Intensive development of the transport network and protection of the agricultural land

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Abstract. Productive land, which primarily includes agricultural land, in any country in the globe, always had special status since they are the basis of the country's food security. The tasks of identifying, recording and preserving land from misuse, depletion, and degradation are in priority when pursuing a state land policy. Recently, these issues have become particularly important due to the high rates of land depletion and degradation, urbanization, industrial and mining development. The most fertile land in Russia classified as the most valuable agricultural land. After analyzing the situation with the definition, recording, and protection of such land in the Russian Federation, the authors concluded that the country does not have clear, objective criteria and methodological approaches for identifying the most valuable land, as well as mechanisms for their protection. This paper provides the basic principles, methodological approaches and the results of the work on the identification and allocation of the most valuable land in agriculture and transport sector of Siberia. Land of 1-5 classes one way or another should be protected from unreasonable withdrawal from agricultural use, land of 6-8 classes may be provided for the development of transport.

1. Introduction
The main factors that affect the rational land use, conservation and protection of land resources are global ecological and food security, world's population growth, climate change, land acquisition by large world agricultural corporations etc. [1]. In this process a priority of attention is protection of the important agricultural lands [2]. Any society in the entire history of its existence has sought to preserve and enhance the values that it possessed. In all cases, fertile land was considered one of the basic conditions for the existence of the state, the basis of its sovereignty, its wealth [3]. Currently, the Russian Federation does not have a coherent system of either legal or methodological support, where criteria, principles, and procedures for the allocation and protection of the most valuable agricultural land (hereinafter referred to as “MVL”) would be clearly and unambiguously defined. Each region itself determines what land should be considered as the most valuable. These decisions are based on the Land Code [4].

The development of society, urbanization, the growth of industrial production require the development of new territories, which leads to the withdrawal of productive agricultural land for non-agricultural needs. In Russia that process is proceeding without consideration about the fertility of that land and its value in terms of food security [5]. Almost all developed countries face the problem of...
preserving the most valuable agricultural land, protecting it from misuse, and there are different approaches implemented. For example in the Republic of Belarus for non-agricultural use agricultural land provided only if it has low fertility and/or it is degraded land [6].

In the United States of America the most valuable land called “prime farmland” [17]. Some states have adopted legislative acts for regulation of the protection of that land [18]. In the People's Republic of China, all agricultural land is considered the most valuable. China supplies food to 20% of the world population using only 10% of the world's total arable land [7]. In the Russian Federation, the legislative activity related to the protection of the most valuable land carried out at the Soil Institute, and at the All-Russian Research Institute of Agricultural Economics under the leadership of the Ministry of Agriculture. The purpose of the study was to develop, taking into account domestic and foreign experience, a criterion and unified methodological approach to the allocation of the most valuable agricultural land and proposals for their protection considering in Russian Federation.

2. Materials and Methods
At present, in the Russian Federation, the criterion for the allocation of the most valuable agricultural land is its cadastral value, "... significantly exceeding the average level of cadastral value in a municipal district (urban district)" [8].

Cost indicators (market or cadastral values) should not be taken as a criterion since they are unstable, can change over one or several years, and has the dubious accuracy of their calculation. We assume that the most stable indicator is the class of land suitability for agricultural use, determined on the basis of a comprehensive characteristic of land productivity - the grain equivalent, which we propose to use as a criterion for classifying land as the most valuable.

The procedure of identification and allocation of the most valuable land in the subjects of the Russian Federation presented in the paper is built on the basis of the methodology of agricultural land classification [9], and the principles laid down in the US productive land classification methodology [10].

The main study methods were as following: statistical analysis, mapping during development and conclusion of cartographic models that displays available spatial information on the distribution of EVL and their evaluation, and subsequent processing methods mathematical and also cartographic modeling provided a new original information. In particular, we used statistical information on quantitative land accounting, land evaluation materials and other data.

3. Results and Discussion
The resulting process of identification and allocation of the most valuable land in the subjects of the Russian Federation is presented in Figure 1.

Unit 1 - “Land Classification” provides the calculation of land quality classes (classification) following the Methodological Recommendations for assessing the quality of land and its classification according to its suitability for agricultural use [11].
Figure 1. The flow chart of the process of identification and allocation of the most valuable agricultural land in subjects of the Russian Federation.

As a result of the classification, “Land Classification Scales” is developed. This is a document agreed upon in a particular subject of the Russian Federation that establishes the correspondence of soil types...
to land suitability classes. That is determining which class of land each soil type (soil assessment group) in the subject of the Russian Federation belongs to.

Unit 2 – «Identification of the most valuable land». Each soil type (soil assessment group) with its class belongs to the corresponding level of importance of the MVL: federal (land of the 1st and 2nd classes), regional (land of the 3rd and 4th classes), and municipal (5th class). Also, unique land (9th class) is defined - land that in general is not suitable for arable land but is unique in its properties for growing some types of crops (tobacco, tea, grapes, rice, etc.).

Other land classified by the legislation of the Russian Federation as the most valuable include: land used for breeding, seed production, variety testing, pedigree animal husbandry, aquaculture, and used for collections of plant genetic resources; reclaimed agricultural land, as well as land plots occupied by reclamation facilities; land plots used for research, experimental and educational purposes related to agricultural production. We propose to provide land of classes 6-8 mainly for the development of transport.

Unit 3 – «Allocation of the most valuable land» includes 4 stages: preparatory, analytical, cartographic and legal.

The Preparatory stage consists of collecting semantic (land classification results) and graphic (available analog and/or digital cartographic material on a specific territory) information.

The Analytical stage involves analysis and (if necessary) adjustment (updating) of the collected graphic and semantic information based on the current up-to-date cadastral data, as well as the results of soil, geobotanical and other surveys; checking and (if necessary) adjusting the classification of soil types (soil assessment groups) to land suitability classes using classification scales.

The Cartographic stage includes the creation of the following digital thematic layers (for municipalities or individual agricultural organizations): soil maps, maps of land suitability classes, schematic map of the most valuable land of various levels (federal, regional, municipal), maps of the most valuable land of agricultural organizations with division into fields and/or work sites. Digital map layers can be created in various geographic information systems (MapInfo, ArcGIS, QGIS, etc.).

The Legal stage consists of such procedures as land surveying and fixing of the boundaries of allocated the most valuable land and the adoption by the authorized state body of the decision on entering the relevant information into the Unified State Register of Real Estate (USRN).

The proposed procedure forms the information basis for the identification and recording of the most valuable agricultural land and also creates the conditions (prerequisites) for providing them with legal protection.

In current study of [12], a mechanism for the preservation of the MVL was proposed, including regulatory, administrative and economic methods. Similar approaches are used in some leading countries of the world [19, 20].

As a result of the research, we estimated the area of the MVL in the subjects of the European part of the Russian Federation. In several subjects, following the current legislation, the most valuable land has been identified and allocated. Comparing the areas allocated in the European part of Russia (3399.0 thousand ha) with the results of our research (65600.3 thousand ha), it can be seen that more than 90% of the area is currently “unrecorded” (62,201.3 thousand ha). That is, all of that land, which essentially ensures the food security of the country, is not subject to legal protection and could potentially be lost for agriculture.

4. Conclusion
Using the procedure proposed by the authors for the identification, allocation and legal protection of the most valuable agricultural land will provide its preservation, which ensures the food security of our country for current and future generations. The development and improvement of the mechanism for the protection of the most valuable land is based on the formation of an appropriate regulatory framework. A tool to automate the process of calculating the suitability classes of productive land is special software developed with the participation of the authors and passed state registration (Software for calculating quality indicators and classifying agricultural land / Nosov S.I., Pshenichnikov A.P.,
Ogleznev A.K., Gladkov A.A., Bondarev B.E., Sapozhnikov P.M. - Certificate of registration of a computer program RU 2015660854, 10/12/2015. Application No. 2015614996 dated 06/10/2015).

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