**Nikolajs KOPIKS, Dainis VIESTURS**
Latvia University of Agriculture, Research Institute of Agricultural Machinery, Riga (Latvia**)**
e-mail: uzc@delfi.lv

# DEVELOPMENT OF FIELD CROP TECHNOLOGIES IN LATVIA

*Summary*

*The article deals with the problems of the provision of farms with the machinery and its use depending on the sizes of the farms, comparing the years 2001 and 2007. The analysis of the farms was made by several parameters – by their number, their technical readiness, and the capacity sufficiency in order to perform field operations in time and high quality. Data are provided about the acquisition of tractors by years, their technical condition, the specific energy supply and the total capacity of the tractor fleet of the farms having different production intensities. The results of the research confirm that the production concentration will continue on larger farms, the application of special technologies will increase, the specific energy supply of the farms will decrease, the capacity of the tractor and combine engines will grow, and the total number of tractors, grain harvesters and other agricultural machinery will decrease.*

## 1. Introduction

A possibility to use the EU financing affects rural farming, the applied technologies, the kind and amount of machinery in the recent years. This possibility has promoted the modernisation of technologies, concentration of goods (the market), and variations in the production costs. Since these processes will continue, the analysis of the development of the applied technologies and machines, and the prognoses for its future development in connection with the evolution of the farms is a topical direction of research.

## 2. Objects and methods

The objects of the present research are the applied field the technologies and agricultural machinery, mainly the fleet of tractors, used on the respective farms. The applied methods are analysis and interpretation of the statistical data and prognoses for the development of farms and technologies. There are used the materials of the Central Statistics Board [1] and National Inspection of Technical Supervision [2], as well as the data from the inspection of the farms.

## 3. Results and Discussion

The possibilities for technological improvements are characterised, to a great extent, by the purchase of modern tractors and harvesting machines, which depends, in its turn, on the financial resources of the rural farms and their sizes. It was stated in our previous publication [3] that the number of small farms (less than 20 ha) is gradually decreasing, there are relatively small changes in the number of the medium-sized farms (20-50 ha) but the number of the large farms (more than 50 ha) is increasing. The total number of tractors on the farms of various sizes and the purchase of tractors produced during the last six years, by comparison of the indices for the years 2001 and 2007, are shown in Figure 1. As it is evident, in contrast to the year 2000, in 2007 the number of the tractors produced during the last six years had decreased on the farms with areas less than 50 ha, on larger farms, particularly on the farms with the areas under crop over 100 ha, it had increased. The average annual rate of increase in the number of tractors produced during the last six years is 6.3% a year. In 2007 the absolute increase in the number of tractors produced during the last 6 years was 1678 tractors as compared with the year 2000.

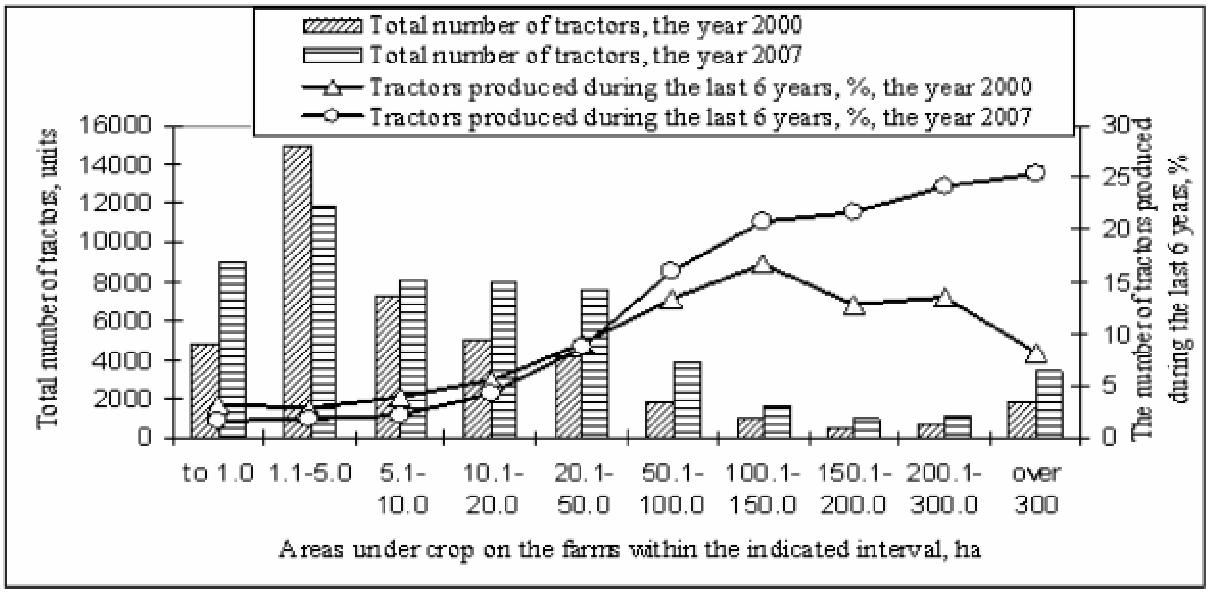

Fig. 1. Total number of tractors, and their percentage, produced during the last 6 years on the farms with different areas under crop (the years 2000 and 2007)

Figure 1 shows also the dynamics of the total number of tractors. As it is evident, on the farms having less than 5 ha of areas the total number of tractors has decreased a little in 2007 in contrast to the year 2000 and changed a little on the farms with areas more than 10 ha. The total number of tractors in the remaining groups of farms has grown by 8.6%, and, in absolute numbers, it was 54820 units in the year 2007. However, only 36 % of the total number of tractors are in a good operating condition and can participate in production at full load. The tractors are mainly in a bad operating condition on the household farms (less than 1 ha) and the small farms (less than 10 ha), which produce most often only for self-consumption (in a variant when no market products are produced). Figure 2 presents the dynamics of the number of tractors in the fleet of tractors produced during the last 6 years from 2000 till 2007 on the basis of analytical alignment of the time series. A trend model is obtained $Y = 17.923X^3 - 198X^2 + 664.2X + 2249.4$, which is adequate to the basic tendency to a change in the number of tractors produced during the previous 6 years. This confirms the value of the determination coefficient $R^2 = 0.8632$. In the trend model the changes in the number of tractors produced during the last 6 years in the fleet of tractors are regarded as the function $Y=f(x)$, where Y is a theoretical value of the number of tractors produced in the previous 6 years, X is the period of time (years), X = 1... 8 (the years 2000 and 2007).

It is evident from Figure 2 that the dynamics of the number of tractors in the fleet produced during the last 6 years has certain heterogeneity caused by economic conditions of the farm and other factors.

The equation obtained as a result of analytical alignment of the time series shows that its development takes place with a variable increase. The coefficient ($a_3$ = 17.923) characterises the acceleration level of the particular process and shows that it grows since $a_3 > 0$.

Analysis is made also of the provision of rural farms with combine harvesters in 2007. From the total number of combine harvesters, which is 6700 units, approximately 2050, or 30% are in a good operating condition, 515 of them are made in the last six years, and the remaining approximately 1200 combine harvesters during the last 15 years. Distribution of combine harvesters by the groups of farms is shown in Figure 3.

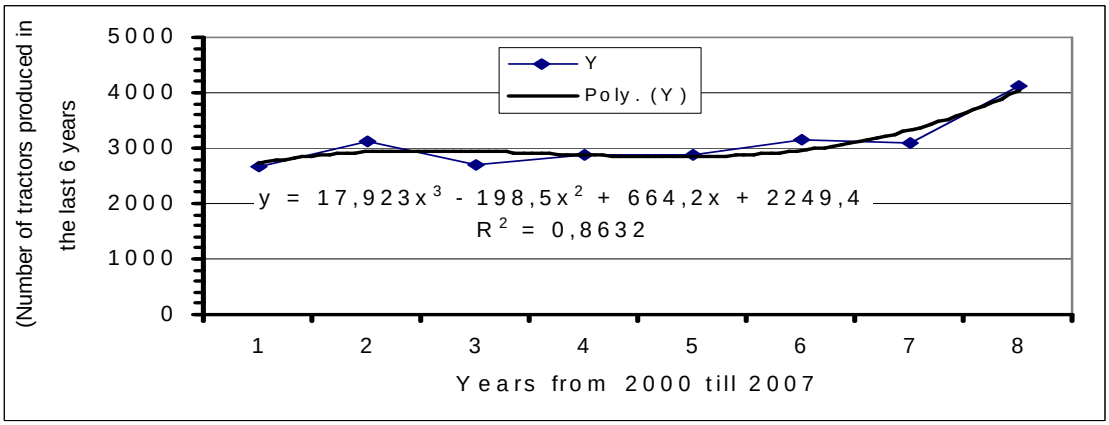


Fig. 2. Dynamics of the number of tractors in the fleet of tractors produced during the last 6 years since 2000 till 2007

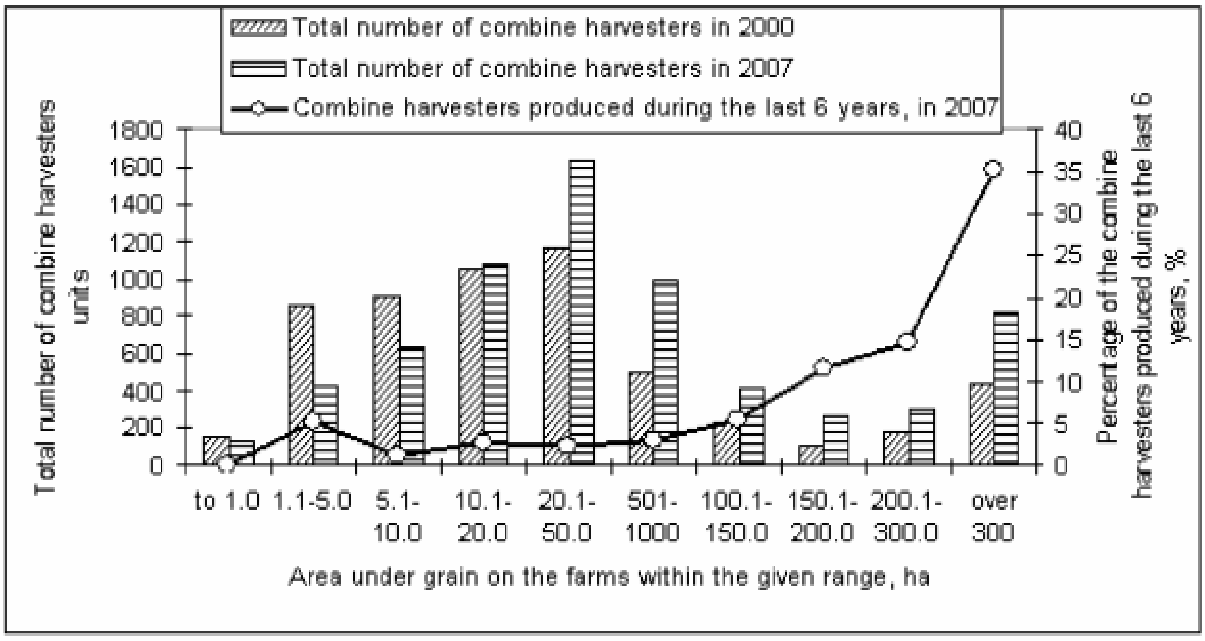

Fig. 3. Total number of combine harvesters and the percentage of their output during the last 6 years on the farms with various areas under grain

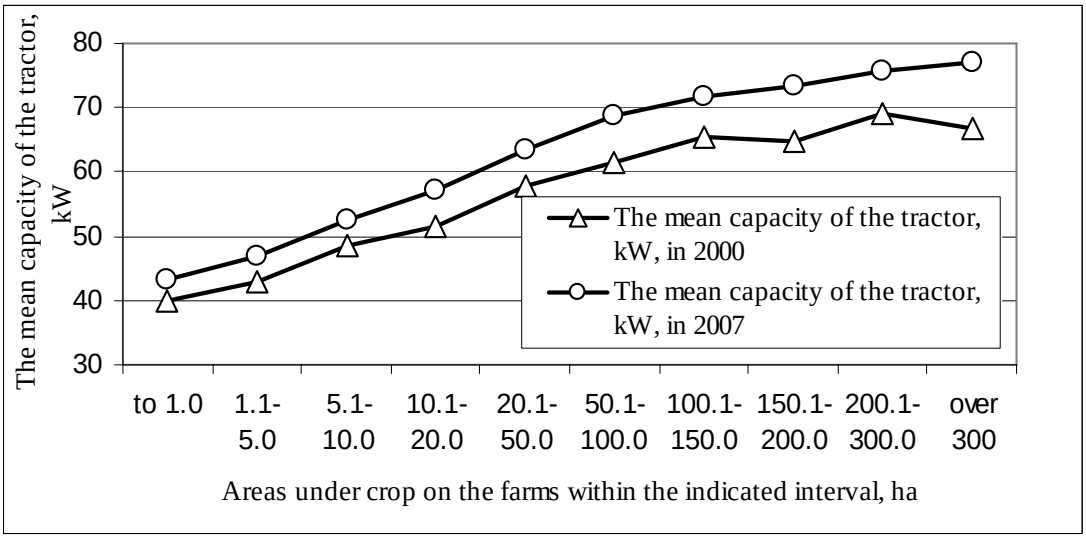


Fig. 4. The mean capacity of the tractor on farms with different areas under crop (the years 2000 and 2007)

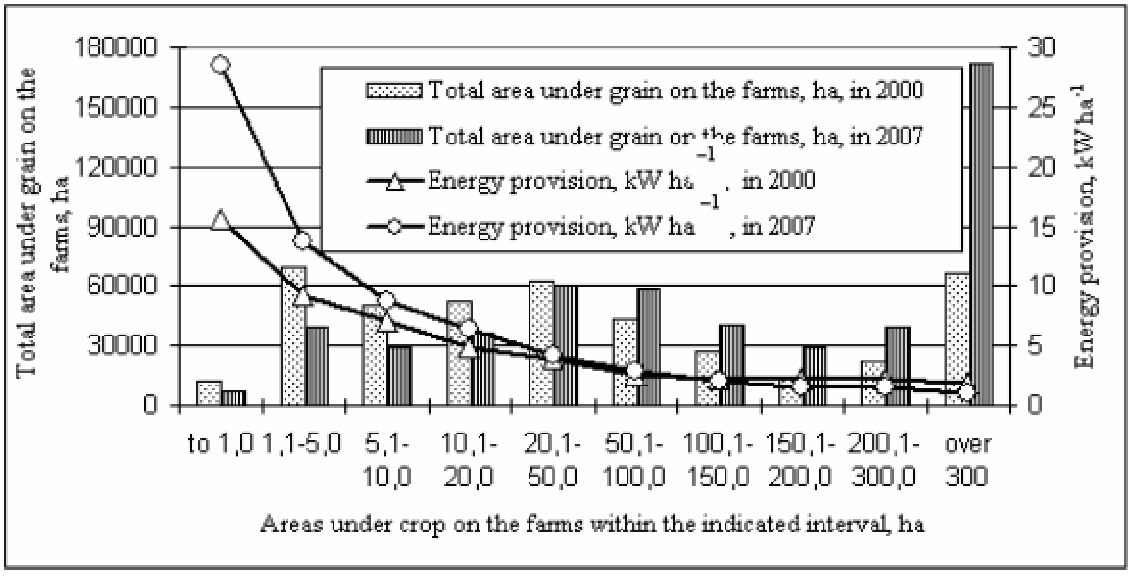


Fig. 5. Distribution of energy provision on the farms with different areas under crop (the years 2000 and 2007)

As it is evident, there are a relatively large number of combine harvesters also on the small farms – with areas up to 50 ha, yet they are in a poor operating condition with a minimal ability to take part in the grain harvesting. The purchase of new combine harvesters occurs basically on the farms with the areas exceeding 50 ha the sowing areas of which were 66% of the total areas under grain in 2007 in contrast to 41% in 2001.

The technical characteristics of tractors vary with the increase in their number – their capacity grows, and other technical features improve, thus making the aggregate more productive. In contrast to the year 2000, in 2007 the total efficiency of the fleet of tractors had grown by 15%. Figure 4 shows the mean capacity of the tractor on farms with different areas in the years 2000 and 2007.

As it is evident, the differences in the capacities of tractors on the small farms and on the farms with areas over 100 ha are from 1.5 to 1.7 times as great. Basically this can be explained by better financial resources and possibilities to use the machines. As evident from Figure 4, the mean capacity of the tractor in 2007, in contrast to the year 2000, has grown on the farms of all sizes, on the small farms increasing, on the average, by 7 %, in the large ones – by 12%.

One of the important indices that characterises the efficiency of technologies on the farm is its specific energy provision, i.e. the efficiency of the tractor per unit of the cultivated area. As a characteristic of the utilisation of machines, this index is used also by other authors [4; 5]. Figure 5 shows the distribution of energy provision on the farms with different areas under crop in 2007 in contrast to the year 2000.

It is obvious that there is a very high-energy provision on the household farms and the small farms, which usually have one tractor with an 18-35 kW capacity per a small area of land. Besides, as evident from the figure, the areas under

crop in this group of rural farms become smaller. As mentioned above, these tractors are often in a poor technical condition and can take limited part in the work Increase in the areas of the farms improves the possibilities to use machines and reduces energy provision, their technical condition and .energy provision. On the farms with areas up to 50 ha, the area under crop has decreased in 2007 in contrast to the year 2000, whereas on the farms having areas over 50 ha it has increased. A particularly rapid increase in the areas under crop – 2.8 times – has been on the farms with areas over 300 ha. But the number of rural farms with the areas under crop over 50 ha constituted 1 % of the total number in 2000, in 2007 – 3 % of the total number. This witnesses once again that there is a tendency of the farms to increase their areas with wider application of modern technologies in the perspective. The specific energy provision on the large farms has decreased in 2007 in contrast to the year 2000, and on the farms having areas over 50 ha the average energy provision is 1.77 kW/ha. As already mentioned, this is due to the increase in the areas of the farms and their financial potential, which allows using modern technologies.

These directions – concentration of production on larger farms and the use of more powerful tractors there – will mainly determine the development of the country's field cultivation technologies in the future. At present only 30-36 % of the agricultural machinery meet the requirements of modern technologies. That is why renovation of the fleet of tractors should be continued by means of national subsidies and the resources of the EU funds. The role of the small farms and the worn-out machines in production will continue to decrease. One can prognosticate that in the perspective there will be 26-30 thousand tractors and 1100-1200 grain harvesters in the country.

## 4. Conclusions

1. Concentration of production is going on in the country on larger farms.
2. Only 30-36% of the existing field crop cultivation machines meet the requirements of modern technologies; nevertheless approximately 60% of the areas under crop are cultivated using these machines.
3. The purchase of agricultural machines has decreased in 2007, in contrast to the year 2000, on the farms with the areas less than 50 ha but increased essentially on the farms with the areas over 100 ha.
4. In the perspective there might be 26-30 thousand tractors and 1.1-1.3 thousand grain harvesters in the country, as well as a considerably smaller number of the other field crop cultivation machines as compared with the present number.

## 5. References


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