

MODEL SYSTEM FOR MONITORING THE RESOURCES OF ANIMAL BY-PRODUCTS IN THE UKRAINIAN MEAT INDUSTRY

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Abstract. The study was motivated by the need to make better use of animal protein from animal by-products. The goal was to develop a tool to monitor and assess the production and use by-products resources in cooperation with both companies and state authorities. Data was gathered from a wide variety of sources, and was used to determine the number of animal (by species) and yield of various types of by-products categorized into risk categories produced per animal during meat processing. The reliability of this data was tested using both direct observation and by comparing with additional data sources. Only the number of animals of each species processed are required to estimate the quantities of the various types of by-products produced within each risk category. This implies that the meat industry is making insufficient use by-products as raw material. A strategy for developing a fully functional and efficient system to manage by-products resources within slaughterhouse is discussed, and our tool, together with these ideas could be used to develop and implement such a plan within processing companies in other countries.

Keywords: livestock by-products, poultry meat, protein of animal origin

Our global food system currently has an acute deficit of protein, including protein of animal origin [1]. Animal proteins suitable for human consumption comprise less than one-third of the total food protein available for consumption globally. In addition, there is also an increasing need for additional protein sources for animal feed production. Simultaneously, the amount of protein lost, during meat processing is unreasonably large, with up to 30 % loss of the protein suitable for human consumption. The losses are mainly caused by the methods commonly used for industrial meat processing, especially the treatment of the animal by-products. The latter are typically utilized for fat production, for technical purposes, or destroyed for safety reasons.

A detailed set of rules for categorizing and handling animal by-products is provided within Ukrainian regulations [2]. These regulations classify animal by-products into three categories according to their potential health risks. The 1st of animal by-products cannot be used for any purposes due to the risk of transmitting spongiform encephalopathy, while the 2nd category of animal by-products can be used for composting, anaerobic digestion or technical purposes. Animal by-products from the 3rd category can be used for many purposes, including composting, also for human consumption. Relevant institutions have agreed upon strict rules for how these different animal by-products categories should be collected, handled, stored, treated, transported, and disposed of within EU countries.

First, we propose an approach that tracks the number of slaughtered animals and yield of animal by-products per animal during meat processing. This approach utilizes the following data from 2019 to 2022:

1. Data from existing databases, including Commercial Register provides data concerning the animal species and the number of animal species and the number of animal processed in meat processing plants. The Ministry provides data concerning the number of live animals produced and sold to slaughterhouse animal species during these years. The Ukrainian institute of Economic Research provides data concerning the quantities of meat produced in Ukraine during the same years by animal species, including data about imported meat and live animals. This institute also provided data concerning the consumption of meat (including feed, forage, losses) and the export thereof (including live animals).

2. A survey by means of pilot monitoring, on-site interviews, and observations was conducted in eight meat processing plants that produce approximately 75 % of the animal by-products in Ukraine. Electronic surveys were also conducted in four meat processing plants and companies. The following data were collected: the number of processed animals by species, the live weight and slaughter weight of the processed animals, the quantities of meat, meat products, slaughter sub-products and animal by-products and waste by categories. A special form was developed to conduct the monitoring portion of this study.

3. Data provided by Ukrainian institute of Economic Research, which is the only plant in Ukraine authorized to process animal by-products of the 1st category were collected by means of interviews and observations conducted during repeated visits. The accounting records of the company were also examined.

Using the data we gathered, we estimated the average live and slaughter weight of the processed animals, together with quantities of meat, meat products, slaughter subproducts, and other by-products that were produced.

The output of the various types of animal by-products within each category for each animal species were calculated as a fraction of the original live weight. These data from the basis of a tool used to calculate the quantities of the various types of animal by-products within each category for each animal species were calculated as a fraction for each category for each animal species were calculated as a fraction of the original live weight. These data form the basis of a tool used to calculate the quantities of the various types of animal by-products within each category over a specified period for given company or region. As an example, we present the output this tool provided for the year 2022.

The monitoring program we carried out in 2022 revealed that most animals were slaughtered in few larger production units. For example, 85 % of the pigs utilized in the Ukrainian meat processing plants were slaughtered in different slaughterhouses and 75-80 % of the respective quantities of bovine animals were slaughtered in the same slaughterhouses. In addition, most animal by-products originate mostly from these larger representatives of the meat industry.

The calculation tool we describe here was developed using data regarding the generation of animal by-products within Ukrainian meat industry, however, this tool can be used to assess and predict the quantities of animal by-products. Both literature data,

and direct observation made within slaughterhouses were used calculate the mean quantity of animal by-products created per animal by species. Based on these two databased – the number of animal by species and yield of animal by-products per animal during meat processing, we tested a general tool for monitoring animal by-products production. The input data required for this system are the number of animals processed, and the output is the quantities of different types of animal by-products classified into risk categories.

The assessment and prediction tool presented herein could be used as the basis for developing a fully functional animal by-products monitoring system in other countries. This monitoring system ought to minimize legal issues and impose only a small burden on the companies involved. Therefore, future activities should proceed from the principle that as little monitoring data as possible should be gathered from meat processing plants.

References:

1. Wu, L., Xu, L., & Gao, J. (2011). The acceptability of certified traceable food among Chinese consumers. *British Food Journal*. Vol. 113 Issue 4 pp. 519-534.

2. Povarova, N. (2020). Problema prostezhuvanosti miasnoi produktsii na miasopererobnykh pidpriemstvakh Ukrainy. [The problem of traceability of meat products at meat processing enterprises of Ukraine] *Innovatsiini tekhnolohii ta perspektyvy rozvytku miasopererobnoi haluzi* [Innovative technologies and prospects for the development of the meat processing industry: Abstracts of materials International. scientific-practical Conf, Kyiv, November 24], 41-11. [in Ukrainian].

Анотація. У дослідженні обґрунтована необхідність розробки та запровадження технології використання тваринного білку із побічних продуктів м'ясопереробної галузі. Розроблено інструмент моніторингу та оцінки виробництва та використання ресурсів побічної продукції у співпраці як з компаніями, так і з державними органами. Дані були зібрані з багатьох джерел і використані для визначення кількості тварин (за видами) і виходу різних типів побічних продуктів, класифікованих за категоріями ризику, вироблених на одну тварину під час обробки м'яса. Достовірність цих даних була перевірена як за допомогою прямого спостереження, так і шляхом порівняння з додатковими джерелами даних. Для оцінки кількості різних типів побічних продуктів, вироблених у кожній категорії ризику, потрібна лише кількість тварин кожного виду, що переробляється. Це означає, що м'ясна промисловість недостатньо використовує субпродукти як сировину. Обговорюється стратегія розробки повністю функціональної та ефективної системи управління ресурсами побічних продуктів на бійні, і наш інструмент разом із цими ідеями може бути використаний для розробки та впровадження такого плану на переробних підприємствах в інших країнах.

Ключові слова: побічні продукти тваринництва, м'ясо птиці, білок тваринного походження.