Age Structure of Tractor Fleet in Latvian Agriculture

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Abstract. This paper deals with trends in the evolution of the tractor fleet in Latvia's agriculture characterised by statistical indicators: average age, renewal rate, and priority tractors. The average age of the tractor fleet is 22.4 years but the renewal rate of tractors has decreased by 25% over the period of 2005-2010. The paper presents the factors having an impact on the abovementioned indicators. The forecasts regarding the quantitative contents of the perspective tractor fleet are also included in the paper.
Key words: tractors, structure, age period, renewal trend.
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Introduction

In agricultural production, particularly in crop cultivation, tractors play the main role in technological processes and constitute the basic energy component on the farm. Therefore, the number of tractors, their structure and length of service need systematic economic analysis and argumentation, which is particularly important today due to the considerable increase in the prices of tractors in recent years, as well as the increase in their efficiency due to higher capacity and speed. The costs of the product may increase disregarding these facts.

The paper aims to provide the analysis of age structure of the tractor fleet characterised by the share of tractors having different lengths of service. The analysis considers the renewal trends of the tractor fleet on farms with various areas under crop cultivation as well as the number of tractors undergoing technical inspection. Based on the abovementioned data and other indicators, it is suggested that a perspective structure of the tractor fleet should be determined. The methods of statistical analysis and the data obtained from the Central Statistical Bureau of the Republic of Latvia and the State Agency of Technical Supervision are used in thepresent paper.

Results and discussion

The age structure and power intensity of the tractor fleet are very important factors for its renewal, since the overextended service life of tractors increases the prime cost of operations due to the loss of time while the machines are idle, increased costs of repairs, and no possibility to use the machines intensively at a high level of physical wear-and-tear. In many ways, the age structure determines the execution of the operations in fixed agrotechnical terms. The average age $\mathbf{T}_{\mathbf{avr}}$ of a tractor fleet can be determined by the ratios of tractors having different age periods of use.

$$\mathbf{T}_{\mathbf{avr}} = \sum_{i=1}^{n} T_i \alpha_i ,$$

where:

$\mathbf{T}_{\mathbf{i}}$ – age period of the use of tractors;

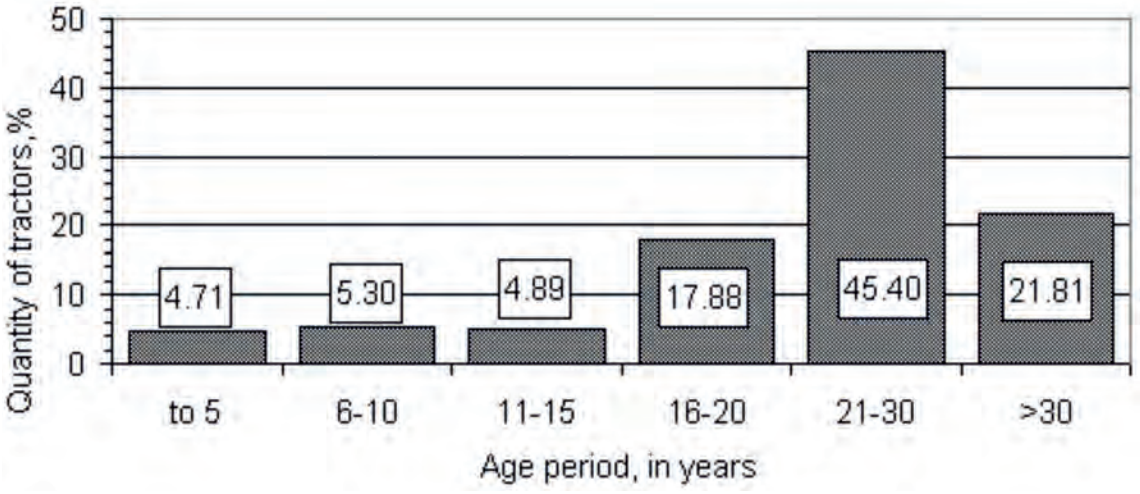
$\alpha_{\mathbf{i}}$ – ratio of the tractors within the i-th age period of their use;

n – quantity of the age periods.

The data analysis showed that, in the following age periods: $\mathbf{T_1}$ = up to 5 years; $\mathbf{T_2}$ = 6-10 years; $\mathbf{T_3}$ = 11-15 years; $\mathbf{T_4}$ = 16-20 years; $\mathbf{T_5}$ = 21-30 years; $\mathbf{T_6}$ > 30 years, the average age of the agricultura tractors constituted 22.4 years. The graph in Figure 1 shows the share of tractors in their total quantity by age periods.

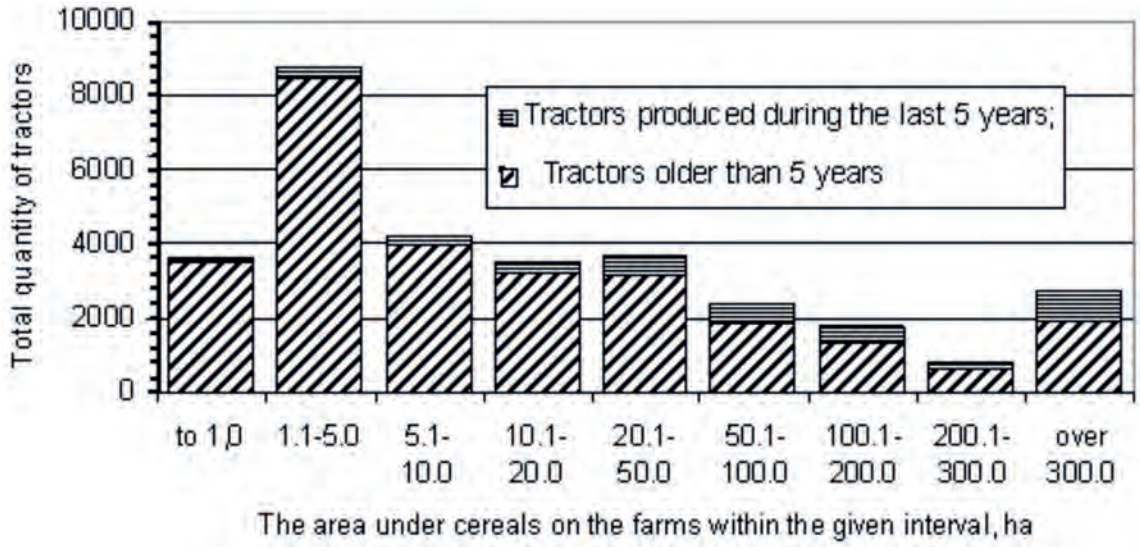
It is evident from Figure 1 that the share of tractors grows in relation with the increase in the age period, indicating that a significant part of tractors in their total quantity is outmoded because their average age is high. Figure 1 also shows that the share of tractors in the age period of 21-30 years reaches 45.4%, which is almost half of the tractor fleet, but for the age periods of up to 5 years and from 6-10 years it is 10.1%. Consequently, the level of technical provision mainly includes obsolete and non-serviceable tractors. In this case, the efficiency decreases, the costs for maintaining the machinery in operable condition increase, and this does not promote a reduction in the deficit of manpower (machine operators).

In many respects, the changes in the age structure of the tractor fleet depend on its renewal rates and the retirement of obsolete machinery. According to the data from the State Agency of Technical Supervision, only 36% of tractors undergo technical inspection, and this constitutes only 27805 tractors out of the 77236 tractors used today in agriculture. Thus, it is confirmed that a considerable number of tractors in the tractor fleet are in a non-serviceable state. The average age of tractors, which have passed technical inspection is 14.8 years. Besides, totally 27.8% of the tractors refer to the age period up to 5 years and from 6-10 years. The renewal of such number of tractors at the existing rate may take



Source: authors' calculations based on the data from the State Agency of Technical Supervision of Latvia

Fig.1. **The share of tractors in their total quantity by age periods**



Source: authors' calculations based on the data from the Central Statistical Bureau of Latvia

Fig.2. **Breakdown of tractors depending on the areas under cereals on the farms**

place every 15 years. This is the average number of tractors undertechnical inspection.

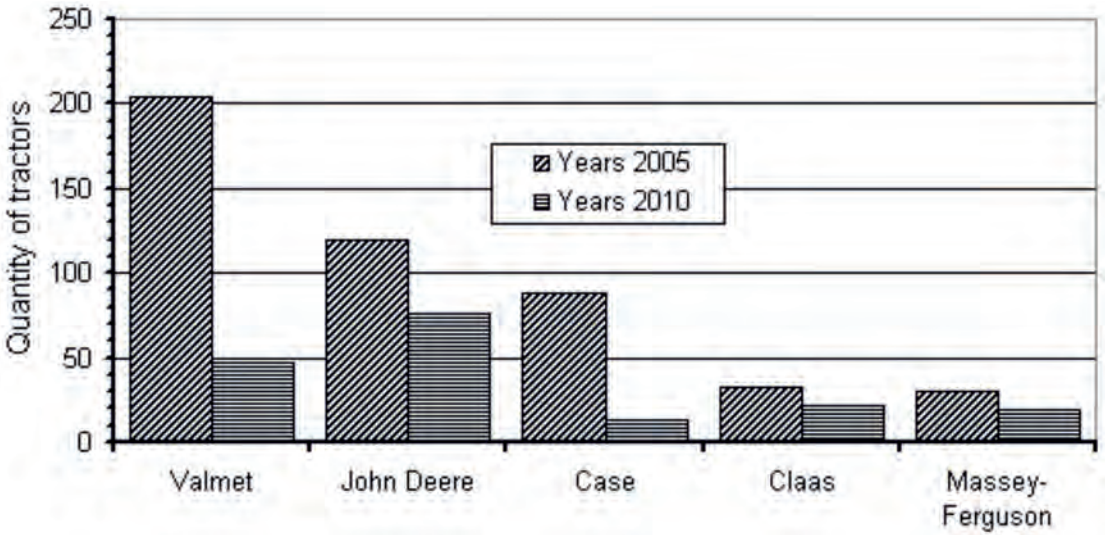
The trend in the growth of contemporary machinery on the farms and enlargement of farms make it possible to predict the number of tractors, which may reach 26 – 30 thousand in the future (Asejeva A., Kopiks N., Viesturs D., 2006; Kopiks N., Viesturs D., 2006).

The renewal rate of the tractor fleet has been considerably reduced in recent years. A great part of the tractors exceed the depreciation period by the time of service, and the reduction process of obsolete and physically worn-out tractors is slow. In many ways, this situation can be explained by an insufficient economic potential of the farms, insufficient subsidies from the state as well as the current situation with the prices in the market of agricultural products.

Breakdown of tractors under 5 years of age and the total number of tractors depending on the areas under cereals is presented in Figure 2.

Figure 2 shows that the number of tractors up to 5 years of age on the farms having crop cultivation areas less than 20 ha constitutes 5.11% of the total number of their tractors (20105), while on farms with large sown areas they amount to 23.32% of the total number of their tractors (11430). For small and big farms, the quantity of tractors under 5 years of age constitutes 11.7%. This number does not include farms without crop cultivation areas.

Such a quantitative difference of tractors can be explained, in many ways, by a different economic potential of this group of farms. For instance, the average productivity on the farms with areas under crop cultivation of up to 20 ha is 1.95 t/ha, while the average



Source: authors' calculations based on the data from the State Agency of Technical Supervision of Latvia

Fig.3. **The dynamics of acquisition of new priority tractors on the farms**

productivity on the farms having large sown areas is 2.59 t/ha (data from the Central Statistical Bureau, 2010). Higher productivity is observed on the farms, which have cultivated areas exceeding 20 ha, since it is mostly connected with one of many factors affecting its value. It is the process of renewal and application of modern, highly-efficient machines, which ensure the execution of operations in high quality and in due time.

A considerable resource for efficient use of the tractor fleet is the improvement of its age structure. The tractors with a small age period (up to 5 years) have less losses of time, particularly in the intensive periods of their use. This is especially important for the agricultural operations the intensity of which is of cyclic character and which shall be executed in fixed agrotechnical terms. However, it is also necessary to remember that the renewal of the tractor fleet should take into account the correlation between its structure and the production technology of agricultural crops. Scientists in Estonia studying their tractor fleet have come to the same conclusion (Traat U., 2007; Olt J., Traat U., Kuut A., 2010).

In many respects, the slow renewal of the tractor fleet can be explained by the fact that the replacement of obsolete machines should be of a complex character considering the correlation between its structure and the production technology. The new modern tractor units cannot be introduced without considering the entire technological process, which includes also other units characterised by their efficiency and the required quality of the performance.

Lack of conformity between the already existing machines and the newly acquired ones has an impact on the efficiency of the executed production processes as well as on the insufficient application of new organisational forms of the use of machines (Pawlak J, Pelizzi G., Fiala M., 2002).

The structure of the tractor fleet is renewed every year at the expense of improved tractors. The dynamics of their acquisition is shown in Figure 3.

Figure 3 shows that the quantity of the acquired priority tractors has not increased. Comparing the years 2005 and 2010, it can be stated that the acquisition of tractors of the Valmet brand has decreased 4.3 times, John Deere – 1.6 times, Case – 6.8 times, Claas – 1.5 times, and Massey-Ferguson – 1.6 times. It should be noted that the tractors of the Valmet and Case brands have the lowest percentage of increase. The average increase rate of the new tractors acquired in the period of 2005-2010 has diminished by 25%. The main reason for the decrease is the reduction of state subsidies to agriculture, and an overall decrease in the economic activity in this period. The subsidies in the period from 2006 to 2010 have decreased four times (Ministry of Agriculture, 2011).

The bulk of the annually acquired tractors are those of the brand MTZ. Yet, the number of purchased MTZ tractors is decreasing from year to year in contrast to all the other brands of tractors acquired in the respective years. For instance, in the year 2010, their acquisition diminished 6 times. Data indicate that ever-increasing preference among the acquired tractors is given to the following brands: John Deere, Claas, and Massey-Ferguson, which are recognised as priority brands. This indicates that the determining factors in the renewal process of tractors today are not only their reliability, economy, power-intensity, efficient applicability, comfort, and other indicators but also their price. One of the reasons for the low renewal rate of the tractor fleet is insufficient financial support to the farms and the current difficult economic conditions.

Conclusions

The average age of agricultural tractors is 22.4 years, only 36% of them being in good working order. The bulk of the new and non-defective tractors are on the farms having crop producing areas of more than 20 ha and high productivity.

The average increase rate of the new tractors acquired in the period of 2005-2010 has decreased by 25%, which can be explained by lower economic potential and financial support to the farms in the second half of the period.

A trend towards the enlargement of the farms and renewal of machines makes it possible to predict the quantity of tractors, which may constitute 26–30 thousand tractors in the future. The renewal of such a number of tractors at the present rate may take place in every 15 years.

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