

PAPER • OPEN ACCESS

## Evaluating the market activity and pricing of agricultural land in the Central Black Earth economic region of the Russian Federation

To cite this article: V Nechaev *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **274** 012011

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

# Evaluating the market activity and pricing of agricultural land in the Central Black Earth economic region of the Russian Federation

V Nechaev<sup>1\*</sup>, G Barsukova<sup>2</sup> and N Saifetdinova<sup>2</sup>

<sup>1</sup> Federal Research Center of Agrarian Economy and Social Development of Rural Areas - All-Russian Research Institute of Agricultural Economics, 35, building 2 Khoroshevskoe highway, Moscow 123007 Russia

<sup>2</sup> Kuban State Agrarian University named after I. T. Trubilin, 13 Kalinina str., Krasnodar 350044 Russia

E-mail: vin981@yandex.ru

**Abstract.** For the analysis of market activity and prediction of market prices for agricultural land plots, a method based on the use of an econometric model of multiple regression is proposed. The method was tested on the example of the regions of the Central Black Earth economic region of the Central Federal District of Russia. The main parameters of the agricultural land market in the regions of the Central Black Earth economic region are determined. The research clearly demonstrates that the activity on the secondary land market of agricultural land is determined by the following factors: the structure of ownership of agricultural land, socio-demographic features, migration processes, income levels of the population, and natural and climatic features of the region. It has been established that a part of transactions on the land market implies further withdrawal of land from agricultural use. The main factors determining the price of a land plot are the size of the plot and the distance to the regional center. It was not possible to establish a statistically confirmed link between the specific market price of a land plot and soil fertility indicators, rental income and indicators characterizing the level of economic development and determining the cadastral value of agricultural land plots. It is concluded that further civilized development of the land market depends on improving the regulatory framework, stricter state control, and restricting the rights of market participants to prevent unreasonable transfer of agricultural land to other categories.

## 1. Introduction

The land market in the Russian Federation is shaped by a multitude of macro and meso-level factors. By the beginning of the two thousand years in the country, the main institutional environment of the agricultural land market was formed, which determined the pace and directions of its development. The Constitution of the Russian Federation approved the ownership of land by peasants and the moratorium on the sale of agricultural land, included land relations into the legal framework, became the main constraining condition for the development of the land market in this category. Thanks to a number of introduced legal acts, among which the main ones were the Federal Law on the State Land Cadastre and on the Turnover of Agricultural Lands, the owners of land shares made it possible to fix their rights to land plots and participate in the market turnover of agricultural lands.



At the same time, the basic principles of the law, which determined the composition of transactions with land shares and prescribed the procedure for identifying specific land plots from shared ownership, hampered the development of the land market turnover, limited the number of land transactions. With a wide range of possible transactions with land shares, their buyers and managers could only become members of common land ownership, as well as agricultural producers using land on a leasehold basis. The high transaction costs of agricultural land rights specifications associated with the acquisition of full rights to land shares did not allow their owners to participate in the market turnover and led to an inefficient redistribution of land and their retirement from legal economic turnover [4, 5, 6].

Some of the powers in establishing the rules of privatization and requirements for the procedure for the allocation of land were transferred to the jurisdiction of the subjects of the Russian Federation. In order to prevent excessive fragmentation of land and taking into account the socio-demographic and economic conditions for the development of agricultural production in the subjects, minimum sizes of land as an object of land turnover were established. In regions with fertile soils, the minimum size of land was established in the interests of large agricultural production; and in areas with high population density and high demand for land for personal use, the minimum boundaries of agricultural land were limited to a few hectares [9, 10].

The main drawback of land reform was the fact that the state during the privatization of agricultural land, creating a subject of ownership, did not endow it with an object of ownership, i.e. a specific land plot [14, 15]. Registration of such ownership shares required a lengthy and costly survey operation, cadastral registration of land, registration of property rights. In many respects because of this, in a number of regions, a whole stratum of unclaimed land shares was formed, which were transferred to municipal property, formed into lands of the redistribution fund, the purpose of which was to introduce such lands into economic circulation. However, in depressed areas, stimulating levers for increasing the demand for such land were not developed, which led to a reduction in the economic use of agricultural land.

Our previous studies [6, 7, 8] made it possible to draw the following conclusions:

- In Russia, the institute of land ownership is actively being formed. Land ownership is a complex socio-economic category which institutional environment includes a combination of economic, legal, political, psychological, and social phenomena.
- The land market is a special institution in a market economy that should have its own legal basis, infrastructure, functioning restrictions, development prospects.
- The features of the land determine the features of the land market. In the market economy, land, being an element of the natural environment and a factor of production, becomes part of the fixed capital and a real estate object, acquires the properties of a product, and participates in transactions of buying and selling, renting, donating, mortgages, etc.
- Turnover of land is growing in all sectors of the land market. The most intensively developed sector was the purchase and sale of land plots by citizens and legal entities in the private sector of the land market, the secondary land market.
- Bidding, sale, exchange, pledge, lease, and sale of lease rights to land plots characterize activity in various segments of the public and private sectors of the land market, including for agricultural purposes.
- The price of agricultural land is growing in all agrarian regions of the country.
- Land legislation forms the legal framework for the turnover of land plots, which includes transactions with land plots accompanied by a transfer of ownership, use, change in the contingent of land plot owners, as well as procedures for administrative allotment, land seizure, change of types of permitted use, limitation property restrictions and other.
- At present, the most attractive and sought-after commodities on the land market are land shares. The land market in general, especially the land share market, is a way of redistributing

land. It is important that land share transactions contribute to the concentration of land in the hands of the most efficient agricultural commodity producers.

It should be noted that there is an insufficient methodological validity of assessing the level of development of the land market, its activity in different regions of the Russian Federation, its infrastructure compliance with the requirements of today, the validity of forecasting market prices for land plots and their valuation (following the research conducted by Borozdin, S. V., Varlamov, A. A., Volkov, S. N., Kresnikova, N. I., Nikonova, G. N., Oganessian, L. O., Petrov, V. I., Sagaydak, A. E., Fedyunina, E. N., Khlystun, V. N., Shagoyda, N. I., and other authors.

The active growth of the market turnover of agricultural lands in the country, as well as the opportunity for the scientific community to monitor the domestic real estate market on an electronic resource of the Federal Service for State Registration of Cadastre and Cartography (ROSREESTR), allows one to have a large array of information on land transactions in regions of the Russian Federation. The turnover of agricultural land varies considerably in the federal districts of the Russian Federation. The level of market prices for agricultural land plots also varies considerably by regions of the federal districts of the Russian Federation by economic region.

Of particular theoretical and practical importance at the present time, in our opinion, is the identification of patterns in the formation of the predicted value of the market price of agricultural land plots. We believe that research should be carried out in the regions of the federal districts of the Russian Federation in the context of economic regions, which will make it possible to take into account the region's climatic, organizational, economic, and demographic features.

Local markets of agricultural land, formed in various subjects of the Russian Federation, have their own characteristics of demand and supply of land, patterns of ownership and peculiarities of the process of land pricing in this category, the size of land plots, due to regional government policies, social diversity, cultural, geographical, and historical factors, as well as the level of social and economic development of the region as a whole [16, 17, 18].

## **2. Research Methodology**

Our research is aimed at studying the market of land plots for agricultural purposes.

The goal of the research is the identification of patterns and the development of methods for the formation of the forecast market price for agricultural land plots.

The objectives of the study are defined:

- Identify factors affecting the activity of agricultural land turnover in the regions of the federal districts of the Russian Federation in the context of economic regions.
- Identify factors affecting the market price level for agricultural land plots by regions of the federal districts of the Russian Federation by economic region.
- To build models and identify patterns of formation of the predicted value of the market price for land plots of agricultural designation in the regions of the federal districts of the Russian Federation in the context of economic regions.

The object of the study is the activity of turnover and pricing for agricultural land. The subject of study is determined: these are factors that influence the activity of turnover and the level of market prices for agricultural land plots.

We assume that the activity of the land market and the cost of land is influenced by a combination of factors: the region's climatic, organizational, economic, and demographic features, the spatial, quantitative and qualitative characteristics of the land, proximity to transportation routes, social infrastructure, social and demographic conditions, income level of the population, investment policy in the region, etc.

The level of turnover and prices for agricultural land with permitted use for agricultural production are formed taking into account the motivational features of the demand for land of this category in the

regions, among which highlight interest in land plots as a means of agricultural production, object of transfer to other categories, use for the further development of knowledge and facilities or investment in order to obtain speculative income [2, 11].

The scientific hypothesis of the study is based on the following assumptions:

1. The market price for land plots for agricultural purposes, determined by setting the equilibrium condition, is a function of the economic state of the agricultural sector, the presence of unused land, incomes of the population, and the patterns of formation of agricultural production and food balance.
2. Patterns of formation and forecast of the value of the market price of agricultural land are possible on the basis of the use of the multiplier of revenue. As a unit of comparison, it is proposed to use the specific gross income from the land plot. The specific characteristics of land plots, which can explain the price variation, are proposed to be derived based on the recognition of the unity of theoretical assumptions underlying the methodology of the income and comparative approach to the valuation of property. For the predictive assessment of the market value of the land and determination of the degree and direction of the influence of pricing factors, it is proposed to use an econometric model of multiple regression [1, 3].

Land is the main factor of agricultural production, an important source of income for both the agricultural producer and its owner. However, until recently, cadastral accounting for the value of land resources (the basis for the formation of land rent and their market value) was carried out in the country according to methods that were not adapted to market conditions of management. The introduction of new approaches to the valuation of agricultural land valuation to the valuation activity equalized the cadastral and market value of land in this category, which provides a fair basis for determining the cost of attracting the main factor in the production process [13].

At present, the cost accounting of agricultural land plots is carried out by applying the land rent capitalization model, in which the main factors-generators of value include the specific gross income, the cost of growing agricultural crops, maintaining soil fertility, as well as the profit of the entrepreneur and the coefficient capitalization.

Formally, the valuation of agricultural land is carried out using the following formula:

$$P_{land} = \frac{GI - CC - CMSF - P_{prod}}{r}, \quad (1)$$

where  $P_{land}$  is the market price of the land plot,  $GI$  is the specific gross income,  $CC$  is the unit cost of cultivation,  $CMSF$  is the unit cost of maintaining soil fertility,  $P_{prod}$  is the entrepreneur's profit, which is an integral part of the agricultural producer's profit,  $r$  is the capitalization rate of land rent [12].

Dividing both sides of the equation by  $GI$ , we get

$$\frac{P_{land}}{GI} = \frac{LP - S_{EMSF} - K_{repr}}{r}, \quad (2)$$

where  $LP$  is the estimated level of profitability of agricultural production,  $S_{EMSF}$  is the share of expenses for maintaining soil fertility in gross income,  $K_{repr}$  is the norm of reproduction of entrepreneurial activity.

Drawing an analogy with the revenue multiplier used to determine the market value of companies, our indicator  $\frac{P_{land}}{GI}$  can be used to analyze and predict the market value of land plots.

The use of a multiplier plays an important role in understanding the variability of market value as fundamental variables change. Such an analysis is possible when considering the  $\frac{P_{land}}{GI}$  indicator as a function of its determinants:

$$\frac{P_{land}}{GI} = f(LP, Fertility, K_{repr}, r) \quad (3)$$

Building a regression dependence (3) will allow to identify patterns in the formation of the market price of agricultural land, to carry out predictive calculations of its value.

### 3. Results and Discussion

#### 3.1. Intensity of use and turnover of agricultural land in the Central Black Earth economic region of the Central Federal District.

The research methodology was tested on materials of the Central Black Earth Economic Region (CBEER) as part of the Central Federal District (CFD).

In the Central Federal District, about 25% of the value of agricultural products is produced, 19% of the arable land of the country is concentrated. In 2016, the structure of the value of agricultural products accounted for 55% in crop production and 45% in livestock products.

In general, in the Russian Federation, in the structure of agricultural lands, state and municipal ownership prevail by forms of ownership. As of January 1, 2017, the share of agricultural land of this type of ownership in the total area of this category was 67%. Although in recent years there has been a process of changing the structure of land in this category by ownership in the direction of expanding private property, the sale of state and municipal land is extremely slow. The average annual area of land plots (objects of sale and purchase by citizens and legal entities) is 15-20 times greater than the area of sale of land of this category, which is in state and municipal ownership. The continued monopoly of state and municipal ownership of agricultural land in all regions increases the demand for secondary market land, increasing their market value.

The Central Federal District includes 2 economic regions, Central Black Earth and Central, which differ in their climatic, organizational, economic, and demographic conditions.

The Central Black Earth economic region includes the Belgorod, Voronezh, Kursk, Lipetsk, and Tambov regions. The area is located within the Chernozem zone of Russia and is characterized by high fertility of arable land and developed agriculture. 40% of agricultural land and 43% of arable land are located in the Central Black Earth economic region, more than 60% of the total agricultural output of the Central Federal District is produced.

Favorable soil and climatic conditions contribute to a fairly high level of development of agricultural production. In 2016, agricultural producers of the region of all forms of management received, on average, 33 thousand rubles per hectare of agricultural land, which is almost 2 times higher than the value of this indicator in the Central Economic Region (Table 1).

In the area, there are two agricultural areas. Agricultural producers in the northern zone, including the Lipetsk, Kursk, and Tambov regions, specialize in growing crops and potatoes. In the south of the region, namely in the Belgorod and Voronezh regions, in addition to grain crops, they specialize in the production of industrial crops and are engaged in animal husbandry.

The redistribution of land during the reforms, the increase in the number of owners, owners and users of land plots did not contribute to improving the efficiency of land use: part of the land was out of circulation, and soil fertility decreased. For the period from 2003 to 2015, agricultural land in the Central Black Earth region decreased by 30.4 thousand hectares, which is 14% of the total land reduction in this category in the Central Federal District.

Arable land in the area is not intensively used by agricultural commodity producers. Thus, the share of crops in arable land is on average 83% in the regions of the district. The structure of

agricultural land in all areas of the region is similar and is characterized by the following ratios: arable land (70-80%), perennial plantings (1.2-1.8%), hayfields (15-19%), pastures (19-23%). In the region, the main producers of agricultural products are agricultural organizations, which account for more than 70% of the total value of agricultural products.

The analyzed areas of the Central Black Earth Region use 77-87% of the arable land for sowing, which is about 10% more than the average in the Central Federal District and 20% more than the average in the Central Economic Region. This shows that agricultural production is the most relevant in the areas of the Central Black Earth region. This conclusion is confirmed by indicators of a significant reduction in agricultural land from 2003 to 2015 and agricultural production per 1 hectare of agricultural land in the Central economic region.

In the Central Black Earth region has developed a fairly sustainable land use. With the active use of agricultural land in agrarian production, the land turnover in the secondary market for buying and selling is not intensive. About 55% of agricultural land is in private ownership of citizens and legal entities, this figure varies from 22% in the Belgorod Region to 79% in the Kursk Region.

**Table 1.** Intensity of agricultural land use in the economic regions of the Central Federal District.

Areas	Including							
	Central Federal District	Central Economic District	Central Black Earth economic region	Including regions				
				Belgorod	Voronezh	Kursk	Lipetsk	Tambov
Agricultural land, thousand hectares, total	33285	19881	13331	2136	4078	2438	1954	2725
Including arable land	23854	11976	10320	1647	3050	1943	1554	2126
fallow	445	392	53	–	39	1	0	13
perennial plantations	526	339	181	34	52	28	35	32
hayfields	2576	2007	567	56	159	102	84	166
pastures	5884	3668	2211	400	777	365	281	388
The proportion of crops in the area of arable land, %	64.7	47.6	86.0	87.45	83.54	85.53	86.54	77.39
Reduction of agricultural land from 2003 to 2015, thousand hectares	-258.8	-228.4	-30.4	-8.5	4.7	-2.4	-4.3	-19.9
Agricultural products in current prices, total million rubles	753 140.4	300 605.3	445 653.6	81 611.2	134 711.3	84 863.8	69 370.4	75 096.9
In % of CFD	100	39,91	59.2	10.84	17.89	11.27	9.21	9.97
on 1 hectare of agricultural land	22.63	15.1	33.4	38.2	33.03	34.81	35.5	27.56
Privately owned agricultural land,	18189	10416	7699	460	2146	1915	1365	1813

thousand hectares

Area under purchase transactions, ha	298207	231536	66670	5790	4506	5309	17906	33159
The share of the area under transactions in the total area of agricultural land in private ownership, %	1.6	2.22	0.87	1.3	0.2	0.3	1.3	1.8

The share of agricultural land under transactions in the total area of privately-owned agricultural land is lower than the average value of the same indicator and is only 0.87%.

According to the results of Table 1, it can be concluded that the agricultural land market is more active in the Central Economic Region, where sales and purchases are made on an area that occupies 2.2% of all agricultural land that is privately owned. However, given that the interest in agricultural production in the region is decreasing, this suggests that transactions on the land market provide for the further withdrawal of land from agricultural use.

The lack of confirmed rights of citizens to plots of agricultural land contributed to the appearance on the market of buyers of land shares with sufficient capital. Their goal is often to further change the targeted designation of land and the sale of land at prices much higher than the purchase price. Despite the protection of agricultural land provided for by the law against use for another purpose, the withdrawal of agricultural land from agricultural use is being actively applied by changing the category or characteristics of the settlement, establishing a different type of permitted use.

### 3.2. Assessment of the main market parameters and pricing factors for land plots for agricultural purposes by regions of the Central Black Earth Economic Region.

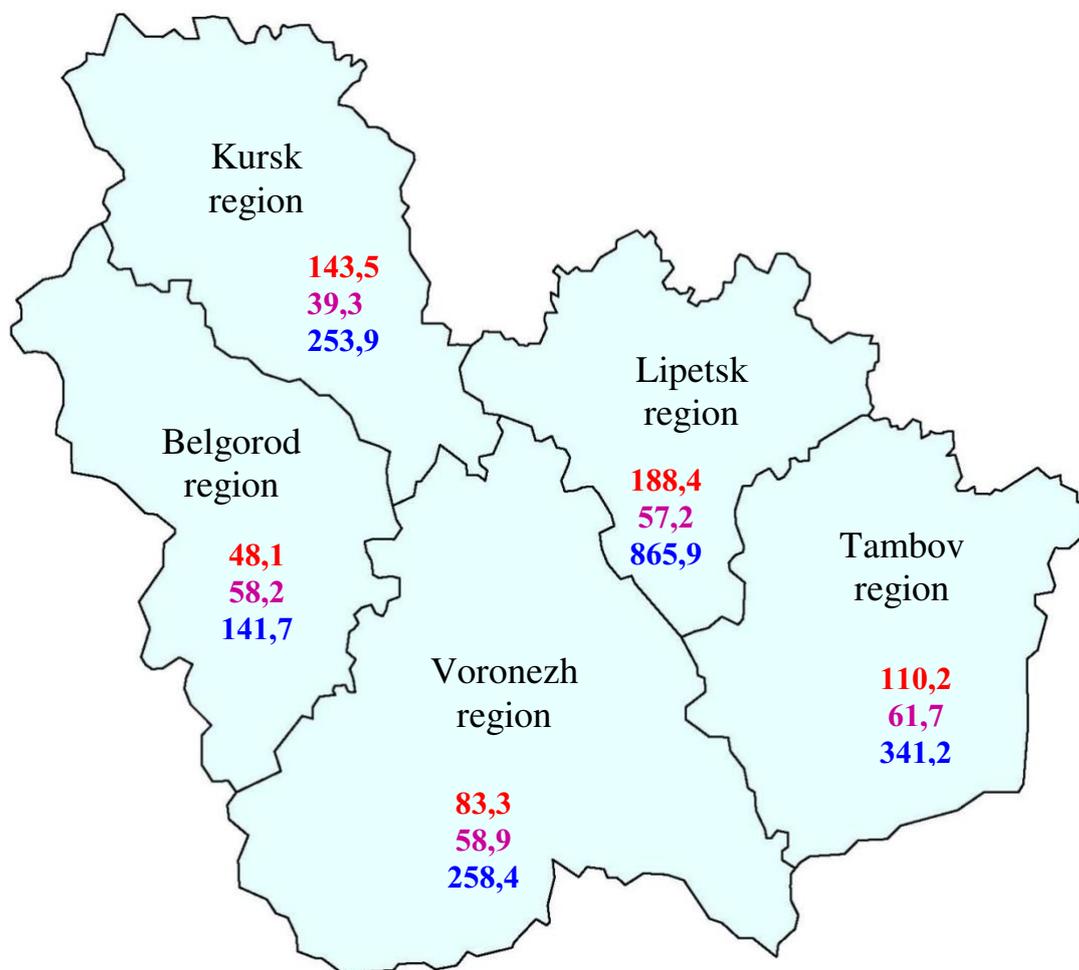
In the regions of the district, there is a gap between the level of the cadastral and market value of agricultural land for agricultural production. The market value exceeds the cadastral value by 15.1, 6.5, 5.5, 4.3, and 2.4 times in Lipetsk, Kursk, Tambov, Voronezh, and Belgorod regions, respectively. The average size of the agricultural land (the object of sale and purchase) is also variable; it varies by region from 48 hectares in the Belgorod region to 188 hectares in the Lipetsk region (Table 2 and Figure 1).

**Table 2.** The main parameters of the agricultural land market by regions of the Central Black Earth Economic Region, 2015-2016.

Region	Number of transactions	Average market price		Average cadastral price		Average land area, ha	Maximum plot size, ha
		specific, thousand rubles / ha	of an average plot, thousand rubles	specific, thousand rubles / ha	of an average plot, thousand rubles		
Belgorod	234	141.7	6820.6	58.2	2801.4	48.1	27206.0
Voronezh	108	258.4	21536.9	58.9	4905.4	83.3	816.8
Kursk	72	253.9	36437	39.3	5637.7	143.5	762.1
Lipetsk	190	865.9	163180.5	57.2	10774	188.4	1581.4

Tambov	531	341.2	37613.1	61.7	6804.6	110.2	3381.3
--------	-----	-------	---------	------	--------	-------	--------

Source: Calculated by the authors according to ROSREESTR (<https://portal.rosreestr.ru>).



**Symbols**

- 118.7 – the average size of the land plot, ha
- 58.9 – the specific cadastral value, thousand rubles for 1 ha
- 258.4 –the market value, thousand rubles for 1 ha

**Figure 1.** Indicators of purchase and sale of land plots by regions of the Central Black Earth region.

In connection with the current demand structure, we assume that the main factors determining the variation in the level of prices for agricultural land among regions are a number of socio-demographic factors and the level of incomes of the population, natural and climatic conditions (Table 3).

The demographic situation is characterized by an average annual growth rate (decline), population density. In all regions, except Belgorod, there is a decline in the entire population. The rural population is declining in all areas, with the fastest pace being observed in Kursk. The population density varies by region, the highest one is in the Belgorod and Lipetsk regions. Per capita incomes are about the same.

On the whole, there is an outflow and a natural decline in the population. However, in the regions of the Central Black Earth economic region, socio-demographic conditions differ significantly. In the Belgorod and Voronezh regions, the natural decline in population is blocked by migration growth due to domestic Russian grants from the Tambov, Rostov, Lipetsk, and Kursk regions and pensioners of

the Far North, as well as due to international migrants from the CIS countries. Intraregional migration is characterized by the growth of urban population due to rural areas. The Tambov region is among the top three regions of Russia with the highest rates of population decline.

**Table 3.** Main pricing factors (estimated) for agricultural land plots by regions of the Central Black Earth Economic Region.

Index	Areas of Central Black Earth Region				
	Belgorod	Voronezh	Kursk	Lipetsk	Tambov
Market price of land, thousand rubles / ha	141.7	258.4	263.9	865.9	341.2
The average size of land, ha	48.13	83.33	143.49	188.44	110.23
The average annual growth rate (decline) of the population for 2002-2017, %					
- total population	0,21	-0.14	-0.67	-0.35	-0.84
- urban population	0.42	0.59	0.06	-0.33	-0.47
- rural population	-0.21	-1.46	-1.99	-0.4	-1.37
Population density, people / sq. km	57.12	44.69	37.2	47.83	29.99
Per capita incomes of the population, thousand rubles	29.6	29.6	25.8	28.5	26,2
Profitability, %					
- crop production	35.5	37.6	41.1	33.5	44.5
- animal husbandry	15.3	16.2	36.6	16.8	11.9
The share of unprofitable organizations in % of the total	23.2	22.1	15.9	16.2	16.9
Produced agricultural products per capita, thousand rubles.	52.6	57.7	75.5	60.0	71.8

Calculated by the authors according to ROSREESTR <https://portal.rosreestr.ru>.

These processes explain the growth in demand and prices for land plots located near major cities, acquired for the further construction of real estate objects.

In general, in 2016, agricultural production among the regions of the Central Black Earth economic region was profitable, the level of profitability of the crop industry in agricultural organizations ranged from 35 to 45%, and the profitability of livestock production was from 12 to 37%. The share of unprofitable organizations from the total number in the Belgorod and Voronezh regions was slightly higher than in the other three regions of the economic region and accounted for 22-23% in 2016 [19].

An analysis of the structure of purchase and sale transactions for this category of land for agricultural production in the Central Black Earth economic region showed that about 72-86% of all land in circulation is traded with land plots over 150 ha in size (Table 4-5).

**Table 4.** The dependence of the activity of the land market and prices on the size of the land in the Lipetsk, Tambov, and Kursk regions, 2015-2016.

Region	Index	Group of land in circulation with an area					Total and average
		up to 25 ha	from 25.1 to 50 ha	from 50.1 to 100 ha	from 100.1 to 150 hectares	from 150 hectares	

Lipetsk	Specific price, thousand rubles / ha	8340	4250	2200	2300	490	860
	Average plot size, ha	7,5	38	71	126	432	188
	Number of transactions, units	61	19	18	21	71	190
	The share of the plot area of the group in the total area of land in circulation, %	1,3	2	3,6	7,4	85,7	100
Tambov	Specific price, thousand rubles / ha	5749	972	339	118	73	341
	Average plot size, ha	8,73	35,2	70,3	121,8	475,9	110,3
	Number of transactions, units	223	98	93	40	91	545
	The share of the area of plots of the group in the total area of land in circulation, %	3,2	5,7	10,9	8,1	72	100
Kursk	Specific price, thousand rubles / ha	3849	170	580	597	42	250
	Average plot size, ha	4,9	39,1	77,6	121,5	585,3	143
	Number of transactions, units	32	9	9	10	14	74
	The share of the plot area of the group in the total area of land in circulation, %	1,5	3,3	6,6	11,4	77,2	100

Source: Calculated by the authors according to ROSREESTR (<https://portal.rosreestr.ru>).

The following situation has been established: the most expensive at the price in the Lipetsk, Tambov, and Kursk regions are small land plots with an area of up to 25 hectares. The specific price for such plots in the studied areas is 17- 92 times higher than on land plots of over 150 hectares. These transactions significantly prevail in quantity in all areas, except Lipetsk, but occupy no more than 3.5% of the total area of transactions. It can be assumed that they are located near regional centers and, probably, their high price is due to the high demand for such plots from urban residents for the purpose of prospective use not for agricultural production. The high specific price for agricultural land in the Lipetsk region is due, in our opinion, to the presence in the region of scenic natural sites on the banks of rivers and near forests, as well as proximity to Moscow.

A similar situation is observed in the Voronezh and Belgorod regions, where the number of transactions with land plots of less than 5 hectares prevails there (Table 5).

**Table 5.** The dependence of the land market activity and price on the size of the land plot in the Voronezh and Belgorod regions, 2015-2016.

Region	Size of land	Group of land in circulation with the size of the area					Total and average
		up to 5 ha	from 5.1 to 30 hectares	from 30.1 to 55 hectares	from 55.1 to 80 hectares	from 80 hectares	
Voronezh	Specific price, thousand rubles / ha	2800	2110	67	180	160	2584
	Average plot size, ha	1.5	17.2	42.3	67	220.13	83.3
	Number of transactions, units	23	24	18	11	32	108
	The share of the area of plots of the group in the total area of land in circulation, %	0.4	4.6	8.4	8.3	78.3	100

	Specific price, thousand rubles / ha	2106	2281.9	27	440
	Average plot size, ha	0.41	15.83	356	48.13
Belgorod	Number of transactions, units	172	32	30	234
	The share of the plot area of the group in the total area of land in circulation, %	0.6	4.5	94.9	100

Source: Calculated by the authors according to ROSREESTR (<https://portal.rosreestr.ru>).

In these areas, such transactions were made on an area of less than 1% of all agricultural land in circulation on the secondary land market. The specific price of such plots significantly exceeds the prices of larger plots.

Analysis presented in Tables 5-6 allows us to conclude that the average size of the land significantly affects the formation of market prices. With the increase in the average size of the site, there is a pronounced tendency of market price decrease.

### 3.3. Models of market price formation.

We have compared the indicators of the average unit price and the average cadastral value of land plots by regions, depending on their geographical location (Table 6).

The methodology of the last round of the state cadastral valuation of agricultural land (2010) suggests using the approach of the cadastral value to the market value. To some extent, this can be seen in the example of the Voronezh, Kursk, Tambov regions, but only in relation to the sites remote from the regional center used for agricultural production. If a region is closer to the center, then the greater the difference between the market and cadastral value of land plots is. The market value of the land plots located near Tambov and Lipetsk is 19 times higher than their cadastral value. The discrepancy between these types of cost of land near Voronezh, Kursk is 12.5 and 15.3 times, respectively.

The size of the land plots involved in the turnover on the sale and purchase market and located in the districts closest to the regional centers is reduced relative to the regional average.

Based on the correlation-regression analysis, it was found that the main factors of pricing for agricultural land in the Central Black Earth Region are the size of the land plot and the proximity of its location to the regional center.

The obtained equations of market price formation in each analyzed part of the Kursk region are characterized by low coefficients of determination, as well as a statistically significant effect of the size of the land plot on the resultant mark. With an increase of 1% in the size of the land in the selected geographical parts of the region, the market value increases by an average of 0.4%.

In areas located near Voronezh, the variation in the level of the specific market price for land plots is substantially determined by the size of the land plot. According to our calculations, the coefficient of price elasticity in terms of the size of the plot was 0.75%. On average, in selected geographic areas of the Voronezh Region, the lowest price for land is observed in the southern regions of the region. The size of the land plot explains only 7% of the total variation in the level of the specific market price of land for agricultural production in these areas.

In the Tambov region, the size of a land plot explains from 11% of the variation of the specific market price for a land plot of the considered category of destination in the eastern and northeastern regions and to 60% in the central, northern and northwestern regions of the region. The greatest elasticity of price change from the variation in the size of the land plot is characterized by the land market in the central part of the Tambov region. This indicator, calculated according to the sale and purchase data of 165 plots for agricultural production in the center of the region, was 1.2%. The increase in remoteness of land from the regional center in the south by 1% leads to a decrease of 1.2% of the transaction price for the sale of land for agricultural production.

In general, in the Lipetsk region, the average level of the specific price of land for agricultural production is higher than the average for the rest of the Central Black Earth Region. In the region, the average price of land in different geographical parts of the region has been established at approximately the same level. The size of the land plot in the selected geographic parts explains from 10% in the central part to 45% in the northern part of the region of variation of the resultant trait. And in the central and southern regions of the region with an increase in the distance of the plot from Lipetsk by 1%, the specific price of a land plot decreases on average by 0.4 and 1.1%, respectively. The variation in the analyzed indicator according to these regions explains 7–9% of the total variation of the specific market price.

In areas located near Belgorod, the price level for agricultural land plots is 39 times higher than the average for the Belgorod region. The average size of the land in this part of the region is 1.5 hectares. In other selected geographic areas of the region, the average prevailing market price level for agricultural land is lower than the cadastral value established on them. In all the analyzed areas with an increase in the size of the land plot, the market price decreases significantly.

**Table 6.** Models of formation of the specific market price for agricultural land in various geographical areas of the Central Black Earth economic region, 2015-2016.

Geographical area	Average unit price, thousand rubles / ha	Average plot area, ha	Average cadastral value, thousand rubles. / ha	The equation	R <sup>2</sup> / F-criterion	Number of transactions	Indicators of the degree of influence of individual factors	
							$\beta$ value - coefficients	Partial determination coefficients
Belgorod north	27.78	25.5	70.1	$\Pi = e^{1.15} \times S^{-0.768}$	0.901/283.25	33	$\beta_1 = -0.949$	X
Southwest	5679	1.50	59.1	$\Pi = e^{9.02} \times S^{-0.396}$	0.303/57.7	135	$\beta_1 = -0.550$	X
South, East	39.9	178.7	55.6	$\Pi = e^{12.58} \times S^{-0.798}$	0.661/122.9	65	$\beta_1 = -0.813$	X
Voronezh north, northwest, west	895.0	44.66	72.0	$\Pi = e^{1.15} \times S^{-0.741}$	0.32/15.76	35	$\beta_1 = -0.569$	X
Centre	146.0	135.43	62.0	$\Pi = e^{-25.25} \times L^{5.41}$	0.47/31.95	38	$\beta_1 = 0.686$	X
south, southwest, southeast	76.0	65.44	43.3	$\Pi = e^{5.91} \times S^{-0.374}$	0.07/12.32	35	$\beta_1 = -0.258$	X
Kursk north, northwest and west	43.2	2297.3	4.01	$\Pi = e^{5.48} \times S^{-0.37}$	0.167/5.22	28	$\beta_1 = -0.409$	X
center, south, southeast, southwest	579.0	92.54	3.77	$\Pi = e^{7.95} \times S^{-0.43}$	0.148/7.27	44	$\beta_1 = -0.384$	X
Lipetsk north	840.0	227.05	58.2	$\Pi = 1402265,03 \times S^{-0.722}$	0.45/68.2	90	$\beta_1 = -0.661$	X
Centre	1040.0	134.73	54.9	$\Pi = 5584 \times S^{-0.28} \times L_{LIPETSK}^{-0.381}$	0.15/4.9	60	$\beta_1 = -0.31$ $\beta_2 = -0.30$	$R_{part1}^2 = 0.10R_{part2}^2 = 0.09$
Southwest	730.0	148.07	56.7	$\Pi = 247410,88 \times S^{-0.895} \times L_{LIPETSK}^{-1.106}$	0.40/12.5	40	$\beta_1 = -0.63$ $\beta_2 = -0.22$	$R_{part1}^2 = 0.40R_{part2}^2 = 0.07$
Tambov north, northwest	74	169.85	61.8	$\Pi = e^{2.01} \times S^{-0.785} \times KC^{6.04}$	0.63/147.09	170	$\beta_1 = -0.77$ $\beta_2 = 0.07$ ,	$R_{part1}^2 = 0.585R_{part2}^2 = 0.02$
Centre	1230.0	84.86	64.1	$\Pi = e^{19.78} \times S^{-1.193}$	0.6/928.5	165	$\beta_1 = -0.777$	X

South, southeast, southwest	45.2	62.26	62.0	$\Pi = e^{16.22} \times S^{-0.71} \times L^{-1.173}$	0.4/58.1	172	$\beta_1 = -0.583,$ $\beta_2 = -0.230,$	$R^2_{part1} = 0.364R^2_{part2}$ $= 0.07$
East and northeast	170.0	156.11	61.0	$\Pi = e^{-18.75} \times S^{-0.36} \times L^{5.46}$	0.33/5.33	24	$\beta_1 = -0.283, \beta_2 = 0.536,$	$R^2_{part1} = 0.11R^2_{part2}$ $= 0.23$

Source: Calculated by the authors according to ROSREESTR (<https://portal.rosreestr.ru>).

#### 4. Conclusion

The conducted research allows to draw the following conclusions:

1. The method of analyzing the value of the market price of agricultural land based on the use of an econometric model of multiple regression is proposed, focusing on the soil fertility, the estimated level of profitability of agricultural production, the share of the cost of maintaining soil fertility in gross income, the rate of reproduction of entrepreneurial activity, and other indicators. The proposed method can be used in analyzing market activity in various segments of the agricultural land market, forecasting market prices for agricultural land by regions of the federal districts of the Russian Federation, depending on the characteristics of economic regions.
2. The Central Black Earth region is characterized by high fertility of arable land and developed intensive agricultural production. Producers of the region provide 60% of the total agricultural production in the Central Federal District, and for 1 hectare of agricultural land they receive 30 thousand rubles of products, which is twice as high as the CER. The CFR has developed a fairly sustainable land use. With a high level of use of arable land, land turnover in the secondary market for buying and selling is not intensive. The share of the area under transactions in the total area of privately-owned agricultural land is lower than the average value of the same indicator. More than 80% of the area under transactions is formed by land plots of more than 100 hectares in size.
3. Land markets in the regions of the Central Chernozem Region have their own characteristics of the structure of ownership of agricultural land, demand, supply, size of plots of this category of destination, etc. It is established that differences in prices for agricultural land between regions, to a greater extent, are due to differences in socio-demographic factors and income levels of the population. The average regional level of prices for land plots for agricultural production is shaped by the effects of pricing on land plots located near regional centers and the number of sale and purchase transactions with such plots for the purposes of their further use for residential construction. A group of factors characterizing the level of economic development of agricultural production (the profitability of sub-sectors, the level of agricultural production per capita) do not have a significant impact on the variation of the specific market value of land plots.
4. The demand for agricultural land can be divided into three motivating components: the acquisition of land in this category for agricultural production; the purchase of land in this category with a further change in the purpose of these lands and the use above all for the construction of real estate; the purchase of land in this category for resale and speculative income. For the implementation of agricultural production, land plots are acquired by agricultural organizations, farms, agro-holding structures of the agro-industrial complex, which have financial opportunities to expand production, including by buying up land shares of citizens. The growth of the welfare of the population in a number of areas of the district located near regional centers contributes to the emergence of effective demand for suburban real estate among the local population. And the remaining unstable profitability, as well as the high capital intensity of agricultural production contributes to the redistribution of agricultural land between different categories of land users. So, the lands of this category are bought for the purpose of their further transfer to the lands of other categories and the construction of various real estate objects on them. Such processes are actively taking place in the territories adjacent to large cities and in picturesque landscapes near water bodies.
5. Rush demand for residential real estate near major cities stimulates large businesses to acquire agricultural land and form a land fund for the further construction of residential real estate. The high prices for such objects, the significant difference between the market price for land for agricultural production and residential construction allow the construction business to bear high transaction costs of making land plots for proper use and contribute to the processes of

further deformation of the price mechanism in the land market. Some of the land was used in agricultural production outside of any accounting and legal registration of the transaction, since it remained difficult to identify the exact boundaries of the plots, high transaction costs of registration of land plots and the lack of financial resources from agricultural producers.

6. The average price level for agricultural land plots with a size of more than 150 hectares in the regions of the Central Black Earth Region was at the level of the average cadastral value of these land plots. This indicates that the use of the new methodology for assessing the cadastral value of agricultural land, which includes elements of the market valuation methods for land, equalizes these two types of value of the objects under assessment. At the same time, indicators of changes in the market value of a land plot are not related by correlation with changes in the cadastral value of a plot. We also failed to establish a statistically confirmed link between the specific market price of a land plot and soil fertility indicators, rental income, and other indicators determining the cadastral value of agricultural land plots according to the old and new methods of its definition. It has been established that the main factors determining the price of a land plot are its size and location relative to the regional center. The revealed patterns confirm the assumption about various factors and peculiarities of pricing for agricultural land plots on sales transactions on the secondary land market with their different future use.
7. At the present stage, state regulation of the land market is necessary, primarily in the area of improving legislation, the specifics of land requires a stricter state control and restrictions on the rights of market participants to prevent unreasonable transfer of agricultural land to other categories. The need for state regulation is due to the uniqueness of the product that is offered to the market, the presence of state and non-state ownership in the economy, and a multi-structured economy.
8. The development of the land market becomes the fundamental need of a market economy. The civilized development of the land market depends on the improvement of the regulatory framework, the degree of substantiation of management decisions, the effectiveness of state regulation, the improvement of economic methods of land management, and the development of market infrastructure.

## 5. References

- [1] Fois M, Fenu G and Bacchetta G 2018 Estimating land market values from real estate offers: A replicable method in support of biodiversity conservation strategies *Ambio* pp 1-11
- [2] Mertens K and Vranken L 2018 Investing in land to change your risk exposure? Land transactions and inequality in a landslide prone region *World Development* **110** pp 437-452
- [3] Sugiyantoro C B and Arianto R 2018 The Study of Attachment between Distribution Pattern of Land Price and Apartments Price (Case Study: Vertical Housing Development in Administration City of South Jakarta) *IOP Conference Series: Earth and Environmental Science* **152**(1)
- [4] Anokhin E I 2012 The State and Trends in the Development of the Agricultural Land Market *BUKEP Bulletin* **3** pp 346-351
- [5] Anoshina Yu 2011 The Development of the System of Economic Relations on the Land Market in the Modern Russian Economy *RISC: Resources, Information, Supply, Competition* **3** pp 162-167.
- [6] Barsukova G N, Nechaev V I and Yurchenko, K A 2012 Transaction costs in the registration of property rights to land. *AIC: Economics, Management* **07** pp 30-36
- [7] Barsukova G N 2012 Features of the Earth as a Natural Object and Object of Land Relations *Proceedings of the KubSAU* **3**(36) pp 25-33.
- [8] Barsukova G N 2016 Theoretical Aspects of the Land Market Formation *Polytematic Network Electronic Scientific Journal KubGAU* **115**(01) pp 389-399

- (<http://ej.kubagro.ru/2016/01/pdf/72.pdf>)
- [9] Golovina I 2012 Analysis of the agricultural land market in the Russian Federation. Agricultural land market of the Orel region *RISC: Resources, Information, Supply, Competition* **21** pp 37-42
- [10] Gulyaeva T I and Sidorenko O V 2017 On the issue of land use in the Orel region *Bulletin of Agrarian Science* **6**(69) pp 93-100
- [11] Dolganova M V 2015 Ecological and economic efficiency of land use in agriculture of the Bryansk region in the new socio-economic conditions *Scientific and Technical Bulletin of Bryansk State University* **1** pp 65-69
- [12] Ministry of Economic Development of the Russian Federation 2010 Guidelines for the state cadastral valuation of agricultural land (approved by order of the Ministry of Economic Development of the Russian Federation of September 20, 2010 N 445) ([http://www.consultant.ru/document/cons\\_doc\\_LAW\\_105109/](http://www.consultant.ru/document/cons_doc_LAW_105109/))
- [13] Nikonova G N 2016 *Study of problems of regulation of land relations in the agrarian sector, Methodological support for conducting scientific research on the economic problems of the development of the agro-industrial complex of Russia: monograph* (Moscow, Russia: Personnel reserve fund) p 544
- [14] Oganessian L O and Fedyunina E N 2014 Conceptual approaches the study of functioning agricultural land market *News of VolgSTU* **17**(144) pp 100-106
- [15] Oganessian L O and Fedyunina E N 2014 Forming the institutional environment for the functioning of the agricultural land market *News of the Nizhnevolzhsky Agrouniversity Complex* **4**(36) pp 1-5
- [16] Sagaidak A E and Divakova E V 2009 Formation of the Agricultural Land Market at the Regional Level *AIC: Economics, Management* **1** pp 74-78
- [17] Suchkov A I and Repotetskaya M Yu 2015 Analysis and Trends in the Development of the Market for Agricultural Land Plots (on the Example of the Novosibirsk Region) *Economics, Organization and Management of Organizations, Branches, and Complexes* **7**(129) pp 99-104
- [18] Shagaida N I 2008 The State of the Agricultural Land Market in Russia as a Factor in the Sustainable Development of Rural Territories *Nikonovskiye Chteniya* **13** pp 618-621
- [19] Semenova E I, Livshits I L and Medvedeva E V 2012 *Evaluation of land use efficiency* Moscow
- [20] Glonti V, Zhiyenbayev M, Manvelidze R 2018 The method of estimating the regional budgetary process *MATEC Web of Conferences* **212** 08029