

TRACTOR FLEET DEVELOPMENT DYNAMICS ON FARMS OF LATVIA

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Abstract. The article discusses the dynamics of the development of the tractor fleet on the farms of Latvia and enumerates its indicators: statistical ones, its age structure, the rate of its renewal, quantitative and qualitative changes, the purchasing dynamics of priority tractors, the average age of the tractor fleet, changes during the period from 2009 till 2013. The factors are shown which affect the indicators mentioned above, as well as the dynamics of the maintenance checkups of tractors. Principal directions are presented stimulating technical backup of the processes of agricultural production and pointing to a tendency to renew the tractor fleet on the farms. A prognosis is given for the quantitative composition of a perspective fleet of tractors.

Key words: tractors, age structure, maintenance checkups of tractors, tendency of renewal.

Introduction

The factors of great importance for the development of agricultural production are: the level of the technical backup of farms which promotes the output of production and labour capacity, a motivated choice of technical means, correct formation of the structure and energy intensity. The topicality of this issue lies also in the fact that tractors constitute one of the main components of the energy basis on rural farms. Their prices and energy intensity have grown considerably, particularly over the last years. In order to raise the labour capacity, high energy support is needed, which can be achieved either at the expense of an increased number of tractors or their capacity. The most efficient is the second way. Therefore, systematic, comprehensive economic and technical assessment of the tractor fleet is required allowing to select the efficient directions of its development. Besides, if the changes in the technical backup continue for quite a long period of time – about 15 years and more – without any changes in the technical characteristics of the tractors, such as their capacity, speed, reliability and other indicators, then the labour capacity will decrease.

Materials and methods

The aim of the work is analysis of the dynamics of the development of the tractor fleet on the farms of Latvia, its age structure characterised by a ratio of tractors with different periods of use, a tendency to renew the tractor fleet on the farms, quantitative changes of tractors, as well as the tractors which have undergone maintenance checkups in the recent years. On the basis of the obtained data and other indicators a perspective change in the quantitative composition of the tractor fleet and its energy intensity can be prognosticated.

The object of the research is the data about the fleet of the tractors on the farms of Latvia. Analysis is made in this work using the methods of statistical analysis and interpretation of the statistical data. The data are borrowed from the LR Central Statistical Board and the State Technical Inspection Agency.

Results and discussion

Using the data about the registration of tractors in the period of the years from 2009 till 2013 the characteristics of the quantitative changes of tractors was determined, their age structure on the farms of Latvia [1]. The obtained indicators show that during this period the number of agricultural tractors which belong to legal and physical persons has increased by 4.7 %, and it constituted 81762 tractors (in 2013). In the year mentioned the average annual growth was 1.14 %.

Figure 1 presents the dynamics of the change in the quantity of the tractors which belong to legal and physical persons in agriculture in the period 2009-2013 as well as the percentage of the tractors which have undergone a maintenance checkup.

It is evident from Figure 1 that the quantity of tractors in agriculture has a tendency to increase. However, the number of tractors which are in good working order and have undergone a maintenance checkup is decreasing. In 2013 their number was only 35 % of the total quantity of tractors that year but in 2009 there were 56 %. The decrease in the number of the tractors having undergone a

maintenance checkup can be explained in many respects by the fact that the dropout of technically obsolete tractors takes place on the farms slowly. Therefore, the total quantity of tractors is increasing at the expense of the share of purchased new tractors and the share of still operating technically outdated tractors. Thus, in 2009 there were 34346 worn out tractors but in 2013 there were 53145 outdated tractors, i.e., by 54.7 % more. Such a ratio of operable and non-operable tractors does not favour decreasing the current costs in order to keep the machines in an operable state. Neither does it allow using efficiently the resources of machine operators. This also leaves an impact on the average age of the tractor fleet which will slowly shrink.

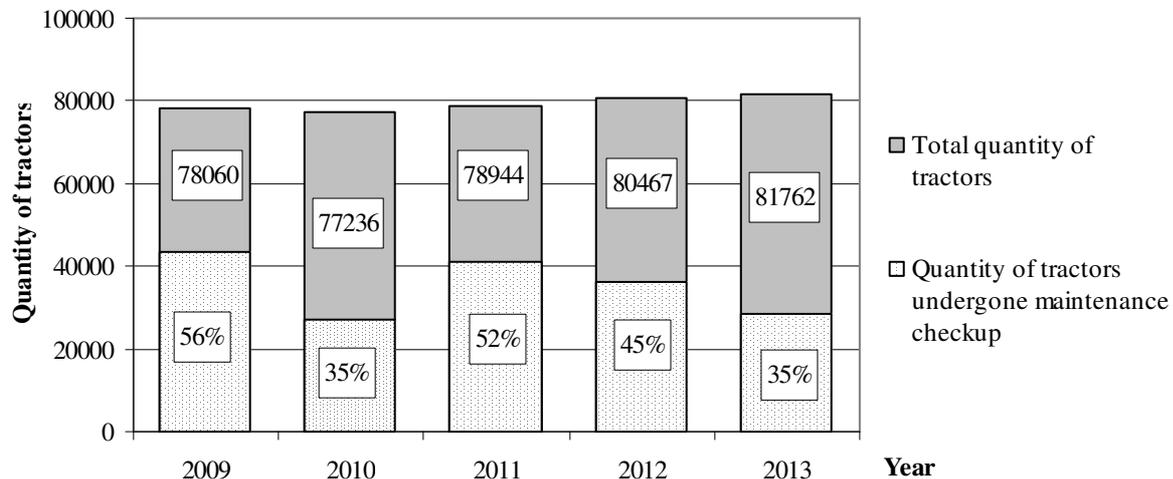


Fig. 1. Dynamics of the change in the quantity of tractors on the farms of Latvia and those which have undergone maintenance checkups (2009-2013)

However, considering the fact that on the farms with areas under crop more than 50 ha and stable outlet of production the average power support is $1.77 \text{ kW}\cdot\text{ha}^{-1}$ but on the farms with cultivated areas exceeding 300 ha, where powerful tractors are generally used, it is $1.07 \text{ kW}\cdot\text{ha}^{-1}$, one can prognosticate the necessary number of tractors which have undergone a maintenance checkup. It may amount to 26-30 thousand.

Yet, when the replacement of the outdated tractors is not too long, the share of the modern technical means increases, their average age falls, their performance and efficiency increases.

The graph in Figure 1 shows the percentage of tractors of their total quantity in different age periods at the existing ratio of operable and non-operable tractors (years 2010 and 2013).

Data analysis showed that the average age of the tractors in agriculture in the age periods presented in Figure 2 in 2010 was 22.4 years but in 2013 – 23.7 years. This indicates that the average age of tractors is growing. The percentage of the tractors in the age period 21-30 years was 45.4 % in the year 2010 but in 2013 it reached 48.5 %. This also indicates that a significant share of tractors from their total quantity has outdated since they have great average age. It makes almost a half of the tractor fleet but for the age periods to 5 and 15 years it constitutes 15.1 % (the year 2013). Besides, the great number of tractors, 15 and more years old, belong to small farms which hardly participate in the market production. Thus, on the farms with areas under crop less than 50 ha the quantity of tractors constitutes 78 % of their total number, and only 5 % are made during the last 5 years whereas on the farms with areas exceeding 50 ha 22 % and 25 % are made during the last 5 years (the year 2010). The number of farms with areas under cereals greater than 50 ha is 9.2 %, their area under crop is 78 % but the yield from the total quantity is 85 % [2].

Consequently, if regarding the level of technical backup as a whole, it consists mainly of outdated machines. In the present situation this slows down the productivity, increasing the maintenance costs of the machines to keep them in a workable state, as well as does not favour reducing the labour deficit (machine operators) [3].

In the recent years the renewal rate of the tractor fleet has significantly shrunk. A greater part of tractors exceed the depreciation period by the date of their use, and the reduction process of outdated and physically worn-out tractors is going on slowly. In many respects such a situation can be explained by an insufficient economic potential of the farms and the necessary support from the state

in the form of subsidies, as well as the up-to-date situation with prices in the market of agricultural products.

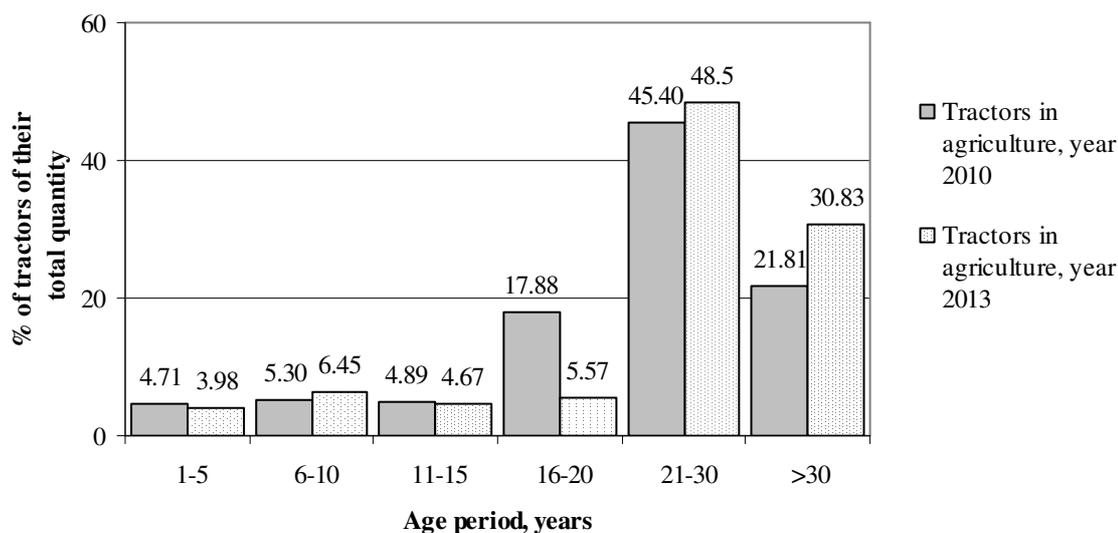


Fig. 2. Percentage of tractors in different age periods of their total quantity

However, the renewal process of machines cannot be a standard for each farm. One should take into consideration its conditions, and it has to be economically efficient. It should promote reduction of unscheduled repairs and technical maintenances; raise productivity; conform to the requirements of production and interrelated technological operations; reduce the deficit of machine operators; and so on.

Similar conclusions are made by the scientists in their investigations about the use of the Estonian fleet of tractors [4].

The purchasing dynamics of the highest priority tractors by the farmers in the period from 2009 till 2013 is presented in Figure 3.

It is evident from Figure 3 that the dynamics of the quantity of the newly purchased priority tractors of one brand does not show any increase but the other brand does, if the years 2009 and 2013 are compared. For instance, purchasing of tractors MTZ (MT3) has decreased by 58.8 %, Case – by 15 %, but tractors John Deere has increased 2.11 times, Valtra – 1.92 times and Massey-Ferguson – 2,46 times. In addition to that, the average accession rate of the purchased tractors (the years 2009-2013) constitutes 0.99 indicating that there is no annual average increase in the number of new purchased tractors.

The data analysis shows that the renewal rate of the tractor fleet has considerably shrunk. For a great part of tractors the depreciation period exceeds the date of their use (see Figure 2) and the dropout process of outdated and physically worn-out tractors is still in progress. In many respects, such a situation, as indicated above, can be explained by the insufficient economic potential of the farms and necessary support from the state in the form of subsidies, as well as the up-to-date situation with the prices on the market of agricultural products.

Considerable possibilities for efficient use of the tractor fleet lie in the improvement of its age structure and motivated choice of tractors. The tractors with a short age period (less than 5 years) have lesser losses of working time, particularly, in the intense periods of their use. This is particularly important for agricultural operations having a cyclic character by the intensity of their fulfilment in set agrotechnical terms. Yet, one should not forget that the renewal of the tractor fleet has to take into consideration interrelation of its structure with the production technology of agricultural crops.

Different technical possibilities of the existing machines and the newly purchased ones influence the performance efficiency of production processes, as well as prospects to use new organisational forms of application of the machines [5].

For many rural farms acquisition of up-to-date technical means is inaccessible because of the high price, although their market today is rather saturated. Access to such machinery for rural farms may be reached at the expense of various forms of its joint usage.

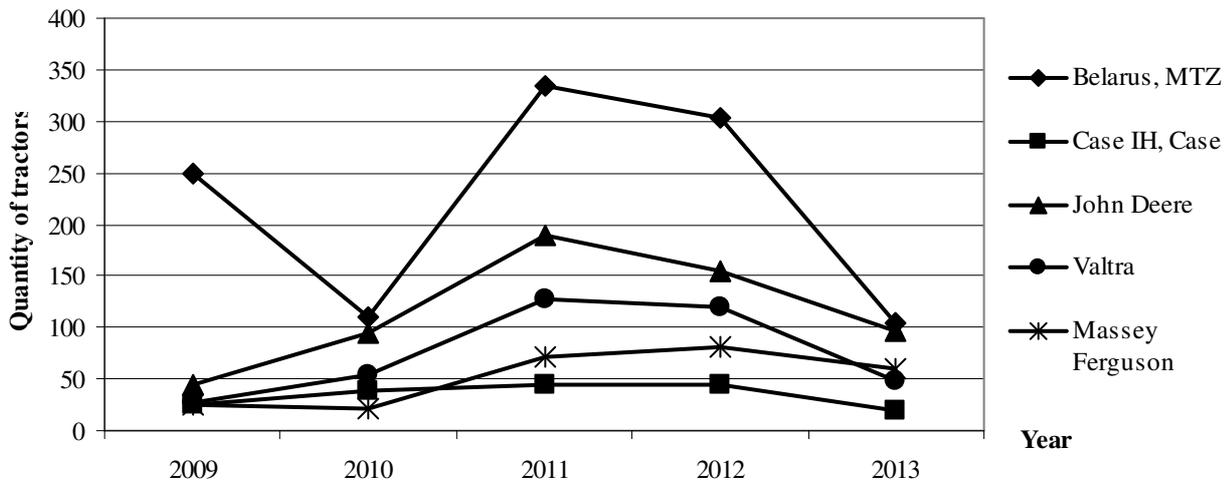


Fig. 3. Purchasing dynamics of the highest priority tractors

The mechanisation level of agricultural production depends in many respects on a motivated choice of technical means on the rural farms themselves stimulating efficient and perspective directions for the development of technical backup of agricultural processes by the state. This particularly relates to the farms introducing new advanced technologies, highly-efficient machines, and applying modern analytic system methodology to solve the tasks of the production management.

Conclusions

1. The data analysis shows that the average age of tractors in the year 2013 in agriculture was 23.7 years. It is by 5.8 % higher than in 2010. In 2010 the percentage of tractors in the age period 21-30 years constituted 45.4 % but in 2013 it reached 48.5 %. This indicates that a significant part of the tractors are out-of-date.
2. In the period 2009-2013 the quantity of the tractors in agriculture which belong to legal and physical persons increased by 4.7 % but the average annual increase in this period of time constituted 1.14 %.
3. The number of the tractors which have undergone maintenance checkups and are able to work adequately has decreased from 56 % in the year 2009 to 35 % in 2013.
4. The tendency of consolidation of the farms and renewal of the machines allows prognosticating the quantity of the necessary tractors which have undergone maintenance checkups and may amount to 26-30 thousand in the future.

References

1. Valsts tehniskās uzraudzības aģentūra pārskati 2009-2013. Rīga: LR Zemkopības ministrija. (Reviews of the State Technical Supervision Agency 2009...2013), Rīga, Zemkopības ministrija. (In Latvian).
2. Latvijas lauksaimniecība. Statistisko datu krājums. Rīga, 2013, 62 lpp. (Agriculture in Latvia. Collection of Statistical Data. Riga, 2013, pp. 62) (In Latvian).
3. Asejeva A., Kopiks N., Viesturs D. Age Structure of Tractor Fleet in Latvian Agriculture. Proceedings of the International Scientific Conference Economic Science for Rural Development. № 29. Jelgava, 2012, pp. 58-61.
4. Olt, j., Traat, U., Kuut, A. Maintenance costs of intensively used self-propelled machines in agricultural companies: Proceedings of the 9th International Scientific Conference "Engineering for Rural Development", Volume 9. Jelgava, 2010, pp. 42-48.
5. Pawlak J, Pelizzi G., Fiala M. (2002). On the Development of Agricultural Mechanization to Ensure a Long-Term World Food Supply. Agricultura /Engineering International: the CIGR Journal of Scientific Research and Development. Invited Overview Paper. Vol. IV. June, 2002.