

Social Ecology

Multifactor Analysis of the Land Fund Management in Georgia

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ABSTRACT. The paper presents the assessment of various potential risks in land fund management. Standing Commission of Scientific Support in Land Fund Management, Georgian National Academy of Sciences developed a project for food security and sustainability of the country. On the example of Dedoplistskaro the biggest Municipality of the country, the multifactor analysis of geographical, geological and climatic risks is described. Structural model is defined with the provisionally estimated factors such as land area, agricultural and climate conditions, soil fertility level, material expenditure, structure and use of the cultivated land, risks, disasters, land market formation process, etc. By means of multifactor modeling technique the tendency of changes for the lands of different categories is determined and their market price is estimated. The overlaying areas of different geo-climatic, economic, cultural, ecological and other factors are presented in the paper. Without their analysis the land management will be a priori ineffective. The importance of identification of dominant parameters in the process of establishing their interrelations is noted. Primary analysis shows that the mentioned dominant factors in separate land categories will be different. In the long, medium and short-term planning, changes in the impact of the factors are also anticipated. © 2017 Bull. Georg. Natl. Acad. Sci.

Key words: land resources, map, geological factors, land fund, modeling, food stability

Agriculture is one of the most important strategic sectors in Georgia for thousands of years due to the great biodiversity, unique natural conditions and centuries-old national agricultural traditions of the country. The fertile soil (14 different varieties), sufficient water resources, favorable climatic conditions give us an opportunity to produce wide range of ecologically pure and competitive agricultural products in Georgia. Under the conditions of proper management in agriculture and effective implementation of inno-

vative technologies, it is possible to satisfy the demand of the population in the country and, even to export the ecologically pure excess product to the international market.

Nowadays, about 80% of the packaged and processed agricultural products are imported into the domestic market. The share of national agriculture in the gross domestic product is approximately 10%.

The increased demand for food, globalization, economic and financial crises, and tendency of gen-

eralizing local wars in the world put the active development of agricultural production on the agenda in every country [1].

At a modern stage of globalization, one of the priority challenges is effective and optimal use of land resources. Land, as one of the main natural resources and the most important factor of production, is characterized by specific features. People can turn it into national wealth. Its location is permanent and cannot be relocated, but it is limited. It is characterized by wearing out and needs restoration etc. [2].

In the period from 1990 to 2014, the agricultural production rate sharply decreased in Georgia. It is significantly lower compared to the rate of 1910. The problems of specification of the land quality, its economic assessment and total potential are to be solved. In rural places the manufacturers pay taxes on “good land”, “medium land” and “bad land”. But the criteria of good, medium and bad land are not defined.

It is impossible to discuss the question of rational use of the land resources without monitoring the quantitative and qualitative conditions of the available land, i.e. without having a special organization of land monitoring [3], which will be responsible for revealing all the negative processes and phenomena related to the land and will take appropriate actions to eradicate them. In every country the agricultural and non-agricultural lands are the subject of monitoring regardless the form of their ownership. The land monitoring is carried out by the public body providing information for the National Land Cadasters and controlling the land exploitation and protection.

The Standing Commission of Scientific Support for Land Management, Georgian National Academy of Sciences, developed a project with the goal of modeling the Land Fund for food security and sustainability of the country. By means of a multifactorial modeling technique the tendency of changes is determined for the lands of different categories and their market price is estimated.

Georgia is distinguished by its soil diversity. All the European soil types and numerous soil types of the world occur on its relatively small area. It is worth noting that some soils were first studied in Georgia and the results were included in the textbooks of many countries (Poland, Japan, Russia).

Naturally, it would be difficult task to solve the given problem for the whole country, therefore, taking into consideration certain criteria we selected one region, the Dedoplistskaro Municipality.

Number of farms and the householders in Dedoplistskaro is larger than in any other region in Georgia [4]. Dedoplistskaro with its large plots of land has favorable conditions for intensive production of some one-year plants such as wheat and sunflower. The region specializes in using the arable lands, hay lands and pastures.

Another peculiarity of the Dedoplistskaro region is that the food crops occupy relatively small lands. It represents an intensive cattle breeding region and largely depends on the extensive use of pastures, which creates a problem of overgrazing and degradation of the pastures [5].

As is known, a large part of the wheat and vegetable oils are imported in the country. World prices of those products are usually characterized by sharp fluctuation, especially in recent years. Given the fact that sunflower crop is lower in Georgia compared to the average global indices [6], it would be difficult for Dedoplistskaro with its relatively great land fund to undertake its potentially due role for providing food security in the region itself and, in general, in Georgia. In addition, the peculiarities of the region’s specialization cannot provide a source of stable income for its population without strong intensification of production.

The region is rich in lands for hay and grazing, therefore, main field of economy in Dedoplistskaro district is cattle breeding. According to the agricultural census of 2004 there were about 39,000 sheep in the region that was about 5% of the total number of sheep in Georgia.

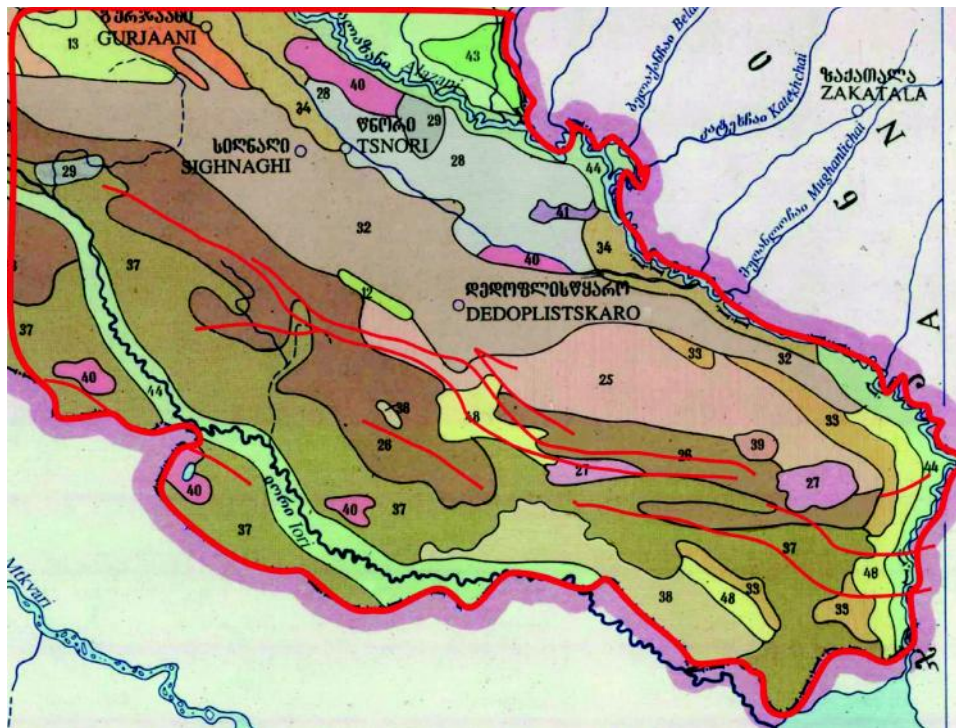


Fig. 1. The tectonic factors coverage zones overlaid on the soil map [8].

Due its geological, ecological and climatic conditions Dedoplistskaro Municipality was selected for research.

According to the newsletter of the National Environmental Agency, Ministry of Environment and Natural Resources Protection of Georgia on the results and forecasts of natural geological disasters of 2015-2016, the main geological disasters threatening to Kakheti region are the debris flows, landslides, erosion and the avalanches in the mountainous zone.

The Kakheti region covers the territories of Akhmeta, Telavi, Gurjaani, Kvareli, Lagodekhi, Dedoplistskaro and Signaghi municipalities. The findings of the research carried out in 2015 and the material obtained during the Force Majeure situations showed that on the territory of Dedoplistskaro municipality the mudflow and gully activation processes did not go beyond the average level of long-standing background [7] indicating certain stability and favorable conditions for research.

Dedoplistskaro region is distinguished by the diversity of the soil zones. It can be said that the

region mainly consists of highly fertile and medium fertile soils. The low-productive and eroded soils are observed in the small area, where effective measures can be taken to increase soil fertility [8].

Soil diversity as a system factor was used as the basis for overlaying it with geological, landslide, seismic risks and atmospheric precipitation factors. The coverage zones were established to show their combined action on the soil and the favorable or unfavorable results those processes can cause.

The tectonic factors coverage zones in the region overlaid on the soil map are presented [8]. In the south of the Municipality some unidentified faults are observed. The main part of the Municipality territory represents fertile, gray-brown and black carbonate soils (Fig.1). Only a small area is represented by salt marsh and alluvial carbonates that are characterized by low fertility and unfavorable physical features. The unidentified faults are found on the territory of rather fertile soil (Fig. 1).

Overlaying the map of soil with the atmospheric precipitation factor shows that the drought is a com-

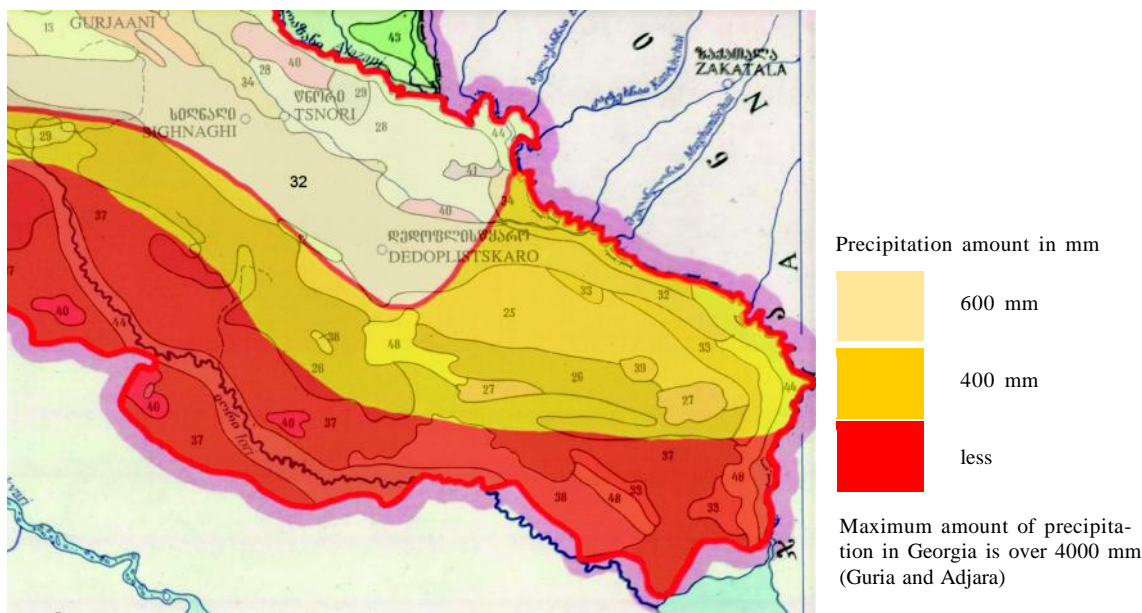


Fig.2. The map of atmospheric precipitation factors overlaid of the soil map [8].

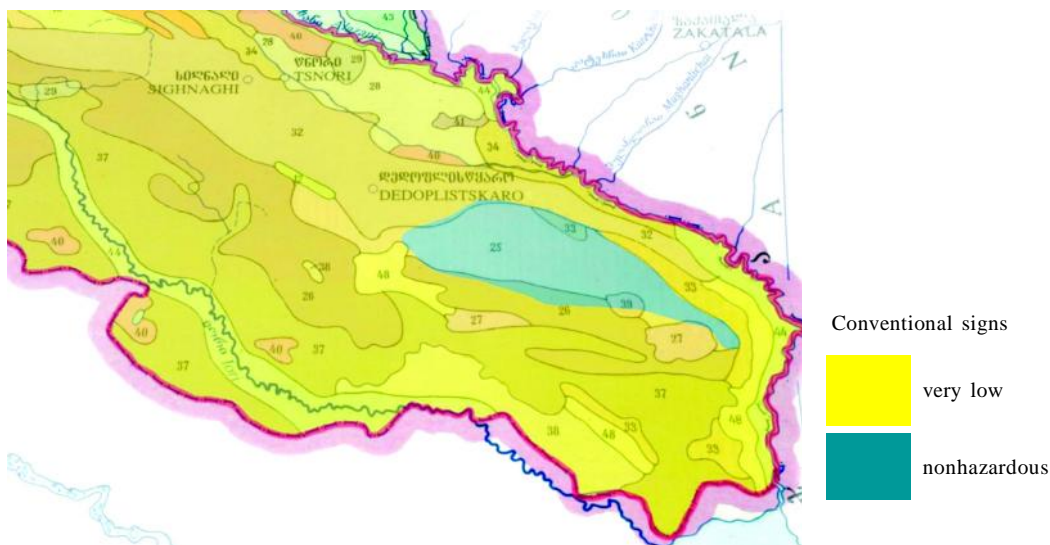


Fig. 3. The map of landslide damage in the Dedoplistskaro region overlaid on the soil map [8].

mon problem in the region. The problem almost equally concerns the whole region. Maximum amount of precipitation is 4000 mm in the region, while in Dedoplistskaro it is 600 mm (Fig. 2).

The map of landslides (Fig. 3) clearly shows that Dedoplistskaro is less likely to be a landslide risk zone.

The region is characterized by high seismic activity (Fig. 4). The coverage zones of tectonic, landslide and seismic factors are given in Fig. 5.

Results and Discussion

Carried out research allowed us to develop an initial action plan for land management in Dedoplistskaro. Management of the mentioned resource is directly connected with the strategic development of the country providing its effectiveness in conditions of any economic model. This unique resource requires complex, systematic, long-term management.

The material presented in the paper shows that various geo-climatic, economic, cultural, ecological

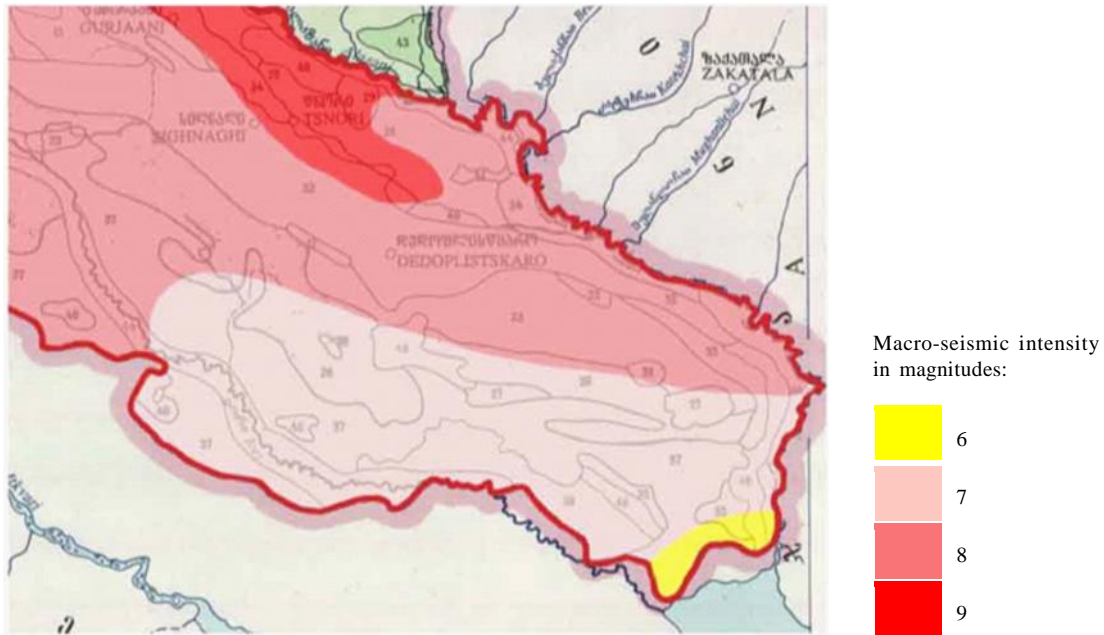


Fig. 4. The map of macro-seismic intensity overlaid on the soil map in the Dedoplistskaro region [8].

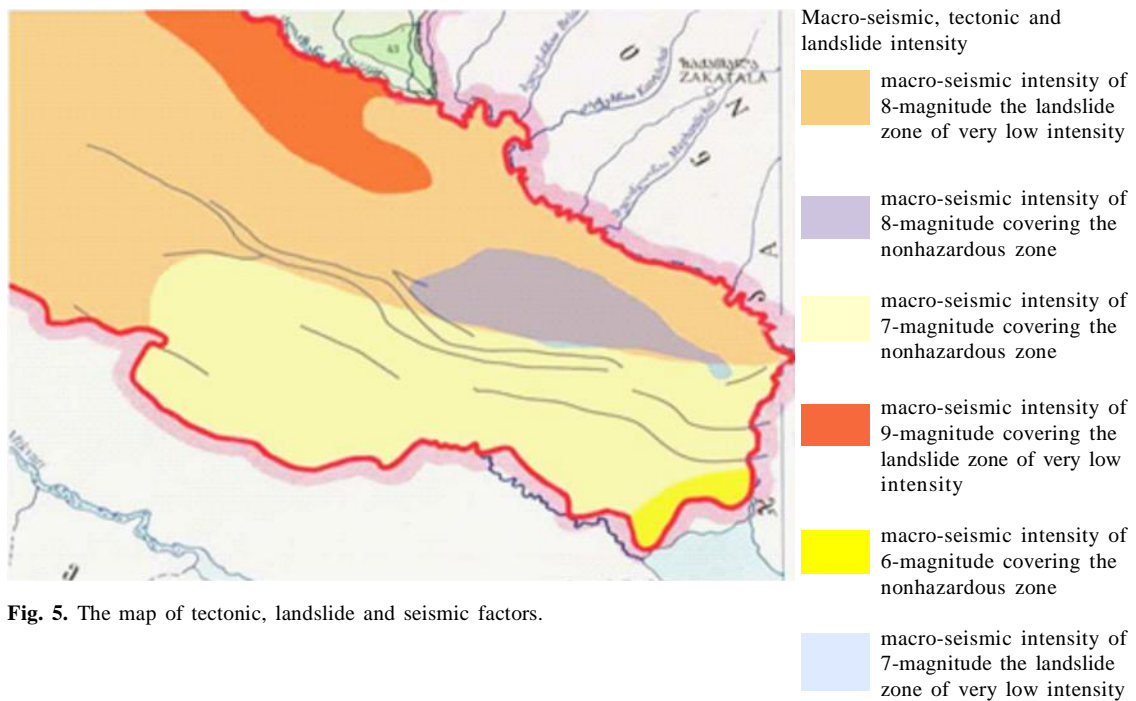


Fig. 5. The map of tectonic, landslide and seismic factors.

and other factors are intertwined areas and without their analysis the land management will be a priori ineffective. Besides, it is important to identify dominant parameters in the process of establishing the interrelation of these criteria. Primary analysis shows that the mentioned dominant factors in the different land categories will be different. In the long, medium

and short-term planning, changes in influence of these factors are also anticipated.

The novelty of the present paper is that the land as a special resource requires system research through the complex analysis of the results obtained in special fields (soil science, economics, landscaping, geology, hydrology, agronomia, logistics and infrastruc-

ture, forestry etc.). This implies appropriate methodological theoretical support and formulation of recommendations for practical activities.

Historically, Georgia has never had the opportunity of realizing the mentioned objective neither in conditions of the USSR nor in the post-Soviet period. Today Georgia as an independent country must develop its

scientific base (theoretical prerequisites, methodology and the scheme of practical implementation of the results) that will guarantee the existence and development of Georgia as an independent state. Clearly, the land fund plot of the country is the main element of existence of our State. The present work is the first attempt to realize this scientific and practical challenge.

საზოგადოებრივი ეკოლოგია

მიწის ფონდის მართვის პოლიფაქტორული ანალიზი საქართველოში

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საქართველოს მეცნიერებათა ეროვნული აკადემიის მიწის ფონდის მართვის მეცნიერული უზრუნველყოფის მუდმივმოქმედი კომისია

(წარმოდგენილია აკადემიის წევრის ა. კორახაშვილის მიერ)

სტატიაში განხილულია მიწის ფონდის მართვის სხვადასხვა მოსალოდნელი რისკების ერთობლივი შეფასება ადითიურობის დადგენის მიზნით საქართველოს მეცნიერებათა ეროვნული აკადემიის მიწის ფონდის მართვის მეცნიერული უზრუნველყოფის მუდმივმოქმედმა კომისიამ შეიმუშავა პროექტი, რომლის მიზანს წარმოადგენს მიწის ფონდის მართვის მოდელირება ქვეყნის სასურსათო უსაფრთხოების და მდგრადობის უზრუნველყოფის მიზნით წარმოდგენილია გეოგრაფიული, გეოლოგიური, კლიმატური და სხვა რისკების პოლიფაქტორული გავლენა მიწის რესურსების მოდელირების შესაძლებლობებზე დედოფლისწყაროს, როგორც ქვეყნის ყველაზე დიდი რეგიონის მაგალითზე.

ნაშრომში წარმოდგენილია სტრუქტურული მოდელის განსაზღვრა შესაბამისი წინასწარ დადგენილი ფაქტორებით, მაგ. მიწის ფართობი, სასოფლო-კლიმატური პირობები, ნიადაგის ნაყოფიერების განაკვეთები, მატერიალური ხარჯები, სტრუქტურა და დამუშავებული მიწის გამოყენება, რისკები, კატასტროფები, მიწის ბაზრის ფორმირების პროცესი და ა.შ. განხილულია პოლიფაქტორული მოდელირების მეთოდის გამოყენებით სხვადასხვა კატეგორიის მიწის ცვლილებების ტენდენციის დადგენა; მიწის საბაზრო ფასი, შესაბამისი ცნობილი ფაქტორების გავლენის დომინანტური ვექტორების გამოყოფით. წარმოდგენილია სხვადასხვა გეო-კლიმატური, სამეურნეო, კულტურული, ეკოლოგიური და ა.შ. ფაქტორების ურთიერთგადაფარული სივრცეები, რომელთა ანალიზის გარეშეც მიწის მართვა აპრიორი იქნება არაეფექტური.

ამავდროულად, წარმოდგენილია ამ კრიტერიუმების ურთიერთკავშირების დადგენის პროცესში დომინანტური პარამეტრების გამოყოფა. პირველადი ანალიზი გვიჩვენებს, რომ სხვადასხვა ტიპის მიწის კატეგორიებთან მიმართებაში აღნიშნული დომინანტური ფაქტორები იქნება სხვადასხვა. გრძელვადიანი, საშუალოვადიანი და მოკლევადიანი დაგეგმარების პირობებში ასევე მოსალოდნელია აღნიშნული ფაქტორების გავლენების ცვლილება.

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