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# The Necessity for the Modernization of the Technical-Material Base of Agricultural Exploitations within the Process of Forming Competition-Economy

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## **Abstract**

The necessity for the modernization of the production processes in agriculture resides in the fact that this is the most important means to raise agricultural productivity, especially in the long term, to reduce production costs and to raise economic profitability, with a direct positive impact on the raising of income for the ones who undergo their activity in the agricultural sector. The case study conducted in Galati county covers the 2006-2007 period regarding the situation of the tractor and agricultural engine fleet as well as the evolution of chemically applied fertilizer consumption.

**Key Words:** agriculture, agricultural engines, technical equipment, consumption, intake

**JEL Code:** N54, O13, P32

## **1. Introduction**

The acceleration of intensive development and the modernization of agricultural exploitation is indissolubly linked to the expansion, perfecting and rational utilization of the technical-material resources used in the process of obtaining and capitalization of agricultural products. The good performance practice of agricultural exploitations in countries with a developed agriculture demonstrates that within the context of competition-economy, obtaining high efficiency, raising of work productivity, climbing to a superior level of economic efficiency and production expenses and finally achieving a durable and competitive productivity, depend in a staggering amount on the dimensions, structure, quality and the managing with maximum efficiency of technical-material resources.

The technical-material resources represent, in fact, an important part of the exploitation capital of an agricultural unit, materialized in fixed capital (this includes, aside from buildings, engines, rigs, installations, equipment, breeding and work animals, the land itself) and working capital known also as intermediary intake. Quantitatively as well as qualitatively, exploitation capital has a direct impact on agricultural competition. The role of technical-material resources in the development of commercial agricultural exploits is determinant, since only the simple agglomeration of terrains through buying, leasing or associating is insufficient without the acquisition of agricultural rigs, quality seeds, fertilizers etc. because this does nothing except perpetuate agricultural inefficiency as well as the crisis of capitalization.

Within the frame of technical resources, the most weight, from a value standpoint as well as from the point of view of the amount of infusion in the production process, is carried by means of mechanization, which may be classified as follows:

- a. engines common to all cultures or animal species (energy base, soil working engines, means of transport, water installations, fodder installations);
- b. engines common to a certain group of cultures or animal species (broadcast seeders, universal combines for crop harvesting, water engines for animals);
- c. engines specific to a particular culture or category of animals (engines for the mechanization of vineyard labor, potato harvesting combines, milking installations).

These are tangible fixed assets which carry a set of specific characteristics when compared to fixed assets used in other economic areas:

- they are vulnerable to a greater degree to the complex influence of natural factors, a fact which leads to faster wear or attrition and determines greater amortization expenditures;
- their use has a seasonal character, due to the disparity between work time and production time, which brings as a consequence the necessity of greater investments since the equipping must be done in accordance with the demands of the peak period and the amortization expenses are greater;
- during use, the rigs are always in motion, a fact which leads to physical wear.

The generalization of engines and tractors in agriculture was at the base of all of the changes recorded in the past 30 years in the rural area. The large scale use of tractors and agricultural engines has a series of social and economic advantages, as follows:

**Social advantages:**

- agricultural engines allow for the work in the field to be significantly easier and at the same time quicker;
- the mechanization of the exploitation of an agricultural ground contributes to the decrease of work time and allows for an expanding of the cultivated area.

**Economic advantages:**

- agricultural engines allow for the raise of ground fertility and improve the effectiveness per area unit;
- agricultural engines allow for the undergoing of quality works at the optimum moment and reduces the number of draft animals used, the work productivity is raised as well, since the time necessary for executing a particular job decreases when switching from draft animals to tractors.

If the introduction of mechanization is not accompanied by the modification of agrarian structures and social means, it may become dangerous and may even limit the use of tractors and agricultural engines for the following reasons:

- the raising of work productivity comes with the raising of value, but also with the fact that a significant amount of workforce is freed, which must then be used elsewhere;
- the decrease in the number of agriculturalists allows for increasing the dimension of the areas to be exploited, which is necessary for the rational use of tractors and other engines;
- the managing of the exploitation becomes more complex and the agriculturalist becomes more and more a true manager;
- the working and living conditions in the rural area are changing, the work is less tedious and hard from a physical standpoint, the agriculturalist has more free time.

Intermediary consumption includes: raw material such as certified seeds and planting material (in the vegetal sector), seminal material, one day chicks, livestock, as well as fertilizers, pesticides (insecticides, fungicides, herbicides, etc.), combined fodder, energy, fuels etc. All of

these intakes are specific to a single production cycle, the final consumption level being 100% within the respective production process.

The modern agricultural production is inconceivable without the use of a wide array of chemical substances, as much in the area of plant cultivation (chemical fertilizer, herbicides, fungicides, insecticides etc.) as well as livestock growth (medicine, bio-stimulators and others). Of all the chemical substances used in agriculture, fertilizers are the most important, since they can determine the growth in production on a cultivated hectare even several times over, becoming thus a particularly efficient production factor. As opposed to chemical fertilizers, the role of which is to boost the fertility of the soil with a purpose to increase the harvestable crop per hectare, pesticides have the role of eliminating or reducing the loss of crop caused by different weeds, insects or fungi. In the pesticide category, we find the following chemical substances:

- herbicides, used for combating weeds;
- fungicides, used for the destroying of fungi which harm crops;
- insecticides, used for combating harmful insects;
- other chemical substances, such as those used for combating rodents;

Seeds and planting material contribute directly to obtaining high production per hectare, influencing at the same time, with serious force, the development of costs. Creating new breeds of plants and animals which are increasingly productive, more resistant to the harmful effects of pests and diseases and better adapted to the concrete demands of agricultural production, constitutes a permanent concern of western-European countries. This implies considerable costs for replacing the old breeds but the effects are visible through the qualitative and quantitative increase in agricultural production. Before 1989, Romanian agriculture had at its disposal a satisfactory technical base, regarding the running of field work. However, there was no adequate structure for the running of animal husbandry and there was no focus on the technical parameters of tractors and combines. Internal tractor and agricultural engine production would allow for the permanent replacement of said machines as well as an important export, but it did not assure a diversified array of products.

## **2. The modernization of the agricultural technical-material base**

Following the application of the provisions of Law no. 18/1991 as well as privatization laws, in the context of the degradation and physical destruction of tractors and rigs, of the increased degree of wear, the number of available tractors and agricultural engines became insufficient, even if their number sees a slight increase. Thus, in 2007, Romanian agriculture would have at its disposal, according to statistical data, for example, 171,811 tractors as opposed to 129,239 in 1989, the largest part of them being in the private sector, 168,947, comprising 98.3%. The combine fleet however, was decreasing from 38,453 in 1989 to 25,552 in 2007, the majority being under private property 25,250, meaning 98.8%.

This level of endowment is far from able to assure the running of the works in optimal periods. Starting from a study done by the Ministry of Agriculture which established that the normal load for Romania is 25-35 he/tractor and 125-200 he/combine, we realize that the current level of coverage is only at 45% for tractors and 48% for combines. The mechanization potential is still low, especially in the horticultural and animal husbandry sectors. It is well known that in Romania, the passing of the optimal time for running the farming works, both in spring and autumn crops, leads to great losses. To the deficiency generated first of all by the insufficient number of rigs, we must add the accentuated physical and moral wear of said tools. Thus, on the whole of agriculture, over 50% of the existing tractors have a use age of over 8 years. From the point of view of technical endowment, Romanian agriculture is placed at bottom in the hierarchy of European countries. Thus, in 2007 the arable surface assigned to one tractor was 54 he and to a combine 369 he, as opposed to the European average of 26 he/tractor and 285 he/combine. Small and very small exploits cannot be undergone by agriculturalists since there

is no way to buy the engines and rigs necessary, thus it is imperative that they be stimulated to organize in associative forms, the diversification of the engines and the amassing of terrains in crop rotations on which the works could be undergone under economic efficiency conditions and at prices accessible for producers, of other service-providing economic actors.

We find a similar situation in the case of intermediate consumption of agricultural exploitations. The reduction of intermediate consumption coming from the industry, used in agriculture, was accentuated after 1990. Auto-consumption through seed use, fodder, and seeding material produced extended, which led to the extensive character of agriculture. Combined fodder factories limited their activity along with the shutting down of pig, poultry and other animal farms. The quantities of chemical fertilizers and pesticides used on agriculture significantly decreased and factories cut production and raised costs. Thus, in 1989 the quantity of chemical fertilizers used in agriculture was 1.159 mil tons, and the one of pesticides of 71,456 tons of active substance, beginning with 1990 consumption drastically decreased reaching in 2007, 380 thousand tons of fertilizer and 9,412 tons of active substance.

The same situation manifests with regards to certified seed consumption where, for example, according to data from the Ministry of Agriculture, the certified seed consumption decreased in 2007 as opposed to 1990 from 320 thousand tons to 200 thousand tons for autumn wheat, from 163.8 thousand tons to 20 thousand tons for barley, from 17.9 thousand tons to 2 thousand tons for oats, from 21.2 thousand tons to 20 thousand tons for corn. Just as chemical fertilizers, certified seeds play a very important role for the level and quality of production, with a direct influence on agricultural growth. Along with the changing of property structures, following the application of Law no. 18/1991, the new owners neglected the role of quality seed, using large amounts of noncertified, weak biological material, with low production qualities.

As a consequence, the endowment of agricultural exploitations did not improve, and the consumption of materials decreased on a yearly basis due also to a hostile price policy towards agricultural producers. The prices for production means of industrial origin climbed at a rate of almost double vis-à-vis the price of the products delivered by the agriculturalists. An eloquent example in this regard is given by the ratio of the indicators of the prices of goods received by the agriculturalists, for agricultural products and the indicators of the prices paid by agriculturalists for the industrial products necessary for agriculture, a ratio also known as "price scissors". The Institute for Agrarian Economy of the Academy of Agricultural and Forestry Sciences "Gh. Ionescu-Sisesti" determined such a ratio for the 1990-1996 period. According to the calculations, the indicator for the price of agricultural products in this period was 19,535.5%, meaning an increase of over 195 times, and the general indicator of the price of industrial products bought by the agriculturalists was 30,108.6%, meaning an increase of over 300 times. From the data available from the institute, we conclude that in 1996, from 1990, the price of tractors increased 428.4 times over, the price for agricultural engines 275.7 times over, the price for chemical fertilizers 175.5 times over, the price of fuels and lubricants 291.5 times over. In these conditions, the price scissors was 65%, with 35% against agriculture.

The raising of the price of industrial products led to the de-capitalization of agricultural exploitations, the incomes of the rural population have diminished year by year, bringing it in the position of not being able to cultivate the areas at its disposal. All of these have determined the agricultural producers to reduce the consumption of fertilizers, to not use high performance technologies, selected seeds or even to give up the mechanization of works, preferring to use animals for ploughing, harvesting and transport. The legal rules and means of support for agriculturalists were not financially sustained at the level of demands, and the actual application was held back by the bureaucratic system which had to be respected. The entire support system for agriculturalists by the state had a limited effect. It managed to keep certain agricultural sectors at a survival level. The yearly financial effort of the state was not sufficient as many agricultural exploitations did not have other means at their disposal to properly use the aid provided.

The negative factors which determined a reduced degree of technical-material endowment of agricultural exploitations are multiple. They can be synthesized as follows:

- ✦ excessive parceling of terrains and inadequate territorial dimensions of the agricultural exploitations regarding the use of tractors and high performance rigs;
- ✦ reduced governmental resources allocated for the modernization of agriculture;
- ✦ the defective management and incoherent nature of the crediting and financing policy of agriculture;
- ✦ the insufficient resources of agricultural producers, devoted to investment, participation and co-financing development projects;
- ✦ the de-capitalization of agricultural exploitations;
- ✦ the lack of a functional system of services for the agricultural producers, especially regarding financial-banking services;
- ✦ the lack of an organizational arena for rural loan cooperatives;
- ✦ the weak presence of foreign investors in agriculture;
- ✦ the lack of organization of downstream farming market in agriculture and the difficulties of adapting to the new agricultural structures;
- ✦ the weak development of markets which generated an unbalanced competitive environment which does not favor agricultural producers;
- ✦ the raising of prices for the industrial products bought by the agriculturalists;
- ✦ faulty management and others.

The favorable environment which might stimulate the development of the technical-material base, the introduction of high performance technologies in Romanian agriculture is the determining private property over the land and main technical means. The modernization of the technical-material base in agriculture is a complex process which includes the expanding of engine uses, chemistry, the raising of high productivity biological material consumption (seeds, planting material, hoeing animals), the extension of irrigations on areas affected by draught and others. During the transition period, for agriculture, certain solutions are imposed for a better management of technical-material factors, a fundamental criteria being the minimizing of acquisition and exploitations costs. The technical-scientific progress and innovation have a big impact on the level of production and productivity of engines. An essential role is played by the interdependencies between technical progress, biological and chemical progress, fodder production process, artificial sowing, improvement of animal breeds and others.

Therefore, the lack of financial resources constitutes the main obstacle for the modernization of the technical-material base in agriculture, widening the agricultural production gap vis-à-vis the European Union, getting farther away from its performances. The technical-material resource deficits within agricultural exploitations have made it so that the crops after the year of 1990 are plagued by reduced efficiency. This is because the dropping degree of soil fertility cannot be compensated in any other way than by raising the amount of allocated fertilizer. The quantitative and qualitative drop in vegetal production is equally dramatic with regards to the consumption of certified seeds, which is both a cause and an effect of this evolution. Without promoting a sustained process of concentrating the exploitation capital and the territorial capital in viable agricultural exploitations, without creating and developing functional markets of necessary input and agricultural products, any agricultural progress in Romania is hard to carry into effect.

### **3. Case Study. The level and structure of technical-material resources in the agriculture of Galati County**

During the transition period to market economy, the agriculture of Galati County is confronted with an acute crisis of capital, both fixed and working. The technical base constituted by tractors and agricultural engines does not come close to satisfying the necessities of the agriculture of Galati, because of their reduced number, as well as the high degree of wear. A large number of rigs have gone over the normal running time (being fully depreciated or

written off), being old and weakly productive, and the percentage of new rigs is very low. This causes additional difficulties causing frequent interruptions in the work schedule during agricultural campaigns. The lack of financial resources makes it so that in the majority of individual exploitations many agricultural works, which would normally have to be mechanized, are replaced by the manual labor of the family members, on many occasions even this labor proving insufficient, a fact which determines frequent situations in which the work takes too long, passing the optimal periods as established by the production technologies. Few individual husbandries afford to use the services of specialized mechanization units, and even these only for a small part of the agricultural works and not for the entire operation, as the agro-technical rules recommended by scientific research would advise.

**Table no. 1. The situation of the tractor and agricultural engines fleet of Galati County between 2001 and 2007**

							- units -
Type of rig	2001	2002	2003	2004	2005	2006	2007
Physical tractors	3585	3408	3313	3243	3405	3423	3501
<i>Private sector</i>	3078	3242	3185	3197	3369	3395	3473
Ploughs for tractors	2777	2816	2702	2762	2934	2962	3109
<i>Private sector</i>	2471	2691	2624	2740	2913	2944	3091
Mechanical traction cultivator	696	715	681	650	608	577	604
<i>Private sector</i>	599	679	658	650	607	575	602
Mechanical traction sowing machine	1526	1492	1445	1464	1464	1468	1544
<i>Private sector</i>	1334	1409	1379	1456	1452	1459	1535
Self-propelled combines for cereal harvesting	491	449	416	346	378	377	421
<i>Private sector</i>	462	437	412	346	377	376	420
Mechanical traction sprinkling and dusting engines	207	196	181	175	118	137	146
<i>Private sector</i>	102	141	136	139	111	131	140

Source: *The Statistical Annual of Galati County - 2008 edition*

From the analysis of the evolution of the tractor and agricultural engines fleet at the level of the County of Galati from 2001 to 2007, we observe a diminishing of their number in 2007 as compared to the reference year of 2001.

When comparing the data above with the terrain resources of the county, we observe a load of 85.67 he of arable grounds per tractor, going well over the country average which was of 54 he of arable grounds per tractor in 2007. An even worse situation is manifested in the case of combines where the average arable surface per combine is of 777.82 he, compared to the country average of 369 he per combine. If we take into account that the average load for Romania, as established by the Ministry of Agriculture is of 25-35 he of arable terrain per tractor and 175-200 he of arable terrain per combine, we get a very conclusive image of the precarious level of technical endowment of the county of Galati. The current status quo leads to the missing of the optimal period of running agricultural works and affects the quality demanded by the technology of each crop. The low level of equipment of the agricultural exploitations is related principally to the insufficiency of financial resources allocated to the acquisition of capital means.

The high degree of fragmentation of agricultural property, the reduced dimension of agricultural exploitations which cannot acquisition their own engines and rigs and cannot loan them either, considering that the associative forms of organizations are few, make it so that the mechanized agricultural works are replaced by manual labor or animal labor. The intermediate

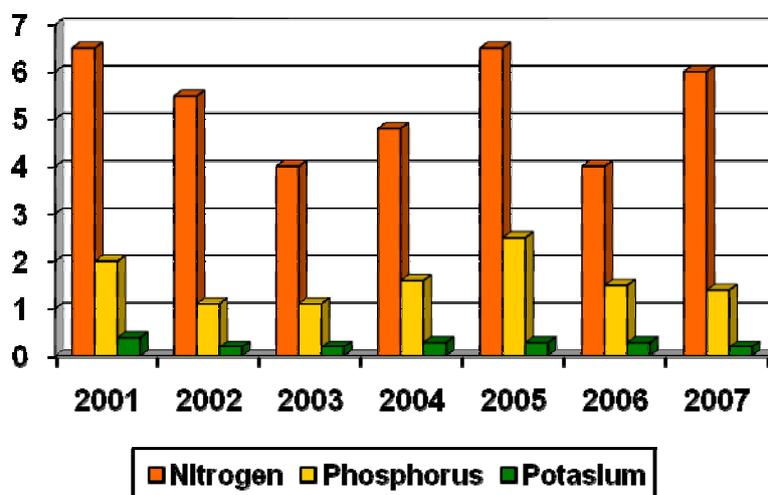
consumption of industrial descent, especially chemical fertilizers and pesticides are way under the necessary level for the County of Galati, but also for the quantities used before 1990, as is evident from the tables below.

**Table no. 2. The evolution of chemical fertilizers applied between 2001 and 2007 in Galati County**

Specification	2001	2002	2003	2004	2005	2006	2007
Chemical fertilizers applied - tons -	8828	6716	6221	6431	9383	5610	8429
<i>Private sector</i>	7318	6226	5699	6334	5146	5265	8235
- nitrogen based	6419	5442	4923	4628	6619	3957	6423
<i>Private sector</i>	5305	4954	4625	4544	4632	3619	6234
- phosphorus based	2025	1190	1179	1580	2604	1436	1574
<i>Private sector</i>	1742	1189	957	1570	458	1429	1569
- potassium based	384	84	119	223	160	217	432
<i>Private sector</i>	271	83	117	220	56	217	432
The area to which the fertilizers were applied (he)	99115	77529	86903	73431	85541	76223	158236
<i>Private sector</i>	79225	69742	81632	72249	25237	72696	156111
The average quantity of fertilizer applied per hectare (kg/he)	89,1	86,6	71,6	87,6	109,7	73,6	53,3
<i>Private sector</i>	92,4	89,3	69,8	87,7	203,9	72,4	52,8

Source: *The Statistical Annual of Galati County - 2008 edition*

**Figure no. 1. The evolution of the quantity of applied chemical fertilizer**



Source: *The Statistical Annual of Galati County - 2008 edition*

**Table no. 3. The situation of the consumption of chemical and natural fertilizers in 2007 and of the areas they were administered on**

Specification	Quantity, tons	The area they were applied to (he)	Average quantity of fertilizer per hectare (Kg/he)
Chemical fertilizer applied	8.429	158.236	53,3
Natural fertilizer applied	87.750	1950	45,0

Source: *The Statistical Annual of Galati County - 2008 edition*

The quantity of chemical as well as natural fertilizer applied covers in a very small amount the need of the agricultural terrains.

### Conclusions

Within the multitude of factors influencing agricultural production, we have material factors (agricultural rigs, fertilizers, pesticides etc.), natural factors (climate, earth or soil, water) as well as social factors. One observes that between the natural factors climate conditions may be identified. In the material (or economic) resources group, we find included the technical means of mechanizing agricultural works, construction, means of transport of products, energy means (be they electrical or thermal), chemical treatment means and water. The material character of these resources results from the fact that they are obtained following the intervention of human labor in the production process.

The most urgent problem and most important one at the level of the County of Galati, as well as at the national level, is the amelioration of agricultural exploitations. By creating exploitations sized between 40 and 50 hectares, the terrain resources may be better harnessed, the excessive parceling of terrains would be reduced and optimal conditions for the use of mechanized means would be created, as well for the application of new technology, and the financial resources, including state support, may be better managed and focused towards the provisioning of engines, rigs, fuels, fertilizers and other materials.

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