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Justification of methods for providing agricultural equipment to agricultural producers of the Lipetsk region

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Abstract. The Lipetsk region has great potential for the cultivation of crops. The priority direction in the field of grain growing in the region is wheat. The main link in the system of technological process in the field of crop production is technological support. Therefore, the purpose of our study is to identify the factors affecting the timely implementation of technological processes in the cultivation of grain crops in the territory of the Lipetsk region. Statistical research methods in dynamics show that the Lipetsk region has a high degree of yield compared with other regions of the Russian Federation. Also, a statistical analysis of the quantitative composition of combine harvesters of the Lipetsk region was made. Using the method of interviewing heads of agricultural organizations of the Lipetsk region, it was possible to establish whether there is a need to attract additional units of equipment to perform technological operations for the cultivation of crops. Based on the conclusions drawn from the analysis of factors, we have developed a proposal to create a regional machine-technological complex, which would reduce the technical and financial burden on agricultural enterprises by providing services for the provision of agricultural machinery for rent, as well as a number of other services used in implementation of technological processes in the cultivation of crops.

1. Introduction

Currently, about 440 units of agricultural organizations, 973 units of peasant (farmer) farms and individual entrepreneurs are registered in the Lipetsk region [1]. The main branch of agriculture in the Lipetsk region is plant growing. In the structure of the sown areas of the region, the largest share is occupied by winter and spring wheat (about 33% of all the sown areas) [2].

Nevertheless, there is a need to maintain the infrastructure area of agricultural producers in the region, which at the moment introduces them to difficult situations in the cultivation of crops having high accounts payable for the acquired agricultural equipment [5-9].

2. Methods

In the Lipetsk region, a priority is the cultivation of crops. Thus, there is a need to attract agricultural equipment from outside organizations. The research toolkit includes methods for analyzing statistical and dynamic information. In conducting this study, the methods of abstract-logical, interviewing, questioning, and others were also used. The study made it possible to substantiate the project to create a machine-technological complex for the development of agriculture in the Lipetsk region.



3. Results

Figure 1 shows the dynamics of acreage, gross yield and yield of grain in the territory of the Lipetsk region in the period from 2013 to 2016.

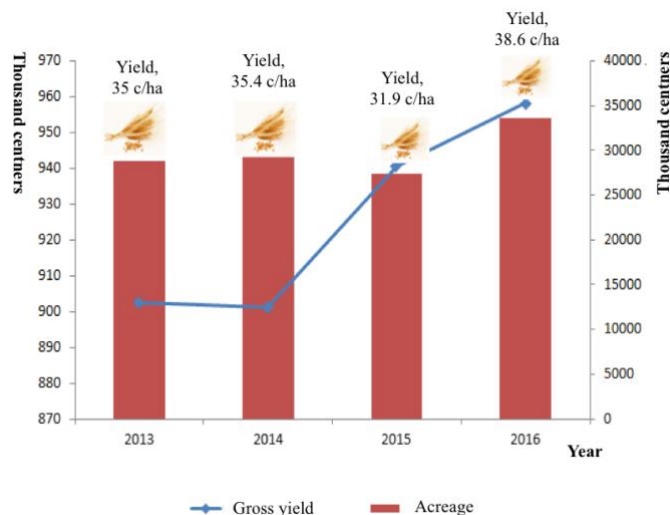


Figure 1. Dynamics of sown areas, gross yield and grain yield of the Lipetsk region from 2013 to 2016.

The indicators presented in Figure 1 indicate a high degree of grain yield in the Lipetsk region. For example, in 2015, the average grain yield across the entire territory of the Russian Federation was 23.7 centners per hectare, when in the same year, the yield was 31.9 centners per hectare in the Lipetsk region. In 2016, the average grain yield in the whole Russia amounted to 26.2 c/ha, and it was 38.6 c/ha in the Lipetsk region. These indicators are directly dependent on favorable weather conditions conducive to the cultivation of grain crops (the region is located in the central black earth zone with a moderately warm summer).

For the implementation of technological processes in cultivation of grain crops, a system of technological support for agricultural producers is needed. The main link of this system is the machine-tractor park. To assess the quantitative composition of combine harvesters of the Lipetsk region, we conducted an analysis for the period 2012-2016, which is presented in Figure 2 [3].

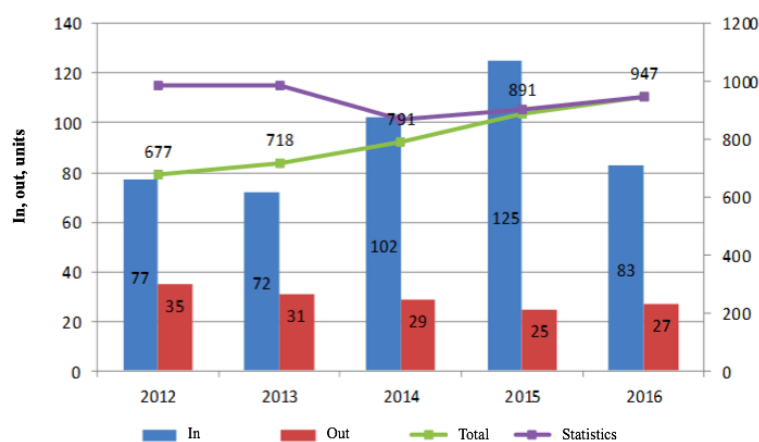


Figure 2. The quantitative composition of combine harvesters of the Lipetsk region.

This analysis confirms that in the Lipetsk region in the period from 2012 to 2015, there was an increase in the purchase of combine harvesters. Compared to 2012, the number of purchased

equipment increased by 38.4% by 2015, which confirms the stable financial position of agricultural organizations (data on the financial results of agricultural organizations are presented in the Table 1) [2].

Table 1. Balanced financial result (profit minus loss) of the activities of agricultural organizations in the Lipetsk region (million rubles).

| Years | 2005 | 2010 | 2014 | 2015 | 2016 |
|------------------|------|------|------|-------|-------|
| Financial result | 387 | -894 | 7028 | 12258 | 11266 |

In Figure 2, we observe that there was a decrease in the purchased equipment by 33.6% in 2016, which indicated a deterioration in the financial results of agricultural organizations (also reflected in Table 1).

Despite the annual increase in purchased equipment on the territory of the Lipetsk region, the energy supply of agricultural organizations, as shown in Figure 3, is decreasing annually.

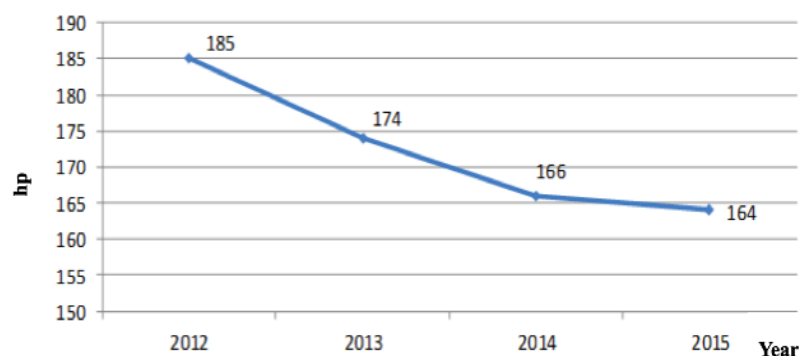


Figure 3. The energy supply of agricultural organizations of the Lipetsk region per 100 hectares of sown area (hp).

4. Discussions

The analysis of the Lipetsk region's experience in the cultivation of crops allows us to draw the following conclusions:

1. Despite the increase in acreage (by 51% compared with 2014), the available quantitative composition of agricultural equipment in agricultural organizations does not allow to process the entire sown area of agricultural organizations, which leads to the use of hired technology. Due to the fact that there are currently no organizations willing to provide rental services of agricultural machinery in the Lipetsk region, heads of agricultural enterprises have to use this type of service from the southern regions of the country (according to the survey of the agricultural organizations' heads in the Dankovsky district of the Lipetsk region, presented in Table 2).

Table 2. The results of interviewing of agricultural organizations' heads and owners of peasant farms in the Dankovsky district of Lipetsk region.

| Interview Questions | Final answers (based on interview results) | | | |
|--|--|----|--------|----|
| | Yes | | No | |
| | People | % | People | % |
| 1. Is there enough equipment available in your farm to perform operations in a given agrotechnological | 9 | 56 | 5 | 44 |

timeframe?

| | | | | |
|--|---|----|---|----|
| 2. Is the technique of third-party organizations or individuals involved in the processing of land on your farm? | 9 | 56 | 5 | 44 |
|--|---|----|---|----|

2. Every year, on average, the energy supply of agricultural enterprises of the region decreases by 3.5%, which entails a load on agricultural machinery and its premature failure.

According to the results of the presented conclusions and stabilization of the activities of agricultural enterprises in the Lipetsk region, we have formed a proposal for the creation of a regional machine-technological complex that would not only perform services for carrying out mechanized work within the framework of technological processes, but also have a wide range of:

- Financial management of agricultural organizations;
- Conducting organizational and technological activities.

The use of the outsourcing system can allow agricultural enterprises experiencing financial difficulties to abandon a large staff and, in turn, would exempt from wages and tax payments.

- Provision of workers during the peak period of field work;
- Improving all employees' skills in agricultural organizations;
- Providing services for repairing and restoring the agricultural machinery;
- Consulting services;
- Selling the refurbished equipment.

By organizing such a complex in the Lipetsk region, it would be possible to reduce the rates for the provision of agricultural services. For example, in a successfully functioning Central Machine-Technological Station of the Republic of Bashkortostan, the cost of direct combine services is 2,200 rubles/ha, and the Lipetsk region pays for this type of service at a price of 3,200 rubles/ha. Such a difference in price is primarily associated with high demand for this type of service during the peak period of field work, as well as with the range of overtaking agricultural equipment from the southern regions of our country [10].

An important feature of the creation of this complex is the interest in using the services of agricultural producers. We interviewed managers of several agricultural organizations of the Lipetsk region of various municipal districts, the results of which are presented in Table 3.

Table 3. The results of interviewing managers of agricultural organizations and owners of peasant farms of various municipal districts of the Lipetsk region.

| Interview Questions | Final answers (based on interview results) | | | | | | | |
|---|--|----|----------------|---|--------------------|----|--------------------|----|
| | Yes, exactly | | Absolutely not | | Rather yes than no | | Rather no than yes | |
| | People | % | People | % | People | % | People | % |
| When organizing MTS functions in the region (region), what is the likelihood that you would use their services? | 2 | 11 | 1 | 5 | 12 | 63 | 4 | 21 |

The results of this interview indicate the interest in using services with the help of the machine-technological complex, which in turn proves the feasibility of its creation.

A distinctive feature of the machine-technological complex offered by us from the already existing machine-technological stations is the use of unmanned aerial vehicles. The use of unmanned aerial vehicles provides for a technological chain of interaction with coordinate farming, in the

implementation of which a modern energy-intensive technology is required for precise seeding, differential fertilization, etc.

The use of unmanned aerial vehicles would allow to carry out such operations as (a) soil analysis, making it possible to determine exactly on which areas it is more efficient to grow a certain type of culture; (b) planting seeds, which would reduce damage to the soil applied by wheeled tractors; (c) treatment of plants, which also reduces damage to the soil and yield losses. Nevertheless, these measures will save time for agricultural workers to analyze the state of farmland. The use of UAVs allows you to switch to an automated process for the production of agricultural products.

When creating a machine-technological complex, we offer an organizational-legal form in the form of a federal state unitary enterprise, which would allow us to attract budget funds for the sustainable financial development of this complex. Also, we propose to establish the pilot project on budget financing of the complex for 5 years, because this would allow to ensure further independent functioning and the creation of an innovative technological developing base in the Lipetsk region.

5. Conclusion

Thus, the analysis made it possible to formulate and substantiate the existing need to create a regional machine-technological complex on the territory of the Lipetsk region, which would provide agricultural enterprises with the necessary amount of equipment during peak periods of field work and also allow using a number of services to support agricultural producers and bringing them to a substantially high innovative technological level.

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