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# Poultry waste recycling - highly efficient business

**L A Zazykina and L M Roiter**

Federal State Budget Scientific Institution Federal Science Center "All-Russian Research and Technological Institute of Poultry" of Russian Academy of Sciences, 10 Pitsegradskaya street, Sergiev Posad, Moscow region 141311, Russia

E-mail: department.economy.vnitip@yandex.ru

**Abstract.** The article discusses the issue of increasing the income of poultry farms when using waste recycling. Based on the analysis of the poultry products market and waste structure, it was concluded that waste recycling is extremely important from the point of view of environmental factors. As a result of the marketing research, possible loss of profits of the poultry farms were revealed when not using recycling. A review of existing methods of calculating the financial efficiency of recycling is given, and a calculation toolkit confirming the economic feasibility of using recycling when taking into account new indicators proposed by the authors is given.

## 1. Introduction

The most important task of modern managers is the organization of recycling waste at poultry farms, with the goal of their disposal and rational use. This problem can be solved only when, when making economic decisions, their environmental consequences will be considered as the main ones along with social and economic ones. The problem of nature conservation is closely related to politics, economics and the social sphere, which makes it necessary to consider it in various aspects: socio-political, legal, technical-technological, environmental-economic, social-hygienic, etc.

The question is how to determine the economic benefit of recycling based on risk. A number of authors dealing with this issue believe that recycling is a promising direction for increasing the profitability of both the enterprise and related industries [1, 2]. At the same time, some authors adhere to the point of view that the implementation of recycling is currently a difficult task. They justify this opinion by the insufficiency of technical-technological and financial potentials for the production of competitive products [3]. The poultry product sub-complex has a wide range of waste, both primary and secondary, which is a platform for increasing funds. Having organized the production with the use of recycling, it is possible to maximize the profitability and as a result of the waste recycling activities being carried out - to improve environmental performance.

Consequently, the purpose of the research is to study the use of recycling in various sectors of the national economy, including the sub-sector of the poultry industry. This issue is relevant and quite promising in improving the performance of the poultry enterprise.

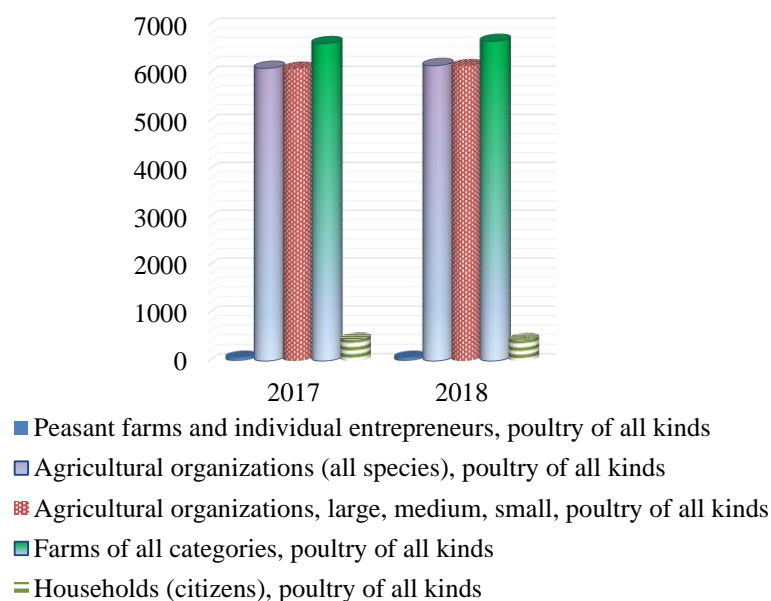
## 2. Research methods

In the process of studying the issue of recycling waste of poultry farms, such as: down-feather raw materials, litter and other types of waste, monographic, statistical-economic, and comparative analysis methods were used.



### 3. Research results

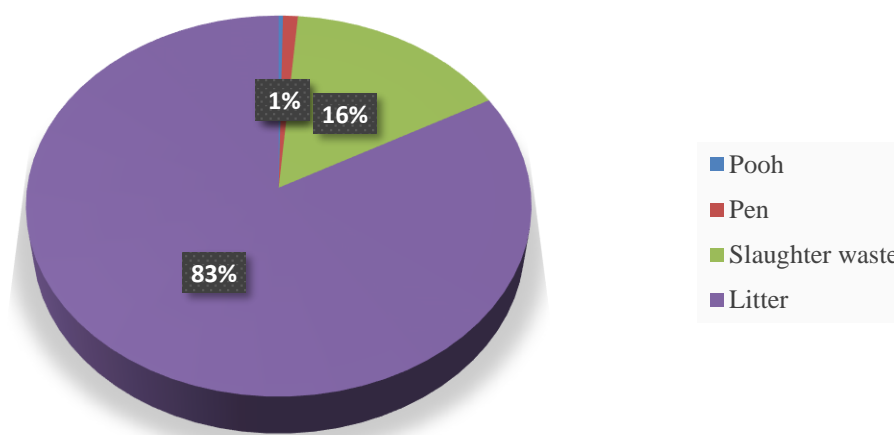
At present, in Russia, poultry farming is the leading and dynamically developing branch of animal husbandry. Thus, according to Rosstat, the poultry population in all categories of farms as of 01/01/2019 amounted to about 204,798 thousand heads. The number of poultry in individual farms as of April 1, 2019 is 81,040.9 thousand heads against 80,781.7 thousand heads as of April 1, 2018. For 2018, poultry production for slaughter in live weight in agricultural organizations amounted to 6.1 million tons, which is 0.9% more than a year earlier (figure 1) [4].



Source: Rosstat

**Figure 1.** Production of poultry for slaughter in live weight for 2017-2018.

Data on raw materials for recycling are as follows: from 175 to 300 g of litter per day come from one adult chicken (broiler), 30 grams of fluff and 100 grams of feather, slaughter waste is about 0.8 - 0.9 kg [5]. Figure 2 shows the structure of poultry waste.



**Figure 2.** Waste structure from 1 bird.

The reserves for capacity building of products for its processing in the poultry industry are very significant, therefore, enterprises using recycling and related diversification have the opportunity to

increase financial capital. As an example, we give a fragmentary example of the possible loss of profit for enterprises that do not use recycling. A clear share of the value of lost profits refers to the litter, since its volumes are extremely large; at the same time this type of waste is the main polluter of the environment. Therefore, the priority issue of recycling should be in the orientation of poultry enterprises to the disposal and processing of litter [6].

For example, the price of litter on the market for 1t ranges from 1,500 rubles. But if you take recycled litter (granulated), then wholesale prices for it will be from 15 to 18 rubles/kg. The cost for 1kg of pooh/pen raw material is 7-12 dollars in the foreign market, in the domestic one it is cheaper and is 150-200 rubles/kg. Therefore, in our opinion, waste is a valuable secondary material resource of modern production, the economic and environmental importance of which as a promising raw material for recycling technologies is steadily increasing.

The effectiveness of the recycling mechanism should be expressed in specific values of the calculation of its effectiveness. Indicators of economic efficiency are the following:

- profit
- value added
- expenses per unit cost of products sold or the cost of services provided, etc. [7].

In this regard, we need tools of calculation, confirming its economic feasibility. Leading Russian scientists in the field of waste recycling O S Kusraeva and L G Vorona-Slivinskaya consider that its constituent economic, environmental and large-scale indicators [8] carry out the analysis of the recycling efficiency index. So in this model, the recycling efficiency index is calculated by the formula (1):

$$Ier = aE \times BM + cE \times BM \quad (1)$$

where:  $Ier$  – recycling efficiency index;  $E$  - economic component of recycling assessment;  $M$  - scale component of recycling process assessment;  $a, b, c$  - weights that determine the importance of each of the components for the recycling process.

However, the existing mathematical models are not perfect and need to be improved and adapted to the poultry industry. The problem lies in the fact that there are no average indicators in the industry, and there is no possibility to carry out a comparative analysis with the proposed weighting factors determined by expert methods. In our opinion, weighting factors for processing products are determined by expert means, which does not exclude subjectivity in their establishment [9]. Therefore, it is logical to carry out this procedure by correlating the coefficient of elasticity of demand and the coefficient of customer satisfaction, taking into account the adjustment for the coefficients of the environmental and social component. Thus, the result of recycling depends on several factors:

- it is possible to determine the strength of the influence of each factor on the result;
- one can choose a more significant factor;
- it is necessary to give recommendations on changing the values of some factors to achieve the desired result.

The use of regression analysis allows to obtain models that reflect the influence of the considered factors  $x$  on the final result. To identify the degree of influence of factors, we use the coefficient of elasticity, in this case we suggest using the integral average coefficient of elasticity (2), since it allows us to observe the continuous change in the function of the coefficient of elasticity and the values of the function of elasticity corresponding to each value of  $x$  factor.

$$\overline{Eu} = \frac{1}{\beta - \alpha} \int_{\alpha}^{\beta} E(x) dx \quad (2)$$

where  $\alpha$  and  $\beta$  are the largest and smallest value of the observed values of  $x$  factor, respectively.

This model allows analyzing several factors, determining the strength of their influence on the result.

#### 4. Conclusion

Recycling of waste products at poultry farms is a fairly efficient business, especially if the potential to reduce the burden on the environment will be with the greatest economic effect. In addition, government

support is needed, which should be implemented in clear legal acts that legitimize and stimulate support for the development of recycling in Russia [10]. Studied foreign and domestic experience has different points of view, while the high efficiency of recycling is not disputed. The main reasons for reducing recycling, which can be resolved through state support in the form of subsidizing waste products, are identified. The attractiveness of this business depends on the methodology, recycling assessment.

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