

## Current condition of Russian agricultural engineering market

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**Abstract.** The current condition of Russian agricultural engineering market, tractors and combines provision indexes of agricultural organizations were researched in this work. The availability of basic kinds of agricultural engineering, decreasing from year to year, is estimated: for analyzing period from 1990, the tractor parks are left only 21,4%, tractor ploughs are 15,2%, different seeding machines are 18%, beet harvesters are 12,4%, haymaking machines are 14,3%, and sprinkling machines are only 6,7%, milking machines are 12,4%. The analysis allowed to get the following picture of the agricultural organizations provision with basic kinds of agricultural machinery during the analyzed period. In spite of the fact that only from 2005 to 2011 in agricultural organizations of Russian Ministry of Agriculture 52 million hectares of the cultivated area were introduced, the economic provision with material and technical resources was increasing quickly from year to year.

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### Introduction

Technical degradation of domestic agricultural producers is a key factor, blocking the development of agricultural production and its competitiveness increase in the global market. The quality of the machinery in many cases is much to be desired. There are serious disadvantages in its using, particularly, it requires a huge repair shops and plants network. Anyway due to the environment of our country, although maybe it's smaller nowadays, a huge park containing mainly domestic machines is required. It is impossible to replace it with import, although a dangerous tendency can be noticed. The economic reform led to the catastrophic consequences for agricultural engineering industry [1].

The deterioration in financial and economic condition of agricultural enterprises with significant change (It should be said that it was in the negative direction) price disparity has led to the fact that the purchases of agricultural machinery have been plummeted [2].

The table 1 shows that for our researched period the machine and tractor park of Russian agricultural organizations degraded and the availability of agricultural machinery basic kinds is decreasing from year to year. For analyzed period from 1990, the tractor park are left only 21,4%, tractor ploughs are 15,2%, different seeding machines are 18%, beet harvesters are 12,4%, haymaking are 14,3%, and sprinkling machines are only 6,7%, milking machines are 12,4%.

The strongest degradation was in combine parks of all types and functions. Russia had 407,8 thousands of combine harvesters till 1990, and in 2011 only 76 thousands were left (or 18,8%). From 120 thousands of available forage harvesters only 18,9 thousands left (or 15,6%), and the reason of it is equal decrease of cattle, pig and sheep population, as a number of forage harvesters.

The analysis showed, that there is a such situation happened with potato harvesters, for researched period their elimination was in high rate and that's why there are only 8,7% of such kinds of machines were left till 2011 [2].

It led to the closure of agricultural engineering industry, stop or a sharp decline of production at leading plants immediately, it is shown in statistics presented below (Table 2).

In general this unprecedented production reducing in peacetime lasts for many years. In this case not only the material part of the machine-building plants is disrupted, also engineers and skilled staff are leaving and it will be very difficult to reestablish [3].

**Table 1. The basic agricultural machinery park**

Types of machines	1990	1995	2000	2005	2010	2011	1990 in % to 2011
Tractors*	1365,6	1052,1	746,7	480,3	310,3	292,6	21,4
Tractor plough	538,3	368,3	238,0	148,8	87,7	81,9	15,2
Cultivators	602,7	403,5	260,1	175,5	119,8	114,1	18,9
Seeding machines	675,9	437,5	314,8	218,9	134,0	123,7	18,4
Combined harvester	407,8	291,8	198,7	129,2	80,7	76,7	18,8
Forage harvesters, item.	120,9	94,1	59,6	33,4	20,0	18,9	15,6
Potato harvesters, item.	32,3	20,6	10,0	4,5	2,9	2,8	8,7
Beet harvesters	25	20	12,5	7,2	3,2	3,1	12,4
haymaking machines	275,1	161,6	98,4	63,9	41,3	39,3	14,3
Sprinkling machines	79,4	46,3	19,2	8,6	5,4	5,3	6,7
Milking machines, item	242,2	157,3	88,7	50,3	31,4	30,1	12,4

\*Tractors, on which excavatory, meliorative and other machineries are assembled.

**Table 2. Production of the basic kinds of agricultural machinery, thousands items**

The kind of machinery	1990	1995	2000	2005	2011	2012	1990 in % to 2011
Tractors	214	21,4	19,2	8,6	15,4	15,0	7,0
Tractor ploughs	85,7	4,0	2,8	2,4	3,0	3,2	3,7
Tractor-drawn cultivators	101	2,0	4,7	8,8	4,5	4,6	4,6
Tractor-mounted sower	51,1	1,5	5,2	6,5	4,6	3,3	6,5
Combine harvesters	65,7	6,2	5,2	7,5	6,4	5,8	8,8
Flax harvester, items	3356	107	146	100	n/a	n/a	-
Forage harvesters, items	10118	511	535	446	869	922	9,1
Power loading machines for agricultural purposes thousands items	29,2	1,74	1,472	2,4	7,1	8,9	30,5
Soil amendment applicators, items	21129	82	217	241	n/a	n/a	-
Milking machines, item	30742	528	394	329	n/a	n/a	-

If this process isn't stopped, it will approach the critical point when it would be impossible to conduct necessary mechanized works in the countryside. This process of the tractor-machine base weakening will lead primarily to the significant increase of the load to the existing technique, basically, which has been working for many years [4].

Old machinery writing-off (and now its average age is 13-14 years) is faster than the inflow (Table 3). The table 3 shows the reproduction dynamics analysis results of the park with various kinds of tractors, combines for 2000 - 2011.

According to the departmental reports for the period from 2008 till 2012, agricultural producers actually purchased 100.3 thousand tractors (57% of the plan), 35.2 million (64%) of combine harvesters and 10.1 million (59%) forage harvesters. A proportion of tractors purchased during the realization of the State Agriculture Development Programme is 21% of their availability from agricultural producers (477,2 thousands), combine harvesters 28% (126,8 thousands items). In 2012 19983 tractors (41,6% of the plan), 6284 combine harvesters (41,9%) and 1385 forage harvesters (40%) have been acquired [5].

**Table 3. The agricultural machinery arrival and writing-off in Russian agricultural organizations, % to availability**

The type of machinery	2000		2005		2008		2009		2010		2011	
	Writing-off	Arrival	Writing-off	Arrival	Writing-off	Arrival	Writing-off	Arrival	Writing-off	Arrival	Writing-off	
Tractors	6,2	1,3	4,8	2,6	5,0	7,8	4,4	2,3	5,1	3,4	5,1	
Seeding machines	-	2,6	5,8	4,1	5,0	8,9	4,9	4,2	5,3	6,2	7,1	
Grass-mowing machines	-	2,5	6,9	4,1	7,1	5,0	7,6	8,4	14,6	8,1	12,5	
Combine harvester	6,8	2,7	6,5	4,2	7,1	6,0	3,4	3,5	6,8	5,3	6,8	
Forage harvesters	9,5	1,9	8,2	4,2	8,7	5,5	9,0	4,1	8,3	6,4	8,3	
Beet harvesters	8,6	1,9	7,7	4,0	9,7	2,2	12,4	5,8	14,2	6,5	14,0	
Milking machines	7,9	1,2	7,5	3,4	6,1	4,1	6,3	n/a	n/a	n/a	n/a	

According to Rosstat, in 2012 the actual park renewal amounted to 3.4% of tractors and 4.8% of combine harvesters and forage harvesters.

On the January 1, 2013 the tractors with useful life up to 3 years old accounted for 10.97% of the total (it was 5, 4% in 2006), combine harvesters 115.49% (in 2006 it was 8,9% ) from the total number of agricultural producers [6].

The combine park coefficient of renewal over the last decade was lower than normal (10%). The reasons of the narrowed reproduction combines park were the lack of own funds and the difficulty of obtaining investment concessional loans.

The beet harvesters production condition differs from the shown above only with the retirement rate which is slightly higher, and arrivals are less about 1.5-2 times.

As to the forage harvesters production, it evolved as in the preceding harvesters types. In all researched years machines elimination due to consumption considerably exceeded than the entering of new harvesters [7].

We analyzed the provision state of the Russian Agriculture Ministry agricultural organizations with main types of agricultural machinery in Table 4 to explain this question.

Table 4 shows that for the researched period the provision with tractors per 1,000 hectares of arable land in the whole Russian Ministry of Agriculture for the same period in 2005 was 6 units against 14.56 units on the norm, in 2011 the ratio was changed more by the Russian Ministry of Agriculture and it was 4 units.

**Table 4. The provision of agricultural organizations with tractors and combines by the end of year [8]**

Factors	2005	2006	2007	2008	2009	2010	2011	2005 in % to 2011
Tractors quantity for 1000 ha of arable, items.	6	5	5	5	4	4	4	66,7
Arable burden to 1 tractor, ha	181	187	197	210	226	236	247	136,5
Combines for 1000 ha of seeding								
combine harvesters	4	4	3	3	3	3	3	75,0
maize harvesters	5	3	2	4	1	1	1	20,0
potato harvesters	32	28	25	23	18	16	16	50,0
flax harvesters	22	21	21	19	18	24	18	81,8
beet harvesters (without top harvesters)	11	8	6	6	5	4	3	27,3
Seeds to one combine, ha								
combine harvesters	253	270	291	317	344	327	354	139,9
maize harvesters	215	339	629	846	731	817	1115	518,6
potato harvesters	31	36	40	43	55	62	61	196,8
flax harvesters	46	48	47	54	56	42	54	117,4
beet harvesters (without top harvesters)	93	131	165	156	184	278	344	369,9

The load to many types of equipment is sharply increased. For example, the area of arable land per one physical tractor increased almost on half compared to 2005. In Russia the load to 1 tractor in 2011 reached 247 hectares, 1 Combine Harvester - 354 ha, respectively, in the U.S. - 28 and 82 in England - 13 and 65, in France - 12 and 63 in Germany - 8 and 67 ha.

The provision with combine harvesters per 1,000 hectares of grain and grain legume in the whole Russian Ministry of Agriculture for the same period in 2005 was 4 units against 9.12 units by the norm, in 2011 the ratio is changed more by the Ministry of Agriculture Russia it was  $9.12 / 3 = 3.04$  times less than the regulatory requirement for combine harvesters.

There was another situation with provision of agricultural organizations with corn harvester. In general, according to the Russian Ministry of Agriculture because of the reduction of corn seeding, it is in the base year 5 units per 1,000 hectares of crops against 9 unit of the norm, but last year it was reduced to 1 unit. At the beginning of the researched period actual provision was over the limit 1.8 times by the end of the period, on the contrary, it is declined sharply and became 9 times smaller ( $5/9 = 0.5$  times less,  $9/1 = 9$  times less). Potato harvesters provision per 1000 hectares of seeding decreased by 50.0 %. It is conditioned with the reduction of crop area.

A similar situation exists with seeding (planting) of the appropriate crop to one combine harvesters. For example, the load to one combine harvester from 253 hectares in 2005 to 354 hectares in 2011. It has led to the growth of harvesters load to 39.9%. The situation is similar for corn harvesters, the load on one processor from 215 hectares in 2005 to 1,115 ha in 2011, i.e. increased 4.18 times.

The analysis allowed to get the following picture of the agricultural organizations provision with basic kinds of agricultural machinery during the analyzed period. Despite of the fact that only for the period 2005-2011 agricultural organizations in the Russian Agriculture Ministry inferred 52 million hectares of seeding area, provision with holdings logistical resources from year to year was being declined rapidly.

It testifies that the elimination rate of physical consumption techniques outpaced output rotations of arable land, so the actual availability of the agricultural organizations with the main types of agricultural machinery (machinery and equipment) was significantly lower than normal [9].

If this process is not stopped, it will approach the critical point when it would be impossible to conduct timely mechanized work in the

countryside [10]. This process of weakening of machine-tractor base leads primarily to a significant increase in the load of the existing technique, mainly, as it has already been mentioned, which has been used for many years.

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