

# Ecologically oriented analysis of the reasons holding back litter processing

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**Abstract.** The article deals with the problems of disposal and processing of litter, substantiates the relevance of their solution in the industry. Various points of view on the conceptual apparatus of litter are considered and the author's vision is given, the essence of which lies in the allocation of litter to by-products. Based on this, it is proposed to consider this type of product as a market potential for expanding its product portfolio. The reasons hindering the disposal and processing of litter are studied, their systematization is clearly given with the rationale for each of the presented block of reasons and possible management decisions. The analysis of the problems and causes hindering the process of disposal and processing of litter indicates the need to continue research on the designated issue from the standpoint of expanding the market potential of this type of by-product and developing existing management solutions and finding new approaches to filling the relevant market niches. This will contribute to the development of the market potential of litter processing products and increase the added value of the own capital of economic entities in the industry.

## 1 Introduction

At the UN Conference on the Environment, a modern doctrine of human development was developed, one of the tasks of which was to solve this problem. The degradation of ecological systems occurs due to the inefficient use of waste products of biological objects in the form of manure, litter, which in turn lead to a decrease in the well-being of mankind.

At the same time, niches in the development of the market potential of agricultural products are the availability of resources (water, land, primarily arable land). According to this criterion, Russia is significantly superior to other countries.

However, in the arable soils of the country, a negative balance of basic nutrients is formed annually, the need for which is satisfied only by 15-30%. Due to the lack of financial resources for the majority of economic entities of animal husbandry in Russia, the level of application of organic fertilizers is insufficient to ensure the fertility of arable soils.

Against the backdrop of an increase in the population of the earth, the problem of increasing soil fertility will intensify due to the growing need of the population for food, especially animal protein. According to the FAO, by 2050 there will be a need to provide

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food for about 10 billion inhabitants of the Earth [1]. However, the growing consumption of livestock products and the strategic goals set to open new markets and increase exports are proportionally leading to a growing volume of production waste. For example, litter during storage bears a great burden on the environment, in the form of soil, water, reservoir pollution, increased insecticidal, parasitic and microbial infections.

In the Russian Federation, more than 2 million hectares of fields are polluted with organogenic waste from animal husbandry. Untimely incorporation of organic fertilizers into the soil, as well as their storage in open reservoirs, according to the European Council, leads to air pollution by 80% ammonia and 10% methane. Moreover, the violation of the technology for storing manure on soil sites (open to atmospheric precipitation in the surface layer of soil 0.4 m contains up to 4950 kg / ha of mineral nitrogen, including 2500 kg / ha of nitrate nitrogen, which is 17 times higher compared to uncontaminated soil. In groundwater, the content of nitrate nitrogen (ml/l) exceeds its content in drainage water from the field by 2 times, ammonia nitrogen by 8 times, phosphorus by 11 times, and potassium by 10 times [2].

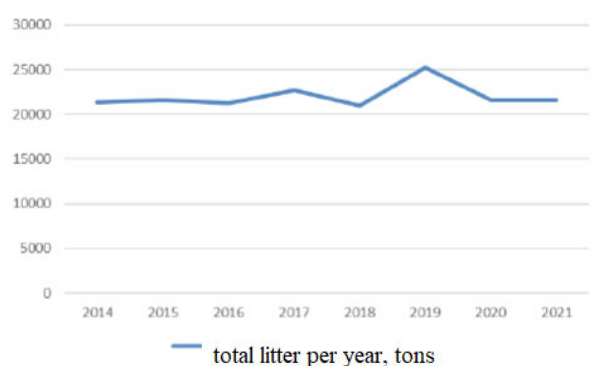
According to the State Committee for Sanitary and Epidemiological Supervision in Russia, only 3.5% of agricultural facilities meet sanitary and hygienic requirements. There is an opinion that the unfavorable ecological situation reduces the reproductive abilities of animals by 15-20%. Thus, the problem of utilization and processing of waste products of agricultural animals is actualized.

## 2 Methods

There are different points of view on the problem of litter disposal, some authors believe that litter refers to waste, others to valuable raw materials. In our opinion, litter is a by-product that leads to a reduction in the cost of the main product and generates added value in the form of an increase in the equity of economic entities in the industry.

## 3 Results

The development of the market potential for the processing of by-products has the prospect of expanding its product range and filling the corresponding market niches. The problem under consideration is especially relevant for the poultry industry, which is the leader in the production of protein of animal origin and occupies 46% in the structure of the meat balance of Russia. Regarding the world production of eggs and poultry meat, its position corresponds to the 5th place for poultry meat, and the 6th place for eggs.



**Fig. 1.** Poultry manure output in agricultural organizations, thousand tons

Against the background of the growth of the poultry population, the volumes of by-products in the form of litter are also increasing.

Farm poultry produces litter 20 times higher than the amount of poultry products, which indicates the need to improve existing and search for new solutions for the processing of litter. This is especially true for large poultry companies with a high concentration of poultry, waste products that lead to excessive intake of nutrients into the environment. Against the background of a lack of land, on a number of poultry complexes, the density of livestock per 1 ha of agricultural land is increasing.

The combination of the above arguments actualizes and substantiates the need for an effective solution to the problem of disposal and processing of litter. Systematization of the main reasons hindering the effectiveness of the goals and objectives set will allow developing appropriate management decisions to eliminate them. The main reasons include:

- Insufficiently developed legal and regulatory framework regarding the disposal and processing of litter.
- Unsatisfactory state of the material and technical base, poor availability of technological control means.
- The multivariance of technologies for the disposal and processing of litter, the groundlessness of the expediency of their use.
- High capital intensity of disposal and processing of litter into products.
- Insufficient funding of agro-industrial complex development programs in terms of processing and disposal of litter.
- Insufficient use of marketing tools when studying the market potential of litter processing products.

The above reasons are summarized in Figure 2.

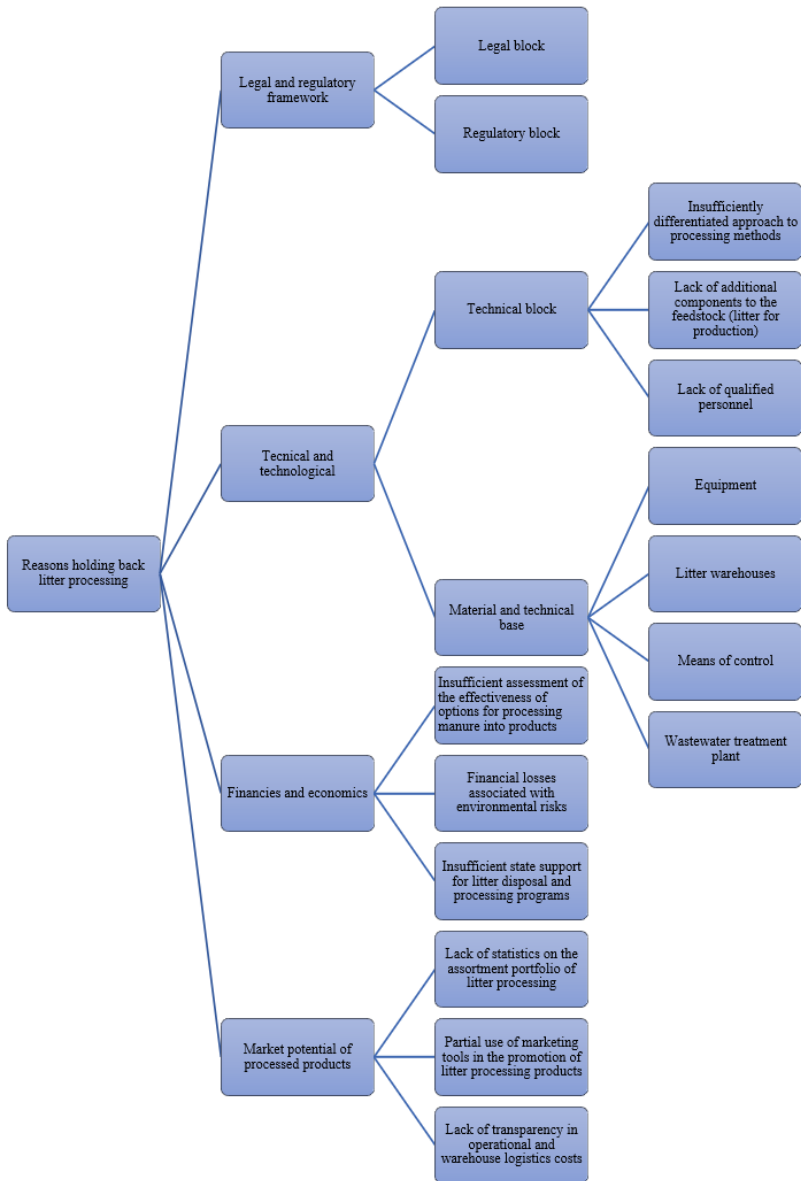
One of the main reasons hindering the disposal and processing of litter is the inconsistency and lack of legal framework. Currently, this area of activity is regulated by various documents in the form of laws, by-laws, technical regulations, government decrees. So, the handling of litter is regulated by the main federal laws, which include:

- 1) On production and consumption waste;
- 2) On environmental protection;
- 3) On the safe handling of pesticides and agrochemicals.

According to the above laws, litter in Russia is recognized as a waste of hazard classes 3 and 4, and, therefore, all activities for the collection, transportation, processing, disposal, neutralization, and placement are subject to licensing.

Since fresh litter cannot be applied to the soil, the use of composting technology is envisaged, which takes 12 months. During this period, the poultry farms are charged for negative environmental impact, and the Ministry of Nature classifies the dung storages as waste disposal sites, which requires the Federal State Ecological Expertise, which is an expensive procedure. The cost of obtaining a license for waste management can reach 1 million rubles.

The current documents and alternative drafts “on products of farm animals and animal by-products” contain amendments to certain legislative acts of the Russian Federation. However, in these projects, no requirements for the safety of livestock products for the environment have been established, these requirements are reflected in such documents as RD-APK 1.10.15.02-17, GOST R 54002-2010, GOST 33379-2015, GOST 33830-2016. Their implementation, even by the leaders of the poultry industry, is associated with large financial and labour costs.



**Fig. 2.** Reasons holding back the processing of litter in poultry farms

Litter and organic fertilizers are incorrectly classified as "agrochemicals" in the law on the safe handling of pesticides and agrochemicals.

A similar situation is typical for the regulatory framework that regulates the process of disposal and processing of litter, despite the presence of certain skeletons, state standards, technical regulations that provide for quality requirements for litter processing products. This process is not singled out as a technological regulation for auxiliary production.

For a long time, the norms and standards for the output of litter per 1 head from various types of poultry were not revised. The doses of applying organic fertilizers to the soil are also outdated.

Therefore, systematization of the legal and regulatory framework is required, with their differentiation in the relevant areas of the processes of disposal and processing of litter.

The technical and technological block of reasons hindering the processing of litter is divided into two sub-blocks, namely:

- Technical one;
- Technological one.

For each of these sub-blocks, the main factors that reduce the efficiency of obtaining litter processing products are identified. Thus, a review of existing manure processing technologies revealed their multivariance; at the same time, there is no differentiation in terms of the feasibility of various options, depending on the conditions of keeping and feeding the birds. There are certain production and financial difficulties in introducing additional components to the feedstock to obtain litter processing products.

Since the technology of litter processing is a labour-intensive, complex process that requires knowledge in various fields of microbiology, chemistry, ecology, and, therefore, specialists of the appropriate skill level are required, in which there is a shortage.

Regarding the technical base that ensures the processing of manure, there are problems in terms of equipment, controls, storage systems, and the availability of treatment facilities. At most poultry enterprises, treatment facilities have been operating for more than 25 years and have a high level of wear. According to the regulations, such facilities must be overhauled every 10-15 years. Almost 30% of domestic poultry farms do not have a dung wastewater treatment system [3]. In most cases, this type of raw material is stored in primitively equipped manure storage facilities.

Each of the sub-causes of this block has the potential for improvement, which is not realized due to the unsatisfactory financial condition of the economic entities of the industry.

In turn, the lack of development in terms of the material and technical base and technology for processing litter forms the reasons for the financial and economic block, which are clearly shown in Figure 2.

The totality of these reasons is the basic basis of financial risks in the form of payments for violation of the ecology of the environment. The lack of financial resources of the enterprises of the industry does not allow to study in detail the market potential of manure processing products and the corresponding reasons for its implementation.

## 4 Conclusion

Thus, a review of the state of disposal and processing of litter, as well as the main reasons hindering the solution of this problem, requires a detailed consideration of the current state of the functioning of the poultry industry, the study of the market potential of the products of disposal and processing of litter, as well as the development of management decisions in order to improve the processes of disposal and processing litter contributing to the growth of own capital by economic entities of the industry.

## References

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