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NON-WASTE AGRICULTURAL PRODUCTION: PROBLEMS OF IMPLEMENTATION IN BUSINESS PRACTICE

The article is devoted to the problem of implementation of non-waste production in modern production and economic activity. The study of the dynamics of raw materials consumption and the generation of waste in the agro-industrial complex leads to the conclusion that it is impossible to further develop agricultural production on the basis of traditional technological processes without taking into account environmental constraints. Non-waste production involves the development of such technological processes that provide integrated processing of raw materials, which allows to use natural resources in an efficient way, to process waste products into goods for sale and to minimize environmental pollution.

The efficiency of non-waste productions can be achieved in practice, if the principles of systemicity are met; integrated use of raw materials and energy resources; cyclicity of material flows; limitation of the impact of production on the environment; rationality of the organization.

Keywords: non-waste production, agro-industrial complex, principles of non-waste production.

Problem statement. The situation in the agricultural sector of Ukraine creates a number of challenges, for solving which some qualitative transformations should be done, that are capable of ensuring the improvement of competitiveness of agricultural production in the domestic and foreign markets as well as the food security of the state. The research of the dynamics of raw material consumption and waste generation in the agro-industrial complex leads to the conclusion that further development of agro-industrial production cannot be carried out on the basis of existing traditional technological processes without taking into account environmental constraints and requires a fundamentally new approach, known as “non-waste technology”.

At International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (Paris, 29 November – 4 December 1976) was noted: “Awareness of negative side effects of modern technology has, in recent years, brought about new economic and legislative measures which are fostering new industrial attitudes and approaches. Attention has been mainly focused on problems connected with treatment of wastes at the end of the production line, once the product (and its consequent wastes) has been produced. But more and more frequently it is being asked whether it would not be economically and socially less costly to minimize all along the line the creation of wastes that need to be treated – from the extraction of raw materials to the end of life of final consumer goods. The essence of non-waste technology is in the answer to this question”¹.

The development and introduction of non-waste technology and methods of using material resources and wastes is necessary from the economic standpoint mainly because of the increasing cost of this form of production. This trend is basically a reflection of the following:

1. Natural resources are being depleted, so that deposits of raw materials that are less promising from the geological and hydrogeological standpoint have to be developed and worked.
2. The volume of waste is growing because production is steadily expanding and because an increasing proportion of the gaseous, liquid and solid substances as well as energy that enter the production process do not end up in the finished product but are released into the environment in the form of partially processed wastes².

¹ International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, XIII.

² International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, 16.

The issue of development and introduction into the modern production and economic activity of non-waste industries is of great importance for a rational combination of the efficiency of various forms of homekeeping in the agro-industrial complex, environmental safety and the social orientation of agricultural production. Non-waste production involves the development of such technological processes that provide integrated processing of raw materials, which allows the efficient use of natural resources, processing waste products into goods for sale and minimizing environmental pollution.

Therefore, the study of the implementation of environmentally harmless technological processes is of paramount importance for solving the problem of optimal consumption of resources in the current conditions of development of society and environmental protection.

Analysis of the last researches and writings. The concept of non-waste production was proposed and developed by academicians N. Semenov, I. Petryanov-Sokolov, B. Lazcorin, S. Yakovlev, and others. In subsequent years, the problems of the introduction of non-waste and low-waste industries were considered in writings of V. Afanasyev, M. Boyko, B. Gromov, G. Geletukha, T. Zhelezna, V. Zaitsev, R. Lohr, D. Melnichuk, V. Odaryuk, A. Safonov, K. Tetzlav, V. Khomyakov, G. Yagodin, P. L. de Reeder, Yong Zhou etc.

The aim of the article. Taking into account the objective nature of increase in the intensity of agricultural production, the necessity for further thorough research of the problem of weighed resource using in the branches of agro-industrial complex is considerably increased, therefore the purpose of the paper is to study the issue of accelerated development of non-waste agricultural production at the present stage of society development.

Basic results of the research. The United Nations Economic Commission for Europe (ECE) organized the first International Conference on Non-Waste Technology in Paris in 1976. In 1979 the ECE adopted a detailed “Declaration on Lowland Non-Waste Technology and Reutilization and Recycling of Wastes”. In this document, the ECE recommended action on both the national and international levels to develop and promote low- and non-waste technologies¹.

The generally agreed definition of non-waste technology, as determined during an inter-governmental meeting at the outset of this ECE project, is: “the practical application of knowledge, methods and means, so as – within the needs of man – o provide the most rational use of natural resources and energy, and to protect the environment”.

Thus, in its essence, non-waste technology is the planning and management of human activities so as to provide the minimum waste of materials and energy².

At the seminar of the European Economic Commission for Low-Tech Technology in Tashkent in 1984, a new definition of non-waste technology was formulated: “method of production goods (process, enterprise, territorial and industrial complex), in which the raw materials and energy in the cycle are used in a most effective way and raw materials and energy are used in a complex during the cycle raw materials – production – consumption – secondary raw materials in such a way that any environmental impact does not violate its normal functioning.”

The criticism of the concept of non-waste production is based on the fact that creation of such production cannot be executed neither practically nor even theoretically, since according to the second law of thermodynamics energy cannot be completely transformed into work, and therefore, energy waste is inevitable. However, the concept of waste-free production is aimed not on the absolute full use of energy, but in using it as rationally as possible.

Non-waste technology is simply the planning and management of human activities so as to incur the minimum waste of materials and energy. This concept then achieves the twin goal of reduced degradation of the environment and increased conservation of natural resources. Non-waste technology can be applied to all activities of industrial man. Most of these activities can be grouped into the chain of production, thus: 1. Production of raw materials. 2. Transportation of raw materials. 3. Manufacture of finished and semi-finished products. 4. Distribution of products, including transportation, storage and sale. 5. Disposal and possible recycling of used products. At each stage in the chain the concept of non-

¹ Office of Technology Assessment of the U.S. Congress (1986). *Serious Reduction of Hazardous Waste: for Pollution Prevention and Industrial Efficiency*. Washington, DC: U.S. Government Printing Office, 238.

² International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, XIII.

waste can be applied at various levels: A. The conception of the product or output. B. The design of manufacturing. C. The design of residuals and re-use of products. D. Design of the centralized waste handling facilities for use of waste as new resources (however, designing to avoid waste before a process begins, rather than handling waste effectively after it has been produced). E. Designing the total system as a whole.

The efficiency of non-waste productions can be achieved in practice on condition that there is a compliance with the principles of systemicity; integrated use of raw materials and energy resources is available; there is a cycle of material flows and low level of the impact of production on the environment; rational organization of non-waste production has been established.

Systemicity is expressed taking into account interconnections and interdependencies of industrial, social and natural processes and provides realization of economically grounded methods of prevention, reduction, neutralization of pollutants at all stages of production: from preparation of raw materials to obtaining a finished manufactured product.

Comprehensive use of raw materials and energy resources is important both in terms of the economy and in terms of ecology. Production wastes are unused or underexploited part of raw materials. In this case, the main production operations are accompanied by operations of extracting useful substances, which are not necessary for basic production, processing of these useful substances into final products or semi-finished products, which can be delivered to other enterprises.

The principle of integrated use of resources involves maximizing the full use of all the properties of raw materials, which can be secured through the use of the latest advances in scientific and technological progress and innovative activities.

So, in Ukraine, in the food industry, a significant amount of waste (squeegees) remains in the fruit and berry juice production, which in the future is practically not used. In the agro-industrial sector, such crops as buckwheat, barley, rape, sunflower, tomatoes, pumpkin, etc. are widespread and recyclable, the wastes of which are also not used. The tests conducted in recent years, suggest that squeegees are a promising source for obtaining many biologically active substances and, as a result, for obtaining new phytopreparations. A. G. Zolotaryov, has proposed the technology of obtaining biologically active dry juices with the possibility of processing of squeegee out left after the juicing process on raw alcohol¹.

Comprehensive use of raw materials and energy resources allows to establish an inter-sectoral cooperation, in particular within the framework of a territorial production complex, for the purpose of using of waste products of some enterprises by other enterprises.

The rational interrelationship created between various types of production units situated immediately next to or near one another which process one and the same raw material in succession enables a vertical relationship to be established between the various stages of the industrial process in question. This arrangement considerably reduces capital outlay and operating costs, as well as expenditure on the transfer of the product from one processing stage to the next because production forces are concentrated in one place. It offers possibilities of labour savings and reduces production costs because outlay on transport declines².

The cyclicity of material flows involves the organized technogenic circulation of matter and the energy transformation associated with it.

As an example of cyclic material flows we can consider a water- and gasreversible cycles. The use of reversible, as far as completely closed, water systems is the initial stage of complex measures which aim to create non-waste technologies in the future. Reversible water supply is a technical system in which reuse of water is used in the production of waste water (after cleaning and treatment) with a very limited level of discharging (up to 3%) in the reservoir. A closed cycle of water use is an industrial water supply and sewage system in which the multiple use of water in one and the same production process is carried out without the dumping of sewage and other waters in natural reservoirs³.

¹ Дегтярџова, К.О. (2015). *Використання продуктів комплексної переробки відходів виробництва соку гарбуза для створення нових лікарських засобів*. Дисертація на здобуття наукового ступеня кандидата фармацевтичних наук, 15.00.03, Національний фармацевтичний університет, Харків, Україна, 15-20.

² International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, 19.

³ Бойко, Н.И., Одарюк, В.А., Сафонов, А.В. (2015). Основные направления безотходных и малоотходных технологий. *Технологии гражданской безопасности*, Т. 12, Вып. 1 (43), 69.

The limitation of the impact of production on the environment has the object of observing such influence, in which the quality of the environment does not change or changes within the permissible limits.

The biosphere is in a state of dynamic equilibrium which human activities and, in particular, the growth of industry, tend to shift. The role of non-waste technology is to reduce appreciably the negative effect of industrialization on the consumption of natural resources and on natural conditions due to noxious emissions, and not to overstep the bounds of biosphere elasticity¹.

To comply with the principle mentioned above, it is important to observe the localization – the restriction of the appearance and harmful effects of pollutants in the place of their formation. Contamination is formed in any technological process, therefore the main task of production is to minimize the volume of the formation of pollutants and waste products and localize them in a confined space of man-made objects. For example, combustion of natural gas in the working space of a metallurgical furnace, if it is poorly mixed with an oxidizing agent (oxygen air), leads to the formation of emissions with high content of carbon monoxide, while the use of automated burners with the qualitative preparation of a mixture of natural gas and air reduces the level of carbon in the content of oxide combustion products to acceptable ecological norm.

Implementation of the principle of limiting environmental impact depends on the perfect environmental monitoring, the introduction of effective economic mechanisms of environmental policy, the achievements of scientific and technological progress.

The rationality of the organization of non-waste production involves the reasonable use of all components and properties of raw materials and can be evaluated by economic, environmental and social indicators.

According to P.L. de Reeder, “The concept of Clean Technologies can be roughly defined when one sticks to simple criteria such as that of production or the treatment of waste, but it becomes highly complicated once extended to other factors such as energy, the environment, ores, heritage, the social aspect etc.”²

The requirements for maximizing the energy, material and labor intensity of production and the search for new environmentally sound raw materials and energy technologies, which are largely related to the reduction of the negative impact on the environment and decrease of the level of damage to the environment, including related industries of the national economy, are determinative. The ultimate goal in this case is to optimize the production simultaneously in terms of energy technology, economic and environmental parameters³.

Implementation of such a task is possible on condition that the technical and technological re-equipment of agricultural production will be conducted, ensuring the introduction of innovation and investment models of development of agro-industrial complex.

An activity similar to the concept of the non-waste technology should be considered as a stimulus of crucial importance to technological development and as a mean of real control for material development.

The introduction of non-waste technology ensures that production wastes are converted into reusable resources and thereby preserves the quality of the environment. In a broad interpretation of the economic laws of socialism, non-waste technologies create increasingly close interrelationships between scientific and technical, political and economic, and organizational and social factors. In terms of the intensification process and its various implications, the recycling or harmless disposal of wastes and their recovery, as well as the substitution of natural materials, implies a transition to non-waste technology, namely, a comprehensive process aimed at achieving a closed “production – consumption” system and, therefore, the creation of a non-waste economy.

Non-waste technology must therefore be regarded as an important component of the production process which at the same time resolves the problem of preserving the quality of the environment⁴.

¹ International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, XVI.

² Reeder, P.L. de (1980). Low waste technology in chemical industries. *Pure and Applied Chemistry*, 52, 1991.

³ Зеркалов, Д.В. (2012). *Екологічна безпека та охорона довкілля*. Київ: Основа, 446.

⁴ International Seminar Organized by the Senior Advisers to ECE Governments on Environmental Problems on the Principles and Creation of Non-Waste Technology and Production (1976). *Non-Waste Technology and Production*. Paris: Pergamon, 14.

Conclusions. Non-waste production is one of the modern trends in the development of agro-industrial production, which is connected with the task of creating economically and ecologically balanced systems that provide integrated raw material processing, efficient use of natural resources, reduction of agricultural production waste and elimination of their negative anthropogenic impact on the environment.

The task of introduction of non-waste production is to create closed cycles of production with the recycling of raw materials, where each final section of one production serves as the starting point of the next one, resulting in the absence of waste in the environment as well as a reduction of negative effects on the natural environment.

It is clear that the research work necessary to promote non-waste technology has not attained a desirable level. Countries must develop multi-disciplined research in order to improve non-waste technology for all branches of industry.

Implementation of non-waste production in the agro-industrial complex will minimize the cost of raw materials and energy resources, limit the negative impact of production on the environment, ensure the cyclicity of material and financial flows, streamline the production and economic activities of the agro-industrial complex, and balance the functioning of the social, economic and environmental spheres of human activity.

The waste-free production model may seem like an ideal construction, but individual productions are already functioning successfully and confidently in the market. Of course, the implementation of non-waste production requires solving a large variety of very complex technological, design and organizational tasks based on the use of the latest scientific and technological achievements.

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