

# Possibilities of land management support for protecting the natural environment during economic use of northern territories

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**Abstract.** The article analyzes modern problems of the Arctic zones of the Russian Federation. The characteristics of human economic activity in the northern regions are given. It is shown that the anthropogenic load on the unique nature of the North increases every year. The climatic features of the northern regions, which limit the possibilities of agriculture, are characterized. The main directions for improving reindeer husbandry and organizing the use of reindeer pastures have been developed. It is proposed to grow crops in vertical farms. It has been shown that vertical farms can improve the environmental sustainability of territories and ensure food security.

## 1 Introduction

The development of the potential of the Arctic zones of the Russian Federation (AZRF) is a priority of state policy; this process, affecting various areas, contributes to ensuring national security, economic growth and demographic stability in the country as a whole.

The territories of the Arctic zones of the Russian Federation are unique in their natural characteristics. Here, climatic conditions are extreme, ecosystems are characterized by a reduced ability to self-heal, and significant reserves of various minerals have been discovered and are being developed [1]. Therefore, global uncontrolled development of these territories can, as academician pointed out. T.Ya. Khabriev, lead to irreparable consequences and a large-scale environmental crisis. But the cessation or significant reduction in the pace of development of the territories of the Arctic zones of the Russian Federation does not at all mean an "automatic" improvement in the environmental situation.

At the same time, various indigenous peoples of the North live in the Arctic zones of the Russian Federation, traditionally engaged in national crafts, reindeer herding, fishing, etc. According to some data, their number ranges from 200 to 400 thousand people.

When using land in the Arctic zones of the Russian Federation, it is necessary to minimize the negative impact on the environment, that is, plan land management in such a

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way as to preserve the unique northern ecological systems and traditional environmental management (reindeer husbandry, hunting, fishing, other crafts), which is for indigenous peoples The North is an important condition of life. At the same time, the main parameters of such a balance must be fixed (primarily by law), and their compliance must be monitored by the state.

## 2 Materials and methods

The article uses abstract-logical, statistical, monographic and historical methods. The following main methodological approaches were used during the research:

- Systemic, in which it is possible to study all aspects of problems as much as possible, as well as taking into account their interrelations and integrity, and in this case, land use in the Arctic zones of the Russian Federation is studied as a systemic orderio
- Conceptual, which takes into account previously completed fundamental and applied scientific developments in land management, continuity and consistency in research.

## 3 Results and Discussion

Human economic activity in the Arctic zones of the Russian Federation (geological exploration, mining enterprises, etc.) is important and necessary for industrial production in Russia, but it contradicts the foundations of life of the indigenous peoples of the North that have developed over centuries. Therefore, economic development (primarily the development of hydrocarbons and their transportation [2]), development and use of lands within the Arctic zones of the Russian Federation must take into account the inevitable impact of such development and use on the established way of life of the indigenous population and ecosystem and not violate the above balance. To achieve and support it, a mechanism is required that will enable these territories to be properly developed. During the Soviet period, a land management system was created to ensure the rational use of land, its protection and reproduction, the creation of a favorable environment and the improvement of landscapes [4, 10].

Over the past 2-3 years, large-scale projects “Arctic Hectare” and “Far Eastern Hectare” (northern regions) have been implemented in the Arctic zones of the Russian Federation, providing for the provision of land plots to citizens. This is carried out without land management support. This determines the need to develop a methodology for applying previously developed land management solutions during the implementation of the Arctic Hectare program.

Any projects for organizing reindeer herding territories contain the following components:

- Determination of areas and placement of land for reindeer husbandry.
- Formation of the organizational and production structure of reindeer pastures, territorial location of individual production units, facilities and structures.
- Placement of permanent and seasonal reindeer pastures.
- Development of pasture rotations and establishment of movement routes for reindeer herds.
- Placement of special-purpose areas on reindeer pastures (spare, quarantine, pre-slaughter, etc.).
- Development of measures for the protection, reproduction and restoration of lands.

Design decisions come down to establishing on plano-cartographic material an accurate graphic image of the boundaries, location and areas of all land plots used for reindeer husbandry and constituting the territorial organization of an economic entity [3, 13]. The

use of aerospace images will make it possible to correct topographic maps without field surveys.

Particular attention should be paid to those natural and climatic factors that influence the establishment of the seasonality of reindeer grazing, the possibility of obtaining food during snowy and other periods, the choice of seasonal reindeer pastures that are favorable in terms of veterinary conditions, etc. It should be noted that the main features of reindeer husbandry largely depend on the “whims” of nature, mainly from prolonged frost and ice, strong cold winds in certain periods, etc.

When studying and analyzing these issues, no small importance should be given to collecting information and assessing the state of traditional economic sectors and the traditional way of life of indigenous peoples of the North at the community level (clan, other economic entity), especially regarding their self-sufficiency in meat, fish, other products of traditional crafts.

Currently, the development of reindeer husbandry largely depends on the availability of a market for reindeer herding products. Although the market demand for venison in the Arctic zones of the Russian Federation is practically unlimited, the sale of products is often hampered by significant transportation costs (due to a sharp increase in fuel prices), as well as by the quality of the products offered to the market.

Field surveys in the Far North to study reindeer pastures include geobotanical, land management, zootechnical and economic research. Taking into account the repeatability of land survey work, the availability of materials from previously conducted surveys, as well as the quality of these materials, in each specific case a decision may be made to conduct field surveys in full or only part of them, in the form of a new survey or adjustment of existing materials.

One of the features of the work on drawing up a project for organizing a reindeer herding farm is to conduct a zootechnical survey, the purpose of which is to determine the availability of food on pastures by deer, the mode of their use, the feeding ration by season and to identify the epizootic state of pastures [12]. At the same time, the following are studied and analyzed:

- The size of existing reindeer herds and their structure (reindeer heifers, heifers, bulls, sires, etc.), actual herd turnover, herd specialization, live weights of reindeer by sex and age groups.
- Production indicators for maintaining the adult number of deer, business output of calves, meat production in live weight per 100 January deer.
- The existing grazing system and technology for keeping reindeer in different periods of the year: during the calving period, the rutting period, during the pre-slaughter period, the period of veterinary activities, etc..
- The ratio of lichen and green food by season, their availability, planning of feeding deer in case of unavailability of food during the cold period.
- The existing organization of work and the load of animals per reindeer herder in teams and the reindeer herding farm as a whole, the distribution of responsibilities between members of reindeer herding teams and their knowledge of their responsibilities and the availability of practical skills.
- Veterinary and sanitary condition of pastures, the presence and location of areas unfavorable for epizootics.
- Organization and state of veterinary and breeding work, knowledge of reindeer herders about veterinary rules for keeping and treating reindeer, the level of disease prevention.

Zootechnical examination is carried out by interviewing livestock specialists and veterinarians, foremen and herders-reindeer herders of reindeer herding brigades, as well as personal observations of the project developers.

In order to obtain additional and (or) clarify existing information about the quantitative and qualitative state of reindeer pastures, their legal status, and actual use, a land survey is always carried out [5].

Organization of the use of reindeer pastures involves the following activities: organizing reindeer grazing according to the seasons of the year, alternating the use of pastures, organizing the movement of reindeer herds along routes, providing drinking water, protecting deer from predators, organizing rest for reindeer, ensuring their protection in the summer from heat and midges and gadflies, and in winter - from the winds, ensuring the mating of deer, calving and preserving the offspring, organizing and carrying out migrations, corral work, driving culled deer, etc.

The development and implementation of veterinary measures is of particular importance, since the timely and correct implementation of these works significantly ensures the safety of the reindeer population and increases the productivity of reindeer husbandry. Particular attention here should be paid to improving the qualifications of reindeer herders, who must know all the veterinary rules for keeping and treating deer, the rules for handling medicinal drugs and pesticides used.

The territories of the Arctic zones of the Russian Federation are characterized by extreme natural and climatic conditions, including most of the territory being permafrost. The ecological systems of the northern regions are highly vulnerable and require a longer period to recover.

The Arctic is an amazing place, attracting with its huge reserves of natural resources, important geopolitical location, as well as land and sea transport routes [14-15]. Relatively recently, the world's leading economies began to show interest in our Arctic zone. Russia, being the largest Arctic country, has significant rights to the Arctic spaces. The Arctic zones of the Russian Federation are a strategically important region for the domestic economy, whose territories need to be developed. Effective use of the potential of the Arctic territories is important for both the economic and geopolitical development of the country.

To provide the population with sufficient and varied quantities of plant products, taking into account natural and climatic conditions, it is recommended to organize vertical farming as a type of controlled environment agriculture (CEA) [8, 11]. In vertical farms, plants are grown using the hydroponics method, without the use of natural soils. Plant roots are in a nutrient solution containing a complete set of elements. The conditions for growing plants are under complete control (diet, lighting, air temperature, etc.).

Currently, CEA, as an innovative approach to the production of agricultural products inside buildings or specially equipped structures using modern technologies and digital solutions, includes two varieties:

- “Greenhouse” agriculture (Indoor agriculture (IA)), in which plants are grown in enclosed spaces, such as greenhouses, containers, boxes, etc. [6].
- Vertical farming (VF), which is a system of producing crop products in specially designed or adapted vertical structures [9]. Their use can significantly reduce the time and distance of delivery of products to the consumer, increase crop yields per unit of area used due to a multi-level system of organizing space. They do not depend on seasonality, weather, climate and soil conditions. This method of growing agricultural plants is especially important for northern territories, which are characterized by limited plant growth due to lack of insolation, which affects the processes of photosynthesis, transpiration and plant development.

The prospects of vertical farming are very relevant for the Russian Arctic, this is due to the fact that, as already noted, all northern regions of Russia are unique territories with extreme weather and climatic conditions. The northern regions of Russia make up about

60% of its total area, which in turn can be divided into three zones: absolutely unfavorable; very unfavorable; unfavorable.

In the north of Russia there are long and cold winters, and summers are short and not hot. Such conditions do not allow for the full cultivation of plants in agriculture. In addition, some northern regions of Russia have high humidity, especially coastal and swampy areas, which affects soil quality and the ability of plants to absorb nutrients. In the summer, droughts and forest fires are possible in the northern territories, causing irreparable damage to agriculture and nature.

Therefore, to ensure sustainable cultivation of crops and economic development of these territories, it is important to create, implement and improve innovative technologies in agriculture [7]. These problems can be solved by developing vertical farming. Such methods of growing in agriculture will improve food security in the northern regions of Russia. The introduction of vertical farms will create new jobs and help improve the economic performance of regions.

However, in modern world practice, vertical farming has become more widespread in urban environments, which is why vertical farms are also called “city farms.” City farms also help improve the environmental sustainability of territories [8]. Growing food on city farms is usually carried out in closed systems, which eliminates the use of pesticides and also reduces the amount of nutrients used. This significantly reduces the risk of environmental pollution and also allows you to obtain environmentally friendly products. Reduces water use (up to 95%), carbon footprint, food loss and waste.

In general, in any conditions, vertical farming allows you to save resources, which reduces the adverse impact on nature. Thus, as a result of the use of vertical farming systems, water consumption is reduced by 70–90%, because Aeroponics or hydroponics are used. In addition, land resources are practically not used and, therefore, their quality does not deteriorate. Modern vertical farms are equipped with artificial intelligence systems, which creates conditions for increasing economic efficiency. With their help, timely adjustment of phytolighting, dosage and supply of nutrient solutions is ensured, thus eliminating the irrational use of resources.

## 4 Conclusion

Currently, large-scale projects for the development of northern territories have been launched in the Arctic zones of the Russian Federation (the “Arctic Hectare” and “Far Eastern Hectare” programs) and during their implementation, previous land management developments (survey data, design solutions), in particular, those carried out by when organizing reindeer husbandry and agriculture.

It is advisable to carry out further research into the organization of land use here in the following directions:

- Study of foreign experience in organizing land use in the north (Canada, Alaska, Scandinavian countries).
- Generalization and analysis of the experience of the country’s regions in the field of legislative regulation of the features of land management support for the organization of the use of reindeer pastures and reindeer herding and, on this basis, substantiation of proposals for consolidating successful regional practices in federal legislation.
- “Linking” land management and environmental measures to the specifics of specific conditions.
- Development of technologies for state monitoring of the condition and use of lands in the Arctic zones of the Russian Federation.

The main thing is that the organization of land use in the Arctic zones of the Russian Federation and the implementation of the “Arctic Hectare” program require, first of all, the

greening of land management, additional scientific research, appropriate financing, legislative and organizational work. In this case, previously developed land management decisions and conducted surveys on the organization of land use in the northern territories can be taken as a basis.

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