On the issue of model elaboration for the involvement of long-unused land in the agricultural circulation of Khabarovsk Territory

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Abstract. Agricultural production is the basis of food security; therefore, the main task of government should be to maintain agricultural production through the efficient use of the main resource - agricultural land. Over the last decades there has been a decrease of agricultural land in the region by 2.7%, arable land – by 8.9% and an increase of set aside land by 27.6%. There are significant areas of land not involved in agricultural circulation in the region. Moreover, many of these areas are currently open for citizens to choose a plot under the “Far Eastern Hectare” program using federal information system “To the Far East”. The article considers elaboration of a model to involve long-unused land in agricultural circulation and to identify promising methods of their use.

1. Introduction

One of the most important government tasks in land management is to increase the effectiveness of land use, especially agricultural land. The difficult socio-economic situation in Russia at the end of the 20th and the beginning of the 21st century led to the process of eliminating significant areas of most valuable agricultural land from circulation.

Noted soil scientist V V Dokuchaev emphasized that the soil always fed the person and kept the world around the person. Currently, anthropogenic impact on the soil have led to the destruction of the soil cover in large areas, soil pollution, and the deterioration of soil quality. About 1.5-2 billion hectares of fertile soil have been lost, and the ongoing reduction of agricultural land as a result of alienation and degradation processes creates a dangerous ecological situation [1].

Negative processes occur on agricultural lands in most regions of Russia, including Khabarovsk Territory. It was noted at the meeting of interdepartmental commission under the government of Khabarovsk Territory that the problem of involving unused agricultural land in circulation is one of the main obstacles to the development of agriculture in the region. It was revealed about 15 thousand hectares of such unused land in the Khabarovsk, Lazo and Vyazemsky districts by commissions of the regional agriculture ministry [www.khabkrai.ru/events/news/174178]. At the same time, according to the ministry, there are about 400 thousand hectares of agricultural land in the region, of which 242 thousand is farmland. Thus, the elaboration of a model to involve long-unused land in agricultural circulation of Khabarovsk Territory (hereinafter referred to as the Model) is timely and relevant.

2. Materials and methods

The problem of rational use of agricultural land was researched at different time periods by A I Altukhov, T A Aseeva, R V Boev, I N Buzdalov, A A Varlamov, V V Vershinin, S N Volkov, A P
Vorontsov, A M Gataulin, V A Dobrynin, E P Kiselev, V V Miloser dov, K R Rakhmonov, M I Sinyukov, A V Tkach, V N Whip and many other scientists.

The basis for the Model elaboration is the research of Russian and foreign authors, disclosing the results of practical and theoretical studies on agricultural land use problems, including materials of scientific and practical conferences, articles in scientific collections, dissertations, monographs.

Statistical, abstract-logical, mathematical modeling method, remote sensing method, cartographic, monographic approaches and methods are used to elaborate the model.

3. The current status of farmland in Khabarovsk Territory

Signs of non-use of land for agricultural production or other related to agricultural production activities are given in the List approved by Decree of the Government of the Russian Federation of April 23, 2012 No. 369 (one attribute is sufficient for recognition of non-use) [2]:
- arable land does not carry out work on the cultivation of agricultural crops and tillage;
- mowing is not performed on hayfields;
- the content of weed grass in the structure of cultivated hayfield exceeds 30% of the land area;
- no grazing is carried out on pastures;
- care and harvesting of perennial plantings is not carried out and the uprooting of decommissioned perennial plants is not carried out;
- afforestation and (or) bush overgrowth on arable land is over 15% of the land area;
- afforestation and (or) bush overgrowth on other types of agricultural land is over 30%;
- landscape deformation and (or) waterlogging is over 20% of the land area.

Khabarovsk Territory is a dynamically developing region of the Russian Far East. Despite the difficult climatic conditions, agricultural production is developing quite intensively in the region. The fundamental instrument of production in this case is land, specifically, agricultural land [3]. As of January 1, 2019, this category of land in the Khabarovsk Territory amounted to 399.7 thousand hectares or 0.5% of the total land area (while farmland area was 665.6 thousand hectares or 0.8% of the land area of the region) (figure 1).

Figure 1. The distribution of land by administrative districts of Khabarovsk Territory (as of January 1, 2019): a – by category; b - by land type.

Agricultural lands include lands granted to various agricultural enterprises and organizations (partnerships and societies, cooperatives, state and municipal unitary enterprises, research institutions), as well as plots provided to citizens for farming, householding, gardening, horticulture, animal husbandry, haying and grazing. In addition, land allocated to Cossack societies and clan communities is classified as agricultural land too. Agricultural land consists of farmland and non-farmland. The area of farmland by this category occupies 238.8 thousand hectares. The area of non-farmland in the structure of agricultural land amounted to 136.0 thousand hectares - this is the land under buildings, structures, on-farm roads, protective forests, enclosed water bodies, and also plots intended for servicing agricultural production.

The total forest area as part of agricultural land remained unchanged and amounted to 25.8 thousand hectares [4]. Last two decades there has been a decrease of agricultural land by 2.7%,
decrease of arable land - by 8.4% and increase of set-aside land by 30.7% in the Khabarovsky Territory. The measures taken in recent years at the federal and regional levels, the implementation of the priority national project “Development of the agro-industrial complex”, “Strategy for the socio-economic development of the Far East and the Baikal region for the period until 2025” and “State programs for the development of agriculture and regulation of raw materials and food markets for 2008-2012; 2013-2020” contributed to the suspension of the recession and to some growth of agricultural production. Since 2010 there has been an increase of sown area in all categories of farms, mainly in agricultural enterprises and farms, when in householdings there has been a tendency to crop reduction. Although 97.5 out of 107.4 thousand hectares of available arable land in 2000 were occupied by crops and 9.3% of arable land was not used, then in 2017 78.5 thousand hectares were occupied and already 20.3% of arable land was not used [5].

Thus, there are significant areas of land not involved in agricultural circulation in the region. Moreover, many of these areas are currently open for citizens to choose a plot under the “Far Eastern Hectare” program using federal information system “To the Far East”. In this regard, to provide methodological assistance for citizens, special attention is paid to the development of a methodology for the restoration of abandoned lands, issues of information support for land management in rural areas [6].

4. Suggestions for Model elaboration
An analysis of the agrarian sector of Khabarovsky Territory revealed that the size of the area redistributed during the land reform greatly affected the economic efficiency of production, at the same time large land acquisition reduced the efficiency of all forms of management.

Soil surveys conducted by research and production organizations also indicate that the quality of land and soil fertility continue to deteriorate, a negative humus balance develops in the soils of most regions in Khabarovsky Territory, valuable agricultural land is overgrown with shrubs and light forests, and is no longer in use.

The unused farmland in the region can reach 70-80 thousand hectares, which is almost a third of the total area recorded in the Unified State Real Estate Cadastre. Over the past 18 years there has been a decrease of agricultural land in the region by 2.7%, arable land – by 8.9% and an increase of set aside land by 27.6% [7].

Arable soils of the Khabarovsky Territory are characterized by low natural fertility, therefore they are acidic, weakly structured, mostly heavily loam, overmoistened during monsoon rains, and, as a result of this, are over compacted. Humus in soil is of unstable composition and during intensive soil cultivation is rapidly destroyed. Soil fertility in extreme environmental conditions quickly and significantly degrades.

All this has led to a sharp deterioration in soil conditions over the past decades. Pasture productivity currently does not exceed 1.1 centners of fodder per hectare, perennials are replaced by low-value ephemeral plants, weed and poisonous herbs.

The horticulture sector of the Khabarovsky Territory has an important social function, providing population with food and being the production basis for ensuring the food security of the region. All horticulture products of the region are consumed locally.

Stabilization of horticulture determines the possibilities to overcome the crisis in the agricultural sector and the prospects for a positive solution of rural social problems. The development of horticulture industry should be carried out by increasing the efficiency of land use through reproduction and preserving soil fertility, expanding sown areas, improving the structure of crops and increasing crop yields.

An algorithm of the Model is being developed to apply to a specific plot, including: collection, processing and analysis of documentation related to the plot; inventory of land and real estate; geobotanical survey and soil sampling to determine the content of basic nutrients and agrophysical properties; assessment of natural soil fertility, determination of plots boundaries with varying degrees of fertility; involvement of land in economic turnover according to the most promising methods.

Testing of the Model is carried out on land plot of the Agrobiological Station (ABS) of Pacific National University (PNU). The station was created in 1954 as an experimental research base for
teachers and students of Pedagogical Institute of PNU. Since 2000 to the present the station has not been fully exploiting, significant areas of the land have been deformed and desolated, buildings require restoration or reconstruction.

Forecast of the horticulture industry development is made through mathematical modeling methods, based on a statistical assessment of the current state of agricultural land in the Khabarovsk Territory. The most fertile land is planned to be sown with crops which are most labor-intensive, energy-intensive for cultivation and crops with a high market conjecture.

Reliable information about unused land plots can be provided by inventory of abandoned, unused land and buildings. These plots are mainly shrubby and forested, swampy and flooded, prone to erosion, which development requires significant resources. In the process of inventory work on the testing plot innovative precision farming technologies are used, such as computer appliance for remote sensing in order to prepare digital maps of mentioned plot. Technological work schedule is being worked out to clear land from trees and shrubs using advanced engineering methods.

It is necessary to solve the following tasks during Model elaboration: to estimate the current state of agricultural land in the Khabarovsk Territory; to predict the development of horticulture industry of the Khabarovsk Territory; to test model of unused land involvement in agricultural circulation; to apply precision farming technologies on a model plot; to introduce innovative technologies for clearing land from trees and shrubs; to develop a project for complex use of territory owned by Agrobiological Station of PNU.

5. Conclusion

Proposed model will provide solutions to a number of problems, such as involvement of unused or “abandoned” lands in agricultural circulation. Currently the “Far Eastern Hectare” program is being implemented in the region, which, among other objectives, aimed to attract population to participate in the life of countryside, to increase the economic activity of citizens who are able to engage in small forms of agricultural production. About 32.5 thousand hectares (41.5% of the total area of the region) are free to be provided under the “Far Eastern Hectare” program. Most of the land is an inter-settlement territory where any type of activity not prohibited by law is permitted. Plots that citizens choose under the “Far Eastern Hectare” program can basically be classified as unused, undeveloped or abandoned. Thus, the elaborated Model will be undoubtedly relevant.

Moreover, it must be stressed that preparation of land for agricultural investment projects using elaborated Model may be a promising agricultural franchise.

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