

## FLEET OF TRACTORS ON FARMS OF LATVIA, ITS STRUCTURE AND ENERGY INTENSITY

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**Abstract.** The article discusses variations in the areas under crops on the farms of Latvia and the dynamics of the development of the tractor fleet in the period from 2007 till 2013. There are indicators presented of the quantitative and qualitative changes of the tractor fleet which characterise its age structure and energy intensity. Factors are shown affecting the above indicators: availability of tractors, which are in good technical order, and renewal of the tractor fleet, which makes it possible to reach a higher level of technical provision of agricultural production. Principal directions are justified for perspective development of technical supply of agricultural farms facilitating their efficient development.

**Key words:** fleet of tractors, energy intensity, power supply reliability.

### Introduction

An important factor for the development of agricultural production is justified availability of tractors on the farms, their age structure and energy intensity. They affect power supply reliability of agricultural processes, labour efficiency, execution of operations in optimal agrotechnical terms, as well as the output expansion of the product [1; 2]. Therefore, systematic analysis of the tractor fleet is needed that will allow justified determination of the course of its development. The topicality of such an analysis increases also because it is one of the principal energy constituents on the farms. Besides, the prices of tractors have jumped during the recent years, and their technical perfection is growing from year to year. It is not possible to raise the competitive capacity of agricultural production processes without up-to-date technical provision and introduction of advanced technologies.

In addition to this, the information obtained as a result of the analysis of the tractor fleet can help the agricultural producers make a justified choice of the machinery, its quantitative and qualitative structure. But the government management authorities should stimulate application of up-to-date engineering means and technologies.

### Materials and methods

The purpose of this work is to carry out an analysis of the dynamics of the development of the tractor fleet on the farms of Latvia, quantitative and qualitative changes, as well as its age structure, which characterises the aging rate of the tractor fleet in the period from 2007 till 2013, to determine the renewal tendencies of the tractor fleet on agricultural farms; to reveal an increase in the energy intensity of the purchased tractors considering variations in the areas under crops on the farms; to establish the correlation of operable and inoperable tractors in the recent years; to show a perspective change in the structure of the fleet of tractors on the basis of the obtained data and other indicators.

The object of the research is the data about the fleet of tractors on the farms of Latvia obtained from the LR Central Board of Statistics and the State Agency of Technical Supervision [3; 4].

The analysis of the data was conducted using the methods of statistical analysis and their interpretation.

### Results and discussion

During the recent years the areas under crops have grown in Latvian agriculture, so has its technical provision. In the period from 2007 till 2013 the areas under crops (1143200 ha) have increased by 9.1 %. Figure 1 shows variations in the areas under crops, the quantity of tractors, and their capacities on different groups of farms differing by the area under crop. In 2007 the area under crop on the farms greater than 50 ha constituted 59 % of the total sown areas in Latvia, but the number of farms was 3.4 % of their total quantity (the account includes those farms which have sown areas); in 2013 these figures were correspondingly 73 % and 6.5 %. This indicates that there is a tendency of the farms to consolidate. It has been established that in the year 2007 the quantity of tractors on the

farms (55293 tractors) was by 11 % greater than in 2013, which is particularly typical of the farms with the areas under crop less than 50 ha. (The source of data used in the account is [3]).

To a large extent the reason of such a quantitative distribution of tractors is that the farms with small sown areas have low-capacity tractors whereas the farms with areas under crops exceeding 50 ha use more powerful tractors (see Figure 1). In 2007 only 7 % of all the tractors had a capacity of more than 100 kW, only 5 % of their quantity being used on the farms with the areas under crop greater than 50 ha. In the year 2013 these figures constituted correspondingly 29 % and 16 %. This is evidence of greater power supply reliability and labour efficiency of the peasant farms.

In addition to that, the total capacity of the tractor fleet in 2013 (3490015 kW) increased by 15 % in comparison with the year 2007, but the average power supply reliability in 2013 was  $3.1 \text{ kW ha}^{-1}$ . Yet, on the farms with the sown areas exceeding 50 ha the power supply reliability was  $1.3 \text{ kW ha}^{-1}$ . The average capacity of a tractor in 2007 was 51 kW but in 2013 it was 63 kW. In the year 2007 the quantity of tractors per 100 ha of the area under crop was 5.3 tractors whereas in 2013 it constituted 4.3 tractors. Such a decrease in the number of tractors per 100 ha of the sown area takes place due to the purchase of more powerful tractors, which promotes higher labour efficiency. (The source of data used in the account is [3]). In the countries of Central and Eastern Europe the number of tractors is 2.7 tractors per 100 ha (Source of data [6]).

The economic efficiency from the use of tractors depends, to a certain extent, also on their age. The use of outdated machines lowers their efficiency, increasing their maintenance costs. Figure 2 shows the percentage distribution of the tractor fleet by the age periods in the years 2011 and 2013.

The average age of agricultural tractors has changed insignificantly during the last three years. For instance, in 2013 it was 23.7 years but in 2011 – 24.2 years. There is slight reduction in the average age of tractors in this period. (The source of data used in the account is [5]). It is evident in Figure 2 that 48 % of the total quantity of tractors (the year 2013) correspond to the age period of 21-30 years but 10 % correspond to the age period of 5, 6-10 years. This indicates that a considerable proportion of the total number of tractors is outdated. (The source of data used in the account is [4]).

The distribution of tractors by age periods in the years 2011 and 2013 has changed but little, which is visually demonstrated in Figure 2.

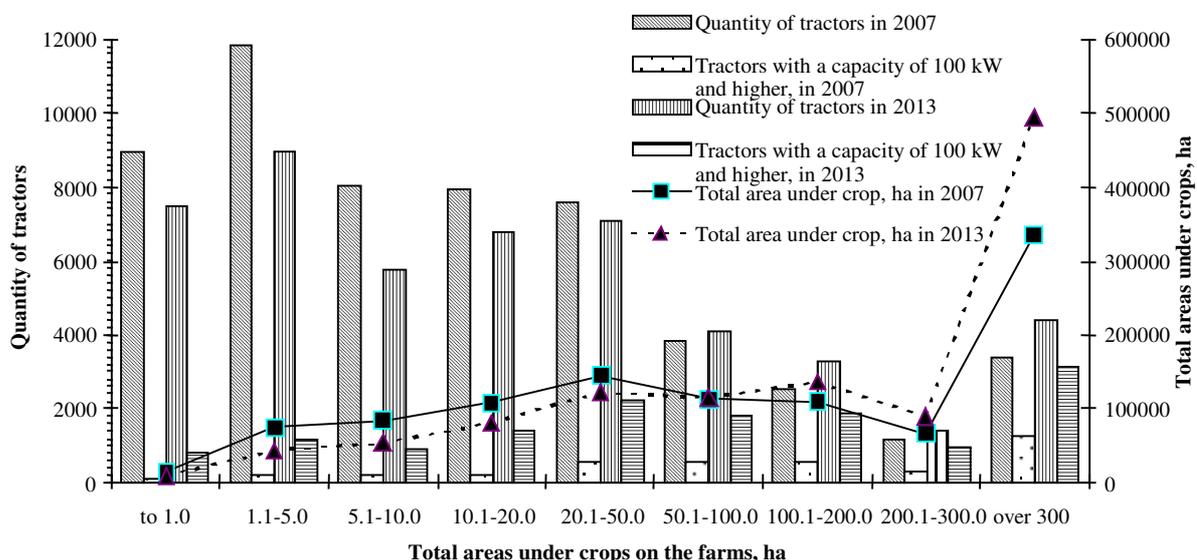


Fig. 1. Quantity of tractors on farms with various areas under crop (the years 2007-2013)

The age level of tractors is considerably affected by belated replacement of the old tractors with modern ones and their tardy renewal process which slows down the growth of the production efficiency.

If tractors which are in good technical order are considered by their technical checkups, then only 35 % (28617 tractors) of the total quantity of agricultural tractors had passed technical checkups in 2013. In many respects this is due to the slow mortality of technically rundown tractors on the farms,

which does not facilitate reduction of the current maintenance costs and the use of labour resources. The average annual renewal rate of the fleet of tractors with new tractors constituted 724 tractors during the period from 2007 till 2013, the average coefficient of growth being 0.87. (The source of data used in the account is [4]). The slow renewal process is, to a great extent, because of insufficient economic possibilities of the farms and scarce support on behalf of the state, as well as the current situation of the prices of agricultural products on the market.

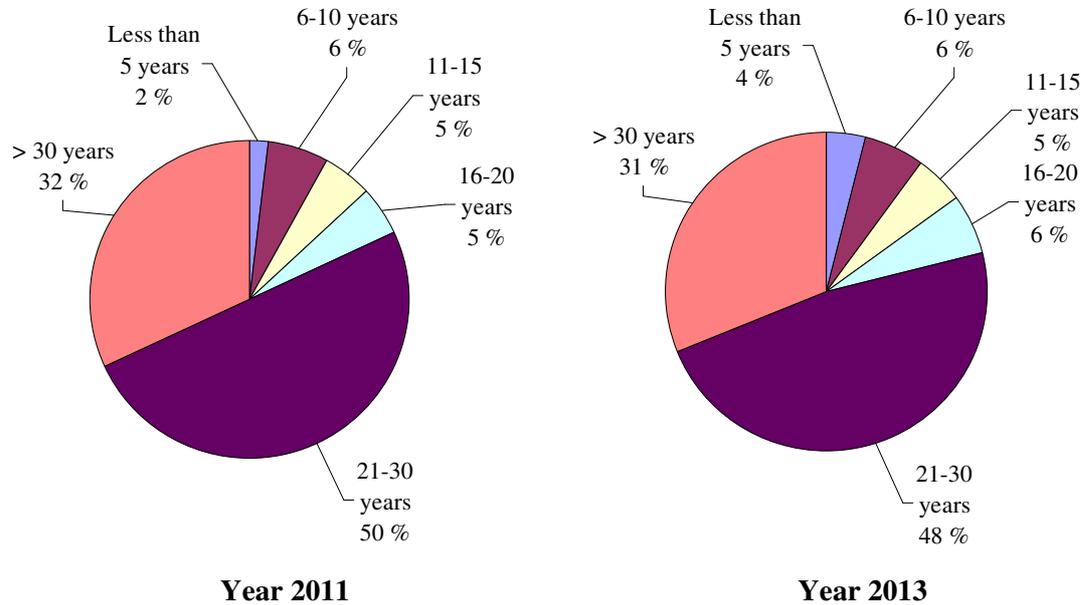


Fig. 2. Distribution of tractors by age periods

When the areas under crops are increased without changing labour resources, the production efficiency can be achieved at the expense of technical provision and use of advanced technologies. The government should create favourable conditions for the development of production and promote the expansion of marketing outlets. It should stimulate perspective directions for the development of advanced technologies and application of up-to-date engineering means.

In order to use efficiently the modern high-performance machines, which the farmers cannot purchase because of the high prices, and ensure sufficient annual load, it is important to introduce various organisational forms of their joint use.

## Conclusions

Although, due to the expansion of the areas under crop by 9.1 % in the period from 2007 till 2013, the total capacity of the tractor fleet increased by 15 %, the specific energy intensity changed insignificantly and, on the average, constituted  $3.1 \text{ kW} \cdot \text{ha}^{-1}$  but on the farms with the areas under crops exceeding 50 ha, it was  $1.3 \text{ kW} \cdot \text{ha}^{-1}$ .

On the farms with more than 50 ha the areas under crops increased in 2013 by 14 % but their number increased by 3.1 % in comparison with the year 2007, which indicates a consolidation tendency of the farms in the period discussed.

The fleet of tractors, as a whole, consists mainly of outdated machines, the average age of tractors in the year 2013 being 23.7 years, 48 % of their total quantity correspond to the age period of 21-30 years, but 10 % – to 10 years.

In many respects, the reason for the high age level is the slow replacement of the outdated machines and the tardy renewal process. A significant proportion of the out-of-date tractors is revealed in technical checkups. In 2013 only 35 % tractors passed a technical checkup, yet the average renewal rate of tractors in the period from 2007 till 2013 was 0.87.

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