

DDDM Concept: Completeness and Reliability of Potato Market Data in the Republic of Kazakhstan

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Abstract. *In the context of current global challenges, the usual course of development of economic markets, including the food market, is changing. The effectiveness of management depends on the quality of decisions based on the concept of Data Driven Decision Making, which relies on the use of data. In this connection, the issue of reliability and completeness of the data used becomes relevant. The purpose of this work is to analyze the data of official statistics on the potato market in terms of their completeness and reliability for decision making. The methods of statistical and comparative analysis were applied in the course of the study. As a result, inconsistencies were revealed in the data on the volume of harvest and the share of losses, which indicates unreliability or incompleteness of information. Measures to avoid the above mistakes were proposed.*

Keywords: *Data Driven Decision Making, data, statistics, reliability, completeness, potatoes, production, losses, decision making, management.*

Introduction

In the modern business environment, more and more often you can find examples of management decisions based on comprehensive data, that is, the application of the Data Driven Decision Making (DDDM) concept.

Data Driven Decision Making is an approach for building a strategic model and making decisions based on periodically or continuously updated data that reflect the current state of the analyzed object.

Brynjolfsson and others have studied the relationship between DDDM and the productivity of 179 US public companies and have shown that the application of this concept leads to an increase in business efficiency by an average of 5-6%. At the same time, this percentage does not include the increase in efficiency from the use of traditional IT resources [1].

In the DDDM concept, an important role is played by data, their diversity, depth, timeliness of receipt, as well as reliability and completeness of data. In January 2022, the Union of Potato and Vegetable Growers of Kazakhstan questioned the reliability of national statistics on the potato market. The research conducted by this organization indicates the presence of attributions in terms of production volume by 2 times [2]. Considering their direct participation in the formation of the potato market of Kazakhstan,

such conclusions require attention.

A review of foreign literature has shown that in the context of global challenges and the simultaneous growth of transparency, the problems of the relationship between producers and consumers of food are being actualized. In the supply chain of products from the farmer to the consumer, the role of information flows on uninterrupted and sustainable food security of food supplies is increasing [3].

Continuous improvement in the quality of consumption leads to significant changes in the supply chain of agricultural goods [4]. The agricultural sector is changing as a result of the introduction of new management methods in large agricultural enterprises, in farms that introduce advanced IT technologies that contribute to the prompt and reliable transmission of information flow [5].

In foreign literature, food safety management is considered through the prism of improving its quality, monitoring safety standards [6]. There are studies on specific foods, such as dairy products.

Despite the fact that IT technologies for collecting and exchanging information in real time are being actively introduced into the business process system [7], there is still no clear description of the decision-making process or the framework of big data-based applications in the literature.

Therefore, the analysis of foreign literature has shown that there are no models for decision-making in the field of production and consumption based on big data, including data collection, storage, visualization and information exchange.

Research methods

In the course of writing the article, the authors relied on the methods of statistical and comparative analysis.

To analyze the availability of food, the authors limited themselves to one type of product – potatoes, since firstly, it is one of the main types of food, secondly, potatoes account for the greatest loss in the Republic of Kazakhstan compared to other types of agricultural production, and thirdly, when analyzing imports and exports, potatoes have almost the same data.

Official data of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan were used for the analysis [8].

Results

About 200 thousand hectares of potatoes have been sown annually on the territory of Kazakhstan since 1999. At the same time, despite fluctuations in the area of sowing, potato yields are steadily growing.

Figure 1 illustrates the change in the acreage, gross harvest and yield of potatoes over the past 22 years. The increase in potato yield can be associated with the introduction of technologies that increase production efficiency, every year on average there is an increase in yield by 4.7 hundredweight per hectare.

The potato market can be saturated not only with its own production, but also with imports. In this regard, it is advisable to conduct a structural analysis of

the resource base.

In official statistics, the resource base of the potato market in Kazakhstan consists of 3 sources: stocks at the beginning of the year, domestic production and imports. Figure 2 clearly shows that over the past 5 years, the share of each source in the total market has remained almost unchanged. At the same time, for the analyzed period, the volume of domestic production is on average 22 times higher than the volume of imports.

The structure of potato resource use has also remained stable for 5 years. At the same time, it should be noted a large share of losses, which on average is equal to 20.6% of the total volume of the potato market (the sum of production and import volumes).

Comparing the data from Figures 2 and 3, we can conclude that despite the high proportion of losses, our own potato production fully satisfies the internal demand. Nevertheless, the presence of such losses does not allow to increase exports, which could potentially amount to at least 25% of production instead of the current 6% (the average for 5 years). In addition, an increase in supply on the domestic market will help to stabilize prices.

According to the Norms of natural loss of food products in retail trade, the rate of potato loss does not exceed 0.7% per year [9].

Potato storage losses depend on several factors:

- groups of ripeness of products (early, mid-ripe, mid-late);
- type of warehouse (cold storage or storage);
- storage method (in grids or in bulk);
- storage mode (temperature, humidity).

Until 2019, the Norms of natural loss, shrinkage, shaking, spoilage of agricultural products and products of its processing provided for a rate of natural losses during storage of potatoes not exceeding 7.8%

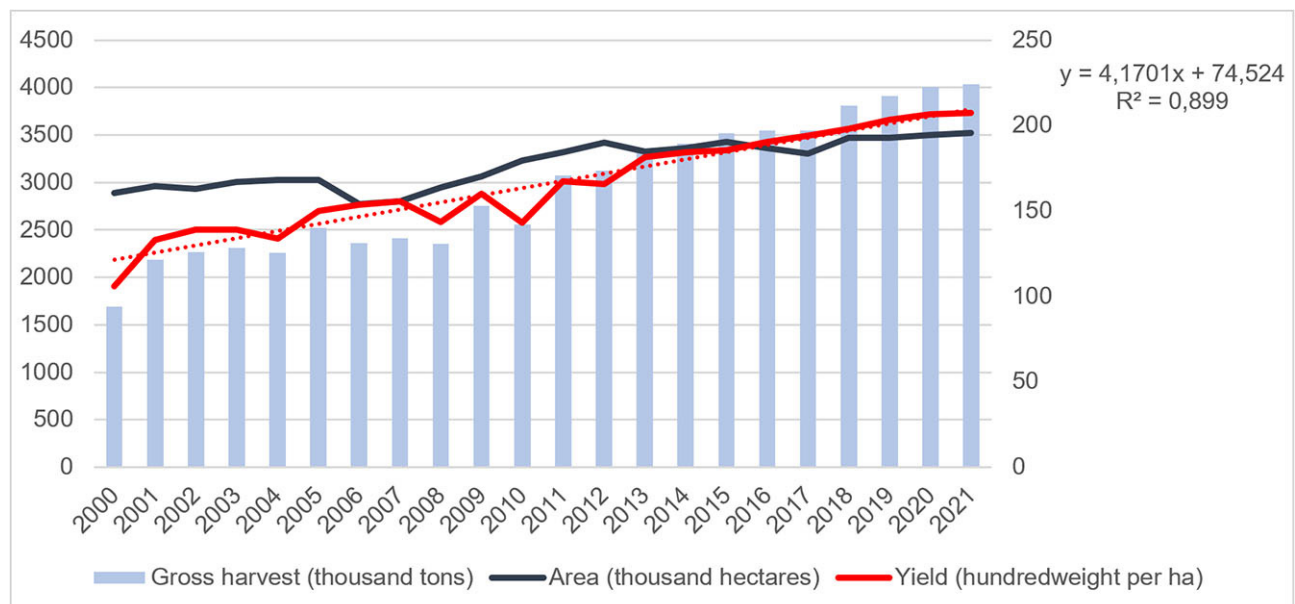


Figure 1 – Comparison of the sown area of the gross harvest and potato yield

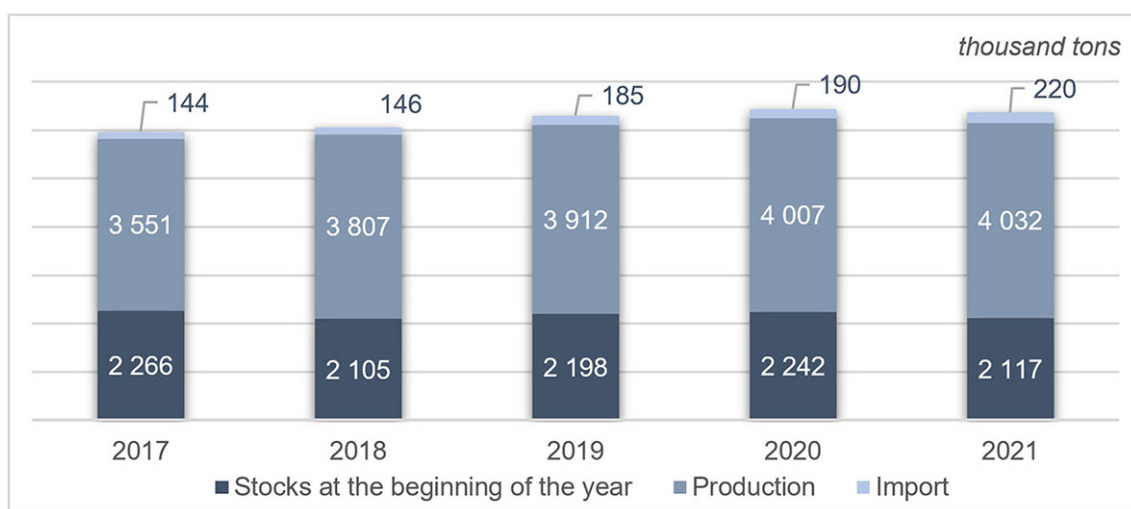


Figure 2 – Structure of the potato market resource base

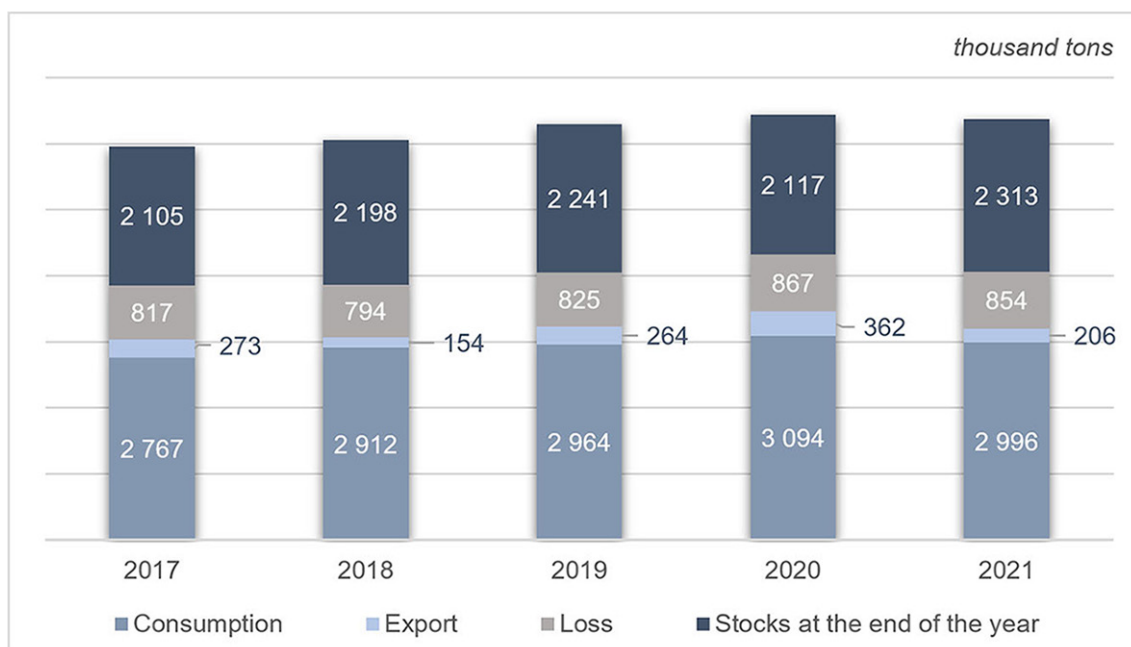


Figure 3 – Structure of potato resource use

for 9 months of storage (in the worst storage conditions). Today, the norms for potatoes have been excluded from the relevant regulatory legal act [10].

Crop losses may also occur during its transportation. However, the legislation of the Republic of Kazakhstan does not contain any acts establishing relevant norms. At the same time, the legislation of the Russian Federation provides for up to 2% of the natural loss of potatoes when transported by road up to 400 km. [11].

Thus, the sum of all possible natural losses (under the worst and longest storage conditions) along the entire supply chain of potatoes does not exceed 10.5%, which is almost 2 times lower than the average annual losses for at least the last 5 years.

Potato cultivation is associated with considerable

difficulties, one of which is the need for constant protection from diseases and pests at all stages. Potatoes can be highly affected by diseases. Almost the entire phytopathogenic potato complex is represented in Kazakhstan.

There is a direct dependence of potato losses on its diseases. Although potato diseases do not pose a direct threat to human health, they affect the shelf life of potatoes, spoil the appearance of tubers, greatly affect losses during harvesting, storage, transportation and consumption. According to the Food and Agriculture Organization, global potato crop losses from diseases annually account for 11.6% of the total gross harvest [12]. Kazakh statistics do not use data on potato losses from diseases.

Conclusion

The concept of DDDM is based on the use of data, on the reliability of which the effectiveness of decisions depends. However, according to the results of the analysis of statistical information on the potato market, the following inconsistencies were revealed:

1) Over 10 years, the volume of production has increased by 29%, despite the fact that the acreage has remained virtually unchanged;

2) The volume of losses for 5 years remains abnormally high and averages 20.6%, which is 2 times more than the norm of natural losses.

If the first discrepancy can be explained by the introduction of technologies (requiring additional resources that are not yet reflected in statistics) that increase production efficiency, then the second causes the need for additional refinement of statistical data for reliability.

Given that general statistics are generated «manually» from a variety of reports of agricultural entities, unintentional or intentional errors in data collection and processing are quite possible. In this regard, for the successful implementation of the DDDM concept, it is necessary to build an effective data collection system that eliminates the human factor as much as possible.

When analyzing losses, it is necessary to take into account the losses associated with potato disease. Introduction of an automated inventory accounting

system for food products in the regions [13], including those located in specialized storages and retail facilities (vegetables, fruits, groceries and meat and dairy products), with access to the system of the Ministry of Agriculture and the Ministry of Agriculture of the Republic of Kazakhstan with a plan to ensure the share of accounting for food products in 2022 – 5%, 2023 – 20%, in 2024 – 50%. This will strengthen the digital monitoring of potato storage points with information about the location, conditions, storage volumes, and degree of contamination of the crop. It is necessary to enter an indicator – an assessment of the degree of infection with the main diseases of the volume of potatoes for storage, sale, production, loss assessment and more.

At the same time, modern technologies should be used: «Internet of things», «machine learning». For example, by means of sensors on scales, it is possible to instantly transfer weight data on the collection, storage and sale of products into a single information platform, and artificial intelligence trained on hundreds of thousands of images can identify a damaged product.

However, when implementing such technologies, the issue of confidentiality and economic feasibility arises before business entities. In this connection, a deeper study of the legal regulation of this process is necessary.

This research is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP14871923).

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DDDM тұжырымдамасы: Қазақстан Республикасындағы картоп нарығы деректерінің толықтығы мен дұрыстығы

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Аңдатпа. Ағымдағы жаһандық сын-қатерлер жағдайында экономикалық нарықтардың, оның ішінде азық-түлік нарығының әдеттегі даму барысы өзгеруде. Басқарудың тиімділігі деректерге сүйенетін Data Driven Decision Making тұжырымдамасына негізделіп қабылданатын шешімдердің сапасына байланысты. Осыған байланысты пайдаланылатын деректердің сенімділігі мен толықтығы мәселесі өзекті болып отыр. Бұл жұмыстың мақсаты – картоп нарығы бойынша ресми статистиканың деректерін, олардың толықтығы мен шешім қабылдау үшін сенімділігі тұрғысынан талдау. Зерттеу барысында статистикалық және салыстырмалы талдау әдістері қолданылды. Нәтижесінде статистикада, ақпараттың дұрыстығына немесе толықтығына күмән тудыратын, егін жинау көлемі мен шығын үлесі бөлігінде сәйкессіздіктер анықталды. Оларды жою бойынша шаралар ұсынылды.

Кілт сөздер: деректер негізінде шешім қабылдау, деректер, статистика, сенімділік, толықтылық, картоп, өндіріс, шығындар, басқару.

Концепт DDDM: полнота и достоверность данных рынка картофеля в Республике Казахстан

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Аннотация. В условиях текущих глобальных вызовов меняется привычный ход развития экономических рынков, в том числе рынок продовольственных продуктов. Эффективность управления зависит от качества принимаемых решений на основе концепции Data Driven Decision Making, которая опирается на использование данных. В связи с этим, актуальным становится вопрос достоверности и полноты используемых данных. Целью данной работы является анализ данных официальной статистики по рынку картофеля на предмет их полноты и достоверности для принятия решений. В ходе исследования были применены методы статистического и сравнительного анализа. В результате выявлены несоответствия в части объема сбора урожая и доли потерь, указывающие на их недостоверность или неполноту информации, предложены меры по их исключению.

Ключевые слова: принятие решений на основе данных, данные, статистика, достоверность, полнота, картофель, производство, потери, управление.

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