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TRENDS IN AGRICULTURE ENDOWMENT WITH MACHINERY IN ROMANIA 2007-2015

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Abstract

The paper goal was to analyze the technical endowment in terms of machinery in Romania's agriculture in the period 2007-2015 and to identify the main trends and problems which affect performance and competitiveness. In the analyzed period, the park of tractors and machinery increased as follows: tractors by 14.5 %, ploughs by 13.9 %, cultivators by 11.3 %, seeders by 14.6 %, combines for cereals by 11.4 and for fodder by 17 %, machines for potatoes harvesting by 43.5 %, presses for hay and straw by 121.7 %, only windrowers and sprayers and dusters declined by 1.2 %, respectively, by 2.6 %. Despite this slight increase, the structure of agricultural machinery is still an uncorresponding one for keeping pace with new technologies. The utilized agricultural area (UAA) increased and as a result the UAA per tractor declined from 44.5 ha to 41.3, which is also a good aspect. Despite that agricultural production increase, its performance is not supported by mechanization mainly in the small sized holdings. The replacement of the existing old machinery with a high usage degree, whose repairs are costing, is obviously needed and requires substantial financial resources. the continuous growth of farm inputs price and the low price at farm gate for agricultural products do not assure farmers enough income to modernize mechanization. The Romanian Government should allocate a higher percentage from budget to agriculture for improving the park of tractors and agricultural machinery. Also, the financial aid per ha coming from the EU should be equitably divided among member states. Farmers need a better endowment in their farms to apply modern technologies and increase production, quality of agricultural products, economic efficiency and competitiveness.

Key words**:** *agriculture, endowment, machinery, Romania, trends*

INTRODUCTION

The assurance of production factors: land, labor and fixed and working capital is a condition of the achievement of high production, economic efficiency and competitiveness in agriculture.

Agricultural equipment and machinery is needed for farmers in planning, cultivating and harvesting of crops, in housing, feeding, watering, milking of animals, in collecting of manure, in transports goods.

The large scale agriculture requires modern technologies and corresponding modern machinery, and even for small scale farming some types of machinery and equipment are very useful. Taking into account the depreciation either determined by usage or technical progress, old machinery should be replaced with modern equipment to help farmers to increase productivity, save time and money. Therefore, farmers need to keep pace with new technologies and corresponding machinery for producing more agricultural products for covering consumers' and processing industry needs [13].

The variety of machinery and equipment used in agriculture is generated by the peculiarities of production and technologies applied in its production sub-branches: crop production, horticulture, and animal production.

In crop production, it is needed a system of specialized machinery for tilling, sowing, planting, applying fertilizers and pesticides, harvesting, transporting. For this reason, there is a large range of tractors and agricultural machinery such as: tractors, plows, planters, drills, sprayers, spreaders, combines, balers, grain trucks, computers and other types of machinery.

The horticulturalist need tractors, tillers, lawnmowers, sprayers, spreaders, irrigation

systems, wood chippers, lawn rollers, leaf blowers, and computers.

In animal production, farmers need also tractors, ploughs, seeders, harvesters, combines, hay and straw presses, windrowers, for producing forages, but also specific installations and machinery depending on farm profile: milking machines, feeding installations, watering systems, incubators, egg candlers, manure collecting systems, computers, and types of machinery and equipment to improve efficiency in the producing farm and assure a high quality of products [10,11].

In the EU, it is a large variety of endowment level, productivity and profitableness in agricultural holdings from its member states. In some countries, agriculture is well developed benefiting a high technologies and the best machinery and equipments, in other countries agriculture has not a modern endowment and less production performance.

The need to invest in new machinery depends on farmers' income, which in its turn is determined by marketed production and price of agricultural products at farm gate, and also by farm inputs variety, performance and price in terms of equipment, installations, machinery. It was noticed that when agricultural commodities are sold at good price in the market, farmers' income grow and their demand for improving the farm endowment as well. However, price increase is not the only factor influencing farmers' decision to improve farm machinery.

The EU agriculture is facing many aspects which could affect its future endowment, such as: the decline in agricultural land by 0.7 % in favor of forestry, the decline in agricultural workers due to the dynamic urbanization, the overproduction in cereals, milk, meat which impose restrains of production. A recent study proved that at present, just 3 new tractors are sold per 100 km^2, where there are 34 farms, instead of 7 tractors in 1950. Annually, in the EU are sold no more than 170,000 tractors, by 15 % less than only one type of car model, whose sale accounts for about 200,000 pieces [2].

More than this, the EU agriculture has a huge number of holdings, accounting for 19,667,460 in 2013, but their average size is 16.1 ha/holding, reflecting small or medium sized farms. About 86 % of the number of holdings own and work less than 20 ha, and only 14 % holdings are larger than this figure.

Also, the utilized agricultural area (UAA) is unequally distributed among holdings. Of the 174,613,820 ha representing the EU UAA, 82 % belongs to the holdings with over 20 ha and just 18 % of surface is owned by small farmers.

The maintenance of machinery is another aspect which could be taken into consideration, because it claims a corresponding service system and a good logistical chain able to supply the spare parts to farmers every moment they require and especially at tilling, plowing, spraying and harvesting.

The endowment level of a farm is also a consequence of farmer's experience, training level, age and of course income. In the EU agriculture the number of young farmers represents only 6 % of their total number. The number of young farmers under 35 years is in decline, due to the lack of substantial support for this category and attraction of the cities where the urban life is easier and jobs are better paid [2, 7].

The agriculture in Romania is characterized by a huge number of small holdings, about 3.5 million, a small farm size about 3 ha/farm, an uncorresponding farm structure which does not allow the implementation of modern technologies except the 1% commercial societies where they are successfully applied, a low productivity and competitiveness determined by the old endowment, population aging in the country side, the lack of financial resources and of a corresponding training level of the farmers [1, 4, 5].

In this context, the paper aimed to analyze the technical endowment in terms of machinery in Romania's agriculture in the period 2007-2015 and to identify the main trends and problems which affect performance and competitiveness.

MATERIALS AND METHODS

In order to characterize technical endowment of Romania's agriculture in terms of

machinery, the following indicators were studied: (i)the number of tractors and agricultural machines; ploughs, mechanical cultivars, seeders, self propelled combines for cereals and food harvesting, combines and machines for potatoes harvesting, straw and hay presses, fodder windrowers, mechanical sprayers and dusters; (ii) utilized agricultural area at the country level and its distribution in the territory by NUTS 2 development regions, (iii) utilized agricultural area per tractor at Romania's level and also in the territory by development region, (iv)agricultural production value at the country level and by region of development,.

For all these indicators there were determined the statistical parameters: mean, standard deviation and variation coefficient.

The empirical data were provided by the National Institute of Statistic, Tempo-online Data base for the period 2007-2015. The index with fixed basis was used to interpret the increase/decrease of the indicator in the analyzed period.

Also, other aspects have been approached regarding the context of agriculture development in Romania and its place in the EU agriculture, using the following system of indicators: surface, population, GDP (PPS), GDP (PPS)/inhabitant, utilized agricultural area, number of holdings and holding size in terms of utilized agricultural area/farm, arable land and its share in UAA, employment in agriculture, output in agriculture and share of agriculture in GDP.

Also, comparisons were made between Romania and other EU countries regarding average UAA per holding, share of arable land in UAA, standard output in agriculture.

The results were graphically represented and tabled, and correspondingly interpreted. Finally, the main conclusions were drawn.

RESULTS AND DISCUSSIONS

Characteristics of Romania's agriculture and its position in the EU. With 238,391 km^2 surface, Romania represents 5.51 % of the EU surface, and from a demographical point of view, 3.96 % of the EU inhabitants are in Romania. In 2013, Romania achieved Euro 289 Billion GDP, contributing by 2.13 % to the EU GDP (PPS). The GDP/inhabitant in Romania accounts for about Euro 7,500, representing about 26.86 of the EU average, Euro 26,918.

The utilized agricultural area, UAA, in Romania accounts for 8,244,351 ha, representing 4.67 % of the EU UAA (Table 1).

Table 1. Romania's position in the EU agriculture in 2013

	MU	EU	Romania	%
Surface	Km^2	4,322,385	238,391	5.51
Population	'000 capita	503,297	19,934	3.96
GDP (PPS)	Euro Billion	13, 548	289	2.13
GDP (PPS)/ inhabitant	Euro/capita	26,918	7,500	26.86
Utilized agricultural area	'000 ha	176,316	8,244	4.67
Number of agricultural holdings	'000	10,951	3,560	33.7
Utilized agricultural area/holding	Ha	16.1	2.31	14.34
Arable land	'000 ha	105,789 60 % of UAAA	5,193 63 % of UAA	4.90
Employment in agriculture	'000 persons	11,500	2,900	25.2
Output in agriculture	Euro Million	331,044	11,990	3.62
Share of agriculture in GDP	%	1.2	4.8	400.00

Source: Own calculation based on [8].

Romania has 3.56 million holdings, representing 33.7 % of the EU holdings, which in the year 2013 accounted for 10,951 thousands. From this point of view, Romania is on the top position in the EU, and together with Italy (106 million holdings), Poland (1.5 million), Spain (989.9 thousands), Greece (723 thousands), Hungary (576.8 thousands) and France (516.1 thousands), totalizes 6,9044 million holdings, representing 53.92 % of the EU holdings [3].

The average UAA per holding in Romania is very small, just 2.31 ha, specific to subsistence agriculture, being by 6.9 times smaller than the EU UAA average/holding 16.1 ha. Despite of the huge number of holdings, the small farm size reflects that in Romania small individual subsistence farms are dominant, and where traditional technologies are applied as technical endowment is scarce and production performance and labor productivity is very low. About 54 % of holdings own less than 1 ha UAA, and only 2.2 % holdings own over 10 ha UAA [3].

The average UAA per holding in different EU member states is presented in Table 2.

Table 2. Average UAA in the EU by member state, 2013 (ha/holding)

Country	UAA/holding (ha)	Country	UAA/holding (ha)	Country	UAA/holding (ha)
Czech Rep.	155	Ireland	38	Poland	14
United Kingdom	86	Belgium	36	Croatia	14
Slovakia	80	Netherlands	28	Hungary	13
Denmark	68	Spain	25	Greece	12
Luxembourg	62	Latvia	23	Slovenia	12
France	58	Austria	19	Romania	2.31
Germany	57	Bulgaria	17	Cyprus	2
Estonia	50	Lithuania	16	Malta	1.8
Sweden	45	Portugal	15	EU-AVERAGE	16.1
Finland	43	Italy	15		

Source: [9].

Romania has 5,193 thousands ha arable land, representing 63 % of its UAA, while the EU has 105.7 million ha arable land, meaning 60 % of its UAA. Therefore, the arable land of Romania represents 4.9 % of the EU arable land.

The share of arable land in various selected EU countries is presented in Table 3.

Table 3. Share of arable land in selected EU countries, 2013 (% of UAA)

Country	Share of arable land in UAA (%)	Country	Share of arable land in UAA (%)	Country	Share of arable land in UAA (%)
Finland	98	Poland	75	France	68
Denmark	92	Cyprus	73	Estonia	68
Sweden	85	Slovakia	72	Latvia	65
Hungary	82	Czech Rep.	72	Romania	63
Lithuania	80	Germany	71		
Malta	79	Bulgaria	71		

Source: [3].

In Romania's agriculture there are employed 2,900 thousand people, representing 25.2 % of the EU employment in agriculture. However, about 35 % of Romania's population is living in the rural areas where the main occupation is agriculture.

The standard output in Romania's agriculture was Euro 11,990 million in the year 2013, representing 3.62 % of the EU standard output. Romania comes of the 8th position based on its contribution to the EU output (Table 4).

The contribution of agriculture to Romania's GDP is 4.8 % compared to 1.2 % the EU average.

Table 4. Romania's position in the EU regarding standard output in agriculture, selected countries, 2007-2013 (Euro Million)

	2007	2010	2013	2013/2007 %
EU	285,597	308,062	331,062	115.91
France	45,978	50,733	56,914	123.78
Germany	44,202	41,494	46,252	104.63
Italy	40,543	49,450	43,767	107.95
Spain	33,363	34,173	35,979	107.84
United Kingdom	17,722	18,987	21,819	123.11
Poland	17,035	18,930	21,707	127.95
Netherlands	18,071	18,930	20,498	113.43
Romania	10,120	10,420	11,990	118.47

Source: Own calculation based on [9].

Technical endowment in terms of tractors and machinery.

The number of tractors increased by 14.52 % from 174,003 in 2007 to 199,284 pieces in 2015 (Fig.1.).

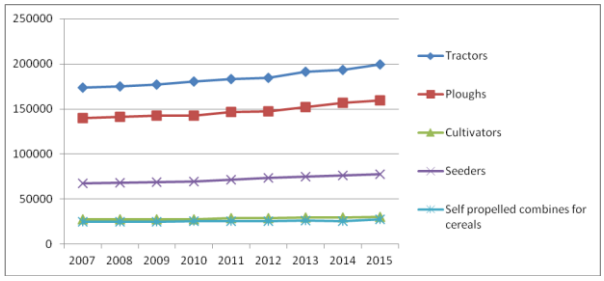

Fig.1. Dynamics of tractors, ploughs, cultivators, seeders and self-propelled combines for cereals harvesting, Romania, 2007-2015 (pieces)
Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

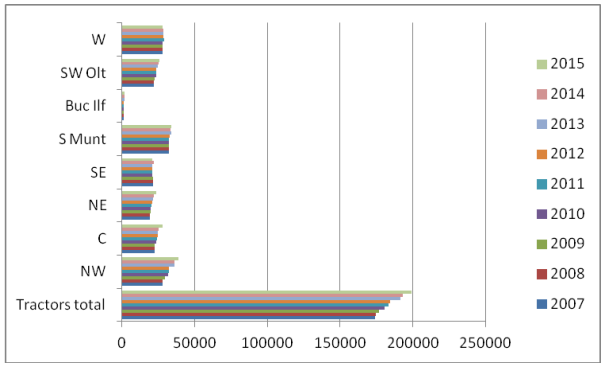

Fig. 2. Dynamics of tractors in Romania and by region of development, 2007-2015 (pieces)
Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017[12].

Their number increased in all the NUTS 2 micro-regions of development, except South East region where they declined by 0.87 %. The distribution of tractors in the territory, in the decreasing order, is the following one: North West region 19.3 %, South Muntenia 17.1 %, West region 14 %, Central region 13.8%, South West Oltenia 12.7 %, North East 11.7 %, South East region 10.3 %, Bucharest-Ilfov area 0.7 % (Fig.2.).

The number of ploughs increased by 13.98 % from 139,782 pieces in 2007 to 159,334 pieces in 2015 (Fig.1.)

The number of mechanical cultivators increased by 11.34 %, from 27,262 pieces in 2007 to 30,355 pieces in 2015 (Fig.1.).

The number of mechanical seeders increased by 14.6 % from 67,674 pieces in 2007 to 77,560 pieces in 2015 (Fig.1.).

The number of self-propelled combines for cereals harvesting increased by 11.49 % from 24,656 pieces in 2007 to 27,485 pieces in 2015 (Fig.1.).

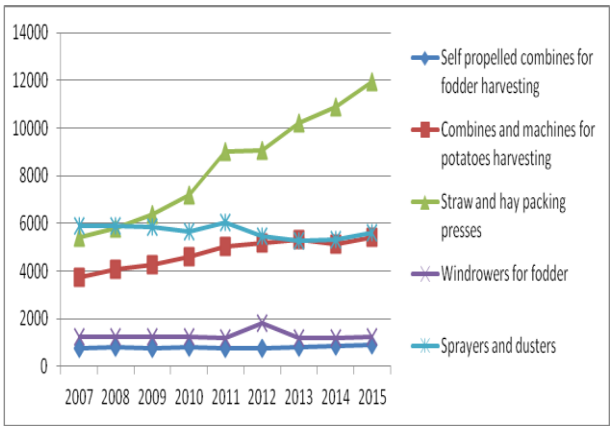

Fig. 3. Dynamics of self-propelled combines for fodder harvesting, combines and machines for potatoes harvesting, straw and hay packing presses, windrowers for fodder, and sprayers and dusters, Romania, 2007-2015 (pieces)
Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

The number of self-propelled combines for fodder harvesting increased by 17.08 % from 761 pieces in 2007 to 891 pieces in 2015 (Fig.3.).

The number of combines and machines for potatoes harvesting increased by 43.50 % from 3,765 pieces in 2007 to 5,403 pieces in 2015 (Fig.3.).

The number of straw and hay packing presses increased by 121.63 % from 5,399 pieces in 2007 to 11,966 pieces in 2015 (Fig.3.).

The number of fodder windrowers declined by 1.2 % from 1,269 pieces in 2007 to 1, 254 pieces in 2015 (Fig.3.).

The number of mechanical sprayers and dusters declined by 2.66 % from 5,876 pieces in 2007 to 5,607 pieces in 2015 (Fig.3.).

Therefore, in general, the equipment in agriculture increased from a numerical point of view, except fodder windrowers and sprayers and dusters.

The change in agricultural machinery structure was determined by the new farm structure, and mainly the commercial companies were able to benefit of the EU funds for purchasing new tractors and equipments. [14].

However, in many agricultural holdings, equipment are old and with a high degree of usage. In the smallest holdings many of agricultural works are executed manually [3].

The utilized agricultural area (UAA) in Romania accounted for 8,244,351 ha in 2015, being by 6 % higher than in 2007 (7,777,174 ha). (Fig.4).

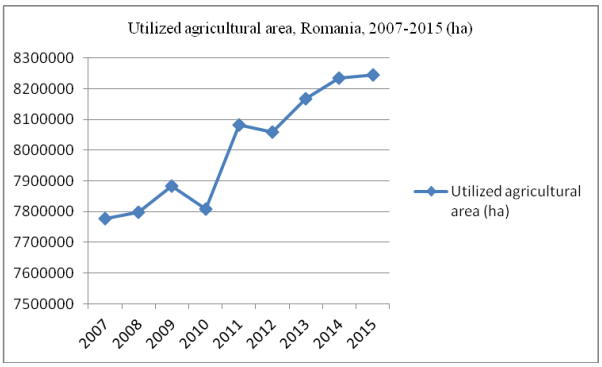

Fig. 4. Dynamics of utilized agricultural area in Romania, 2007-2015 (ha)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

In general, the UAA increased in almost all NUTS 2 regions, except North West region where it declined by 7.5 % and Bucharest-Ilfov where it declined by 14.8 %.

The distribution of UAA in the territory of Romania, in the decreasing order, is the following one: South Muntenia 22.3 %, South East 22 %, North East 14.7 %, South West Oltenia 12.9 %, West 10.7 %, North West 9.4 %, Center 6.9 %, Bucharest Ilfov 0.8 % (Fig.5).

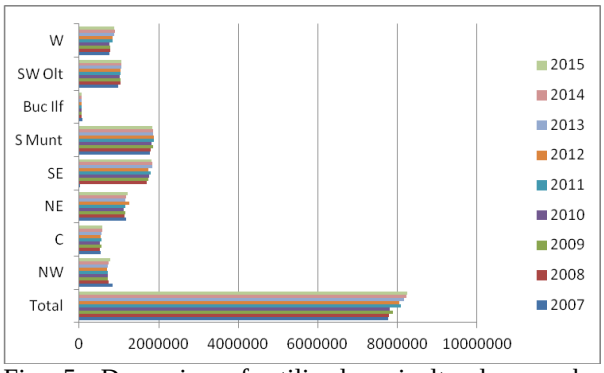

Fig. 5. Dynamics of utilized agricultural area, by regions of development and at country level, Romania, 2007-2015 (ha)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

The utilized agricultural area per tractor was in average at country level 41.3 ha/tractor, a consequence of the evolution of the cultivated surface and the number of tractors in the analyzed period.

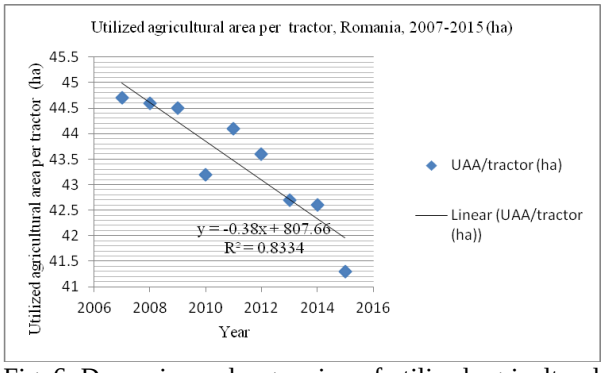

Fig. 6. Dynamics and regression of utilized agricultural area per tractor, Romania, 2007-2015 (ha/tractor)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

In 2015, the UAA per tractor declined by 7.7 %, from 44.7 ha/tractor in 2007 to 41.3 ha in

2015, being a positive aspect. However, Romania has still a high charge of ha per tractor compared to the EU average or UAA/tractor in the EU member states with a high development of agricultural equipment (Fig.6.)

The UAA per tractor by development region NUTS 2 was the following one in the year 2015, in the decreasing order: South East 88.4 ha, South Muntenia 53.9 ha, North East 52.1 ha, Bucharest Ilfov 43.1 ha, South West Oltenia 41.9 ha, West 31.7 ha, Center 20.7 ha and North West 20.1 ha. A positive aspect is that UAA per tractor declined in almost all the regions of development, except South East area and West region where it increased (Fig.7).

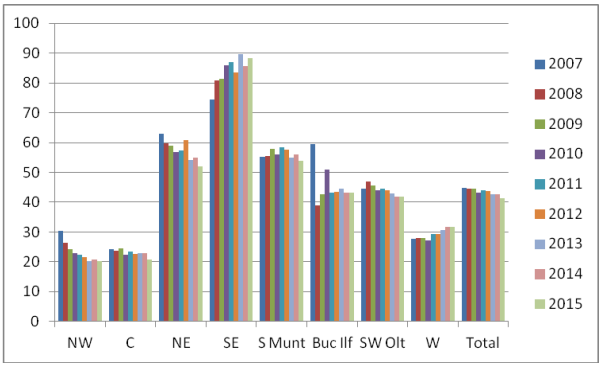

Fig. 7. Dynamics of utilized agricultural area per tractor, by regions of development and at country level, Romania, 2007-2015 (ha/tractor)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

By NUTS 2 region of development, the situation is the following one: North West-30.3 ha/tractor in 2007 and 20.1 ha/tractor in 2015 (-33.7%), Central area 24.3 ha/tractor in 2007 and 20.7 ha/tractor in 2015 (-15 %), North East 62.9 ha/tractor in 2007 and 54.9 ha/tractor in 2015 (-17.2 %), South East 74.3 ha/tractor in 2007 and 88.4 ha/tractor in 2015 (+18.97%), South Muntenia 55.3 ha/tractpr in 2007 and 53.9 ha/tractor in 2015 (-2.6 %), Bucharest Ilfov 59.6 ha/tractor in 2007 and 43.1 ha /tractor in 2015 (-27.7 %), South West Oltenia 44.5 ha/tractor in 2007 and 41.9 ha/tractor in 2015 (-5.9 %) and West region 27.6 ha/tractor in 2007 and 31.7 ha in 2015 (+14.85 %).

Agricultural production value could be considered a consequence of the number and quality of equipment and machinery used in agriculture, besides other factors such as: obtained agricultural production, price at farm gate for agricultural products, climate conditions, soil conditions, technologies applied, other farm inputs (biological material, fertilizers, pesticides etc), farm management, farmers training level etc.

Agricultural production increased at country level by 44.21 % from 47.67 Lei Million in 2007 to 68,749 Lei Million in 2015 (Fig.8).

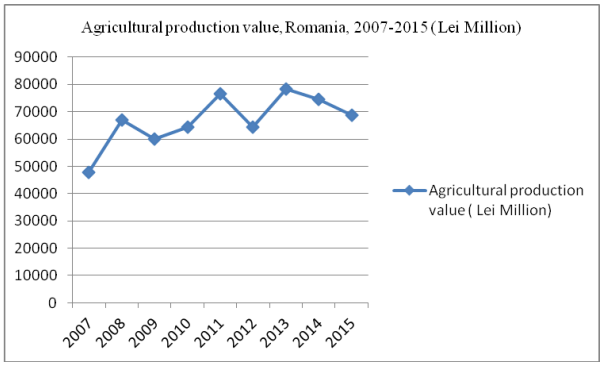

Fig. 8. Dynamics of agricultural production value in Romania, 2007-2015 (Lei Million)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017 [12].

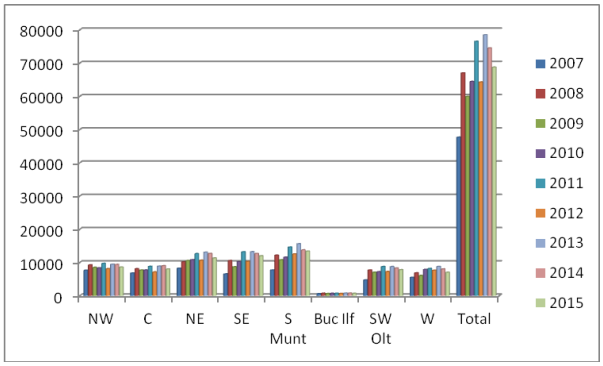

Fig. 9. Dynamics of agricultural production value, by region of development and at country level, Romania, 2007-2015 (Lei Million)

Source: Own design based on the data provided by National Institute of Statistics, Tempo-online Data Base, 2017[12].

An important growth of agricultural production was noticed in all the development regions as follows: North West + 12.55 %, Central area + 17.33 %, North East +37.22 %, South East +83.52 5, South Muntenia + 73.72 5, Bucharest Ilfov +12.79 %, South West Oltenia + 65.48 % and West +27.87 % (Fig.9).

The contribution of various regions to agricultural production value in Romania in the year 2015 was the following one: North West 12.50 %, Central region 11.63 %, North East 37.22 %, South East 17.41 %, South Muntenia 19.45 5, Bucharest Ilfov 0.98 %, South West Oltenia 11.31 %, and West 10.22 %. Therefore, the highest contribution is gicen bt North East, South Muntenia and North West regions.

Statistical parameters of the studied indicators is presented in Table 5.

Table 5. Statistical parameters: mean, standard deviation and variation coefficient for the studied indicators characterizing agricultural equipment and machinery in Romania, in the period 2007-2015

	MU	Mean	Standard Deviation	Variation coefficient %
Tractors	Pieces	184,142	8,801.35	4.77
Ploughs	Pieces	147,630	7,024.81	4.75
Cultivators	Pieces	28,648.3	1,107.15	3.86
Seeders	Pieces	71,997.11	3,686.70	5.12
Self propelled combines for cereals harvesting	Pieces	25,587.44	901.01	3.52
Self propelled combines for fodder harvesting	Pieces	805.11	47.66	5.91
Combines and machines for potatoes harvesting	Pieces	4,758.88	594.53	12.49
Straw and hay packing presses	Pieces	8,432.44	2,358.26	27.96
Windrowers for fodder	Pieces	1,300.77	194.86	14.98
Sprayers and dusters	Pieces	5,669.33	270.72	7.77
Utilized agricultural area	Ha	8,005,809.2	181,447.82	2.35
Utilized agricultural production value per tractor	Ha/tractor	43.47	1.13	2.59
Agricultural production value	Lei Million	66,938.88	9,479.82	14.18

Source: Own calculation

The main problems which are in agriculture of Romania related to technical endowment in terms of machinery and equipments are the following ones:

(i)the number of machinery and equipment for Romania's agriculture is still unsufficient to correspondingly cover the volume and quality of agricultural works, to assure the implementation of modern technologies, and increased production performance and competitiveness;(ii)the structure of the machinery system is unbalanced distributed in the territory, related to the actual structure of production and types of technologies applied;

(iii)the actual park of tractors and machinery is old in most of part, it is not able to assure a high quality of agricultural works, it requires important costing repairs, it has a high fuel consumption and low productivity and efficiency;

(iv) there is an imperious need to replace old machinery with modern equipment in the most of farms for increasing their production performance;

(v)the high UAA per tractor is still far away from the EU average and from the one of the EU countries with high developed agriculture; it perfectly reflects a low endowment level, one of the lowest in the EU;

(vi)the unsufficient use of the EU funding for purchasing modern equipment;

(vi)the substantial reduction of the budget allotments of expenditures for agriculture, compared to other EU countries; for instance,

(vi)the value of fixed assets in Romania's agriculture is still low compared to fixed capital in other EU countries. For instance, in Romania, the value of fixed assets is Euro 3,600/farm compared to Euro 290,000/farm in France [6];

(vii)the low financial aid allotted to Romania's agriculture compared to other EU countries; Despite that Romania contributes to the EU GVA by 4.48 %, coming of the 7th position in the EU from this point of view. In 2010, Romania received from EU, Euro 151.4 /ha financial aid, compared to other EU countries like: France, Italy, Spain, Germany, Poland, United Kingdom, Greece, Hungary, Austria and Belgium [6] (Table 6).

With such a low financial aid both from the Romanian Government and EU, the Romanian farmers can not face the higher and higher prices for farm input and the low price

at farm gate for agricultural products, which assure an income at the threshold of profitability and many times losses.

Table 6. Financial aid from Government and EU for Romania's agriculture compared to other EU countries, 2010 (Euro/ha)

Country	Government aid (Euro/ha)	EU aid (Euro/ha)	Total aid (Euro/ha)
EU-27	55.7	318.3	373.9
France	69.1	284.8	353.9
Italy	63.4	466.6	530.1
Spain	22.6	330.2	352.8
Germany	61.9	417.4	479.3
Poland	42.5	256.1	298.6
United Kingdom	24.6	234.3	258.9
Romania	**6.9**	**151.4**	**158.3**

Source: [6]

Under these conditions, it is obviously impossible to modernize farm machinery and equipment for obtaining a higher performance and competitiveness.

CONCLUSIONS

The study emphasized the slight increase in the number of tractors and agricultural machinery in Romania's agriculture, and the fact that technical endowment is still weak compared to agriculture needs for increasing production , economic efficiency and competitiveness.

In Romania's agriculture there are still old machinery and equipment with a high usage degree, whose repairs are not justified by the high cost. The lack of financial resources in most of farms do not allow farmers to improve the structure of the mechanization system, which is compulsory taking into account the modern technologies.

The Government should allocate a higher percentage from budget to agriculture for improving the park of tractors and agricultural machinery.

Also, the distribution of the EU financial aid per ha should be equitably divided by member states.

Farmers need a better endowment in their farms to apply modern technologies and increase production, quality of agricultural products, economic efficiency and competitiveness.

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