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# **AGRICULTURAL NATURE MANAGEMENT IN THE NORTH-**EAST CAUCASUS: CURRENT STATE AND OPTIMIZATION

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#### Abstract

The paper shows the increasing role of agrarian policy in the strategy of sustainable development of rural areas. It assesses the state of the agricultural sector in the regions of the North-East Caucasus on the basis of statistical, comparative-geographical and historical methods. The ratios of fodder and arable land, shares of used arable land, and yield indicators were identified at the regional level. The arable lands in Dagestan are used in full in a number of mountainous areas. Annually, about 30% of arable land remains unused. In Ingushetia, arable land is used more fully in the areas of chernozem distribution, while about 60% of arable land is concentrated in the zone of risky agriculture. Chechnya utilizes only half of arable land. Arable land is mostly used in the Achkhoi-Martanovsky region. In most areas, about 30% of arable land is used, and in highlands it is almost not used. The use of arable land in the mountainous area is limited by the lack of material and technical resources, the steepness of the slopes, the inability to use equipment, and in the lowlands - secondary salinization, wear and tear of irrigation systems, etc. The solution of problems of agricultural nature management will increase the level of agricultural production, the quality of life and the level of employment of the population.

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# 1. Introduction

The relevance of the problem of optimizing agricultural nature management is increasing in the conditions of international sanctions and the need for import substitution. The primary objective is to improve the environmental and economic efficiency of the use of natural resources in the agricultural sector, which consists in the rational use of land and water resources, improving the quality of land, and minimizing the negative impact on the environment. The analysis of the system, factors and efficiency of agricultural nature management is particularly important from theoretical and practical perspective. However, in most countries of the world, such studies still do not meet the requirements of modern achievements in science, real needs and the evolution of agrarian practice (Bachev, 2016).

# 2. Problem Statement

National food security depends on the effectiveness of public agrarian policies. In accordance with the Doctrine of Food Security approved by Decree of the President of the Russian Federation No. 20 "On the Approval of the Doctrine of Food Security of the Russian Federation" of January 21, 2020, the state socio-economic policy is aimed at providing the population with agricultural products, raw materials and food that shall meet quality standards and safety requirements. This may only be achieved through a set of national, socio-economic, institutional and environmental measures (Altukhov, 2019).

# 3. Research Questions

The improvement of the system of agricultural nature management in rural areas may play a key role in increasing its functionality, attractiveness for both investors and tourists, which will also have a positive effect on the employment of the population. Financial policies in general, especially tax and credit policies should also be effective elements of the economic mechanism for sustainable agrarian nature management. The state policy strategy for sustainable development is most effectively implemented at the regional and municipal levels, since the regions are empowered and generally have the necessary resources and capacities to implement their own agrarian policies. At the municipal level it is possible to implement specific measures aimed at optimizing nature management.

# 4. Purpose of the Study

The study considers the regions of the North-East Caucasus as the subject of research.

# 5. Research Methods

The methods of comparative geographical analysis, statistical, historical, SWOT analysis and content analysis of published domestic and foreign sources were used to assess the current state of the agricultural sector and identify opportunities for optimizing agricultural nature management. The information base included electronic databases (Rosstat, departmental sites), archive materials of agricultural research institutes.

# 6. Findings

The regions of the North-East Caucasus are among the agrarian-oriented regions. Agricultural land in the structure of the land fund of the regions (as of 01.01.2020) accounts for 86.4%, 63.6% and 41.6%, respectively, in Dagestan, Chechnya and Ingushetia (State (national) report on the state...). As of 01.01.2020, the area of agricultural land in Chechnya amounted to 1000.7 thousand hectares (or 62% of the total land fund), in Dagestan – 3220.7 thousand hectares (74.1%), Ingushetia – 222.1 thousand hectares (61.2%). In the structure of agricultural land, the following are distinguished: arable land, perennial fruit plantations, deposits, hayfields and pastures. In Chechnya and Dagestan, the structure of agricultural land is dominated by fodder lands (pastures and hayfields), which account for 62.9% and 83.8%, respectively, while arable land prevails in Ingushetia – 58.3%.

Among all the regions of the North Caucasus Federal District, the least arable land (15.5%) is in Dagestan, the relief of which is characterized by a huge contrast of absolute and relative heights. The territory of the republic with its variety of soil and climatic conditions changes even at short distances. In the development of the agricultural sector, the role of arable land is paramount. On the territory of the republics of the North-East Caucasus, arable land is unevenly distributed: on its plain it is almost 3/4, in the foothills – about 1/6, and in the mountains – 1/10.

Fodder lands prevail over arable land in Ingushetia, particularly in the mountain areas: Dzheyrakh – 45136 hectares, in Chechnya in Shelkovsky – 200405 ha and Naursky – 119447 ha of areas that are not favorable for cultivating crops, and in mountainous areas: Shatoysky – 23817 ha, Vedensky – 38797 ha, Itum-Kalinsky – 46469 ha and Sharoysky –34765 ha. Here, the production is limited to the strongly crossed terrain and climatic conditions of the highlands.

A similar situation is observed in Dagestan. Forage lands prevail in the northern (arid) regions: Nogaysky – 691175 ha, Tarumovsky – 209045 ha, Kizlyarsky – 173951 ha and in the mountain Gumbetovsky – 54276 ha, Botlikhsky – 52359 ha, Tsumadinsky – 85549 ha and other areas. In recent years, there has been a decrease in the area of agricultural land in all regions of the North Caucasus, with the exception of the Stavropol Territory. Throughout 2008-2020 the agricultural land here decreased by more than 80 thousand hectares. The largest losses were observed in Dagestan and Chechnya mainly due to transfer to buildings and roads (in settlements), as well as to military landfills. Besides, over the past decade, there has been a decrease in the area of arable land. At the same time, the maximum loss of arable land took place in areas of moisturization, high natural soil fertility and favorable temperature conditions (Grozny, Sunzhensky and Shalinsky).

Serious losses of arable land occurred in Dagestan (by 3.81 thousand hectares), especially taking into account their insignificant share (15%) in the structure of agricultural land. The reduction occurred both due to the diversion of land for development, and an increase in the area of perennial plantations. In Ingushetia over 2008-2020 the arable land decreased slightly (0.61 thousand hectares), however, compared to 1992, arable land losses amounted to at least 18 thousand hectares.

Together with other factors (population growth, etc.), the availability of arable land per capita in the regions of the Northeast Caucasus is lower than the average Russian (0.86 ha) and amounts to: in Chechnya – 0.28 ha, Ingushetia – 0.16 ha, Dagestan – 0.18 ha. In the conditions of the mountain regions

of the North-East Caucasus, agricultural production is imprinted by a number of characteristic features that affect the level of environmentally safe and cost-effective functioning of agroecosystems (strong terrain dissection, vertical belt of the soil cover, fine land use, etc.). Due to the fragility and instability of mountain geosystems, agro-industrial production in mountains and foothills is becoming more difficult. The leading problem is the progressive degradation of land in mountains and foothills. All these factors prevent the inclusion of all balance agricultural land.

In the North-East Caucasus, arable land is more fully used in Ingushetia (70%) and Dagestan (68%). Chechnya utilizes only half of arable land (52%). At the level of administrative regions, the approach to the use of arable land is quite differentiated. In Dagestan, despite the difficult physical, geographical and natural-climatic conditions for agricultural production, arable land in some mountainous and highland areas is used in full, including Akhtynsky, Botlikhsky, Gergebilsky and Dokuzparinsky regions. And yet over the past 10 years, over 150 thousand hectares of arable land (about 30%) remain unused here annually. In the mountainous area this is caused by the lack of material and technical means, the steepness of the slopes, the inability to use equipment, and in the lowland part – secondary salinization, lack of water for irrigation, wear and tear of irrigation systems, etc.

In Ingushetia, arable land is used more fully in the areas of chernozem distribution, while about 60% of arable land is concentrated in the zone of risky agriculture (Alkhanchurt Canal). In the highland Dzheyrakh district, the share of arable land is insignificant (about 4%) and is almost not used. In Chechnya, arable land is more fully used in the Achkhoi-Martanovsky region. In Groznensky and Vedensky regions, only one third of arable land is used, and in the highland Itum-Kalinsky and Sharoysky regions, the arable land area is insignificant and almost not used.

Until the 1990s the agricultural industry in the region had a well-developed material and technical base. Agriculture was dominated by grain farming (wheat, barley, oats, corn) and fine sheep farming. As of January 1, 2020, about 90% of the republican number of cattle and 88% of the number of sheep and goats were in the personal farms of the population. Radical socio-economic and geopolitical transformations began in the early 1990s in the agro-industrial complex of the regions of the North-East Caucasus (as in the country as a whole). The total sown areas in Chechen-Ingushetia in 1990 were 97%. In Dagestan, sown areas in the period of 1990–1995 decreased by 80 thousand hectares. All state farms and collective farms were transformed into state unitary enterprises (state farms), which became the main producer of agricultural products. Another not less important producer of such products is peasant farms. In the period of 1996-1999, when state farms were in neglect, they were the main producer of agricultural products of the North-East Caucasus, state farms are mainly engaged in the production of grain and leguminous crops, and the production of potatoes and vegetables has become the prerogative of peasant farms and the household of the population.

The current state of the agricultural sector of the regions of the North-East Caucasus (as well as the entire economy as a whole) is quite complex and unstable against the background of some positive trends in recent years (positive dynamics of yield indicators, etc.). In addition to objective factors the main problems of agricultural nature management include the following: underdevelopment of market infrastructure (agricultural and food markets); significant wear and tear of the existing agricultural

machinery fleet; underdevelopment of agricultural production technologies; reduced soil fertility; reduction of farmland area; low efficiency of arable land use, etc.

These problems limit balanced agricultural nature management and despite the presence of natural prerequisites (favorable natural and climatic conditions in a significant part of the territories, virgin lands, etc.), labor resources (continues to increase, although the number of people employed in the agricultural sector is declining) and the existing need for food, the level of agricultural production in Chechnya, Dagestan and Ingushetia remains low. The bulk of the food that may be produced here is imported or brought from neighboring regions. One of the reasons for this situation is the inconsistency and non-adaptation to specific agroecological conditions of agricultural nature management methods, poor environmental protection and energy-resource-saving validity of technologies, which, combined with the deterioration of soil cover reproduction, leads to a progressive decrease in the environmental and economic efficiency of agricultural production. At present, traditional farming and animal husbandry systems have been lost for a number of negative reasons.

The development of the agricultural sector is largely determined by the state of land reclamation systems taking into account the fact that in Chechnya and Ingushetia more than half of the territory is located in the arid zone, and in Dagestan – over 1/3 of the territory. In Chechnya, reclamation irrigation systems were destroyed by 80% and re-commissioned. In Ingushetia and Dagestan, these systems have largely failed and require repair. The agriculture of these regions, like other mountainous territories of the North Caucasus, is dominated by grain crops – wheat, barley, corn. Potatoes, vegetables, sunflower and technical crops are also grown. In animal husbandry, priority is given to the breeding of dairy and meat cattle.

Another limiting factor is the insufficient introduction of mineral fertilizers. According to the Dagestan Research Institute of Agriculture and Agrochemical Service of the Republic of Dagestan, mineral fertilizers in the amount of at least 148 thousand tons (in the current substance) are required to provide agricultural land with nutrients in Dagestan. According to the calculations of the Ministry of Agriculture of the Chechen Republic, about 230 thousand hectares of arable land are needed in mineral fertilizers in the amount of 33 thousand tons. According to some studies in the foothill and especially in the mountainous zone of the North Caucasus, soil-climatic conditions favor the production of highly reproductive and quality seeds of crops, in particular potatoes (Basiev et al., 2009). Harsher conditions than on the plane prevent the development of various pathogens (viruses, aphids, etc.), and climatic conditions generally contribute to the accumulation of large amounts of sugars, starch, ascorbic and other organic acids and pigments in plant tissues. High-quality and environmentally friendly potatoes were traditionally grown in the Itum-Kalinsky and Shatoysky regions of Chechnya.

Like all mountain countries another feature of the regions of the Northeast Caucasus is the presence of pastures covered with alpine and subalpine meadows. As of 01.01.2020, the number of cattle in all categories of farms amounted to 952.1 thousand heads in Dagestan, 252.8 thousand heads in Chechnya, and 67.2 thousand heads in Ingushetia. Dagestan (4647.1 thousand heads) is the leader in the number of sheep and goats among the North Caucasian republics. At the same time, their main share is concentrated in the households of the population. However, this does not even cover domestic meat needs in these regions. For example, cattle are imported to Chechnya to cover domestic needs for meat and meat

products from the territory of Rostov Region and Kalmykia. One of the problems determining the low efficiency of livestock breeding and the development of degradation processes within mountain geosystems is the lack of livestock and sheep species adapted to harsh mountain conditions.

The main condition of sustainable (balanced) agricultural nature management in the regions of the North-East Caucasus is the rational use, reproduction and protection of fertile agricultural lands (Zaburaeva, 2020). An important role is given here to attracting investors and state support in the development of agricultural production infrastructure (Herlindah, 2017). Public-private partnerships can serve as an essential tool for rural economic development, thus ensuring the rational use of natural resources and improving the quality of life of rural population (Tretiak et al., 2020).

Some European countries (France, Switzerland, etc.) widely use the practice of supporting agricultural producers with special government programs (Zaburaeva et al., 2018). Among the most effective agroecological projects in the USA and the European countries the leading position is attributed to the processing of livestock waste (cattle farms, poultry and pig factories) with the production of quality organic fertilizers as a secondary product.

A number of researchers consider adaptive landscape land management as a basis for sustainable agricultural land use taking into account environmental, economic and social criteria (Tartarintsev et al., 2020). Work (Hreshchuk, 2019) proposes a matrix-based method for assessing the effectiveness of land-use management, which identifies weaknesses and deficiencies in management decisions at the municipal level and, accordingly, expeditiously takes adequate measures to address them. The optimization of land use management is also meant to improve the legal regulation of land relations (Kuznietsova et al., 2020).

Agricultural nature management around the world is becoming more knowledge-intensive through the introduction of new technologies (biological, organic agriculture) and other measures to increase the volume and quality of products (Stativka, 2020). Sustainable agricultural production is also associated with the introduction of nanotechnologies in this area (Raliya et al., 2018).

#### 7. Conclusion

In the long term, in order to solve the problems of agricultural nature management, including optimizing the process of import substitution in the North-East Caucasus and the country as a whole, it is necessary to focus on the complete transition of agricultural production to waste-free technologies and closed cycles of nature management that exclude the release of harmful substances and waste into the environment. At this stage, a number of challenges need to be addressed in order to tackle the scarcity of agricultural commodities and the rational use of existing potential in the studied regions: to reclaim disturbed and contaminated agricultural land; to improve the use of arable land by preserving and improving soil fertility; to exercise strict control at both the regional and municipal levels over the diversion of agricultural land for non-agricultural purposes; to carry out anti-erosion (agrotechnical, forestry, etc.) operations in the zones of semi-deserts of Chechnya and Dagestan, as well as in a number of foothill and mountainous regions of all three republics to combat water erosion of soils; to restore destroyed or failed irrigation systems and put new irrigation systems into operation; to make sufficient amounts of mineral and organic fertilizers; to ensure the development of large-scale agricultural

production of meat and milk, mainly through the development of mountain animal husbandry; to develop various forms of integration of agricultural production with processing industries.

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