

# Perfection of the technical and technological reequipment mechanism for agricultural production in Russia

## La perfección del mecanismo de reequipamiento técnico y tecnológico para la producción agrícola en Rusia

Natalia N. KONOVA [1](#); Dmitry S. BELAITS [2](#); Svetlana G. CHERNOVA [3](#); Marina S. PETUKHOVA [4](#); Maxim S. VYSHEGUROV [5](#); Alexey I. GOLIKOV [6](#)

Received: 05/03/2018 • Approved: 28/03/2018

### Content

- [1. Introduction](#)
- [2. Methods](#)
- [3. Results](#)
- [4. Discussion](#)
- [5. Conclusion](#)
- [References](#)

#### ABSTRACT:

State support is a reliable and effective tool for stimulating the acquisition of high-tech and modern machinery and equipment by agricultural producers for agricultural production. Technical and technological reequipment is a vector of development of domestic agricultural production and ensuring its competitiveness in the global market. At present, there is a situation when farms mainly use outdated, already used agricultural equipment. It does not allow increasing labor productivity and, accordingly, reducing the cost of production, so most farms conduct unprofitable economic activity.

**Keywords:** technical and technological reequipment, material and technical resources, agricultural production, reimbursement, subsidies

#### RESUMEN:

El apoyo estatal es una herramienta confiable y efectiva para estimular la adquisición de maquinaria y equipos modernos y de alta tecnología por parte de los productores agrícolas para la producción agrícola. El reequipamiento técnico y tecnológico es un vector de desarrollo de la producción agrícola nacional y asegura su competitividad en el mercado global. En la actualidad, existe una situación en la que las granjas utilizan principalmente equipos agrícolas obsoletos y usados. No permite aumentar la productividad laboral y, en consecuencia, reducir el costo de producción, por lo que la mayoría de las granjas realizan actividades económicas no rentables.

**Palabras clave:** reequipamiento técnico y tecnológico, recursos materiales y técnicos, producción agrícola, reintegro, subsidios

## 1. Introduction

Only a deep technical and technological modernization of the agro-industrial complex in general and of agriculture in particular can solve the problem of import substitution and ensuring Russia's food security. The current state of the agricultural fleet is the main inhibitory factor of the technical reequipment of the industry.

One of the main factors for increasing the efficiency and competitiveness of domestic agricultural production is the technical potential. Continuous development of the technical basis of the industry: the commissioning of new machinery, mechanization and automation of agricultural production are of great importance in improving the efficiency of agricultural organizations. The acquisition of high-performance machinery and equipment contributes to the optimization of the load of arable land or crops per unit of machinery and creates favorable conditions for complying with the agronomic terms of agricultural work (Shelkovnikov, et. al 2015). The effective development of agricultural production directly depends on the level of its technical supply.

The technical basis plays a significant role in increasing the volume of production of domestic agricultural products, and thereby increasing the domestic gross product and national income, increasing the country's food security and accelerating the pace of import substitution, which ultimately leads to higher living standards in rural areas and development of rural areas (Zyabirova 2015).

---

## **2. Methods**

The purpose of the study is to develop theoretical provisions and practical recommendations for the implementation of the organizational and economic mechanism of technical and technological reequiment of agricultural production.

The object of the study is a complex of organizational and economic relations arising in the process of interaction of agricultural producers, agricultural machinery dealer companies and the state.

The subject of the study is a set of principles, methods for the formation and development of a mechanism for state support of technical and technological reequiment of agricultural production.

The objects of observation have been the agricultural organizations of the Novosibirsk Region.

The theoretical basis of the study is the fundamental provisions of the economic theory on state regulation of the economy, the scientific works of domestic and foreign scientists who expressed their views in scientific articles, monographs, dissertations on the problems of the agriculture state support and technical and technological reequiment. The information base of the research is presented by the state and regional programs for the development of the agricultural sector, official information of the Ministry of Agriculture of the Novosibirsk Region, materials of the territorial body of the Federal State Statistics Service for the Novosibirsk Region, annual and other reports of agricultural organizations in the Novosibirsk Region.

The following methods have served as the methodological basis of the study: monographic, abstract-logical, comparative, computational-constructive, as well as methods of economic analysis: statistical groupings, correlation-regression.

---

## **3. Results**

In our opinion, agricultural producers are not able to independently reequip their own production, so we proposed a mechanism for state support of technical and technological reequiment of agricultural production. The result of the proposed mechanism will be an increase in the amount of equipment purchased, an increase in energy supply and renewal of the machine and tractor fleet, an increase in labor productivity, and, accordingly, the wages of workers. The mechanism of reimbursement for costs is based on the distribution of agricultural producers in 3 groups depending on the number of livestock and on the crop area. The right to receive this subsidy is entitled to agricultural organizations, peasant households (farms) and individual entrepreneurs. Reimbursement from the regional budget should be provided only for equipment that contributes to the increase in the energy capacity of agricultural organizations, which is the ratio of horsepower per hundred hectares of arable land. The speed and quality of spring field works and harvesting operations directly depend on this indicator. Thus, state support of agricultural producers in the region becomes

more targeted.

We also propose approving a list of subsidized equipment that will help stimulate agricultural producers to purchase high-performance, energy-saturated agricultural machinery and equipment, and increase the efficiency of using budgetary funds as well as reduce the technological time for seeding and harvesting campaigns.

---

## **4. Discussion**

### **4.1. Principles of state support of technical and technological reequipment of agricultural production**

Effective implementation of the organizational and economic mechanism developed by us requires the definition of its basic principles. In addition to the principles of assurance, stability, sustainability and others, we have proposed the following principles of state support for the technical and technological reequipment of agricultural production:

- differentiation of subsidies depending on the size of the agricultural producer. The more the breeding stock of dairy or beef cattle and crop area in the presence of the agricultural producer are, the higher is the level of reimbursement for the costs of acquiring agricultural machinery (Krokhta, et.al. 2012);
- priority of technical and technological reequipment over modernization, as the latter represents point improvement – improvement of production. Technical and technological reequipment is a complex of measures aimed at increasing the technical and technological level of production through the utilization of advanced equipment and technologies, and production automation. As part of the technical and technological reequipment, an agricultural producer moves to a new technological level;
- targeting;
- maintenance of equipment – partial reimbursement of delivery costs and subsequent servicing.

### **4.2. Mechanism of state support of technical and technological reequipment of agricultural production**

Utilization of machinery and equipment that is technically obsolete and has worked out its amortization period in the production process leads to the emergence of the following negative processes:

1. significant excess of actual costs over regulatory ones (Krokhta, et. al. 2013);
2. an increase in fuel consumption up to 40% of the norm;
3. a low level of labor productivity;
4. impossibility of meeting modern agricultural production technologies by agricultural machinery (Dragaytsev, et. al. 1998).

The consequences of such processes are an increase in the cost of production of agricultural products, a reduction in the wages of workers engaged in agricultural production and, accordingly, a lack of labor resources in agriculture (Rudoy, et.al. 2016). Thus, there are objective prerequisites for the development of a mechanism for state support for the technical and technological reequipment of agricultural production (Figure 1).

The purpose of the mechanism is the technical and technological reequipment of agricultural production in the Novosibirsk Region.

The following tasks should be solved in order to achieve this goal:

1. stimulation of agricultural producers to purchase modern agricultural machinery and equipment;
2. stimulation of agricultural producers to maintain machinery and equipment in operational condition;
3. ensuring the modernization of agricultural production in the Novosibirsk Region;
4. improving the infrastructure system of state support for the purchase of agricultural machinery.

The developed mechanism is based on the following provisions:

- 1) partial reimbursement of the costs for the purchase of agricultural machinery and

equipment, the size of which is differentiated depending on the size of the agricultural producer. Reimbursement is carried out after equipment acquisition. In order to receive a subsidy, an agricultural producer needs to provide the Ministry of Agriculture of the Novosibirsk Region with copies of documents confirming the purchase of equipment and its public registration (Rudoy, Stadnik, et. al. 2015);

2) partial cost reimbursement at the interest rate received as a result of the credit purchase of agricultural equipment;

3) partial reimbursement of costs for the delivery of machinery purchased by the agricultural producer to the farm. The considerable distance between many municipal districts and regional center, where agricultural equipment is mainly purchased, creates unequal conditions for agricultural producers, for example, in the Novosibirsky and Kyshtovsky Districts;

4) partial cost reimbursement for concluding a service contract between the agricultural producer and the seller of agricultural machinery;

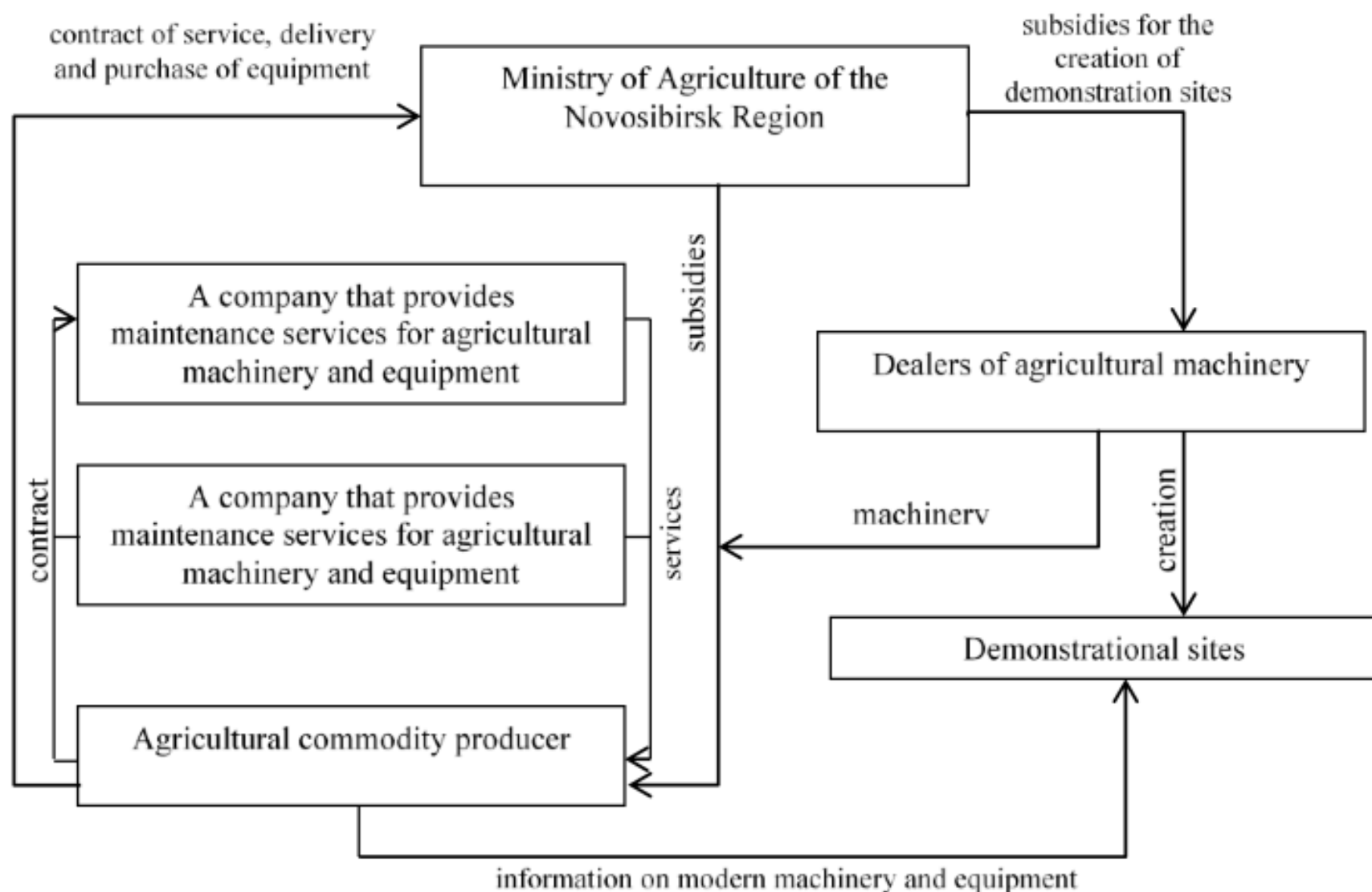
5) creation of modern agricultural machinery demonstration sites (Kochetkov 2012).

The expected results of the proposed mechanism are:

1. An increase in the amount of agricultural machinery and equipment purchased by agricultural producers for agricultural production.
2. An increase in the agricultural organizations energy supply indicator value per 100 crops.
3. Growth of the renewal rate of main types of agricultural machinery and equipment.
4. An increase in the proportion of finished self-propelled machines for spring field works and harvesting operations.
5. An increase in the proportion of ready-made milking equipment for livestock farms.
6. An increase in the number of self-propelled machines and milking equipment technical services.

**Figure 1**

The mechanism of state support of technical and technological reequipment of agricultural production



### **4.3. Algorithm of state support of technical and technological reequipment of agricultural production depending on the number of livestock and the crop area**

In modern conditions of management, obsolete agricultural machinery and equipment must be replaced with new high-performance machinery and equipment in accordance with the requirements of promising technologies, which will ensure a reduction in labor and material resources per unit of output (Rudoy, Matveev, et. al. 2015).

The authors have improved the algorithm of state support of technical and technological reequipment of agricultural production. The algorithm for costs reimbursement is based on distribution of agricultural producers in 3 groups, depending on the number of livestock and the crop area, with reimbursement of 50, 30, 20% of the new purchased equipment cost. Agricultural organizations, peasant households (farms) and individual entrepreneurs have the right to receive this subsidy (Figure 2).

The first group of entities, for which state support is established in the form of 50% reimbursement of the purchased technical and agricultural production equipment cost, includes:

1) agricultural organizations and agricultural producers having the breeding stock of at least 300 milk heads of cattle or at least 150 meat heads according to statistics as of January 1st of the planned year;

2) peasant (farm) households and individual entrepreneurs engaged in agricultural production, having the breeding livestock of dairy cattle according to statistics as of January 1st of the planned year:

- not less than 20 heads in case the crop area of up to 500 hectares is used;
- not less than 30 heads in case the crop area of up to 1,000 hectares is used;
- not less than 50 heads in case the crop area of more than 1,000 hectares is used;
- not less than 100 heads in case the crop area of up 2,000 hectares or more is used;

3) peasant (farm) households and individual entrepreneurs engaged in agricultural production, having the breeding stock of meat cattle according to statistics as of January 1st of the planned year:

- not less than 10 heads in case the crop area of up to 500 hectares is used;
- not less than 15 heads in case the crop area of up to 1,000 hectares is used;
- not less than 250 heads in case the crop area of more than 1,000 hectares is used;
- not less than 50 heads in case the crop area of up 2,000 hectares or more is used.

The second group of entities, for which state support is established in the form of 30% reimbursement of the purchased technical and agricultural production equipment cost, includes:

1) agricultural organizations and agricultural producers having the breeding stock of at least 100 milk heads of cattle or at least 50 meat heads according to statistics as of January 1st of the planned year;

2) agricultural organizations that have a livestock of servicing bulls for the production of breeding products according to statistics as of January 1st of the planned year;

3) agricultural organizations, producers of agricultural products engaged in the production of poultry products, pigs, industrial crops, potatoes, vegetables, provided that the return from the sale of the above products in these entities is at least 50% of the total sales of agricultural products in the previous calendar year;

4) peasant (farm) households, individual entrepreneurs engaged in the production of agricultural products, not included in the first group of entities;

5) agricultural consumer cooperatives;

6) citizens who lead personal subsidiary plots.

The third group of entities, having the state support of 20% reimbursement of the purchased technical and agricultural production equipment cost, includes:

1. Agricultural organizations and agricultural producers having the breeding stock of at less than 100 milk heads of cattle or less than 50 meat heads according to statistics as of January 1st of the planned year;
2. Agricultural organizations and producers of agricultural products engaged in the production of crop production, with the exception of products listed in subparagraph 3 of the second group, which do not produce livestock products.

The algorithm for providing state support (in case the equipment was purchased at own expense) is as follows:

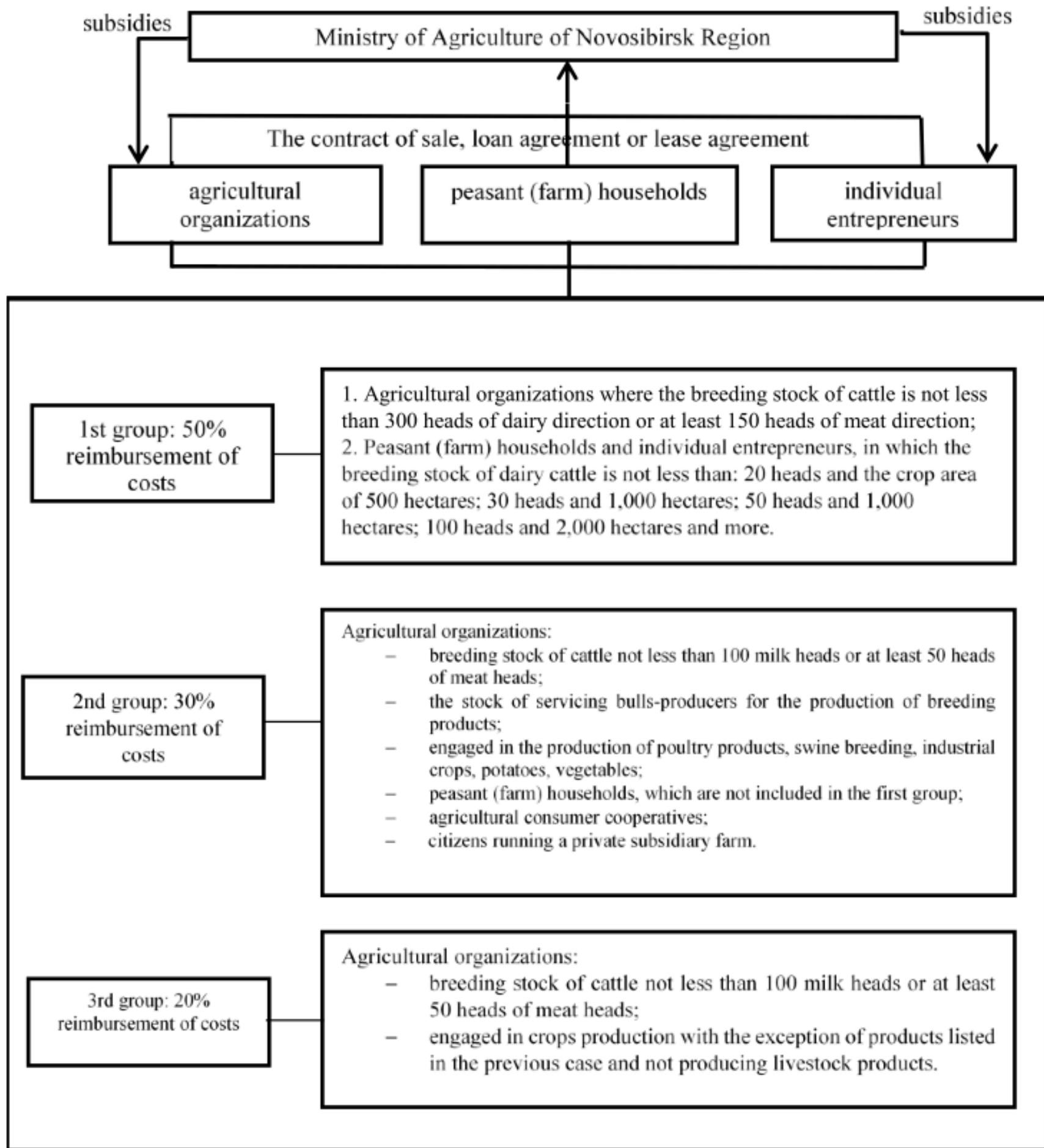
1. After the conclusion of the contract of sale, the agricultural producer provides the Ministry of Agriculture of the Novosibirsk Region with a copy of this contract, financial statements on the financial and economic situation in the previous year, containing information on the breeding stock of cattle and the sown area, as well as an application for purchased equipment cost reimbursement.

It should be noted that reimbursed is only the cost of agricultural equipment that was purchased no more than one year ago. The date of purchase coincides with the date of signing the contract of sale.

2. After the submitted documents are reviewed by the Ministry of Agriculture of the Novosibirsk Region and their filling in correctness gets verified by the specialists of the Ministry, the amount of necessary reimbursement is calculated and transferred to the account of the agricultural producer. The amount of reimbursement will be 50, 30 or 20% of the cost of equipment specified in the contract of sale, depending on the size of the farm.

**Figure 2**

Algorithm of state support of technical and technological reequipment of agricultural production



The second option is reimbursement of the amount of borrowed funds spent on the purchase of equipment, which is the most common since most agricultural producers are not able to carry out technical and technological reequipment of production only at the expense of their own funds. In this case, the agricultural producer together with the above-mentioned documents must provide the Ministry of Agriculture of the Novosibirsk Region with a loan agreement. Then the reimbursement will be 50, 30 or 20% of the amount specified in the loan agreement plus own funds (since the loan is usually not taken for the entire cost of equipment). State support is provided after the conclusion of a loan agreement (Shelkovnikov, et. al. 2017).

Another option is leasing, which is the most optimal method of technical and technological reequipment and also less expensive than purchasing equipment on credit. The reimbursement in this case will be 50, 30 or 20% of the value of the leasing contract.

As already mentioned above, technical and technological reequipment should significantly

increase labor productivity in the economy, automate production and transfer it to a new technological level (Shelkovnikov, et.al. 2016). Therefore, we propose the following list of types of technical and agricultural production equipment, for the acquisition of which state support is provided:

- tractors with engine power over 59 kW (80 hp);
- sowing complexes, grain-harvesting, forage harvesting, potato harvesting, flax harvesters;
- machines and equipment for post-harvest grain processing, grain dryers and self-propelled mowers.

Reimbursement paid from the regional budget should be provided only for new equipment, which contributes to the increase in the power-to-weight ratio of agricultural organizations, that is, the ratio of the horsepower per hundred hectares of arable land. The speed and quality of spring field and harvesting operations directly depend on this indicator. Thus, state support of agricultural producers in the region becomes more addressed and targeted (Kotov 2010).

The approval of the list of subsidized equipment is intended to stimulate agricultural producers to purchase new high-performance, energy-saturated agricultural machinery and equipment as well as to increase the efficiency of using budgetary funds and to reduce the seeding and harvesting campaigns technological time (Polukhin 2014).

#### 4.4. The method of partial cost reimbursement of agricultural machinery delivery to the farm

Acquisition of agricultural machinery is accompanied by two problems that require additional financial resources: the delivery of equipment to the farm and the conclusion of a service contract.

Let us consider the first problem – the delivery of purchased agricultural equipment (Shelkovnikov 2010). A considerable length of the Novosibirsk Region from west to east (642 km) creates unequal conditions for agricultural producers, for example, of the Kyshtovsky and Novosibirsky Districts. In case of the first, it is necessary to deliver the equipment to the farm located about 600 km from Novosibirsk (where the main dealers of agricultural machinery are located), while in the second case it is only 10-20 km away. The cost of delivery will differ by times. Therefore, we propose a methodology for reimbursing the costs for the delivery of agricultural machinery to the farm, depending on its remoteness (Table 1).

The calculation will be based on the example of delivery of a tractor "Belarus-1221.2" from a dealer company located in Novosibirsk to all districts of the Novosibirsk Region. The cost of delivery is 30-40 rubles per kilometer. The distance is counted in both directions.

We propose to reimburse part of the costs for the delivery of machinery and equipment for households in cases when costs exceed the average costs for the Novosibirsk Region. The amount to be reimbursed is calculated as the deviation of the actual delivery cost of the tractor from its average value by the area:

where  $K$  is the necessary amount of reimbursement;

$x_i$  is the actual cost of tractor delivery from Novosibirsk to the regional center;

$x_{av}$  is the the average cost of the tractor delivery from Novosibirsk to regional centers of the Novosibirsk Region.

**Table 1**  
Calculation of reimbursement amount for an agricultural producer's expenses to deliver the "Belarus-1221.2" tractor within the Novosibirsk Region

No.	District	Distance from Novosibirsk, km	Belarus-1221.2 tractor delivery cost, $x_i$ , rubles	Deviation of actual delivery cost from its average region price, $x_i - x_{av}$ , rubles



1	Novosibirsky	20	1,600	-
2	Kolyvansky	47	3,760	-
3	Kochenevsky	52	4,160	-
4	Iskitimsky	58	4,640	-
5	Moshkovsky	62	4,960	-
6	Ordynsky	106	8,480	-
7	Cherepanovsky	108	8,640	-
8	Toguchinsky	110	8,800	-
9	Bolotninsky	131	10,480	-
10	Chulymsky	144	11,520	-
11	Maslyaninsky	169	13,520	-
12	Kargatsky	181	14,480	-
13	Suzunsky	190	15,200	-
14	Kochkovsky	204	16,320	-
15	Ubinsky	226	18,080	-
16	Dovolensky	279	22,320	640
17	Krasnozersky	298	23,840	2,160
18	Barabinsky	315	25,200	3,520
19	Kuybyshevsky	327	26,160	4,480
20	Karasuksky	386	30,880	9,200
21	Zdvinsky	397	31,760	10,080
22	Chanovsky	419	33,520	11,840
23	Bagansky	435	34,800	13,120
24	Severny	446	35,680	14,000
25	Wengerovsky	463	37,040	15,360
26	Tatarsky	473	37,840	16,160

27	Chistoozerny	493	39,440	17,760
28	Kupinsky	505	40,400	18,720
29	Ust-Tarksky	517	41,360	19,680
30	Kyshtovsky	569	45,520	23,840
Average, xav		-	21,680	-
Total		-	-	180,560

The difference between the cost of tractor delivery to the Novosibirsky and Kyshtovsky Districts is about 44 thousand rubles. This once again confirms the need for machinery delivery state support, which aims at equalizing the conditions of agricultural producers (Sinelnik 2009).

If the cost of equipment delivery to the area is below the average value of delivery in the Novosibirsk Region, then reimbursement is not exercised. In our case, there are 15 of such areas. Agricultural producers that are located in the Dovolensky District 270 km away from Novosibirsk and further have to receive reimbursement for the equipment delivery.

#### **4.5. Method of partial reimbursement of agricultural machinery maintenance costs**

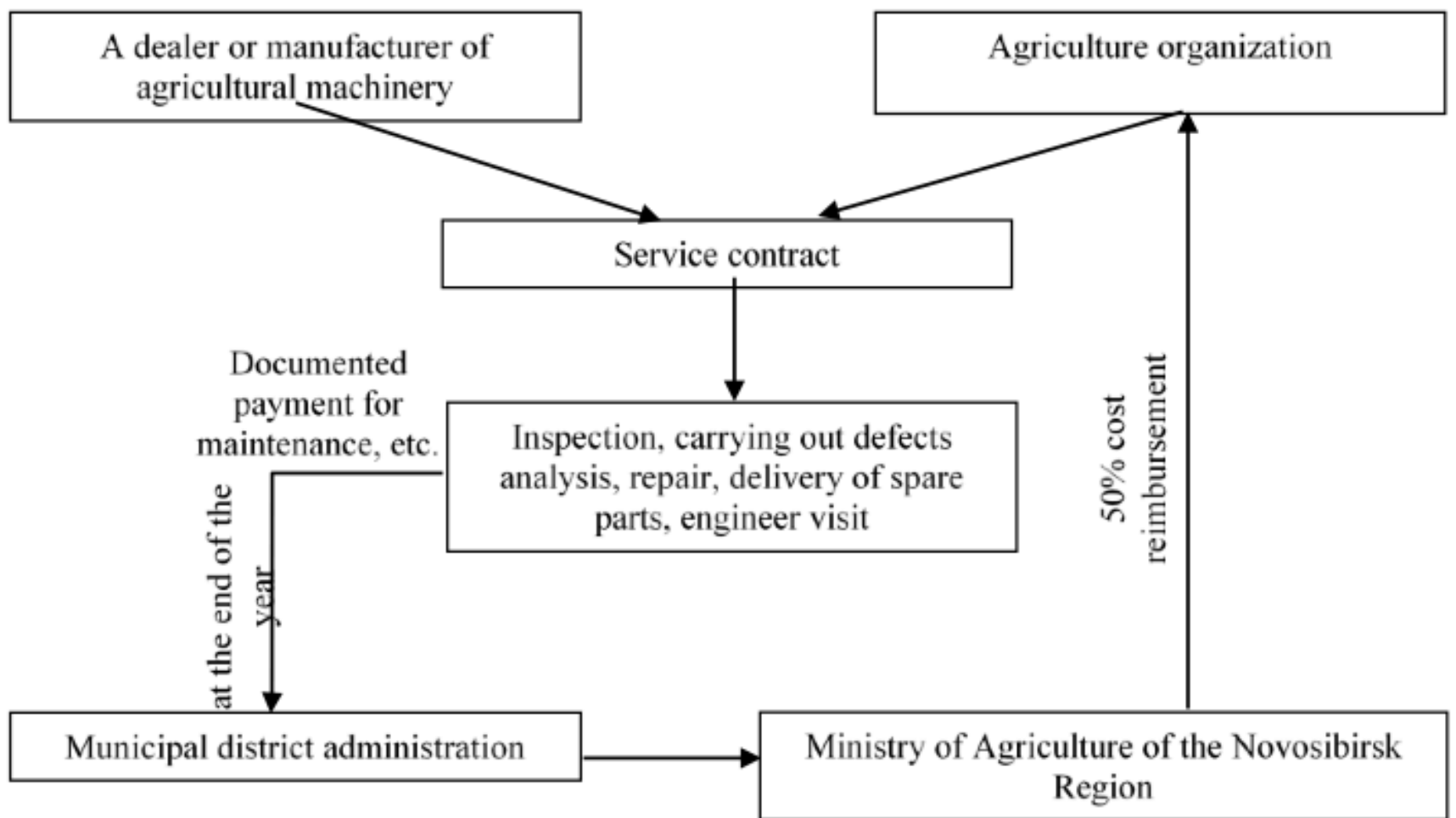
The second problem is the need to conclude the service contract. The presence of the service contract allows keeping the equipment in a working condition for a long time and significantly extends the period of its operation (Petukhova 2016).

We propose the following algorithm to reimburse an agricultural producer's maintenance expenses (Figure 3):

1. At the time of the purchase of equipment, the farmer concludes a service contract with the supplier, which includes regular technical inspections (after the end of running-in and every 500 hours of operation) as well as repair and replacement of various elements of equipment (Stadnik, et. al 2011).
2. After a year from the date of the conclusion of the service contract, the agricultural producer sums up all the costs for inspection and repairs carried out over the past year and submits the documents confirming their payment, an application for reimbursement and settlement account details to the relevant department of the municipal district administration.
3. In turn, the relevant department of the municipal district administration collects during a calendar year reimbursement applications from agricultural producers of the district and passes the documents to the Ministry of Agriculture of the Novosibirsk Region until February 15th of this year.
4. The Ministry of Agriculture of the Novosibirsk Region checks the completeness and reliability of provided information and, in case of a positive result, transfers reimbursement to the account of the commodity producer.
5. Reimbursement amount is calculated as 50% of the annual maintenance cost.

**Figure 3**

An algorithm for reimbursement of an agricultural producer's service costs



It should be noted that this reimbursement is provided only to those agricultural producers who have concluded a service contract with a dealer company or a manufacturer of machinery. This is done in order to reduce the number of machine failures, increase the load on them and, accordingly, increase the amount of harvested crops.

#### 4.6. Calculation of maintenance and delivery of agricultural equipment costs reimbursement

Let us consider the implementation of the proposed mechanism of state support for the technical and technological reequipment of agricultural production and reimbursement methods for costs of agricultural machinery servicing and delivery to farms by an example of two agricultural organizations: JSC Alexandra Nevskogo in the Bagansky District and LLC Kolkhoz Nasha Rodina in the Severny District of the Novosibirsk Region.

The breeding stock of dairy cattle at JSC Alexandra Nevskogo was 535 heads at the end of 2015. It means that farm belongs to the first group of agricultural organizations, which get the 50% of the purchased equipment cost reimbursed (Table 2).

**Table 2**  
Determination of the reimbursement amount for the cost of purchased equipment for the reviewed agricultural organizations

Organizations	The breeding stock of dairy cattle, heads	Group number	Machinery cost reimbursement amount, %
JSC Alexandra Nevskogo	535	1	50
LLC Kolkhoz Nasha Rodina	124	2	30

The breeding stock of dairy cattle at LLC Kolkhoz Nasha Rodina was 124 heads at the end of 2015, which attributes it to the second group of agricultural organizations with 30% reimbursement of the purchased equipment cost.

Both agricultural organizations have purchased the "Belarus-1221.2" tractor in Novosibirsk, which is subject to the proposed mechanism of technical and technological reequipment of agricultural production, since the engine's power is 122 hp, which is more than the power claimed in this mechanism.

JSC Alexandra Nevskogo acquired the tractor using credit funds, and LLC Kolkhoz Nasha Rodina used leasing. The cost of the tractor is 2,250,000 rub. The amount of partial cost reimbursement for the "Belarus-1221.2" tractor due to the loan will be 1,390,559.5 rubles. The reimbursement amount under the leasing agreement is 725,310 rubles (Tables 3, 4).

**Table 3**

Calculation of the tractor cost reimbursement amount for JSC Alexandra Nevskogo

Loan amount, rubles	2,250,000
Term of loan, years	5
Interest rate, %	9
Repayment frequency	quarterly
Total loan amount, rubles	2,781,119
Costs reimbursement amount, rubles	1,390,559,5

-----

**Table 4**

Calculation of the tractor purchased in leasing cost reimbursement amount for LLC Kolkhoz Nasha Rodina

Advance payment, %	20
Advance payment, rubles	450,000
Interest rate, %	3,5
Term of leasing, years	5
Repayment frequency	quarterly
Leasing agreement total amount, rubles	2,417,700
Costs reimbursement amount, rubles	725,310

Agricultural organizations will be able to get state support after entering credit and leasing agreement. That is, quarterly payments can already be made using the received reimbursement.

#### **4.7. Calculation of the amount of state support for the delivery of purchased equipment**

Next, we are going to calculate the amount of state support that agricultural producers can receive for the delivery of purchased equipment to the farm (Table 5).

**Table 5**

Determination of the amount of reimbursement for the cost of delivery of purchased equipment to the agricultural organizations being studied

Organizations	Distance to Novosibirsk, km	Delivery cost, rubles	Delivery cost reimbursement amount, rubles
JSC Alexandra Nevskogo	458	36,640	14,960
LLC Kolkhoz Nasha Rodina	490	39,200	17,520

For JSC Alexandra Nevskogo, the amount of reimbursement for the cost of delivery will be: 36,640 rubles – 21,680 rubles = 14,960 rubles.

For LLC Kolkhoz Nasha Rodina, the amount of reimbursement for the cost of delivery will be: 39,200 rubles – 21,680 rubles = 17,520 rubles.

In addition, we will calculate the expenses of agricultural organizations for technical inspections during the first year of operation.

The average cost of inspection, which includes the cost of works of the service engineer and used materials (fuel, filter, etc.) is:

a tractor of 8-9 series (80.1, 82.1, 892, 920) – 15,000 rubles;

a tractor of 10-12 series (1025, 1221) – 17,000 rubles;

a tractor of 15-20 series (1523; 2022) – 19,000 rubles;

a tractor of 30 series (3022; 3522) – 25,000 rubles.

Also, transportation costs (an engineer's visit) is taken into account – 18 rubles per km (counted both ways).

Inspection should be done at least once a year. Inspection after the end of break-in is included in the warranty period of service and is done free of charge upon the conclusion of a service agreement with the dealer.

Inspection for the "Belarus-1221.2" tractor will cost 17,000 rubles. In addition, it is necessary to pay the costs for the engineer's visit to the farm:

to JSC Alexandra Nevskogo in the Bagansky District – 18 rubles/km × 458 km = 8,244 rubles;

to LLC Kolkhoz Nasha Rodina of the Severny District – 18 rubles/km × 490 km = 8,820 rubles.

Thus, the total cost of inspection for JSC Alexandra Nevskogo is 25,244 rubles and 25,820 rubles for LLC Kolkhoz Nasha Rodina.

Upon the expiration of the calendar year, the agricultural organization shall provide the relevant body of the administration of the municipal district with the total amount spent on the maintenance of equipment, confirmed by receipts and the agreement, which are then transferred to the Ministry of Agriculture of the Novosibirsk Region. In case of truthfulness and correctness of all documents, the reimbursement in the amount of 12,622 rubles will be transferred to the account of JSC Alexandra Nevskogo, and 12,910 rubles will be transferred to the account of LLC Kolkhoz Nasha Rodina. In subsequent years, the maintenance cost will be significantly higher; hence, the amount of maintenance cost reimbursement will also increase.

Let us define the total amount of state support that can be obtained by the surveyed agricultural organizations in case of purchasing agricultural machinery and concluding service contract (Table 6).

**Table 6**

Total amount of state support for the purchase of the "Belarus-1221.2" tractor and the conclusion of service contract

Organizations	Purchased machinery cost reimbursement, rubles	Cost of machinery delivery to farm reimbursement, rubles	Maintenance cost reimbursement, rubles	Total state support amount, rubles
JSC Alexandra Nevskogo	1,390,559,5	14,960	12,622	1,418,142
LLC Kolkhoz Nasha Rodina	725,310	17,520	12,910	755,740

Since the cost of purchasing agricultural machinery on credit is usually much greater than the cost of concluding a leasing contract, the total amount of state support in JSC Alexandra Nevskogo will be greater than that of LLC Kolkhoz Nasha Rodina. In addition, the calculation of the final reimbursement amount has been influenced by the difference in the size of cost reimbursement: in the first case, it is 50%, while in the second – 30% (depending on the breeding stock of the dairy cattle).

#### 4.8. Economic efficiency of the proposed activities

Consequently, JSC Alexandra Nevskogo will receive 1,418,142 rubles of state support, and LLC Kolkhoz Nasha Rodina will receive 755,740 rubles. That will affect the growth of efficiency indicators of agricultural production in farms (Tables 7, 8).

**Table 7**  
Efficiency calculation of the proposed activities for JSC Alexandra Nevskogo in the Bagansky District of the Novosibirsk Region

Indicator	Actual 2016	Planned 2016	Deviation	
			%	±, thousand rubles
The amount of state support, thousand rubles	7,814	9,232	118,1	1,418,0
Proceeds from sales of products, thousand rubles	53,929	53,929	100,0	0,0
Cost of sales, thousand rubles	41,565	41,565	100,0	0,0
Interest to be paid, thousand rubles	-	187	-	-
Profit before taxation, thousand rubles	12,364	12,177	98,5	-187,0
Costs of core production, thousand rubles	92,950	92,950	100,0	0,0
Level of production profitability, state support considered, %	48,5	51,5	-	3,0
Level of sales profitability, state support considered, %	37,4	39,7	-	2,3
Power capacities, hp	10,691	10,813	101,1	122,0
Power-to-weight ratio, hp/person	71,3	72,1	101,1	0,8
Energy supply, hp/ha of crops	3,09	3,13	101,3	0,04

Acquisition of agricultural machinery on credit by JSC Alexandra Nevskogo will reduce the amount of profit before tax by paying 187 thousand rubles interest on the loan. However, cost reimbursement compensates for this decrease. As a result, the amount of state support provided to the economy will increase by 18%, leading to an increase in the production profitability by 3 percentage points to 51.5%, sales profitability – by 2.3 percentage points up to 39.7% and payback of expenses for core operations – by 1.5 percentage points up to 68%. All indicators were calculated taking state support into account.

Also, the acquisition of an energy-saturated tractor will lead to an increase in the level of material and technical support, such as energy capacity by 1.1%, power-to-weight ratio by 1.1% and energy supply by 1.3%.

**Table 8**

Calculation of the proposed measures' effectiveness for LLC Kolkhoz  
Nasha Rodina of the Severny District of the Novosibirsk Region

	Actual 2016	Planned 2016	Deviation	
			%	±, thousand rubles
The amount of state support, thousand rubles	7,031	7,787	110,8	756,0
Proceeds from sales of products, thousand rubles	19,866	19,866	100,0	0,0
Cost of sales, thousand rubles	-22,717	-23,712	104,4	-995,0
Sales profit, thousand rubles	-2,851	-3,846	134,9	-995,0
Costs of core production, thousand rubles	41,362	41,362	100,0	0,0
Level of production profitability, state support considered, %	18,4	16,6	-	-1,8
Level of sales profitability, state support considered, %	21,0	19,8	-	-1,2
Power capacities, hp	7,831	7,953	101,6	122,0
Power-to-weight ratio, hp/person	103	104,7	101,7	1,7
Energy supply, hp/ha of crops	1,73	1,76	101,7	0,0

Acquisition of agricultural equipment in LLC Kolkhoz Nasha Rodina will not lead to an increase in financial indicators, since in the first year it will be necessary to make an advance payment under the leasing agreement, and the provided equipment cost reimbursement does not fully compensate for the increase in production costs. However, in subsequent years, the financial situation is leveled due to the productive work of the new tractor. As a result of the equipment acquisition, the energy capacity of the farm will grow by 1.6%, power-to-weight ratio - by 1.7%, energy supply - by 1.7%. The cost recovery level for main production, taking state support into account, will increase by 1.8 percentage points.

Thus, the proposed mechanisms for reimbursement of the acquired equipment cost, delivery to the farm location and service will allow stimulating agricultural producers of the Novosibirsk Region to upgrade their machine and tractor fleet with energy-saturated machinery.

## **4.9. Demonstration sites as a tool to raise awareness among agricultural producers on the latest models of machinery and equipment**

Technical and technological reequipment of agricultural production requires raising the awareness of producers about the latest models of agricultural machinery and technologies. As foreign and Russian practice shows, one of the most effective tools for expanding cooperation between producers of agricultural machinery and its consumers is the construction of demonstration sites (Ushachev 2011). In our opinion, it is necessary to create them on the basis of agricultural machinery dealers, where demonstration sites can simultaneously concentrate the following information:

technical characteristics of machines and equipment;

cost of machinery and equipment;

existing mechanisms of state support for the technical and technological reequipment of agricultural production, as well as the conditions for obtaining it;

ways of purchasing equipment on credit or under a leasing agreement;

seminars, refresher courses and retraining of agricultural personnel (Shelkovnikov, et. al 2015).

Such firms in the Novosibirsk Region are LLC Agrotekh, LLC Agrosnabtekhservis, LLC TD MTZ-Sibir, etc.

The main purpose of demonstration sites is to provide an agricultural producer with detailed information on modern equipment and technologies and how to acquire it.

The drawback of existing demonstration sites is the lack of information about the methods of purchasing agricultural machinery and equipment. The incentive to purchase an agricultural tractor or combine harvester will be information about the mechanisms of state support for this type of equipment. A potential buyer must know whether reimbursement will be received for part of the cost, how much will be reimbursed by the state when concluding a service contract and whether the delivery of equipment to the farm will be reimbursed. The availability of this information will greatly facilitate the process of acquiring new agricultural machinery to agricultural producer.

In our opinion, the demonstration sites must meet the following requirements:

transport accessibility;

the presence of sowings of perennial grasses and arable land near the site, in order to demonstrate the field capabilities of machinery;

provision of engineering infrastructure;

the availability of regular seminars, refresher courses, reeducation of agricultural workers.

Creation of demonstration sites on the basis of agricultural machinery dealer companies will lead to a significant increase in the awareness of agricultural producers about modern models of machinery and technology; an increase in labor productivity and power-to-weight ratio in farms; creation of new high-performance jobs; technical and technological reequipment of agricultural production (Fedorenko & Khlepitko 2014).

Demonstration sites are an effective tool for stimulating agricultural producers to purchase new, high-performance machinery and equipment, and to increase the efficiency of agricultural production.

Currently, there is only one permanent demonstration site on the basis of the GK Agrosnabtekhservis in the region. It is necessary to increase their quantity by creating demonstration sites of agricultural machinery on the basis of other dealers.

The main investments in the creation of demonstration sites consist of the construction of exhibition pavilions, open sites and specialized educational audiences. Construction should be carried out in close cooperation with the Ministry of Agriculture of the Novosibirsk Region



and producers of agricultural machinery and equipment. The cost of one demonstration site, based on the Rostov-on-Don and Lipetsk exhibitions' experience, is no more than 8 million rubles.

#### 4.10. Industry development forecast till 2025

The following trends will be observed in the agricultural production of the Novosibirsk Region and its technical and technological reequipment till 2025:

The number of main types of agricultural machinery (tractors and harvesters) will continue to decline. This process is explained by the fact that there is a gradual replacement of several obsolete machines by one energy-intensive and high-performance machine in the machine and tractor fleet of agricultural producers. In connection with this, the power capacities of the machine and tractor fleet of agricultural producers will increase.

At the same time, the cost of machinery and equipment will increase and gain more and more weight in the fixed assets of the farms.

As a result of purchasing modern tractors, harvesters, balers, the tendency to reduce the number of workers employed in agricultural production will not be so catastrophic. Since one machine operator is now capable of doing work for which several people used to be needed, one machine operator is now able to operate modern machinery.

The consequence of point 3 will be the growing demand for highly qualified specialists (engineers, operators, machine operators).

As for the area of arable land and crops, this figure will not change much and will remain at the level of 2016 – 2.2 million hectares. The increase in the production of agricultural products will take place primarily through increased yields and labor productivity.

All of the above will cause a change in the following indicators of technical and technological reequipment of agricultural production (Table 9).

**Table 9**  
Forecast of key performance indicators of agricultural producers in the Novosibirsk Region until 2025

Indicator/year	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demonstration sites, units.	1	1	3	3	4	4	4	5	5
Power-to-weight ratio, hp/person	91,8	97,4	103,5	110,2	117,6	125,9	135,3	145,8	157,8
Power supply, hp/ha	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,4	1,4
Technical equipment, unit/person	0,35	0,36	0,37	0,38	0,39	0,40	0,41	0,43	0,44
Labor productivity, rubles/person	1,478	1,741	2,031	2,350	2,704	3,098	3,541	4,041	4,610
Volume of agricultural production, billion rubles	88,3	92,9	97,6	102,3	106,9	111,6	116,2	120,9	125,5
Profitability of production, state support considered, %	32,2	33,2	34,1	35,0	35,9	36,9	37,8	38,7	39,7

One of the main indicators of technical and technological reequipment of agricultural production is the power-to-weight ratio. Its growth will be 78% by 2025 in relation to 2017, and will reach 157.8 hp per worker employed in production. Two main reasons for its growth are an increase in energy capacity in connection with the acquisition of energy-saturated machinery and a gradual reduction in the number of workers employed in agricultural

production.

As mentioned above, the arable land area in the farms will remain practically at the level of 2016; therefore, the energy supply indicator will grow only by 8%.

Exceeding the rate of reduction in the number of workers engaged in agricultural production over a reduction in the number of main types of agricultural machinery will lead to a slight increase in the technical equipment rate – by 25%.

The increase in the volume of agricultural production will be ensured by a significant increase in labor productivity – a little more than 3 times by 2025 in relation to 2017.

The result of the technical and technological reequipment of the industry will be an increase in the volume of agricultural production up to 2025 in comparison with 2017 by 42% and profitability of production, taking into account state support by 7.5 percentage points.

The basis for all positive changes in the technical and technological reequipment of agricultural production is the strengthening of its state support (Table 10).

**Table 10**

Forecast of the growth of the amount of state support for agricultural production, including for the purchase, delivery and maintenance of agricultural machinery

Indicator/year	2017	2018	2019	2020	2021	2022	2023	2024	2025
State support, million rubles	3,410.6	3,541.8	3,673.0	3,804.2	3,935.3	4,066.5	4,197.7	4,328.9	4,460.1
State support for the purchase of agricultural machinery, million rubles	711.6	744.4	777.2	810.0	842.8	875.5	908.3	941.1	973.9
State support for the delivery of agricultural machinery, million rubles	8	8.3	8.6	8.7	9	9.2	9.4	9.8	9.9
State support for maintenance, million rubles	6.1	6.3	6.5	6.6	6.9	7.1	7.3	7.6	7.9

The implementation of the mechanism proposed by us for the partial reimbursement of agricultural machinery cost requires an annual increase in the amount of state support, since prices for modern machinery also increase regularly, and not every agricultural producer has the opportunity to purchase it without state participation.

## 5. Conclusion

1. State support is a reliable and effective tool for stimulating the purchasing by agricultural producers of high-tech and modern machinery and equipment for agricultural production. The result of the implementation of the mechanism for technical and technological reequipment of agricultural production developed by us will be an increase in the number of equipment purchased, an increase in energy supply and renewal of the machine and tractor fleet, an increase in labor productivity and, accordingly, employee wages. Technical and technological reequipment is a vector of development of domestic agricultural production and ensuring its competitiveness in the global market.

2. The proposed reimbursement mechanisms of the purchased equipment cost, delivery to farm location cost, and service cost will allow stimulating the agricultural producers of the Novosibirsk Region to renew their machinery and tractor fleet with energy-saturated machinery.

The usage of all mechanisms of state support suggested in the article for technical and technological reequipment of agricultural production will ensure further progressive development of agriculture in the Novosibirsk Region making it more efficient and energy-saturated.

---

## References

Dragaytsev, V.I., Tulapin, P.F., & Butenko, T.Y. (1998). *Metodika opredeleniya ekonomicheskoi effektivnosti tekhnologii i selskokhozyaistvennoi tekhniki* [Methodology for Determining the Economic Efficiency of Technology and Agricultural Machinery]. Moscow: Ministry of Agriculture of the Russian Federation. (p. 220).

Fedorenko, V.F., & Khlepitko, M.N. (2014). Analiz kachestva selskokhozyaistvennoi tekhniki [Agricultural Machinery Quality Analysis]. *Tekhnika i oborudovanie dlya sela*, 1, 2-5.

Kochetkov, I.A. (2012). *Sovershenstvovanie ekonomicheskogo mekhanizma gosudarstvennogo regulirovaniya razvitiya materialno-tekhnicheskoi bazy selskokhozyaistvennykh organizatsii (na primere Kostromskoi oblasti): Avtoreferat dissertatsii na soiskanie uchenoi stepeni kandidata ekonomicheskikh nauk* [Perfection of the Economic Mechanism of State Regulation of the Development of the Material and Technical Base of Agricultural Organizations (on the Example of Kostroma Region) (Ph.D. Thesis Abstract)]. Moscow State Agroengineering University named after V.P. Goryachkina, Moscow.

Kotov, R.M. (2010). *Sovershenstvovanie gosudarstvennoi podderzhki selskogo khozyaistva na regionalnom urovne: Avtoref. dis. kand. ekon. nauk* [Perfection of Regional Level Agriculture State support (Ph.D. Thesis Abstract)] (pp. 3-4). Kemerovo State Agricultural Institute, Novosibirsk.

Krokhta, M.G., Stadnik, A.T., & Matveev, D.M. (2012). Povyshenie effektivnosti gosudarstvennoi podderzhki tekhnicheskogo pereosnashcheniya selskogo khozyaistva [Increasing the Effectiveness of State Support for the Technical Reequipment of Agriculture]. *Vestnik NGAU*, 3(24), 132-136.

Krokhta, M.G., Stadnik, A.T., Matveev, D.M., & Colds, P.P. (2013). *Rol konsaltingovoi deyatel'nosti v tekhniko-tekhnologicheskoy pereosnashchenii selskogo khozyaistva* [The Role of Consulting Activities in the Technical and Technological Reequipment of Agriculture]. Novosibirsk: Publishing house of NSAU. (p. 200).

Petukhova, M.S. (2016). Razvitie materialno-tekhnicheskogo obespecheniya selskokhozyaistvennykh organizatsii [Development of Material and Technical Support of Agricultural Organizations]. In A.A. Kuttubaev, & T.A. Kuttubaev (Eds.), *Problemy i perspektivy razvitiya ekonomiki i prava v sovremennykh usloviyakh: sbornik nauchnykh trudov* [Problems and Prospects of Development of Economy and Law in Modern Conditions: A Collection of Scientific Papers]. Gorno-Altaysk: RIO GAGU. (p. 152).

Polukhin, A.A. (2014). *Organizatsionno-ekonomicheskii mekhanizm tekhnicheskoi modernizatsii selskogo khozyaistva: Avtoreferat dis. dokt. ekon. nauk* [Organizational and Economic Mechanism of Technical Modernization of Agriculture (Doctoral Thesis Abstract)]. All-Russian Research Institute of Agricultural Economics RAAS, Moscow. (p. 35).

Rudoy, E.V., Matveev, D.M., Sycheva, I.N., Glotko, A.V., & Shelkovnikov, S.A. (2015). 'Green Box' and Innovative Development of Agriculture in the Altai Territory of Russia. *Journal of Advanced Research in Law and Economics*, 6(3), 632-638.

Rudoy, E.V., Stadnik, A.T., Shelkovnikov, S.A., Rudoy, Y.V., Matveev, D.M., & Gabdrahmanov, M.M. (2015). Increasing Efficiency of Breeding Dairy Cattle in Agricultural Organizations of the Russian Federation. *Asian Social Science*, 24(8), 1535-1539.

Rudoy, E.V., Stasiulis, M.V., Samokhvalova, A.A., Vyshegurov, M.S., & Iakimova, L.A. (2016). Development of Agrofood Market in the Southern Part of Siberia by Means of Regional and

Food Relations. *International Journal of Applied Business and Economic Research*, 14(9), 5875-5890.

Shelkovnikov, S.A. (2010). *Formirovanie i razvitie mekhanizma gosudarstvennoi podderzhki selskokhozyaistvennogo proizvodstva v regione (teoriya, metodologiya, praktika): Diss. ... dokt. ekon. nauk* [Formation and Development of the Agricultural Production State Support Mechanism in the Region (Theory, Methodology, Practice) (Doctoral Thesis)]. Novosibirsk State Agricultural Institut, Novosibirsk. (p. 335).

Shelkovnikov, S.A., Matvienko, S.N., Vyshegurov, M.S., Fedyaev, P.M., Semina, L.A., & Petukhova, N.V. (2017). Boosting the Efficiency of Agricultural Organizations Taking Into Account the State Support (A Case Study of the Novosibirsk Region). *International Journal of Economic Research*, 14, 421-435

Shelkovnikov, S.A., Petukhova, M.S., & Kononova, N.N. (2015). Razvitie gosudarstvennoi podderzhki tekhnicheskogo perevooruzheniya selskokhozyaistvennogo proizvodstva Novosibirskoi oblasti [Development of State Support for the Technical Reequiment of Agricultural Production in the Novosibirsk Region)]. *Ekonomika i predprinimatelstvo*, 1(Part 2), 243-247.

Shelkovnikov, S.A., Stadnik, A.T., Rudoy, Y.V., Matveev, D.M., & Petukhova, M.S. (2015). Improving the Methodology of Disposition of State Support Funds for Agriculture under the WTO Rules. *Asian Social Science*, 11(14), 133-140.

Shelkovnikov, S.A., Tsoy, S.A., Samokhvalova, A.A., Petukhova, M.S., & Fedorov, M.N. (2016). Sustainable Development of a Dairy and Grocery Sub Complex in Novosibirsk Region. *International Review of Management and Marketing*, 6(4), 798-806.

Sinelnik, Y.V. (2009). Lizing kak metod gosudarstvennoi podderzhki razvitiya selskogo khozyaistva Rossii [Leasing as a Method of State Support for the Development of Agriculture in Russia]. *Obshchestvo i pravo*, 1, 135-137.

Stadnik, A.T., Stadnik, T.A., & Matveev, D.M. (2011). *Upravlenie tekhnologicheskimi protsessami v selskokhozyaistvennykh organizatsiyakh* [Management of Technological Processes in Agricultural Organizations]. Novosibirsk, EKOR-kniga. (p. 245).

Ushachev, I.G. (2011). Choosing an Innovative Way of Development of the Agroindustrial Complex Is an Objective Necessity. *Ekonomika selskogo khozyaistva Rossii*, 9, 10.

Zyabirova, V.I. (2015). *Gosudarstvennaya podderzhka tekhnicheskogo obespecheniya selskokhozyaistvennykh organizatsii: Avtoref. dis. dokt. ekon. nauk* [State Support of Technical Support of Agricultural Organizations (Doctoral Thesis Abstract)]. Penza State Agricultural Academy, Penza. (p. 33).

---

1. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160, E-mail: [natalia.konova@list.ru](mailto:natalia.konova@list.ru)

2. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160, E-mail: [belaits@list.ru](mailto:belaits@list.ru)

3. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160

4. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160

5. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160, E-mail: [vyshegurovm@bk.ru](mailto:vyshegurovm@bk.ru)

6. Novosibirsk State Agrarian University, 6300039, Russia, Novosibirsk, Dobrolyubova Str., 160, E-mail: [golikov.alexey@list.ru](mailto:golikov.alexey@list.ru)

---

Revista ESPACIOS. ISSN 0798 1015  
Vol. 39 (Number 19) Year 2018

[Index]

[In case you find any errors on this site, notify us sending an e-mail to [webmaster](mailto:webmaster)]