

The country's land potential as a key factor in ensuring its food security: land management and legal aspect

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Abstract. The article analyzes the state of the country's land resources and land management measures to optimize their use for reliable food security. According to the results of the analysis, a number of problems that arose in the post-reform period were identified: unclaimed land shares and their allocation to independent consolidated plots, termination of processing of previously developed farmland, lack of proper land management support, including due to imperfect legislation. The prolonged consequences of these processes are still underestimated. The authors point out that land management measures and the need for their implementation are a necessary condition for successfully solving these problems.

1 Introduction

The importance of a prudent attitude to farmland to reliably ensure food security has been investigated and justified by many scientists, economists, land managers, and lawyers specializing in agrarian and land relations. But the current situation in agricultural land use is unique: tens of millions of previously developed lands were eliminated from the sphere of agricultural production; large-scale privatization of farmland at the end of the twentieth century was replaced, although smaller in area, but still comparable to their deprivation (unclaimed shares, empty plots); in conditions of reorientation of agricultural (and not only) exports "to the east and to the south" there is an opportunity to use domestic food as a "soft power" in global world politics (as previously – hydrocarbons).

2 Methodology

Government and departmental decisions and reporting data of the federal level, scientific publications on the studied problems were used. Abstract-logical, statistical, historical, and graphical methods are used in their processing.

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3 Results

3.1 Russia in the global food security system, opportunities for expanding agricultural exports

In Russia, since 2010, the tasks of ensuring food security have been formalized at the highest level in the relevant Doctrine (one of the authors of this article was directly involved in the development of that Doctrine). At that time, the main problem was seen in the insufficiency of domestic agricultural producer's products in the domestic market [7; 13, 20]. Since then, the situation has changed – the agricultural sector shows steady development (growth in crop production by 1.5-2 times). As the priority issue of self-sufficiency in crop production was resolved, it became possible to move on to a more ambitious task – to organize the export of "surplus", including by orienting agricultural farms and agrotraders to this. This is reflected in the new version of the Doctrine 2020, which includes provisions on the export of agricultural products (this was not mentioned in the previous version). There are opportunities for this. Thus, grain production in the country as a whole is already more than 1.5 times higher than the level required for domestic consumption (laid down in the 2010 Doctrine). Nevertheless, even before these values were reached, grain exports (mainly wheat) were quite developed. At the same time, Azerbaijan, Bangladesh, Egypt, Iran, and Turkey traditionally act as importers, and in recent years the countries of Central and South Africa have joined them (although the solvency of most African countries is low, and humanitarian supplies are the most promising form of grain export for them). In the future, the structure of grain exports may change: V.D. Goncharov, V.V. Rau are indicated as very promising in this regard - corn and barley. As a feed grain, corn has been supplied to Korea, Iran, Lebanon, and Turkey for several years.

In the Far Eastern direction, soybeans (both beans and soybean oil) have no less potential, the Amur region specializes in their production (although soy is grown by farms in other regions, including the European part of the country). Soy is an important component of nutrition in such prospective countries for export supplies as China, Korea, Vietnam, and other densely populated states of Southeast Asia [8]. Sunflower can also be considered as a "competitor" of soybeans, but it depletes the soil more and is susceptible to pests and diseases, which requires a more complex 6-8-year crop rotation (whereas in the already mentioned Amur region, soybeans are grown in a simple two-field crop rotation alternating with corn).

That is, Russian exports of agricultural products have been steadily developing for a long time. In current difficult conditions, when its decades-old fundamental basis of national exports – hydrocarbons - has to be oriented to new markets, laying new logistics, it is agroexport that replaces them as a system-forming component. At the same time, it also acts as a "soft power".

3.2 The state of land in Russia

The growth of agricultural production depends on a number of factors (technology, seed stock, skilled workers, reasonable business policy, etc.). In crop production, along with them, the most important factor, limiting the production process, is the availability of farmland suitable for this [12]. This is also considered in the Doctrine 2020: in it, firstly, the decrease in the fertility of agricultural lands and their degradation are recognized as clear threats to food security. Secondly, it is indicated that it is important not only to increase the fertility of the lands and prevent their retirement from the economic turnover (this was also in the Doctrine-2010), but also to use them rationally, to restore abandoned lands. The latter is very important due to the lack of productive land on a global scale. Thus, in the world,

according to the UN FAO, no more than about 5 billion hectares are suitable for agricultural production [16], about 0.5 billion hectares could be further developed, but climatic conditions, water scarcity and the nature of the prevailing terrain are traditionally constraining. Calculations carried out at the turn of the XX-XXI centuries show that with current agricultural technologies, the developed (used) area is able to provide food for 10, maximum – 12 billion people [18]. Such a population of the planet is predicted by the UN in a few decades.

The current century is actually becoming the boundary of the final transition between different stages in the organization of agricultural land use:

- extensive, when the growth in food demand due to an increase in the population was compensated by the agricultural development of new lands;
- then came an *intensive stage* (up to the turn of the XX-XXI centuries), when the increasing population density required the extraction of a larger crop from the already developed areas;
- finally, the beginning of the current century was also the beginning of a stage when it became obvious that the inability to compensate for population growth and the resulting increase in agricultural scarcity on a global scale was only an increase in the productivity of traditional agricultural labor, the introduction of large doses of fertilizers, etc.

Despite the colossal total territory of the country (1.7 billion hectares), farmland accounts for only 13% of them, and Russia ranks fourth in the world in terms of arable land reserves, behind China, India, and the USA. During the post-Soviet period, the total area of the most valuable arable land in the country decreased (from 132 million hectares to 122 million hectares). On the one side, this was a continuation of the trend that has developed over the past half century to reduce the total area of agricultural land (Fig. 1; – do not confuse the total area of the category of land with farmland; this figure clearly shows that inconveniences have decreased in this category of land).

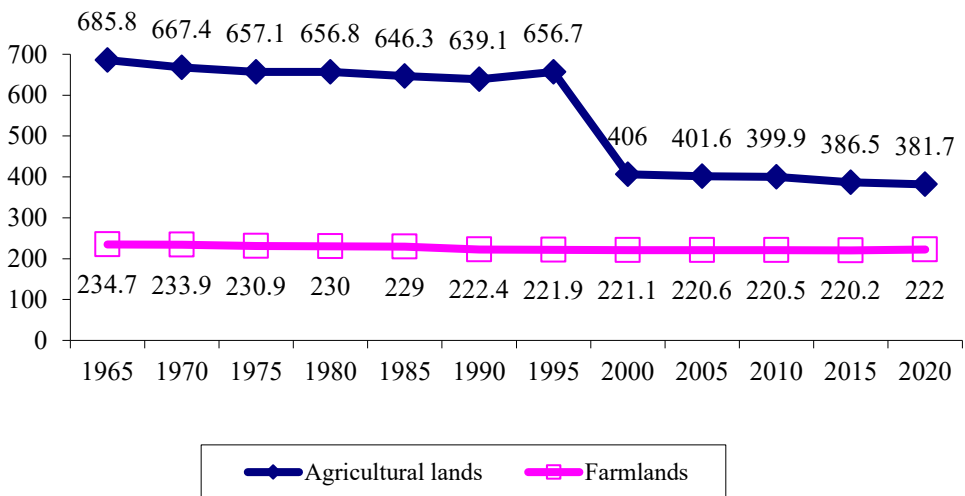


Fig. 1. Dynamics of the total area of agricultural land and farmland in Russia/RFSFR (as part of all categories of land), million hectares, developed by the authors, source – [10].

On the other side, as a result of the transformation of land ownership relations, the process of disposal of fertile lands from the sphere of agricultural production has accelerated (both to other spheres, and simply – the termination of their processing). Being recognized as property, land (land plots) as a result of various processes of transformation of land ownership (Fig. 2) now: 1) may belong to private individuals (and their share in

agricultural production is quite comparable to state ownership); 2) is involved in market turnover; 3) in relation to non-privatized lands, there is a process of its differentiation between different levels of public entities [6; 11; 15; 21; 25].

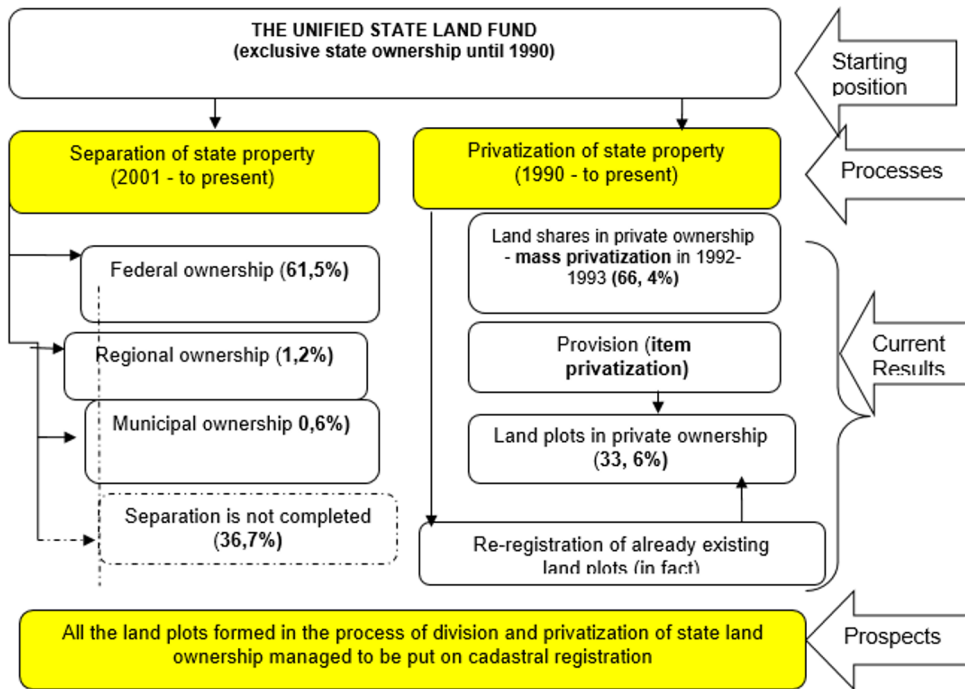


Fig. 2. Processes of transformation of land ownership in post-Soviet Russia.

Returning to the problem of the fact that there is now a significant area of abandoned farmland, we note that until relatively recently there were two different approaches to this phenomenon. Supporters of the first (the authors of this article have always treated them) proceed from the fact that all previously developed lands that have been abandoned should be redeveloped and their inefficient use should not be allowed in the future [1, 2, 3, 23, 24]. This approach fully considers the principle of neoclassical economic theory, according to which land as an exceptionally useful and irreplaceable resource in agricultural production (and not any land is suitable for agricultural purposes) should be in the household turnover. If current agricultural technologies do not allow to receive economic benefits from the cultivation of agricultural crops on them (so-called marginal lands), then they should still be reserved for the agricultural sector for the future (preserved as farmland).

Proponents of the second approach proceed from the fact that this sphere (both the use and market turnover of these lands) should be outside of any special instruments of state regulation, that there is enough market self-regulation, and the law of equilibrium of supply and demand, the current economic situation will determine the purpose of a particular site (whether it should be used for cultivation of agricultural products, or under construction) or not used at all [14; 13, 22].

In the current geopolitical conditions, the correctness of the first approach has become obvious.

3.3 Legislative measures to optimize land use

Since qualitative changes are currently continuing in the state of the lands involved in agricultural production (as well as those that have left it) (work is underway with unclaimed shares, and next year all of them will be transferred to municipalities at the same time), a necessary condition for the successful development of relevant processes and the prevention of problems of a prolonged nature is proper land management. The preparation of a new version of the relevant law has now become a determining factor for the prospects of Russian land management. There are already several variants of it, differing in: 1) understanding the essence of land management – as a service or the participation of society and the state in the management of the land fund; 2) the degree of continuity in relation to the previous practice of Russian land management; 3) focusing on various problems in land use, primarily in agricultural. When choosing the final approaches to this bill, it is important to consider:

1) the objective processes disclosed above in the agricultural land use system (the insufficiency of land management support for which, to some extent, has become one of the causes of the problems that have arisen there in recent years);

2) the rapid development of land legal acts at the federal level (both the adoption of completely new ones on the subject of regulation, and the adjustment of existing ones, and adopted relatively recently);

3) the use of advanced digital technologies (which are sufficiently developed for land management [4, 5, 17; 18]) - it is important that they allow integrating new solutions with previously autonomous functional and software modules, such as: a) discrete models for organizing optimal crop rotations and allocating plots at the expense of land shares (which already allow to "link" the preferences of shareholders with the formation of optimal land arrays suitable for the use of modern farming technologies); b) methodology for analyzing the spatial variability of crop yield characteristics depending on the conditions of the agricultural landscape; c) systematized database of field experiments of the agrochemical service of the Federal Ministry of Agriculture and the Agrogeos geonet; d) module for automated processing of cartographic information about agricultural land and calculation of their cadastral value, etc.;

4) the need for significant intensification of agricultural land use and cultivation of products in regions with relatively unfavorable climatic conditions (which make up about 70% of the country's territory), in particular by placing vertical farms. Such farms allow to grow agricultural products using the hydroponics method, in any facility. This is especially important for the northern territories, where agriculture faces the problem of limited plant growth – lack of sunlight, especially in the winter months, when the days are short and the sun is low above the horizon, limits photosynthesis and plant growth. Summer, in turn, is characterized by short periods of heat, and the growth season for plants is limited. The development of vertical farming is just capable of dramatically improving the food security situation in the northern territories. The appearance of such farms will entail the creation of jobs and significant resource saving, since they use hydroponics or aeroponics, which reduces water consumption by 70-90% compared to classical methods of agriculture. In addition, their placement does not require very scarce farmland in the north (and in general, they need minimal areas). Moreover, such farms can be equipped with artificial intelligence – accurate, timely switching on and off of phyto-irradiators, the supply of nutrient solution eliminates the possibility of irrational use of the required resources.

3.4 The role of land management education (on the example of the FSBI HE State University of Land Management)

The University of Land Management (SULUP) is a major university in the country, the center of education and science in the field of land management, cadastre, and real estate registration. At the current stage, one of the key tasks in its development is to improve the material and technical base, the instrument park and the availability of polygons for the development and testing of new technologies for obtaining, processing, and distributing topographic and geodetic, planning and cartographic, monitoring, and other land management information.

The most important place among the current strategic projects implemented in SULUP is the creation of a unique agro(bio) technopark "Chkalovsky" on the basis of the University geodetic polygon, which will allow simultaneously:

- develop and generalize the previously performed achievements of University scientists;
- consider modern problems, needs, and opportunities in knowledge-intensive agro (bio)technospheres (new challenges in the field of food security; promising scientific and industrial developments and technologies – city farming, lighting technology in protected soil crop production, organic and carbon farming, unmanned aerial vehicles (UAVs) and their widely scalable application in a variety of fields, artificial intelligence capabilities, etc.);
- consider the demands of the changing labor market and orient the educational process for all levels of training (bachelors-masters-postgraduates), in particular, its scientific, material, and technical base will allow to master competencies in the areas of piloting UAV and processing data obtained from them, growing crops in multi-tiered city farms and processing the received products;
- integrate university science and education.

Based on previously formed trends, new opportunities that have opened up, as well as promising, breakthrough technologies in the domestic agro-industrial complex for the next 5-6 years, Agro(bio)Technopark Chkalovsky will develop as a complex of interconnected clusters (in the future, other research and production areas are possible):

- an educational cluster that has existed since 1963 in the form of an educational and production geodetic polygon. Over the past year or two, this cluster has already received a qualitatively new development in the form of a reference linear basis, reconstructed residential houses, in the future, along with geodesic ones, soil science, agronomic and forestry components will be developed here, in particular, students will hold practical training as already existing ("Ecology and Nature Management" and "Landscape architecture"), and fundamentally new educational profiles "Cadastral activity", "Engineer of protected ground", "Reforestation", "Regulation of land management and cadastral activities", "Judicial land management expertise", "Digital technologies in geocology and land management", "Information support of spatial development" (the last two – in cooperation with FSBI HE the Financial University under the Government of the Russian Federation), etc.

- the cluster of the UAV "Sphere", which will allow the University not only to train students and other trainees to manage the UAV and develop intelligent systems for them, but also to certify aircraft;

- the agro-cluster will become the basis for closer integration of the University both into the system of agricultural colleges (here that students of the profile "Engineer of protected soil" will hold practical training), and agricultural farms (cooperation in scientific support of their activities, including farms and subsidiary farms), systems of structures engaged in the complex solution of forest accounting tasks;

- the cluster of the University's Military Training Center;
- the cluster of the FAI "Glagosexpertiza of Russia" will allow linking the educational process and current scientific research in the architectural and construction field with advanced practices and technologies.

Moreover, all these clusters will complement each other. Thus, the educational process will be carried out not as a part of only the first – educational cluster, but also all the others. Surveys and observations from the UAV on the state of crops in the agro cluster will improve the technology of their cultivation and protection, etc. That is, the full use of the capabilities of all clusters will allow to get a synergistic effect.

4 Conclusions

Russia, as the largest player in the world market of agricultural products, makes a significant contribution to strengthening global food security. There is sufficient potential, including land, to expand our country's contribution to solving the problem of food shortage in developing countries. The state is implementing additional measures to make more complete use of all farmland reserves – in 2021, a program for the re-development of abandoned lands was adopted and successfully implemented [9], work is underway with land shares that turned out to be unclaimed after the reform of the 1990s, etc. Nevertheless, underestimation of land management capabilities prevents the full realization of the existing land potential. At this stage, the priority measures for its development are seen in the early adoption of a new version of the relevant law. Other measures are the introduction of digital land management technologies, as well as the optimal placement of vertical farms that allow having a controlled yield on very small areas all year round, regardless of climatic factors and adverse weather conditions (dry or cold time periods, etc.). As for university education, it seems very promising to create an agro (bio) technopark at the University as a unique infrastructure complex designed to accommodate and operate innovative companies and organizations on its territory, whose activities are aimed at the development and production of high-tech products, commercialization of existing scientific developments, creation of systemic conditions for the harmonization of University activities in the fields of education, science, production, and training.

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