

CONSIDERATIONS REGARDING THE STORAGE OF AGRICULTURAL PRODUCTION IN ROMANIA

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Abstract

Storage spaces are economic units where complex activities from reception-storage-delivery are carried out, with the aim of ensuring a constant flow of products downstream, in accordance with the food demand of people and of the animals. The aim of the paper is to analyze the main storage capacities in Romania, starting from general information collected from the Ministry of Agriculture and Rural Development (MARD) and National Institute of Statistics (NIS) database. The research methods used in this study have been the bibliometric analysis, the "bibliographic analysis" and the statistical-mathematical analysis for the calculation of averages by development regions and counties. Romania's agricultural areas are large, the soil and climate being favorable. However, the infrastructure is deficient, the number of operators dealing with the storage of agricultural production is high, but the average storage capacities are rather medium or small. Medium and long-term estimates show that Romania will also be affected by climate change, which leads to the conclusion that in order to keep harvests in optimal conditions and ensure constant production flows, important steps must be taken to develop this segment of activity. The researchers concluded that "storage is the key point of food security around the globe" because it ensures the preservation of products in sufficient quantities and of good quality. Romania's membership in the European Union made it possible to use the specific instruments of the Community Agricultural Policy, majorly influencing the agri-food market, increasing the value of services for agriculture. That is why funds were allocated that allowed our country to produce cereals in quantities that exceed the internal need, becoming one of the most important exporting countries in Europe.

Key words: warehouse, storage, food safety, preservation, correlation of demand with supply, production process

INTRODUCTION

Starting from the definition, role and functions of warehouses, in the present paper a brief analysis is made regarding this segment in Romanian agriculture. Economists have defined warehouses as commercial units where certain processes are carried out, starting with receiving, receiving and continuing with storage, conditioning and delivery to other economic agents on the agri-food chain. This activity is intended to ensure the quantity of products necessary to satisfy the demand, so that the flow of products is constant and of quality until the time of delivery.

The existing pedoclimatic conditions in the area of the Black Sea Basin favor the cultivation of cereals. The large quantities produced in this area determine the

development of the storage sector in order to sell the surplus [5].

Depending on the weather conditions, culture, economic-social and sanitary conditions, the variation of the demand for a certain product according to the seasonality of the production, it is difficult to estimate with certainty the evolution of the demand for agricultural products. That is why warehouses come to support demand during peak periods, contributing to cost savings, buying a quantity in excess of immediate needs and obtaining quantitative discounts from suppliers. In addition to the traditional function of keeping and providing a buffer stock, the division into lots and the creation of assortment structures according to certain qualitative criteria takes place here: the type of product, humidity, foreign bodies, hectoliter weight, sanitary condition and the types of the warehouse[10].

The storage of each species is done separately, taking measures to avoid mechanical mixing between the products. Within each species, the compartmentalization is done taking into account the destination of the product, the humidity, the content of foreign bodies and the number of necessary operations to remove them, the hectoliter mass important for the industrial processing process (eg: bread wheat 75 gr/hl, pasta 77 gr/hl), the sanitary condition or the type of storage. When distributing the products in warehouses, the influence that each type of warehouse has on the preservation conditions is taken into account [2; 15].

In order to increase the quality of the grains that will be stored, different mechanisms are used. A faster drying, with hot air, leads to a better quality of the grain harvest that will be stored [4].

Al. Buryanov states that using the method of uncovering the plants at the root, before harvesting, leads to an increase in the amount entering the shakers [3].

As it follows from the Special Report no. 11/2008 of the European Court of Auditors "the objective of the public storage of agricultural products is to stabilize the related markets and to ensure a fair standard of living for the agricultural population. When the prices on the market are low, the member states purchase the products offered by the producers or intermediaries at the intervention price established by the Council based on a proposal from the Commission. The products are stored in warehouses until they are sold either on the domestic market or for export." [7]

Storage is a vital technology for any farmer, and choosing the right crop storage method can bring a consistent income increase.

Until 1987, the subject of storage was practically non-existent in research activity. It was only 20 years ago that the subject slowly began to gain importance, the storage of agricultural products having an essential role in their accessibility throughout the year, in line with the relatively constant consumption demand.

In the period 1987-2023, 574 scientific articles were written, with China in first place with 76 publications, followed by the USA (67 publications), India (55 publications), Italy (48

publications). Romania appears in this ranking with only 10 publications. Vikas Shrotriya's conclusion is that storage is the key point of food security across the globe, with the need to combine management with warehouse design to enhance usability [13].

In their work, Hamel D. and his collaborators show the importance of warehouses for keeping product quantities and ensuring a sufficient amount of good quality food for the population. For many years, the correct and long-term storage of grain was based on the use of various synthetic pesticides. For this reason, measures have been taken to reduce pesticides by 50% by 2030. The "Farm to Fork" strategy aims to reduce pesticide use and risks in agricultural production, as well as improve the application of integrated protection measures, while the use of silos and agricultural warehouses for storing agricultural products do not even mention them, these methods being considered irrelevant [9].

Due to the ever-increasing population, food security is the most important issue at the global level, a constant concern for meeting the demand for food for both developed and developing countries around the world. In developing countries, cereals are the staple food and almost 70% of the population depends on agriculture [17]. In India, the most difficult problem is their storage due to insect pests that spoil them during storage. Infestation with insects and pests occurs throughout the year, their appearance being favored by climate conditions. Insect infestation is a major contributor to the deterioration of stored food quality [14].

The accession to the EU and the use of the specific instruments of the CAP have strongly influenced the agri-food market. Accession has allowed the increase in the value of services for agriculture, even if they are still far below the levels of other member states. As a result, important funds were allocated, allowing Romania to produce cereals in quantities which exceed the internal need, becoming one of the most important exporting countries in Europe. In order to benefit from the possibilities offered by the PAC instruments and to improve the management, Romanian farmers made investments regarding the

storage and conditioning of cereals. Most Romanian farmers still sell their grain production immediately after the harvest when prices are the lowest. Storage thus appears as a necessity to substantially increase their profits and to distribute the grain supply over a longer period of time [6]. From the analysis of the most relevant articles that had storage as their subject, it emerged that the researchers' interest was focused on storage technologies, in order to prevent the occurrence of pests, fungi and microorganisms that affect cereals and their products during storage.

The main purpose of this paper is to present a comparative analysis of the existing storage systems in Romania, currently, as well as the situation of economic operators that exploit storage spaces (number and average storage capacity) carried out by counties and development regions.

The objective of this work is to identify the number and capacity of storage by type, by geographical region and by county in order to assess the concordance between what is needed and what exists.

MATERIALS AND METHODS

Several data analysis and processing methods were used in the paper. The first research method used was the "bibliometric analysis" which was based on the SCOPUS database for searching, filtering and extracting scientific articles relevant to the topic addressed, with the reference period 1971-2023, by studying the identified scientific articles, filtered by title, abstract and keywords. The second research method used is the "bibliographic analysis" which aimed to extract the official data existing in the research scope of the paper. The data was collected by accessing the MARD and NIS databases. The third method used was statistical-mathematical analysis for the calculation of averages by development regions and counties.

RESULTS AND DISCUSSIONS

The increase in demand for agri-food products, the increase in prices, and climate change are

just some of the factors that make crops vulnerable.

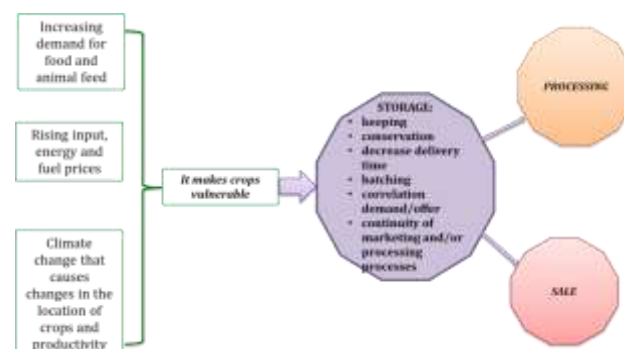


Fig. 1. The role and factors of storage
 Source: authors' interpretation based on The technology of reception [15].

The role of warehousing thus emerges: preservation and/or conservation, reduction of delivery time, allocation of stored/delivered quantities, correlation of demand with supply, continuity in the marketing/processing process (Figure 1).

Warehouses are classified according to several criteria. There are several types which present several construction methods.

Storing the harvest allows flexible times of sale and it can bring a more advantageous price to the seller. That is why we have summarized the main criteria for three storage systems:

- medium and large farmers prefer the metal silo and the metal hall, while the silobag can be used by any category of farmer;
- construction authorization is required for the first two categories of storage systems, while silobags are not;
- the construction time is very different, ranging from 3-5 months, for the metal silo, to 30-60 minutes, for the silo bag;
- the metal silo occupies a small area (12-14 meters in diameter/cell) being developed vertically, while the metal hall and the silobag are placed horizontally and occupy areas between 200-400 square meters;
- the silo-bag has a small storage capacity of 200-400 tons/cell, but it has the advantage of being stored in categories according to the percentage of gluten, humidity or origin; in the other two storage systems, up to 5,000 tons can be stored, but without taking into account the farmer who produced them or the characteristics of the stored grains;

-if in the silo we can only store cereals, oilseeds and fodder, in the metal hall we can also store agricultural machinery; compared to these, waste or road salt can also be stored in the silo bag;

-the loading speed differs depending on the chosen loading method, from 100-150 tons/hour in the case of the metal silo, to 60-100 tons/hour in the case of the silo bag;

-the estimated losses vary between 1-1.5% in the case of the metal silo and the metal hall and are only 0.1% in the case of the silo bag;

-the storage period varies between 1 year in the case of the metal hall and 2-3 years in the case of the silo [8].

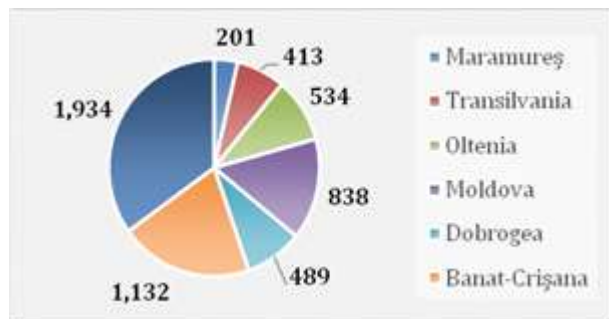


Fig. 2. Number of economic operators operating storage spaces
 Source: authors' design based on the List of authorized spaces for the storage of agricultural products MADR [11].

According to the data from MADR, in 2015, Romania had a number of 4,327 authorized storage spaces, while in 2022, their number reached 5,541, resulting in an increase of 1,214 operators exploiting authorized storage spaces (+28.06%) [10].

Currently, most operators 1,934 (35%) are in the Muntenia Region and 1,132 (20%) in the Banat-Crișana Region (Figure 2). The total authorized capacity in silos and warehouses was over 29.5 million tons nationwide [1]. In Muntenia, for example, the silos had a total capacity of 5.23 million tons, and the warehouses 4.72 million tons, totaling 9.95 million tons (33.62%). The lowest capacities are found in Maramureș [11] (Figure 3).

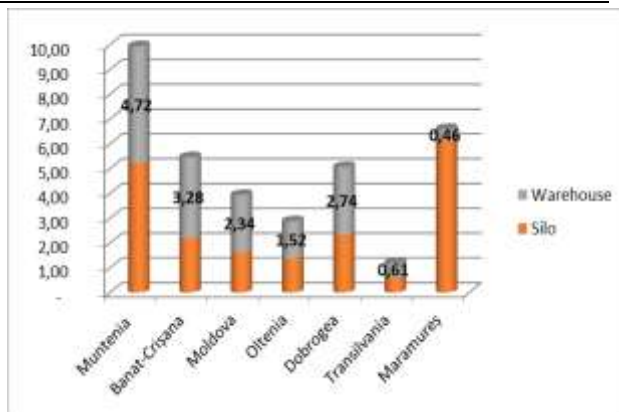


Fig. 3. Total authorized capacity (millions of tons)
 Source: authors' design based on the List of authorized spaces for the storage of agricultural products MADR [11].

In the ranking of the number of operators that exploit storage spaces, Timiș County leads with 513 economic agents, followed by Arad County with 396 and Călărași County with 349. In opposition, Sălaj County has only 5 operators and the Municipality of Bucharest only 2 operators (Figure 4).

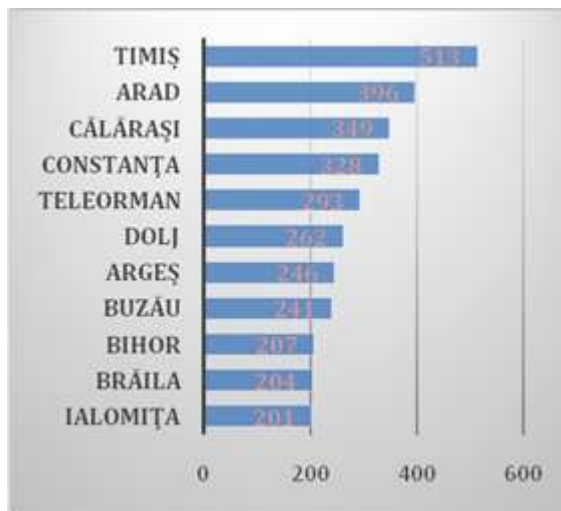


Fig. 4. Top 10 number of operators by county
 Source: authors' design based on the List of authorized spaces for the storage of agricultural products MADR [11].

The largest storage capacities are found in Constanța County, with a calculated average of 12,503 tons/warehouse, Caraș-Severin County with 10,396 tons/warehouse and Ialomița County with 8,408 tons/warehouse. The lowest storage capacities are found in the Covasna County - 1,190 tons/warehouse and Bistrița-Năsăud - 788 tons/warehouse.

A study case in Constanta County

We will take as an example the County of Constanța - the first ranked in terms of calculated average storage capacity. The data used in this example comes from INS and MARD [12, 10, 11].

Comparing the number of authorized operators in 2022 with that of 2015, it increased in Constanța County by 68 (+26.15%), reaching 328.

The total storage capacity in silos in Constanța County increased by 475.6 thousand tons (+31.29%), and in warehouses with 802.6 thousand tons (+61.61%).

Table 1. Number of authorized storing operators and the storage capacity in silos and warehouses in Contanta County in 2022 versus 2015

	2015	2022	2022/2015 %
Authorized storing operators (No.)	260	328	126.15
Total Storage capacity (Thousand tons)	2,822.67	4,100.97	145.28
Storage capacity in Silos (Thousand tons)	1,520.04	1,995.64	131.29
Storage capacity in Warehouses (Thousand tons)	1,302.63	2,105.23	161.61

Source: Own calculation based on the data from MARD [11].

The explanation for the sharper growth of authorized warehouses compared to silos, lies in the fact that they require a shorter construction time, they can have other uses than the storage of agricultural production (they can store agricultural machinery, salt for roads, etc.), and the costs of construction and maintenance are much lower.

The authorized storage capacity at the level of Constanța County increased from 2,822.7 thousand tons in 2015 to 4,100.9 thousand RON in 2022 (+1,278.2 thousand tons, respectively +45.29%).

The agricultural production of Constanța County increased in 2022 compared to 2015 by 588.8 thousand tons (+34.33%). Thus, in grain cereals (wheat, rye) production increased by 345 thousand tons (+31.38%): barley by 165.7

thousand tons (+76.1%), corn by 50 thousand tons (+28.88%) and sunflower with 24.3 thousand tons (+15.99%). Rapeseed production increased the least by 2.9 thousand tons (+3.28%) and soy the most by 823 tons (+165.59%). Relating the productions obtained to the total storage capacities, we obtain 38.4% in 2015, respectively 34.8% in 2022, these indicating the shares in which the warehouses in Constanța County are occupied.

From the list available on the TopFirme website based on the balance sheets submitted by them, it stands out that in Constanța County there are a number of large producers specialized in the cultivation of cereals, leguminous and oleaginous plants [16].

Among them is LTA Mondial SRL with a turnover of 399.9 million lei which ranked first place in Constanța County and 5th place nationally. This producer is followed by Carco Grup Agritrade SRL, SMAG Group SRL, Andra International SRL.

According to the current accounting regulations, the calculation of the storage cost is carried out on the basis of the weighted average of the cost of similar items in stock at the beginning of the period and the cost of similar items produced or purchased during the storage period. This cost can be calculated monthly or after each reception. The storage cost includes reception, conditioning, drying, recirculation, gasification or aeration expenses and is calculated per physical ton. It differs from one plant to another, according to the duration of storage and the type of storage (silo or warehouse). The actual rates are regulated by Government Decisions and are updated periodically.

CONCLUSIONS

Efficient storage of agricultural produce plays a pivotal role in ensuring food safety, optimizing the production process, and maintaining a seamless correlation between demand and supply. The fluctuations in demand, often influenced by various economic and environmental factors, necessitate adaptive and resilient storage solutions.

Preservation methods implemented within these storage facilities not only extend the shelf

life of products but also contribute significantly to mitigating post-harvest losses. As the global population continues to rise, the importance of sustainable and secure products storage becomes even more evident. The success of future agricultural endeavours hinges upon the ability to strike a delicate balance between production, storage, and distribution.

The presented data showed that in 2022, of the total authorized storage capacity at the level of the entire country (29.8 million tons), the share of the main stored agricultural products is only 80% (23.9 million tons).

At the level of the analyzed county (Constanta), the storage capacity is much higher than the production capacity of the county. The degree of occupancy of storage spaces is 34.8%, the difference being able to be used for products in transit (due to the presence of Constanta port on the territory of the analyzed county).

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