Features of using the land resources in the agricultural sector of the Russian Federation

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Abstract. The article presents the results of a systematic analysis of land use in the world and the Russian Federation, which has a significant potential for agricultural land. The authors analyze such issues as the land reform and formation of a mixed agricultural sector; the use of farmland and arable land assigned to users; soil fertility depletion; a sharp reduction in the use of mineral and organic fertilizers; underestimation of the role of crop rotations.

1. Introduction

Today, more than 200 countries of the world are trying to overcome and get out of the economic, financial, food, and other crises. Most underdeveloped and developing countries are concerned about food shortages. The problem of providing the population with food in the world has not been solved yet. Over 50 years, from 1950 to 2000, the population of the planet grew from 2.5 billion to 6.2 billion people. The planet population reached 7.6 billion people in June 2018. According to UN experts, the planet population on average is increasing by one and a half times. Thus, it will reach 9.1 billion people by 2050. According to the UN, the number of hungry people on the planet reaches 2 billion people or every third inhabitant of the world is undernourished [1].

According to the FAO, with the growth of the world’s population, global food demand will double by 2050. For this, grain yields in developing countries need to be raised by 40\%, irrigation water consumption needs to be raised by 50\%, to 200 million hectares of additional land, which not only is not present on the planet, but a permanent reduction of arable land per capita is underway, should be involved in the economic turnover. At the same time, due to the lack of resources for intensive agricultural production, 20\% of arable land and 10\% of pasture land in the world is undergoing degradation. The degree of plowing up of territories with limit values of 40\% reached 75\% in China, 70\% in India, and more than 55\% in the Russian Federation [2].

Meanwhile, according to the FAO, the humans receive 95-97\% of food through agricultural production using soil resources and no more than 5\% comes from the World Ocean and aquaculture. Therefore, the effective use of land resources is a determining factor for sustainable agricultural production.

The economic development of most countries in the world continues to be carried out mainly by reducing natural resources.
The pollution of water, atmosphere, and soil has become threatening. The natural soil erosion is magnified by human activity. It has been established that about 75 billion tons of soil is removed from land as a result of wind and water erosion each year. In Europe, 46% of the soil is subject to erosion. Dust storms take out up to 20-40 tons of soil per hectare, while the natural recovery is 20-40 times lower. In Europe, the rate of soil erosion is 17 times higher than the rate of its formation, and it is not more than 17 t / ha per year in recent years.

In 2007-2009, in the world, 6-7 million hectares of land fell out of agricultural use as a result of erosion, and another 1.5 million hectares of land fell due to waterlogging, salinization and leaching annually [2].

For Europe, acidification is the most common type of soil pollution, especially in Ukraine (about 11 million hectares) and in Poland (about 10 million hectares). The deposition of nitrogen oxides and sulfur leads to a decrease in soil pH. In Central Europe, the deposition of nitrogen oxides exceeds 50 kg / ha per year, while in Central Europe and China, the deposition of sulfur oxides exceeds 10-100 kg / ha per year.

In Europe, more than 3 million hectares of land are saline. Salinization can be caused by overexploitation of groundwater in coastal areas, contributing to the infiltration of seawater, the use of saline water for irrigation. In most cases, salinization slows plant growth, reduces biodiversity, leads to desertification.

For Russia, in addition to erosion, salinization, waterlogging, deflation, desertification, waterlogging, overgrowing of fields by scrublands and shrubs and other processes leading to the loss of fertility of agricultural land and the withdrawal of arable land from agricultural circulation are characteristic. The main reasons for this are both climate change and economic activity.

According to the state report on the state of the environment in 2007, 80% of agricultural land (mainly erosion) is subject to degradation in Russia. Salinization covers up to 20% of land, 12.3% of the area falls on waterlogging, 17.8% is due to water and 8.4% on wind erosion. The most important consequence of erosion is the reduction of organic matter in the soil and the productivity of ecosystems, the reduction of biodiversity in the plant - soil microorganisms’ system. It is established that over the past 100 years, the content of humus in the soil has decreased by 30% in Russia. For the period from 1979 to 2000, the area of degraded soils increased 1.6 times [3].

Thus, the humanity will have to tackle the food problem in the conditions of a growing shortage of land and water resources, global climate change, the need to preserve natural landscapes, and maintain biodiversity.

2. Land Resources: Russia in Focus

The Russian Federation has the necessary potential for the development of the agro-industrial complex, which includes extensive territories with fertile soils, rich reserves of fresh water, and territorial proximity to the largest consumption centers. At the end of the last century, 9% of the world's productive arable land, 52% of the world's black soil, 20% of the world's freshwater reserves and 8.5% of the production of mineral fertilizers accounted for Russia [4].

Russia had a significant potential for agricultural land, ranking fourth in the world in terms of its reserves (124 million hectares of arable land) after the United States (176 million hectares), India (162 million hectares), and China (143 million hectares). And it is also ranked 4th in the presence of arable land per resident (0.86 ha), after Australia (2.40 ha), Canada (1.46 ha) and Argentina (0.89 ha) [4].

As of January 1, 2013, the land area of the Russian Federation amounted to 1,709.8 million hectares. In the structure of the land fund of Russia, forest land (1121.9 million hectares or 65.6%) and agricultural land (386.1 million hectares or 22.6%) occupy the main share. The area of agricultural land in all categories of land amounted to 220.2 million hectares, which corresponds to 12.9% of the land fund of Russia. This means that only one-eighth of the entire land fund of the country is suitable for farming.

In the structure of agricultural land, the share of arable land was 55.2% of its total area, and this was one of the best indicators in the world. A high proportion of forest land provides a favorable
economic environment not only in our country, but throughout the world. At the same time, the existing structure assumes a careful attitude to the existing fund of agricultural land.

Over the years of land reform, a steady trend of reducing the area of agricultural land has developed, including arable land (Table 1) [5], [6].

Table 1. Availability and use of land resources of the Russian Federation, thousand hectares (according to the results of the All-Russian Agricultural Census 2006 and 2016).

| On June 1, 2006 | On June 1, 2016 |
|----------------|-----------------|
| Total land area | 450,599.5       | 348,362.8 |
| of the total area: agricultural land | 165,985.1 | 142,659.7 |
| including: arable land | 102,140.0 | 94,641.1 |
| hayfields | 13,930.2 | 10,309.5 |
| pastures | 35,200.5 | 26,539.4 |
| fallow lands | 13,936.1 | 10,519.2 |

Of the total agricultural land, the following amount is actually used

125,480.3 125,031.4

Over the 10 years that have passed between the agricultural censuses of 2006 and 2016, the total land area has decreased by 22.7%, agricultural land – by 14.1%, and arable land – by 9.8%. In fact, the used area of farmland increased from 27.8% in 2006 to 35.9% in 2016.

In Russia, a total of 255 million hectares have moved to other categories from agricultural land since 2008. The area under crops was reduced from 118.4 million hectares in 1986-1990 to 77.7 million hectares in 2011–2015, or by 34.4% due to alienation and transition to other categories, including the category of waste land, also not used by the state in agricultural production (Fig. 1).

Fig. 1. Dynamics of average annual indicators of sown area of vegetable crops in farms of all categories, thousand hectares (according to Rosstat).

According to A. V. Petrikov (All-Russian Agricultural Census, 2016), as of July 1, 2016, among personal subsidiary and individual farms of citizens in rural settlements, the number of abandoned land plots and with empty houses in 17 regions ranged from 20.2% (Tula region) to 43% (Sakhalin region), in the Kamchatka region – 20.5 %%, in the Komi and Altai Republics – 20.1% of the total number of farms. Abandoned land plots of citizens and abandoned land, turned off from circulation, including fertile and floodplain vegetable-suitable land plots, are overgrown with shrubs, they are being swamped. In the Far East and Siberia, part of the unused agricultural land is already overgrown with forest.

Throughout the entire period of reforms, the overgrowing of agricultural land by forest has been observed, which is due to their lack of demand. In some regions, the voluntary refusal of the agricultural organizations and peasant farms from the lands given to them earlier due to the lack of their own resources and the lack of state support measures by the regional authorities is recorded annually. Lands of this category are often allotted for the construction of new and expansion of the
territory of existing enterprises of industry, communications and transport. Large areas that belong to the peasant farms are used for unauthorized landfills. This situation testifies to the irrational use of land due to the inaction of regional authorities.

Measures to engage unused land into circulation are ongoing, but their rates remain low.

In Russia, about 30 million hectares of arable land remains unused. According to expert assessments of the specialists of the Ministry of Agriculture of the Russian Federation, about 12 million hectares of arable land can actually be put into circulation, while the rest of arable land not used in the pre-reform period has been overgrown with forest. Therefore, it is constantly drawn up and transferred to the forest fund.

The reclamation construction and restoration of soil fertility is extremely slow. The irrigated agricultural land decreased from 2375.1 thousand hectares in 2006 to 1816.5 thousand hectares in 2016 or by 23.5%. 55.2% of agricultural land from the total area was actually irrigated in 2016 (Table 2).

Table 2. The presence and use of reclaimed land of the Russian Federation, thousand hectares (according to the results of the All-Russian Agricultural Census 2006 and 2016).

|                         | On June 1, 2006 | On June 1, 2016 |
|-------------------------|-----------------|-----------------|
| Irrigated farmland       | 2375.1          | 1816.5          |
| actually irrigated lands | 939.2           | 1003.0          |
| Drained farmland         | 2405.0          | 1072.6          |
| land with actually       | 1100.4          | 667.7           |

In 2012, in the country, 489.7 thousand hectares were at the stage of land reclamation and soil fertility restoration, if necessary 1.5-2.0 million hectares per year. Large areas of land are irrigated in the Krasnodar, Stavropol, Rostov, Astrakhan and Volgograd regions. At the same time, the ameliorative condition of most of the lands of these regions is characterized as good.

Thus, the ongoing land reforms are not yet conducive to the full and effective use of existing land potential.

During the years of the Russian Empire and the Russian Federation, several land reforms were carried out [7], [8]. In the early 90s, in Russia, another attempt at a fair distribution of land was made. The economic reform in the agricultural sector of Russia began with land reform. The main task of the agrarian reform in Russia carried out since 1991 was the privatization of land and the reorganization of collective and state farms with the aim of creating effective agricultural production based on private ownership of land and personal enterprise of agricultural producers.

The adopted legal acts were aimed at changing the state land ownership to private. In the pre-reform period, the main forms of management in the agrarian sector of the country were collective and state farms, the number of which was just over 25 thousand. During the reforms, 11.9 million Russian peasants received conditional land shares (10-15 hectares per person). Collective and state farms were reorganized into various organizational and legal forms of private property: 5,400 joint-stock companies, 6,700 limited liability companies, 116,000 agricultural cooperatives, 3,200 state unitary and municipal enterprises were created out of 25.8 thousand collective and state farms (1990).

The main goal of land transformations in the Russian Federation was to ensure the rational use and protection of land as the most important natural resource, the creation of legal, economic, organizational and technological and other conditions for the reproduction and improvement of soil fertility, the preservation of rural, forest, and other lands, improvement of the natural environment, development of rural and urban settlements. Restrictions on developing personal subsidiary farms (PSF) were removed. Farm sector began to be created. In 2006, as a result of transformations, a mixed agrarian sector was formed, consisting of agricultural organizations, peasant farms and individual entrepreneurs, personal subsidiary farms.

The distribution of land and material means of production into private property due to contradictions and non-conceptual agrarian land policy of the state did not lead to an increase in business activities of millions of new owners, the flow of capital into agriculture. All these factors led to
the fact that the destructive tendencies in the agrarian sphere are clearly ahead of the creative processes.

According to the 2006 Agricultural Census, 58,901 agricultural organizations were in the agricultural sector, including 27,781 large and medium-sized enterprises, 253,236 peasant farms and 31,789 of individual entrepreneurs. Only 67.6% of agricultural farms carried out agricultural activities, including 69.5% of large and medium, 49.3% of peasant farms and 66.0% of individual entrepreneurs.

In 2001-2005, the most active cessation of the activities of peasant farms and individual entrepreneurs was registered. The reform of state and collective farms led to a sharp decline in production. The main reason was the division of the material and technical base into property shares of the owners, which eventually led to a resource and production crisis. At the same time, small enterprises did not receive the equipment necessary for processing the received land plots, as well as the production facilities necessary for carrying out production activities. The absence in small enterprises of the necessary equipment, high-quality seeds, qualified specialists (agronomists, engineers, machine operators, etc.), necessary services and departments capable of maintaining the existing technological and technical level of production led to the need for the following actions: either refuse to use the land, or lease their land resources to large highly integrated holding companies and agrofirms, or join rapidly developing farms. On the basis of medium and small enterprises, with the participation of investors, large agricultural holdings were created, which had financial and technical capabilities to involve unused land resources into circulation [9].

According to the results of the agricultural census of 2016, for the period from 2006 to 2016, the number of agricultural farms decreased by 22.8 thousand (38%), the number of farms decreased to 136.6 thousand (53.5%), personal farms remained around 16.2 million (i.e. their number decreased by 20%), private households remained at a figure of 3.2 million, or three times less than in 2006.

In 1991, the transfer of land ownership rights to new owners in the amount of 213.8 million hectares was carried out, including 209.8 million hectares of agricultural farms and 4 million hectares of peasant farms and personal subsidiary farms. After 15 years, due to the withdrawal of land from agricultural land, the area of agricultural land in the agricultural farms decreased by 36% (to 133.6 million hectares), and it increased in farms to 24.5 million hectares (6 times). The weakening of state control over the level of land use, the reduction of state support to a minimum, the provision of excessive autonomy to landowners when using agricultural land led to the fact that some of the land was not used by new landowners. According to the 2006 agricultural census, the area of agricultural land used was reduced to 96.5 million hectares (by 27.7%), 23% of agricultural land was not used by large and medium-sized farms, as well as it was not used in by small enterprises (47.5%), subsidiary farms (38%), and by farms (19.3%) already by 2006.

**Table 3.** The area of land assigned to different users, thousand hectares (according to the results of the All-Russian Agricultural Census 2006 and 2016).

| Total land area | Agricultural organizations | Peasant farms | Individual entrepreneurs |
|-----------------|---------------------------|---------------|--------------------------|
|                 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 |
| including farmland | 402,110.6 | 290,781.2 | 263,493.3 | 378,782.2 | 3375.8 | 5434.3 |
| of which: arable land | 133,596.8 | 90,184.0 | 21,918.5 | 350,467.2 | 2554.7 | 4531.1 |
| Farmland from the total area is actually used | 82,268.7 | 64,981.2 | 14,993.7 | 23,645.5 | 1734.3 | 3202.3 |
| 96,542.5 | 80,193.1 | 17,697.8 | 32,368.4 | 2124.5 | 3920.3 |

The census of 2016 showed that in the 10 years since the previous census, the area of actually used land has increased significantly. In agricultural organizations, these lands increased from 72.3% in 2006 to 88.9% in 2016, in peasant farms and individual entrepreneurs – from 81.0% to 91.7%, respectively. At the same time, 12.2% of agricultural farms and 17.2% of peasant farms and individual entrepreneurs did not have land in their ownership. The land area over 10,000 hectares had 76.7% of agricultural organizations (the average size per organization was 6,612.2 hectares), 33.8% of peasant
farms, and the individual entrepreneurs had a land area of 501 to 3,000 hectares, 30.2% more than 3,000 hectares, and 0.3% of farms possessed up to 4 hectares (with an average area per farm around 1.7 hectares) (Table 3).

Depending on the regional location of agricultural organizations with a land area of up to 3 hectares, potatoes, vegetables, and melons and gourds predominate in crops. More than half of agricultural products, including vegetable, are produced in personal subsidiary farms, although an increase in production in recent years is reduced in them. At the same time, small agricultural organizations are engaged in the cultivation of monocultures, and medium-sized and large farms are beginning to use a science-based farming system, which includes crop rotation. Sowing and harvesting complexes were effectively used only in 7.8% of medium and large farms. Agricultural and farm enterprises are engaged in entrepreneurial activities, while private farms are developed mainly for the purpose of self-employment and self-sufficiency. Therefore, the development of agricultural farms and peasant farms is of economic importance, while personal subsidiary farming has the aim of social development of rural areas.

According to Rosstat, in Russia, in the post-perestroika period, 660–690 thousand hectares are actually under vegetable crops annually, which is about 0.9% of the total crop area in the country.

![Fig. 2. Dynamics of average annual indicators of sown area of vegetable crops in farms of all categories, thousand hectares (according to Rosstat).](image-url)

Since 1945, the general dynamics of the open-field vegetable crop area tends to decrease. Sown areas of vegetable crops in farms of all categories decreased from 901 thousand hectares in 1945-1950 to 697 thousand hectares in 1981-1990 and to 662 thousand hectares in 2017 (Fig. 2) [9, 10].

During the period of reforms, a sharp decline in acreage in the agricultural organizations, and an increase in the farms of the population and emerging peasant (farmer) farms occur. In 1986-1990, vegetable crops occupied 669.4 thousand hectares, 470 thousand hectares (72.2%) of them were sown by agricultural organizations, 199.4 thousand hectares (29.8%) of which were households. In 2001–2005, 118.0 thousand hectares (17.1%) of 690.1 thousand hectares belonged to agricultural organizations, 530.2 thousand hectares (76.8%) belonged to households and 41.9 thousand hectares (6.1%) - to peasant (farmer) farms and individual entrepreneurs. From 2006 to 2016, the share of sown areas for categories of farms changed slightly, including for agricultural organizations, the share changed from 13.6% to 16.1%, for households – from 70.8% to 75.5 %, for peasant farms and individual entrepreneurs – from 10.3% to 13.5%. At the same time, from 2015 to 2017, the production of vegetables in agricultural organizations increased from 17.9% to 21.2%, in peasant farms – from 15.1% to 15.9%, but the production of vegetables decreased in households from 67.0% to 62.9% of the releve production level in farms of all categories.

As we see, the agrarian reform was accompanied by the irrational use of land resources in some cases.

Evaluating the efficiency of farmland use, we should note that 67.6% of the arable land available is used for crops in Russia as a whole. The level of arable land use by districts of Russia ranges from...
64.0% in the Far Eastern Federal District to 76.4% in the North Caucasus Federal District. The irrational use of arable land is reflected in a decrease in the general culture of agriculture, a violation of crop rotations, and cultivation technologies. The application of mineral and organic fertilizers, plant protection products from pests, diseases, and weeds were reduced. In solving the problem of preserving and increasing the volume of production, this leads to a depletion of fertility and an increase in the need for material and technical resources. However, with a lack of material and technical resources, the soil fertility decreases, and with an increase in anthropogenic impact, the soil is excessively polluted and compacted. So, the use of heavy agricultural machinery leads to soil compaction. Physical degradation leads to a decrease in porosity and permeability of soil particles, reduced access of water and oxygen to plant roots, slowed plant growth, reduced number of available habitats for soil organisms, including earthworms and microorganisms, and, ultimately, reduced productivity and biodiversity. Such physical degradation covers more than 28% of the agricultural land of European countries.

Optimal solutions in the use of land resources can be achieved by maintaining the area of arable land and the optimal levels of intensification of farming and advanced technologies.

In 2000, 144 million tons of mineral fertilizers were used in the world, and this is an average of 23 kg per person. Globally, 103 kg of fertilizer was applied on average per 1 ha. From 1980 to 2010, the use of mineral fertilizers decreased from 860 kg to 520 kg per 1 hectare in the Netherlands, while a number of countries increased their use: from 297 to 346 in the UK, from 244 to 356 in Israel, from 542 to 651 in Ireland, and from 453 to 836 kg / ha Malaysia. The growing use of mineral fertilizers in the world threatens environmental degradation, and it is dangerous for the environment and the population.

One of the guarantees of a stable growth in crop production in Russia can be the rational use of mineral and organic fertilizers. After all, our country produces 8.5% of the global production of mineral fertilizers.

In the framework of the target program “Preservation and Restoration of Soil Fertility of Agricultural Lands and Agrolandscapes as the National Achievement of Russia for 2006-2010 and for the Period up to 2012,” measures to restore soil fertility were envisaged. Within the framework of the State Program, land protection measures were fully financed, and fertilization measures were partially funded. Therefore, with the plan of 12.4 million tons, 10.9 million tons were contributed in fact, 90 kg per 1 ha of arable land. The plan for the application of mineral fertilizers as a whole is fulfilled only by 88.1%. However, a sharp decline in these indicators is going on (Table 4).

Table 4. Production and application of mineral and organic fertilizers for vegetable crops (according to Rosstat).

|                        | 2015  | 2016  | 2017  |
|------------------------|-------|-------|-------|
| Production of mineral or chemical fertilizers (in terms of 100% nutrients) million tons including the following: |       |       |       |
| Nitric                 | 20.1  | 20.8  | 22.5  |
| Phosphoric             | 8.7   | 9.5   | 10.0  |
| Potash                 | 3.3   | 3.6   | 3.9   |
| Total mineral fertilizers applied for sowing in agricultural farms (in terms of 100% nutrients), million tons | 2.0   | 2.3   | 2.5   |
| per 1 hectare, kg     | 42    | 49    | 55    |
| the total area under crops vegetables and melons | 166   | 195   | 198   |
| Organic fertilizer applied total million tons | 64.2  | 65.2  | 66.6  |
| per 1 hectare, t      | 1.3   | 1.4   | 1.5   |
| the total area under crops vegetables and melons | 3.6   | 2.8   | 2.6   |
The sale of mineral fertilizers in the domestic market is no more than 23-25% produced in the country. Import of mineral fertilizers increases from 69.6 thousand tons in 2015 to 97.0 thousand tons in 2016, with exports of 15,354.9 thousand tons in 2015 and 15,504 thousand tons in 2016.

According to Rosstat, in 1972, up to 1000 kg of mineral fertilizers and more than 15 tons of organic fertilizers were applied to each hectare of a vegetable field. A sharp decrease in applied fertilizer occurred from 400–450 kg / ha during the pre-perestroika period, to 131 kg in 2006 and to 198 kg in 2017, and a sharp decrease in applied organic fertilizer occurred from 15 t / ha in 2006 to 2.6 t / ha in 2017. At the same time, in agricultural organizations, organic fertilizers were applied to only 8-9% of the cultivated area. Such amounts of mineral fertilizers do not cover 40-50% of the removal of nutrients from the soil, as a result, the soil devoid of organic and mineral fertilizers is depleted. The annual removal of nutrients from the soil is 4-5 times greater than their return. The lack of organic and mineral fertilizers causes a steady trend of soil dehumification, leads to the development of degradation processes, namely dehumification, acidification, erosion, and secondary salinization [10, 11].

According to Rosstat, the proportion of the sown area fertilized with mineral fertilizers is 33.7% in agricultural organizations, 19.5% in peasant farms and individual entrepreneurs. The state monitoring of the lands of the Russian Federation showed that 46% of the surveyed area is characterized by a very low content of organic substances.

The renewal of the fertility of vegetable-friendly soils can be carried out only by a well-thought-out, scientifically based combination of two measures, namely fertilization and proper crop rotation [10, 11].

The role of crop rotation is primarily to improve soil fertility through the following measures: regulating the regime of soil organic matter and mineral nutrients, maintaining a satisfactory structural state of the soil; preventing erosion and deflation; limiting the development of weeds; controlling phytosanitary in soils; increasing productivity and product quality of agricultural crops, including vegetables. Long-term studies of VNIIO in cooperation with vegetable experimental stations located in the main areas of commercial vegetable production on seven soil varieties with humus content from 0.6% to 6.6% and thickness of the humus horizon from 15-20 cm to 100-120 cm, showed the following. Preservation of high soil fertility in vegetable growing, optimization of their nutritional regime, improvement of physicochemical, agrophysical, and agrochemical properties of the soil is possible only with the use of organo-mineral or organo-mineral-biological fertilizer systems in vegetable-feed and vegetable- crop rotations [10], [11].

Scientists and practitioners of agricultural production are in a state of constant search and development of the most rational economically acceptable technologies for the production of agricultural products, including vegetable. Currently, a number of alternative farming systems are developed and exist in practice, including biological (ecological) farming. The farming system suggests the following: using crop rotations and fertilizers properly, such as organic, plant residues, straw, green manure, etc.; ensuring natural soil fertility, which solves the problem of nutrition; improving the uptake of nitrogen due to legumes; complete rejecting the use of mineral fertilizers and pesticides. Ensuring the ecological purity of products and the absence of environmental pollution and increasing the natural fertility of the soil is a valuable and attractive feature of biologization.

3. Conclusion and Suggestions

The state should play a major role in solving the complex problem of rational use of land resources, including with respect to arable lands. Only with the help of state regulation (land management, land monitoring, the state land cadastre, etc.), prudent management on earth can be achieved using economic impact mechanisms. Mechanisms of state control over the targeted use of land will solve the problems of entering unused land into agricultural circulation. The modern land reform does not promote the rational use of land resources. The mechanism of rational use of land resources in the agro-industrial complex, including in vegetable production, should include both the reproduction of soil fertility and the use of science-based agricultural technologies that contribute to the preservation
Preservation and improvement of soil fertility in the agro-industrial complex of the Russian Federation, including vegetable growing, can be provided by a combination of the necessary agrotechnical and phytosanitary measures. Development of the unclaimed land (land shares) redistribution and their return to agricultural use is needed.

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