITION AND CLASSIFICATION OF WASTE IN THE AGRICULTURAL ENTERPRISES' BUSINESS ACTIVITY

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Abstract

The work dwells on the nature of waste as a social phenomenon and defines the term 'waste' from the standpoint of their further use to achieve economic effect. In order to combine the diversity of all components that characterize certain waste features within specific economic conditions, an economic classification of wastes has been developed, that makes it possible to identify areas of effective waste management. It was developed an effective economic mechanism for waste management, which would improve the socio-economic efficiency of public production.

Key words**:** *waste, agro-industrial production, management, pollution, classification of waste*

INTRODUCTION

The agro-industrial complex is a strategically important branch of Ukraine's economy, which accounts for about 17% of gross domestic product. This can be explained by the fact that Ukraine has high-quality land resources: chernozems account for 60% of the total area of the country. Favourable climatic conditions also contribute to the effective development of agricultural production.

One of the problems of agro-industrial waste is its danger to the environment. Agro-industrial complex proves to be one of the key generators of waste in Ukraine. The constant increase in agrobusiness production shows that serious attention needs to be paid to developing the methods of agricultural waste collection, processing and disposal with minimal pollution.

At the same time, the production of agricultural goods and their processing given the insufficient technological support generate large-scale volumes of waste, the calculation and identification of which do not meet current requirements. The National Waste Management Strategy [1] distinguishes this type of waste among others and aims at its prevention, efficient use and recycling, urging the need to reconsider existing approaches to the development of agro-industrial production as well as the sustainable development of agricultural landscapes [10, 11]. It should be noted that agricultural products processing is accompanied by waste generation in the course of both its production and consumption, while the responsibility for their disposal falls largely on local authorities and local governments. Agricultural enterprises do not comply with the corresponding waste disposal obligations, causing exorbitant damage to the environment and harm to the health of local population.

MATERIALS AND METHODS

The issue of waste in the agro-industry is reflected have been researched in the works of such scholars as: Yu.K. Boroday, V.S. Gonchar, Yu.V. Kersanyuk, A.A. Murakhovskaya, L.I. Stadnik, N.A. Khizhnyakova, L. Filonenko and others.

These authors studied the aspects of waste management, and in particular, sustainability of their disposal.

The main objective of this work is to develop the agro-industrial waste classification, taking into account their impact on the environment as well as determining the economic nature and notion of waste as a social phenomenon within the management system.

RESULTS AND DISCUSSIONS

In order to look into waste issues it is necessary to define certain terminology. In a broad sense, waste is all that people throw out onto the planet as a result of farming, obtaining energy and other life-sustaining activities. There are objective reasons to agree that waste form a kind of "ecological footprint" to be left by each person during the lifetime [6, 7].

Waste management is one of the most acute and complex problems in the world. In Ukraine, the amount of accumulated waste in designated places has increased tendentiously in recent years, as no due attention has been paid to its recycling. In 2019, the volume of solid household waste amounted to 441,516.5 thousand tons, leading to the deterioration of the environmental situation and the increase in the number of fly dumpings in every region of the country [1]. The dynamics of waste generation by types of economic activity is given in Table 1.

Table 1. Dynamics of waste generation by types of economic activity, thousand tons

Waste producers	Years of observation					2019 in % relation to 2010
	2010	2015	2017	2018	2019	
Total	**425,914.2**	**312,267.6**	**366054,0**	**352,333.9**	**441,516.5**	104
From economic activity	**419,191.8**	**306,214.3**	**360196,0**	**346,790.4**	**435,619.8**	104
Agriculture, forestry and fisheries	8,568.2	8,736.8	6188,2	5,968.1	6,750.5	78
Mining activity and quarrying	347,688.1	257,861.9	313738,2	301,448.9	390,563.8	112
Manufacturing industry including:	50,011.7	31,000.5	32176,7	315,23.2	30,751.8	61
Food production	7,245.4	4,222.2	6446,5	5,818.4	5,581.4	77
Beverage production	1,522.2	939.2	394,2	447.4	342.0	23
Production of chemicals and chemical products	2,679.0	703.3	1242,9	1,227.8	1,199.5	43
Production of basic pharmaceutical products and pharmaceuticals	615.4	10.8	12,5	11.5	15.4	2,5
Metallurgical production	32,844.2	20,725.6	21980,0	21,799.3	21,515.3	66
Supply of electricity, gas, steam and air conditioning	8,641.0	6,597.5	6191,7	6,322.7	5,959.2	69
Water supply; sewerage, waste management	1,698.7	594.2	408,7	397.4	411.8	24
Construction	329.4	376.2	493,8	378.8	188.7	57
Other types of economic activity	2,254.7	1,047.2	998,7	751.3	994.0	57
From households	**6,722.4**	**6,053.3**	**5858,0**	**5,543.5**	**5,896.7**	44

Source: State Statistics Service of Ukraine URL: http://www.ukrstat.gov.ua/ [13].

Based on the above indicators given in Table 1, compared to the previous year, the volume of waste generation in the mining industry increased by 12%, in agriculture, forestry and fisheries it decreased by 22%, and in the processing industry it decreased by 39%.

Insufficient financial support of waste management measures, neglect by production enterprises to fulfil their obligations as to supporting products in their further disposal, inadequate control over the implementation of relevant operations, etc. are the main causes of environmental degradation that requires an integrated problem solution through the development of effective waste management mechanism.

Despite all efforts undertaken in more or less developed countries to address these problems, today environmental degradation is not just slowing down, but is rather progressing and becoming a real security threat. This issue is illustrated in the Protecting Europe's Environment report, which states that "economic growth and consumption have proved to be a much stronger determinant of waste generation than all initiatives and measures to prevent it" [3, 9]. In the course of material benefits production companies use natural resources and enter into collaborations in order to produce, distribute, exchange and consume goods. The synthesis of these phases provides a certain reproduction cycle. The reproduction cycle begins with the production phase, where resources are being used and transformed to create benefits, satisfying social needs. At the same time, this production process is associated with a large volume of waste. The distribution phase actively distributes both the production factors as well as the results to which waste is a component.

The exchange stage presupposes the redistribution of the received national product share in the necessary goods and services. With no proper level of exchange development, there's no way that production, and therefore consumption, can develop. During the consumption phase, goods are transformed into consumer goods or labour items. Thus, consumption is the last phase of the reproduction process, the moment of goods assignment, but at the same time the start of a new production process. The classification of waste by source of their origin thus affects the manner in which they are recorded and evaluated for accounting and monitoring purposes, as well as the identification of further measures to be undertaken in their relation. The company's financial performance depends on the chosen waste management measures and the tax consequences in the course of its activity.

Table 2. Current state standards in the field of waste management

No.	Name	Enacted/ Effective as of
DSTU – 4462.0.01:2005	"The Nature Conservancy. Waste management. Terms and definitions"	First time/ 2006-07-01
DSTU – 4462.0.02:2005	"The Nature Conservancy. Complex of standards in the field of waste management"	First time/ 2006-07-01
DSTU – 4462.3.01:2006	"Environmental protection. Waste management. Procedure for of operations"	First time/ 2007-07-01
DSTU – 4462.3.02:2006	"Environmental protection. Waste management. Packaging, labeling and disposal of waste. Rules of transportation of waste. General technical and organizational requirements".	First time/ 2007-07-01
DSTU – 3911-99 (ГОСТ 17.9.0.1-99)	"The Nature Conservancy. Waste management. Identifying waste and submission of information data on waste. General requirements".	First time/ 2001-01-01
DSTU – 3910-99 (ГОСТ 17.9.0.1-99)	"The Nature Conservancy. Waste management. Classification of waste. Procedure for denomination on the genetic basis and the reference to classification categories".	First time/ 2001-01-01
DSTU – 2195-99 (ГОСТ 17.9.0.2-99)	"The Nature Conservancy. Waste management. Technical passport of waste. Structure, content and rules of change".	To replace DSTU – 2195-93 (GOST 17.0.0.05-93) /2001-01-01
DSTU – 3052-95	"Resource Saving. Procedure for establishing parameters of resource saving in the documentation for products".	/1997-01-01

Source: DSTU DK 005-96. Waste Classifier. K.: Derzhstandart of Ukraine, 1996 [2].

Table 2 shows current state standards, which identify the terms and definitions, regulate the naming procedure, and recognize the transfer of waste data.

Classification of agro-industrial waste (Fig. 1) based on safety level affects the organization of tax accounting in terms of the need to determine the rate of environmental tax for operations related to hazardous waste, that is, waste that threatens the environment and human health. Waste can be disposed of by means of own capacities or involve recycling companies specializing in this activity.

Given the method of disposal chosen by the enterprise, this will depend on the expense items reflected in the accounting system, as well as on the need to purchase additional equipment for waste recycling that utilize these methods.

Depending on their properties waste can be recycled biologically, thermally, mechanically or chemically. For this purpose, the company must carry out waste analysis by means of recycling and taking into account whether their own or attracted funds are involved. Lake take a closer look at the abovementioned classifications: 1) based on source of origin: waste from main and auxiliary industries; 2) based on disposal method: by means of own capacity or involving recycling services; 3) based on recycling method: mechanical, biological, chemical; 4) based on safety level: safe, hazardous. The most important industries are characterized by large volumes of waste. Waste processing and recycling within the conditions of scientific and technological advances is a constantly increasing alternative to natural resources.

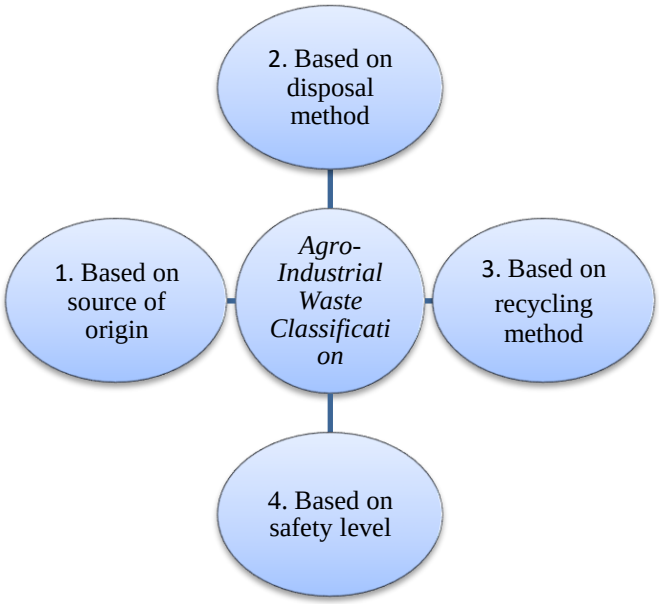

Fig. 1. Classification of agro-industrial waste
Source: DSTU DK 005-96. Waste Classifier. K.: Derzhstandart of Ukraine, 1996 [2].

This can be explained by the fact that the most available raw material deposits are gradually depleting, thus creating the need to develop new, more distant deposits with worse mining conditions that require additional investments. As a result, the cost of materials and extracted resources is increasing, making it necessary to look for resource equivalents - secondary raw materials, which can save up significant production expenses [8, 4].

Moreover, with the continued growth of production output in industrialized countries, the consumption of secondary raw materials is highly dependent on the availability of material resources. Being an alternative to material support for industrial growth, their lack leads to the increasing use of secondary resources.

The environmental dimension of the problem is particularly important, since most production areas generate waste that adversely

affects the environment. If such waste accumulates, the problem of its placement (storage) worsens, which means that we are looking at additional investments to be allocated to the organization of landfills and industrial sites. It is worth mentioning that one of the priority areas for minimizing the accumulation of industrial waste is to return it into production aiming at extracting valuable components as well as using it for recycling.

Recycling of waste as a material resource solves a number of crucial economic problems. However, due to various, mostly organizational and economic reasons, the industry accumulates heterogeneous wastes. Therefore, first of all it is necessary to clarify the nature of the term 'waste' that can be done by defining its characteristics.

Today, there is a large number of definitions of the term 'waste' in scientific literature, most of which relate primarily to the issue of material origin, not focusing attention to their further use by a certain enterprise (company) where they were generated or found. This means that such definition does not have the potential to stimulate further waste recycling. Therefore, it is possible to conclude that the definition of 'waste' has certain drawbacks, with the lack of economic content being the most important one, and as such denies it to be a resource for further use. The definition should thoroughly outline the main properties, features and characteristics of waste, since it forms the basis for methodological approaches to the effective management of waste, the choice of disposal methods and the implementation of resource regeneration measures at all stages of reproduction. Given the aforementioned, we can formulate a definition that focuses on motivating economic entities to attract waste into production and then reuse it to achieve economic effect.

The intensification of agro-industrial production has led to the accumulation of waste, accompanied by its decomposition and the expansion of the land areas on which they are located. The potential environmental quality problems associated with agro-industrial production are largely influenced by the production processes, recycling methods as well as waste use by farmers and the processing industry [12, p. 44].

In our opinion, agro-industrial waste should be understood as substances or materials arising in the course of business activity which have completely or partially lost consumer properties, although they can be reused as raw materials in future production, provided that appropriate technologies are in place as well as organizational and economic prerequisites exist to neutralize their negative impact on the environment and human health. Enterprises generate a lot of waste across various sectors of the economy, making it difficult to account for, plan, control and choose methods for efficient waste management. Due to a number of reasons Ukraine and other countries lack of a universally recognized scientific classification of industrial waste, which would broadly encompass their diversity. Existing waste classifications are substantially varied and unilateral, characterized by indistinct characteristics and duplication, etc. This complicates information perception and impedes the development of an effective waste management mechanism. Therefore, at the very first stage, it is necessary to improve the classification based on identification of existing types and categories of waste.

Classification is widely used in science as it establishes a certain order and divides the objects in question into groups in order to organize them and make information review more accessible. Classification is a multi-level, branched distribution. It should be noted that the principle of toxicity is often chosen as the basis for the primary classification. However, such a classification does not provide for an economically reasonable and rational consideration of disposing different types of waste. It is possible to provide the most complete information on waste, but not to define a hazard class, according to the national waste classifier DC 005-96, which provides information support to address a wide range of public waste based on accounting which is harmonized with international systems.

Waste classification is crucial for investigation of their characteristics and

establishing certain links between them in order to determine the best management methods and plan organizational and technical measures for waste utilization. Based on the analysis of drawbacks, we have developed and proposed the classification of waste that combines the diversity of all components that characterize specific features of waste management under certain economic conditions (Fig. 2). Let's now have a closer look at waste types. In terms of utilization all generated waste can be classified as real and potential secondary resources. Real secondary resources include waste that is currently used on the farm to produce goods at or outside the plants generating such waste. Real secondary resources are divided into three categories according to their consumer characteristics: high-quality secondary raw materials, secondary-quality raw materials and waste, which are difficult to dispose of. The first category of waste includes high-quality secondary raw materials, the processing of which under local conditions allows producing in demand goods, and ensures high profitability (industrial waste in the form of by-products, scrap, ferrous and non-ferrous metals). Medium-quality secondary raw materials, the processing of which allows to produce in demand goods, but where the sales revenue roughly corresponds to collection expenses, primary treatment and recycling of waste, include raw materials containing cardboard, waste paper, mixed waste paper, polymers, textile waste, worn tires. Waste subject to significant processing are associated with recycling costs that given the current economic conditions exceed the income from their utilization (waste from the raw materials extraction and enrichment, the metallurgical and chemical industries, the recycling of which in order to obtain valuable components is unprofitable; moisture-resistant waste paper and traditional paper; highly contaminated polymer waste).

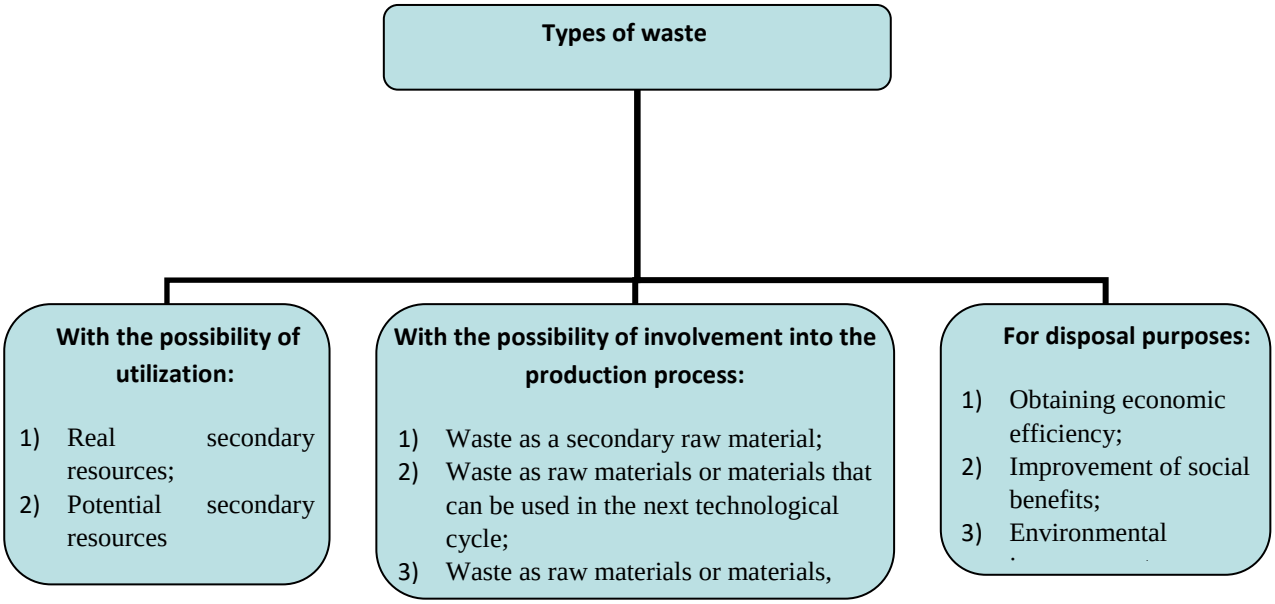

Fig. 2. Classification and types of waste
Source: State Statistics Service of Ukraine URL: http://www.ukrstat.gov.ua/ [13].

Potential secondary resources include waste that is not currently used due to the lack of organizational and technical measures as to their utilization, no capital investment into recycling or the absence of consumer demand. In practice, there is a need to group waste for their further disposal. Achieving economic benefit is critical for business when we speak about making a decision on waste management, as it presupposes cost-benefit comparison. Determination of the economic consequences following such measures is based on the comparison of costs associated with their implementation and the economic benefit as far as the participants are concerned. In addition, the economic benefit

of the waste management operations can be illustrated based on the size of annual economic losses from pollution, which these operations aim to avoid. The economy is closely connected with the improvement of the social status, aimed at society development, in particular improving the quality of people's life, which is characterized by such indicators as living standards, promoting good health, improving working conditions and much more. The social effect in the field of material production is characterized by the increase in production, profits, labour savings and maintaining of social work, that means the reduction of work duration. Another factor of importance is improving the environmental situation in order to prevent or reduce potential environmental harm from industrial waste pollution as well as to enhance the environment [14].

The combined effect is aimed at both achieving economic impact as well as positive social and environmental consequences. Partial environmental effect is reflected, for instance, in the improved economic performance: the savings due to the possibility of reusing waste and reducing production waste, recording of pollutant emissions which is possible with the help of advanced technologies, as well as the economic savings due to reducing costs allocated for improvement of the environment, the external environment and the reduction in fines for violating environmental legislation.

For example, GOODVALLEY-Ukraine farm conducts sustainable agriculture, in particular cultivating fields, producing fodder, breeding pigs and producing its own high-quality products in full-cycle production. In other words, the farm is a food brand operating under the principles of sustainable agriculture, which is constantly working to reduce emissions based on calculations and control in accordance with UN climate projects (UNFCCC), namely, Joint Implementation, Joint Implementation of CDM/Clean Development Mechanism. Reporting, control procedures and the use of methods for calculating and reducing produced emissions are reviewed annually by TÜV heinland, an independent accredited auditor, which conducts an on-site audit and issues a certificate of net emissions. At GOODVALLEY-Ukraine farm, CO2 emissions comprise 2.4 kg per kilogram of meat, compared to the average indicator for Denmark and the world of 2.8 kg CO2 and 5.2 kg CO2 per kilogram of meat, respectively. This has been achieved at the farm by replacing the sources of major CO2 emissions with more sophisticated alternatives. In Ukraine, the farm has established 29 waste processing stations in the neighboring villages and concluded cooperation agreements with waste recycling companies [5].

The main focus of the classification criteria for distributing waste is drawn to the degree of participation in the process of waste production as a secondary raw material. Thus, the criteria define three groups: 1) waste as a secondary raw material used as an additive or a complete substitute of primary raw materials and materials (waste paper, building materials, etc.); 2) waste as raw materials or materials that can be used in another process cycle; 3) waste as raw materials or materials, characterized by fundamentally new properties, lacking in primary raw materials.

Revenues and expenses associated with the processing flow into the enterprise where financial and economic performance is created. It is possible to research this process by determining the method of influence. Direct consequences arise when it is assumed that income will be derived directly from third parties. In some cases, however, this category may result in losses due to transportation costs, waste removal costs or disposal costs. Indirect consequences arise when waste is used in subsequent stages of production, that is, reducing the cost of the raw materials involved. Extraction and processing of valuable waste components during recycling includes their distribution into complex and single-component based on the variety of useful substances. Waste containing two or more useful components is complex. Single-component waste consists of a useful component and impurities, the removal of which is associated with additional costs. The

reuse of single-component waste allows ensuring the availability of necessary material resources in the production process, and waste containing multiple useful components makes it possible to differentiate production, which in its turn increases the competitiveness of the company.

CONCLUSIONS

As a result of the study, it was shown that waste occupies a central place in the system of managing and reproducing the national product. The work dwells on the nature of waste as a social phenomenon and defines the term 'waste' from the standpoint of their further use to achieve economic effect. In order to combine the diversity of all components that characterize certain waste features within specific economic conditions, an economic classification of wastes has been developed, that makes it possible to identify areas of effective waste management. At the same time, it is necessary to develop an effective economic mechanism for waste management, which would improve the socio-economic efficiency of public production. The gap between the accumulation of agro-industrial waste and measures to prevent its reuse, recycling and disposal exacerbates the environmental crisis and slows down the development of the state's economy. Ukraine urgently needs a reform of the legal and economic system to regulate the use of waste, in particular in the field of agriculture, as one of the key spheres of our economy, taking into account world and European experience. The interdependency between the efficiency of agro-industrial production and the potential deterioration of environmental quality is becoming more pronounced due to the increasing intensity of agro-industrial production methods. All negative environmental impacts can be significantly reduced or completely eliminated by changing production technologies in the agro-industrial complex, especially upon the launch of waste-free agro-industrial production. This shall maintain a balance between agro-industrial production and the environmental conditions, ensuring a sufficient number of agricultural and food products, acceptable income to the producers of such products, as well as an optimal state of the environment for the population.

REFERENCES

[1]Dovkillia Ukrainy za 2018 rik, 2019. Statystychnyi zbirnyk. http://www.ukrstat.gov.ua/druk/publicat/kat_u/2019/zb/11/Zb_dovk_2018.pdf (in Ukrainian) Accessed on November 13, 2019

[2]DSTU DK 005-96, 1996, Waste Classifier. K.: Derzhstandart of Ukraine, 305 p.

[3]Gamalia, V. M., Ruda, S. P., Gamalia, K. M., 2016. Ecology of the City: Historical Retrospective and Future Trend. Young scientist. No. 9. http://molodyvcheny.in.ua/files/journal/2016/9/10.pdf Accessed on September 05, 2016

[4]Business Insider, 2018, If you could monetize all of the plastic garbage around the world, you could buy the NFL, Apple, and Microsoft, https://www.businessinsider.com/monetizing-all-of-the-plastic-trash-in-the-world-would-make-you-rich-2018-12, Accessed on March 20, 2020

[5]Goodvally Ukraine, 2021, https://goodvalley.com/ua/ Accessed on February 25, 2021

[6]Kolodiichuk, I. A., 2017, Waste and Their Positioning within the Territorial Socio-Economic Systems. Socio-Economic Problems of the Current Period of Ukraine: Collection of Scientific Papers/NAS of Ukraine. SE "Institute of Regional Studies named after M.I. Dolishny of NAS of Ukraine"; Ch. Ed. V.S. Kravtsiv. Issue 6 (128). 84-88 pp.

[7]Kolodiichuk, I., Kolodiichuk, V., 2020, Formalization of the waste management task in Ukraine for ensuring the environmental stability of Eastern Europe. Journal of Eastern European and Central Asian Research (JEECAR). – Vol. 7, No. 1, 51–60. DOI: http://dx.doi.org/10.15549/jeecar.v7i1.353, Accessed on March 23, 2021.

[8]Kravtsiv, V., Kolodiichuk, I., 2016, Conceptual principles of the waste disposal mechanism formation based on the e-products recycling in Ukraine. Economic Annals-XXI: Journal, № 159 (5-6), 89–92.

[9]Lör, R., 1979, Processing and use of agricultural waste/R. Lör; ed. A.N. Shimko; translation from English by V.V. Novikov. Moscow: Kolos, 415 pages.

[10]Mishchenko, V. S., 2011, Udoskonalennia systemy klasyfikatsii vidkhodiv i zasady ukrainskoho spysku vidkhodiv. [Improving the waste classification system and the principles of Ukrainian list of wastes]. Ekologiya i promyshlennost. No. 2, 107–111. (in Ukrainian).

[11]Pylypiv, N. I., Maksymiv, Yu. V., 2010. Ekonomichna sutnist ta klasyfikatsiia vidkhodiv dlia vidobrazhennia yikh v obliku na derevoobrobnykh pidpryiemstvakh. [Economic essence and classification of waste to reflect them in accounting at woodworking

enterprises.].Visnyk ZhDTU. No 3 (53), 201–205. (in Ukrainian).
[12]Samoylik, M.S., 2014, Ekonomichna model rozvytku sfery povodzhennia z tverdymy vidkhodamy rehionu z urakhuvanniam ekolohichnykh faktoriv [Economic model of solid waste management development in the region, taking into account environmental factors]. Visnyk Poltavskoi derzhavnoi ahrarnoi akademii, 1, 82–87. (in Ukrainian). http://nbuv.gov.ua/UJRN/VPDAA_2014_1_22, Accessed on March 15, 2021.
[13]State Statistics Service of Ukraine. http://www.ukrstat.gov.ua/ Accessed on April 20, 2019.
[14]Tulush L., 2013, Income From Waste. Bulletin of the Ministry of Revenue and Fees of Ukraine. No. 8 http://www.visnuk.com.ua/ua/pubs/id/4942 Accessed on Fabruary 22, 2013.