

# Evaluation of the Effectiveness of the Digital Transformation of Crop Production of the Pskov Region

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**Abstract.** The article deals with the essence and advantages of digitalization – the introduction of digital computer technologies and information presented in digital form into production activities. The cost of economy digitalization and its individual industries is estimated. It is concluded that the decision on digitalization should be justified, supported by the necessary calculations. The article states that the use of computer technologies by Russian agrarians in production processes is the exception rather than the rule. The capacity of crop production as a long-term process, variable in terms of technological effectiveness, structure of operations and costs, for the introduction of advanced information technologies, is estimated. The article presents a description of the place of agriculture in the economy of the Pskov region, the characteristics of the main indicators of crop production. It is concluded that the growth of the gross output of the main types of agricultural products in crop production was largely due to a significant increase in yield index, but the acreage and provision of agricultural machinery in the region continue to decline. The study revealed that the power supply per production unit of agricultural producers combined with the level of digitalization reduce the size and change the structure of production costs. In addition, an assessment of the effect of the introduction of information technology in the chain of formation of the costs of crop production is given. The article describes the sequence of evaluation of the return on investment costs for digitalization of crop production in the Pskov region. The rate of payback due to savings in production costs is estimated at 5 years.

**Keywords:** digitalization, efficiency, crop production, information technology, cost structure, investments.

## 1 Introduction

The digital economy is understood as an activity in which the key factor of production is digital computer technology and information, presented in digital form [1]. Economy digitalization or its individual industries can significantly improve the efficiency of business processes. However, the price of this increase is significant – the cost of implementing digital technologies is usually high. The decision on digitalization should be justified, supported by the necessary calculations.

Today, the digital economy penetrates practically into all spheres of life and sectors of the economy. Agriculture is no exception [2]. Of course, the use of computer technologies by Russian agrarians in the production processes of livestock breeding and crop production is the exception rather than the rule. However, the crop production, being a long-term process, variable in technological effectiveness, structure of operations and costs, is the most information-intensive industry in terms of digital transformation.

## 2 Problem Statement

Agriculture is one of the priority directions of socio-economic development of the Pskov region [3]. About 57% of all land in the region is agricultural land. There are 186 agricultural enterprises, 224 peasant (farm) enterprises and more than 88.4 thousand private subsidiary farms in the region. In 2017, the gross yield of grain crops amounted to 81.3 thousand tons, potatoes – 146.4 thousand tons, open and protected ground vegetables – 39.1 thousand tons.

The growth of gross output of the main types of agricultural products in the crop production of the Pskov region between 2010 and 2016 was largely due to a significant increase in yield index: grain and leguminous crops (in weight after processing) – 1.86 times, potatoes-1.38 times, vegetables (open ground) – 1.17 times. But the acreage and provision of agricultural machinery in the region continue to decline.

Edaphoclimatic conditions of cultivation of the basic crops set the limits of change of such factor of production as yield. The land use area sets the limit of change of such factor of production as the cultivated area of the basic agricultural crops.

### 3 Research Questions

Technological processes of crop production are different from industrial processes because they are largely determined by natural and biological factors. Therefore, the digital transformation primarily affects crop farming [4]. Digitalization makes crop farming accurate, and soil fertility – controllable.

### 4 Purpose of the Study

The use of digital technologies in crop production, which allows each cultivated plant to get exactly what is needed for its optimum growth, requires significant investment [5].

The energy intensity of agricultural producers, combined with the digitalization level, reduces the size and changes the structure of production costs [6].

The purpose of the study is to substantiate the economic efficiency of the digital transformation of crop production, specifically, an aggregated estimation of the economic effect (cost saving) of the introduction of information technologies in the chain of formation of the cost of crop products in the region.

### 5 Research Methods

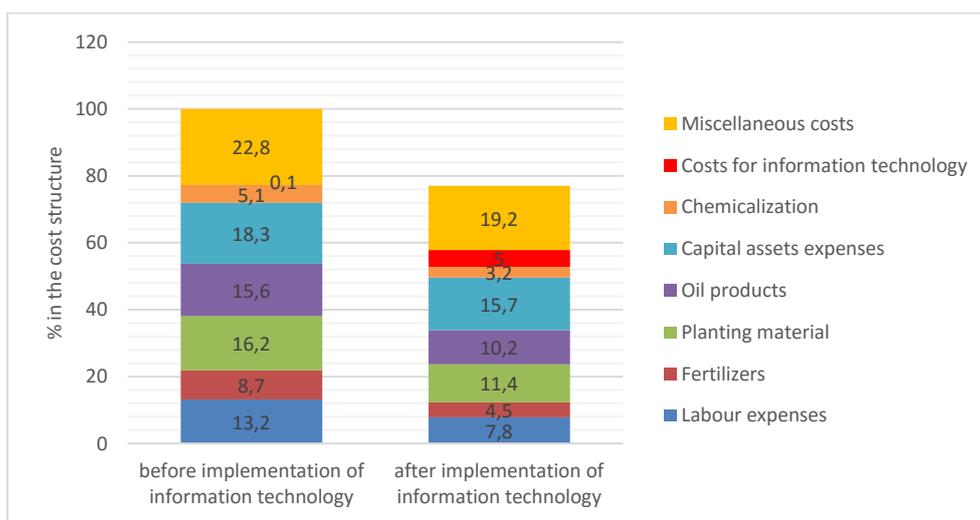
The study utilized methods of retrospective and regression analysis, comparison, abstract-logical, observation, generalization, calculation and discussion [7].

The materials of monitoring of the domestic market of agricultural products of the Analytical center under the Ministry of agriculture of Russia, the consolidated corporate and statistical reporting of Chief Administration of agriculture and technical supervision of the Pskov region are used as initial information [8].

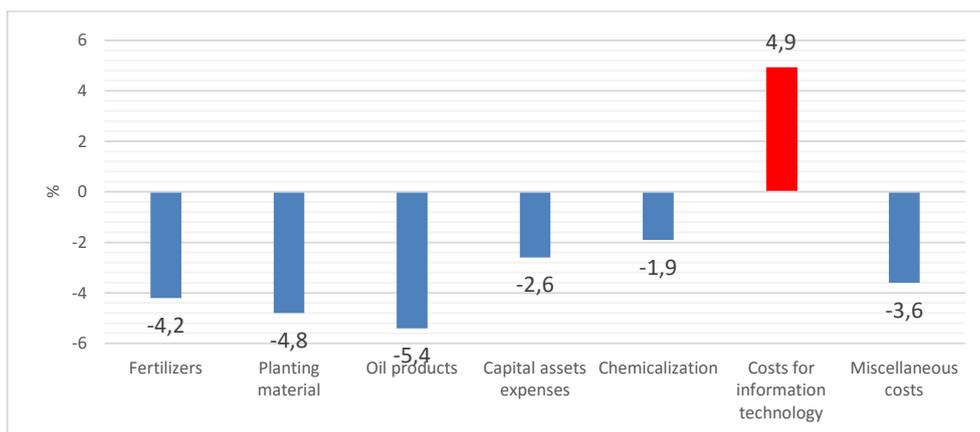
### 6 Findings

If the information about similar costs in technologically advanced countries is used during a determination of the amount of investment in the digitalization of the crop production, the introduction of information technology in crop production in the Pskov region will require 105.36 million rubles (247.9 thousand hectares x 350-500 rubles/ha) [9,10].

In 2017 the volume of gross output of crop production in the Pskov region amounted to 7534.1 million rubles in current prices. If the profitability index does not exceed 14%, the costs of crop products will be 6479.33 million rubles. This amount can be reduced by 23% by using advanced information technologies (fig. 1, fig. 2).



**Figure 1.** Cost structure in crop production (grain growing) before and after introduction of advanced information technologies (Source: compiled by the authors)



**Figure 2.** Cost savings in crop production (grain growing) after the complex introduction of advanced information technologies (Source: compiled by the authors)

The return on investments for digitalization of the industry due to savings in production costs can be amounted to 5 years.

## 7 Conclusion

Digital economy is an activity, in which digital computer technology and information presented in digital form are the key factor of production. Digitalization of individual sectors of the economy can significantly improve the efficiency of business processes. The decision on digitalization should be justified, supported by the necessary calculations.

Agriculture is one of the priority directions of socio-economic development of the Pskov region [3]. The growth of the gross output of the basic types of agricultural products in crop production was largely due to a significant increase in yield index. But the acreage and provision of agricultural machinery in the region continue to decline.

Edaphoclimatic conditions of cultivation of the basic crops set the limits of change of such factor of production as yield. The land use area sets the limit of change of such factor of production as the cultivated area of the basic agricultural crops.

The power supply per production unit of agricultural producers, combined with the level of digitalization, reduce the size and change the structure of production costs

The introduction of information technologies in the chain of formation of the costs of crop products provides a whole host of positive effects, including economic – cost savings by at least 23%. The return on investments for digitalization of the industry due to savings in production costs can be amounted to 5 years.

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