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Pasture farming and its impact on the geocological situation in the Rakhiv District of Transcarpathian Region

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SUMMARY

The peculiarities of geospatial differentiation and the current state of the pasture farming in the territory of the Rakhiv District of the Transcarpathian Region are described. A database was created and statistical information on the species structure and number of livestock in the studied area was analyzed, which made it possible to determine the centers of the greatest farming load on the mountain geocomplexes of the area. As a result of the conducted research, maps of the distribution of mountain pastures and the distribution of livestock within the territorial communities of the Rakhiv district were also developed, the functioning and development of which is possible under the condition of inexhaustible use of natural resources. Special attention is paid to the analysis of geocological consequences and dangers associated with the long-term management of pasture farming in the Rakhiv District.



Introduction

The pasture farming is one of the most important economic sectors in the Rakhiv District of the Transcarpathian Region, the formation and development of which is determined by the specifics of natural conditions, historical, socio-cultural and other factors. The development of the economic complex of Rakhiv District and the entire Hutsul Region was relatively isolated and focused on cattle breeding (*Gudovski et al., 2010; Lavruk, 2011*). Significant areas of natural meadows, relatively fast regeneration of plant cover in conditions of sufficient rainfall and solar radiation were important factors for the management and development of the pasture (pastoral) farming here (*Karabiniuk, 2020, 2021*). The lack of arable land in the Rakhiv District in the past forced the local population to focus on the economic use of territories with natural meadow vegetation for agricultural purposes and their expansion due to the cutting of forests and shrubs on gentle denudation surfaces, mainly in the subalpine zone. As a result, on the highest hypsometric levels of Chornohora, Svydovets and other mountain massifs, polonynas were formed, the exploitation of which provides agricultural needs even today.

Long-term farming use of the territory of the Rakhiv District directly affects the current ecological situation and the state of the natural environment. The geocological situation in the polonynas of the district mainly depends on the intensity of the load, the nature of use and the peculiarities of the implementation of ways to optimize management in the conditions of environmental protection activities (location of the Carpathian Biosphere Reserve), the development of recreation and tourism, etc. At the same time, as a result of the significant decline of the pasture farming in the 21st century, the processes of overgrowth of pastures with tree and shrub vegetation intensified, which leads to the raising of the upper limit of the forest and the loss of valuable agricultural land (*Karabiniuk, 2020, 2021; Karabiniuk & Pavlovysh, 2022*). Therefore, it is important to study the current state of pasture farming in the Rakhiv District and conduct an analysis of related geocological problems using modern geoinformation technologies (GIS).

Method

Modern studies of the pasture farming and its impact on the geocological state of the mountain polonynas of the Rakhiv District require the use of the latest research methods and geospatial data processing tools. These are modern geoinformation technologies that are actively used to study the properties of mountain geocomplexes and processes in the Ukrainian Carpathians (*Karabiniuk et al., 2020; Burianyk, et al., 2021*). With their help, we conducted a geo-informational analysis of statistical data and developed high-quality cartographic materials. Modern pasture farming in the Rakhiv District is characterized exclusively by the pasture type, and natural high mountain meadows are used only as pasture lands (*Karabiniuk, 2020*). Therefore, the primary task of the primary analysis of the factors of development and differentiation of the pasture farming in the region was to study the structure of agricultural lands and establish the features of the distribution of mountain pastures here in terms of communities and their associations – territorial communities. It was based on the data of the Main Directorate of the State Geocadastre in Transcarpathian Region as of 2021.

Our further studies of the current state and features of the territorial differentiation of the pasture farming in the Rakhiv District are mainly based on the analysis of statistical data of the department of agro-industrial development of the Rakhiv District Administration (*Results of livestock..., 2021*) and Carpathian Biosphere Reserve (*Journal of accounting..., 2021*). As a result, a database of the number of livestock in various polonynas of the Rakhiv District, including within nature conservation areas, was formed and analyzed. Its subsequent statistical and geoinformational processing made it possible to analyze the territorial distribution of livestock within the district and across territorial communities, as well as to determine the centers of the greatest farming load and potential deterioration of the geocological situation in mountain geocomplexes. The study of the influence of pasture farming on



the geocomplexes of the Rakhiv District and the analysis of geoecological threats associated with them was based mainly on the results of long-term field research during 2015–2022 in the highlands of the Chornohora and Svydovets mountain ranges and adjacent territories, where the largest polonynas areas of the district are concentrated. During the field survey, the main manifestations of damage to the soil and plant cover, the development of erosion processes and the degradation of geocomplexes in general were recorded here. The ArcGIS software environment was used for mapping and geoinformation data analysis.

Examples

Rakhiv district is located in the central, highest part of the Ukrainian Carpathians. There are more than 80 polonynas with a total area of more than 15 000 hectares within its borders (*Karabiniuk & Pavlovych, 2022*). The largest of them are confined to the massive spurs of the ridges of the Svydovets and Chornohora landscapes, which are characterized by a smoothed relief, the presence of massive spurs of the ridges and the best-expressed highlands with a high natural diversity of meadow vegetation. On average, the area of polonynas here ranges from 250 to 350 hectares, but the largest exceed 800 to 900 hectares. The largest in terms of size in the Rakhiv District are the fields of Turkulska (944,3 ha), Hereshaska (869 ha), Urda (712,9 ha) and Vytropy and Stih-Hrobovyi (875,4 ha), which are located above the named mountain ranges (*Accounting of agricultural..., 2021*).

The complex combination of mountain massifs and extensive intermountain valleys in the terrain of the Rakhiv district caused the uneven placement of polonynas and related mountain pastures. The largest number of pastures is located in the upper reaches of the Chorna Tysa River basin within the Chorna Tysa and Yasinia communities, the area of which here exceeds 1 200 and 900 hectares, respectively (**Fig. 1.a**). The absolute majority of the polonynas of these communities are confined to the northeastern macroslope of the Svydovets landscape (the pastures of Dragobrat, Dovha, Ploska, etc.) and Chornohora (the pastures of Hropa, Shumnieska, Shysa, etc.). On average, the area of these polonynas ranges from 350 to 450 ha and is located at the junction of the upper forest boundary and the rest of the subalpine vegetation belt. A significant number of powerful polonynas are also located on the southern slopes of the Svydovets massif, from which the mountain Kosivska River originates. Thus, within the boundaries of the Kosivska Poliana community, the total area of mountain pastures also exceeds 970 hectares. Two of the largest polonynas of the entire Rakhiv district are located here - Gereshaska and Urdu, the area of which is 869 and 712,9 hectares, respectively (*Results of livestock..., 2021*).

Significant areas of polonynas are also characteristic of the Bohdan and Luhy communities, which are located in the upper reaches of the Bila Tysa River basin. The largest meadows here are Harmanieska, Rohnieska ta Tomnatyk, the area of each of which exceeds 400 hectares. The peculiarity of these polonynas is their location within the Carpathian Biosphere Reserve, which makes it necessary to observe a special grazing regime and organization of economic activity here. Also, here at an altitude of 1 410 m above sea level the largest polonyna of the district is located – Turkulska, the area of which is 944,3 hectares. Bilyn, Kvasy, Lug and other communities, confined mainly to the valley of the Tysa River with its main tributaries, are characterized by the spread of mountain ridges and spurs with dominant forest vegetation, dismembered by erosion. Therefore, the area of polonynas here does not exceed 100–150 hectares (*Journal of accounting..., 2021*).

An important aspect of the analysis of the pasture farming of the Rakhiv District is the study of the species structure and number of livestock that graze on the polonynas. As of 2021, 17 957 heads of livestock were grazed on the territory of the polonynas of the studied district, of which about 85 % are sheep. The total number is 15 226. Cattle make up about 12 % of the total number of livestock, and horses make up the remaining 3 % (*Results of livestock..., 2021; Journal of accounting..., 2021*). The largest total number of livestock is observed annually in the meadows of Yasinia, Chorna Tysa,



Rakhiv and Verkhnie Vodiane communities (Fig. 1.b). Their number here exceeds 1 750–2 000 heads. This is the result of the location of powerful polonynas (Vorozheska, Krachunieska, Shumnieska, Steryshora, etc.), which by specialization are combined with the predominance of sheep breeding.

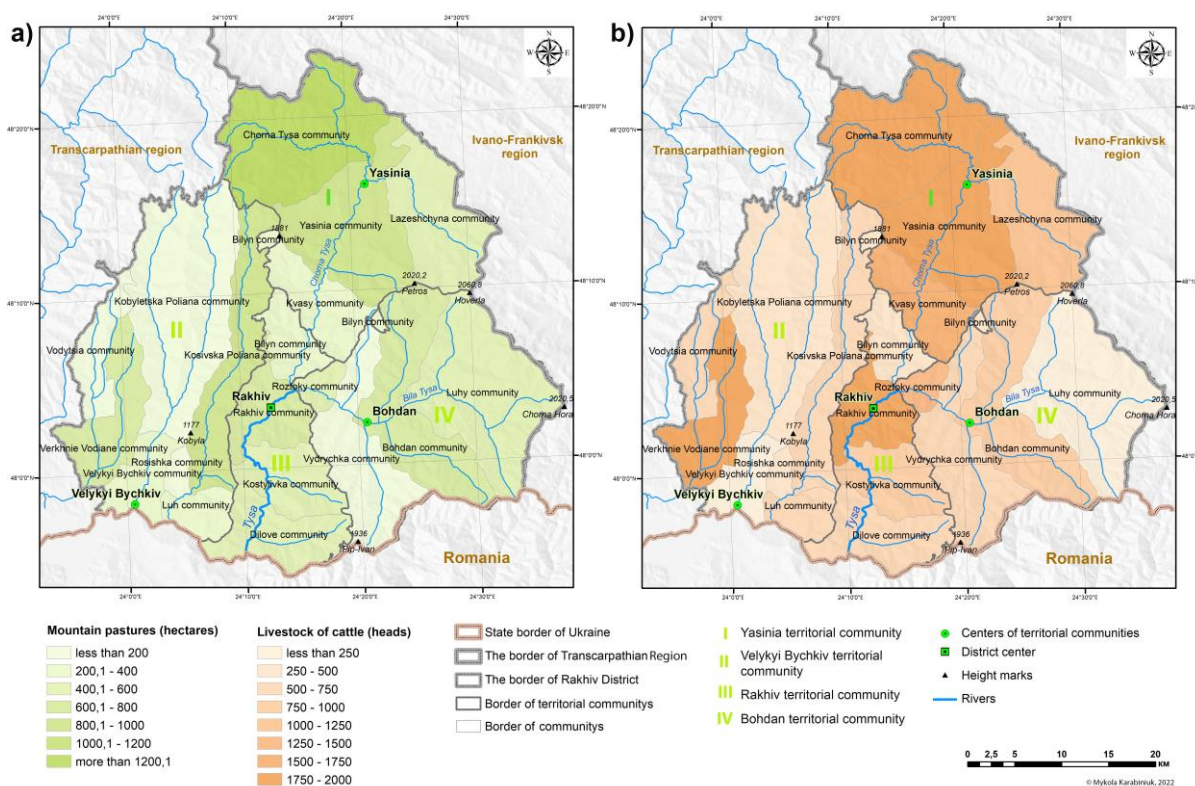


Figure 1 Map of territorial communities of Rakhiv district of Transcarpathian Region (as of 2021): a – distribution of areas of mountain pastures; b – distribution of the total number of livestock in the polonynas

A peculiarity of a number of polonynas of the Chorna Tysa and Verkhnie Vodiane communities is the largest share of horses in the Rakhiv District. Thus, more than 40–50 horses are grazed annually in the meadows of Poharska and Ripta Apshynska. The classical dominance of sheep in the species structure of livestock of the polonynas of the Rakhiv District with a decrease to lower hypsometric levels is significantly changing. Among all the polonynas of the studied area, only in the Luhy and Bylin Village, there are polonynas specializing in cattle, namely, Olen, Turkul, Shtyivora and other polonynas. These polonynas are significantly different from others, as they are much smaller in size (mostly up to 50 ha) and are located in the forest layer, the pastures of which are areas of secondary meadow vegetation.

Conclusions

Thus, the largest number of livestock (6 396 heads) is grazed on the territory of the Yasinia settlement territorial community, which is located in the upper reaches of the Chorna Tysa River basin. The leveled denudation slopes of the spurs of the ridges of the Chornohora and Svydovets massifs, as well as a rich fodder base, etc. are favorable here for the development of not only sheep breeding, but also cattle breeding. The smallest number of livestock belongs to Bohdan territorial community, which is 2 962 heads. The main amount of polonynas in the Rakhiv District is located at the junction of the forest mid-mountain and subalpine high mountain landscape tier at heights of about 1 250–1 500 m above sea level. Therefore, the main load on the natural environment is experienced by geocomplexes



of forests and areas of the subalpine tier. The long-term and intensive pasture farming in the Rakhiv Region led to a significant restructuring of the structure and nature of the vegetation cover, led to a high degree of anthropogenic modification of the landscape complexes of the highlands and mid-mountains of the Chornohora, Svydovets, and other mountain ranges.

One of the most negative geocological consequences of the intensive management of pasture farming in the territory of the Rakhiv District is the significant disturbance and complete destruction of the natural subalpine shrubs, the natural distribution of which is at altitudes of 1 450–1 850 m above sea level is characteristic of the highest mountain massifs of the district. Also, under the influence of the farming, there is a radical restructuring of the structure of plant communities, a decrease in the upper limit of the forest and the spread of low-yielding meadows. For example, in Chornohora, the subalpine shrubs was completely destroyed in the vicinity of the polonynas of Rohnieska, Sheshul, Konets Polonyna, etc. This leads to the activation of negative processes of linear erosion, scree, etc. within the highlands and the destabilization of mudslides and floods in the mid-mountain basins of rivers and streams that originate here – Paulek, Rohnieskul, Harmanieskul, etc.

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