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## Conference Paper

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# ANALYSIS OF THE POTENTIAL OF THE PARK OF MACHINES AND AGRICULTURAL EQUIPMENT AT REGIONAL LEVEL

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**Summary:** *In Romania, over 73% of agricultural machinery in Romania have an exceeded service life, and the technical endowment of agricultural machinery farms has a direct influence on the market performance of the producers. The increase of productivity in the agricultural field depends to a large extent on the mechanization of the sector, which is supported by the funds allocated for investments in purchasing or the modernization of agricultural machinery parks. The purpose of this paper is to examine the agricultural mechanization sector in Romania, carrying out both a qualitative and a quantitative analysis of the data related to agricultural machines and machines. In order to highlight the differences at the regional level of development of investments in the mechanization of the farms, the two periods of implementation of the NRDP 2007-2013 and 2014-2020 were considered.*

**Keywords:** *agricultural machinery park, mechanization, investments*

**JEL classification:** *Q16*

## INTRODUCTION

Agriculture plays a strategic role in all countries of the world, as it is the main sector responsible for the food security of the population, at the same time having a special contribution to the overall process of sustainable economic development and environmental protection.

Technical equipment of agriculture is one of the essential elements in capitalizing on the potential existing in this sector, implicitly, in ensuring the food security of the country's population. The level of the factors of production represents the decisive element in the development of the production processes in agriculture.

The capital in agriculture, expressed by the quantity and quality of the technical-material factors, has a social importance, considering that the inadequate facilities of the agricultural holding with agricultural machinery and equipment, as well as with constructions with agricultural destination, is one of the main growth factors, of agricultural labor productivity.

The consequences of poor mechanization of agriculture or of inadequate equipment are reflected in: shallow plowing, increase of soil compaction, quality of crop care works, mechanical deterioration of the quality of the harvested products, increase of harvest losses, delay of the optimum period of work, polishing soil, water and air, spreading harmful substances due to exhaust gases or chemicals used for chemical protection, etc. To a great extent, the economic development depends on the quantitative, structural and qualitative evolution of the fixed capital.

The production and use of capital goods in the economic activity of the holding contributes to the increase of the productivity of the other factors of production..

The main results regarding the technical equipment of agriculture are presented below at national level and in regional profile.

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## MATERIALS AND METHOD

Within the study are processed statistical information that is provided by the National Institute of Statistics (INSSE), MADR and EuroStat.

For a closer examination of the mechanization sector, a qualitative and quantitative analysis of the data is processed, using the indicators: annual growth rate, standard deviation and coefficient of variation.

In order to highlight the regional differences, the 8 development regions of Romania will be studied during the NRDP programming periods 2007-2013 and 2014-2020.

## RESULTS

Making a report of the two periods studied, at national level, the total number of agricultural machinery and equipment registered an increase of 12% compared to the first period 2007-2013 (469.5 thousand units), recording annual rates of increase of 1.66%, respectively 2.17%, the coefficients of variation being around 3.3%.

Table 1. Regional distribution of the technical endowment of the park of agricultural machines and machines

Total agricultural machinery and equipment	Period 2007-2013				Period 2014-2018			
	Average	Annual Rhythm %	Standard deviation	Coefficient of Variation %	Average	Annual Rhythm %	Standard deviation	Coefficient of Variation %
Total	469510.57	1.66	15572.04	3.32	532752.8	2.17	17633.65	3.31
North- West	72990.29	4.31	6228.62	8.53	92966	4.04	5438.95	5.85
Center	60856.14	1.85	2673.23	4.39	71074.2	2.99	2950.83	4.15
North- East	51459.14	2.23	2253.80	4.38	62716.2	5.03	4689.12	7.48
South- East	57567.86	-0.75	1105.01	1.92	56887.2	-0.48	438.06	0.77
South-Muntenia	89454.86	2.14	3809.26	4.26	99130.4	-0.86	2154.33	2.17
Bucharest - Ilfov	3927.00	0.90	106.84	2.72	4060.8	0.35	20.02	0.49
South-West Oltenia	62831.86	1.41	1982.82	3.16	68867	1.90	1896.41	2.75
West	70423.43	-0.06	741.17	1.05	77051	3.23	5082.79	6.60

Source: data processed according to INSSE

Analysing at regional level it can be observed that:

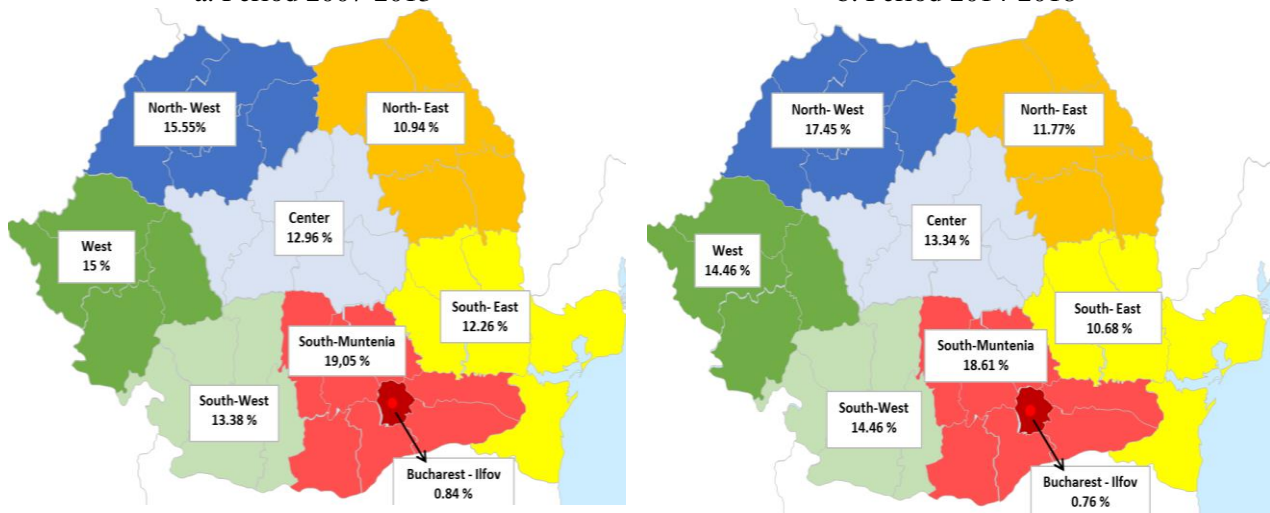
- The South-Muntenia region recorded the highest share of the number of agricultural machinery and equipment reported at national level, between 2007 and 2013, of 19.05% (figure no.1.a.), this fact being maintained on 2014-2018 period (18.61%). In the first analysis period, was recorded an average annual rate of 2.14%, with a coefficient of variation of 4.26%, and in the second period, an average negative annual rate of -0.86% was registered, with a coefficient of variation of 2.17%;

- According to the South –Muntenia region, the following two regions with the highest average number of agricultural machinery and equipment are North West and West ranging from 72.9 thousand units and 70.42 thousand units, with a standard deviation from the average of 6.22 thousand units and 741 units, for the first period studied;

- A negative annual rate was registered for the two periods considered in the South-East region, of -0.75% and -0.48% respectively. The number of a agricultural machinery and equipment

decreasing from an average value of 57.56 thousand units in the first period, to 56.88 thousand units in the second period.

Figure.1 The share of agricultural machinery and equipment at regional level  
a. Period 2007-2013 b. Period 2014-2018



Source: data processed according to INSSE

Source: data processed according to INSSE

By analysing the weight of agricultural machinery and equipment at regional level, it can be seen in figure no. 1. the fact that the South-Muntenia, North-West and West regions hold the majority of the national share in the two periods considered.

A decrease in the share of agricultural machinery and equipment, from the first period 2007-2013 to the period 2014-2018 can be seen in the regions: South-Muntenia, (from 19.05% to 18.61%), West (from 15% to 14.46%), South-East (from 12.26% to 10.68%) and Bucharest Ilfov (from 0.84% to 0.76%). This decrease in the weight of the 4 regions is counterbalanced with the increase of the weight in the South-West, Central and North-East regions.

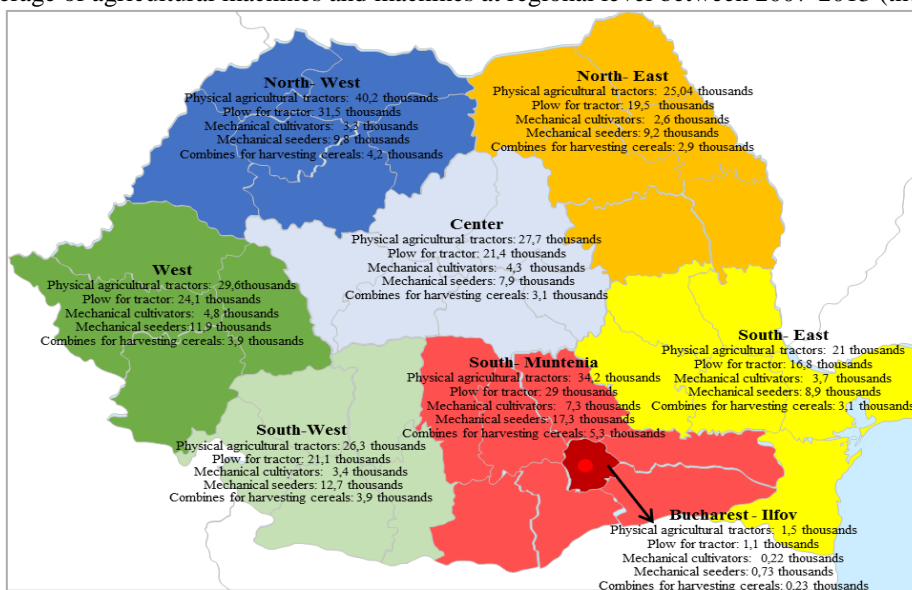
Table 2. Categories of agricultural machinery and equipment

Categories of agricultural machinery and equipment	Period 2007-2013			Period 2014-2018		
	Average	Standard deviation	Coefficient of Variation %	Average	Standard deviation	Coefficient of Variation %
Physical agricultural tractors	180696.86	5392.40	2.98	205803.00	8477.17	4.12
Plow for tractor	144624.57	3653.53	2.53	164905.20	5584.88	3.39
Mechanical cultivators	28274.00	804.47	2.85	29906.80	497.46	1.66
Mechanical seeders	70587.57	2430.83	3.44	78753.20	1753.09	2.23
Combines for harvesting cereals	25301.14	551.25	2.18	26851.20	655.36	2.44

Source: data processed according to INSSE

At national level it can be observed in table no. 2, that by analysing the categories of agricultural machinery and equipment, those with a significant share of the total are the categories that include physical agricultural tractors and plows for tractors. Comparing the averages of the categories studied in the two periods, an increase of the 5 categories with coefficients of variation between 1.66% and 4.12% is observed.

Figure 2 Average of agricultural machines and machines at regional level between 2007-2013 (thousands units)



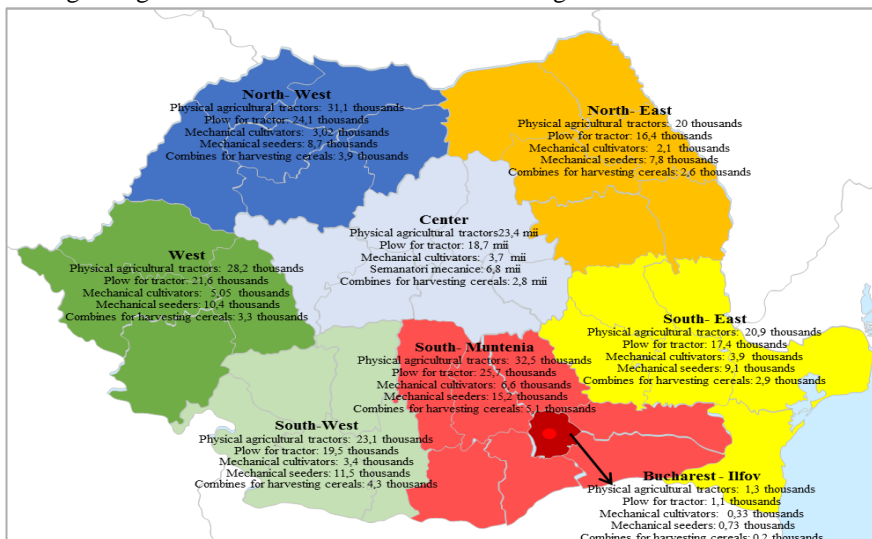
Source: INSSE processing data

Situation of the categories of agricultural machinery and equipment for the period 2007-2013 (figure nr.2) , at regional level is presented as follows:

- The regions with the highest number of agricultural tractors are South-Muntenia, North-West and West with average values varying between 28.2 thousand units and 32.5 thousand units. The Bucharest-Ilfov and North East region have the lowest average values of 1.3 thousand tractor units, respectively 20 thousand tractor units;
- In the case of plows for the tractor the distribution is similar, The regions in which the units average is the highest for this period are the South-Muntenia Region (25.7 thousand units) and North-West (24.1 thousand units);
- The average number of the period for mechanical cultivators is higher in the Western region (5.05 thousand units), and the lowest is found in Bucharest Ilfov Region (0.33 thousand units).

Compared to the first period, in the second period 2014-2018, the distribution of each class of machines and machines remains largely similar except that the average values of the number of units are higher. The average of the highest number of agricultural tractors is found in the North-West Region (40.2 thousand units) and South Muntenia (34.2 thousand units). Of the 5 categories taken for analysis, the smallest environments are recorded by the combined categories of harvesters and mechanical cultivators.

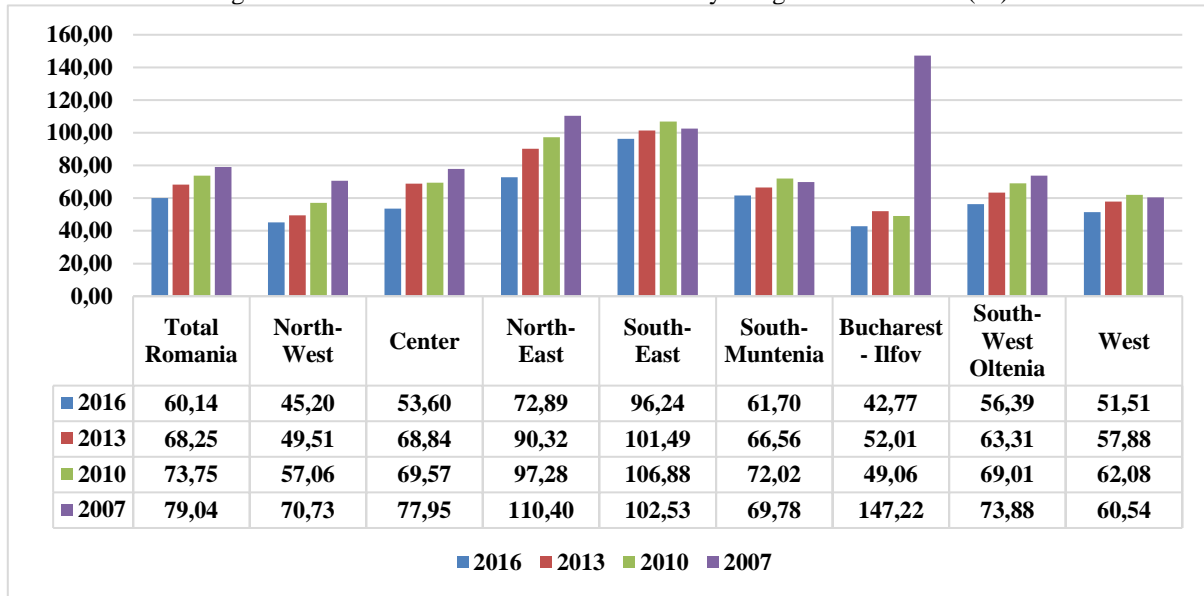
Figure 3. Average of agricultural machines and machines at regional level between 2014-2018 ( thousands units)



Source: INSSE processing data

Compared to the machines of the European states, the tractors in Romania are overloaded. If in 2007, the agricultural area served by a tractor was 79.04 ha, by 2016 it decreased by 24%, 60.14 hectares / tractor. At regional level it can be seen in figure no.4 that the regions with the highest average load of a tractor in 2007 were the Bucharest-Ilfov, North-East and South-East regions with values of over 100 ha / tractor. In 2016, the regions with the lowest values and below the national averages, of the theoretical load of the tractor are found in the North-West (45.20ha / tractor), Bucharest-Ilfov (42.77ha / tractor) and West (51, 51 ha / tractor).

Figure 4. The evolution of the surface served by an agricultural tractor (ha)



Source: INSSE and Eurostat processing data

Agricultural machinery and machinery to be more efficient from this point of view requires continuous and efficient investments in this sector. Replacing old agricultural machinery and equipment involves high costs, so that financial aid from national rural development programs is needed.

During the two programming periods PNDR it was observed that with the continuity of the financing of investments in the purchase of agricultural machinery and equipment, their number increased.

## CONCLUSIONS

The present study aimed at examining the park of agricultural machines and machines in the period 2007-2018 at both national and regional level. It can be seen from the analysis carried out during the two programming periods that significant investments have been made in the last 10 years in the renewal of the agricultural machinery and equipment park, many factors contributing to the realization of these investments to modernize the sector. Both the European funds and the rabla program, special co-financing credits and the purchase of second-hand machines have helped to support farmers in the purchase of machinery.

By increasing the number of modern and efficient farms, which cover large areas, investments in agricultural machinery and machines have also increased, allowing them to invest in agricultural machinery both with and without subsidies.

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