

LEASECON 2020**International Conference «Land Economy and Rural Studies Essentials»****AGRARIAN SPECIFICITY OF HIGH MOUNTAIN VALLEYS OF
ALTAY AND HIMALAYAS**

Andrey V. Ivanov (a), Tatyana A. Artamonova (b)*, Vadim V. Ostanin (c),
Oxana A. Parpura (d)
*Corresponding author

- (a) Altai State Agricultural University, 98 Krasnoarmeyskiy Prospekt, Barnaul, Russia, ivanov_a_v_58@mail.ru
(b) Altai State Agricultural University, 98 Krasnoarmeyskiy Prospekt, Barnaul, Russia, art-katun@mail.ru
(c) Altai State Agricultural University, 98 Krasnoarmeyskiy Prospekt, Barnaul, Russia, vadim_bh@mail.ru
(d) Altai State Agricultural University, 98 Krasnoarmeyskiy Prospekt, Barnaul, Russia, oxikanka@mail.ru

Abstract

Altai and the Himalayas are two mountain systems of Eurasia, similar in their natural and climatic conditions and biosphere potential, which determines the commonality of social and environmental problems, the similarity of economic strategies. To assess the general problems and trends in the development of agriculture in the Altai and Himalayan regions, in the Russian-Indian research project, Uimonskaya (Ust-Koksinsky district, Altai Republic, Russia) and Kinnaurskaya (Himachal Pradesh state, India) mountainous areas were selected as representative territories. The common biosphere features of the two territories were identified (high mountains, climate severity, vulnerability of mountain landscapes). The parallelism in the use of biosphere products (Siberian and Himalayan pine nuts), crops cultivated in these territories (barley, wheat, buckwheat) is shown. General economic, ecological and social problems are indicated, which include soil degradation and deforestation, uncontrolled tourism, high production costs, loss of traditional lifestyle, population migration, climate change. Recommendations in the field of agriculture and nature management in high mountain areas are given. In particular, due to the remoteness of the mountainous regions of the Uimon Valley and Kinnaura from the sales markets, it is important to develop deep processing of agricultural and biosphere products locally, to intensify the production of products according to historically traditional recipes, which makes them an exclusive product on the market. A common challenge for Russian and Indian village inhabitant living in unique natural landscapes is the introduction of organic farming technologies.

2357-1330 © 2021 Published by European Publisher.

Keywords: Altai, agriculture in high mountain valleys, Himalayas



1. Introduction

Altai and the Himalayas are two great mountain systems of the Eurasian continent, bordering from the north and south the arid territory of the drainless basins and ridges of Central Asia. These mountain systems are similar in their natural and climatic conditions and are the largest centers of biodiversity. Within the framework of the Russian-Indian scientific project “Altai and the Himalayas as unique cultural and biosphere regions of Eurasia: the search for common values, ecological and economic strategies, sociocultural parallels” in 2016-2017, the Uimonskaya (Ust-Koksinsky District, Altai Republic, Russia) and Kinnaurskaya (Himachal Pradesh state, India) mountain valleys were chosen as research sites for comparative economic and comparative sociological research. Over the next years, joint Russian-Indian research was continued. Today we can summarize some of the results and prospects for further research.

2. Problem Statement

The similarity of the biosphere-climatic potential determines the common agronomic and environmental problems, as well as the strategies of economic activity in these territories. The features of this similarity include the highlands and the remoteness of economic entities from large agro-industrial centers. This contributes to the preservation of specific forms of agricultural activity and environmental management systems.

The traditional knowledge of the population of these regions contains the regulatory principles that have ensured sustainable farming in the past. In Kinnaur, as well as in the Uimon Valley, the most developed branch of the economy is agriculture. This branch (krishi - "land, agriculture", Sanskrit) is already mentioned in one of the oldest religious and philosophical texts of India – “Bhagavad-gita” (Gambhirananda, 2003, p. 813), as well as in the most important socio-political and legal treatise of ancient India “Artha-shastra” (“The Arthashastra of Kautilya...”, 1924, p. 32). It is noteworthy that both texts invariably emphasize that the land and animals used in agriculture are not just an economic resource for achieving mercantile goals, but objects of protection and special care, without which human life in harmony with the surrounding world is simply impossible. A similar motive for the sacred nature of human economic activity on Earth sounds in Russian spiritual poetry. This, in particular, concerns the special reverence for Mother Earth. In Russia, there was a rite of asking for forgiveness from the Earth, which preceded the rite of church confession. The repentant addressed the Earth with the following words:

I pray You, Mother Earth Raw, nurse, I pray you, poor, senseless, sinful, forgive me for trampling you with his feet, throwing you with my hands, looking at you with my eyes, spitting on you with my lips ... Forgive, darling, I'm a sinner (Rybakov, 1987, p. 769).

Today, this attitude, common for Russian and Indian traditional cultures, towards the Earth as a living being, requiring a careful and loving attitude towards itself, turns out to be more relevant than ever.

Therefore, today the most urgent problem is the organic combination of traditional and modern land use strategies, careful protection and deep processing of natural resources, and the creation of a

network of specially protected natural areas. All this applies to modern agriculture in general, but especially in high mountain areas.

3. Research Questions

The topic of the organic combination of traditional and modern land use systems has long been studied in the works of both Altai and Indian scientists (Altai-Himalayas: traditional knowledge, 2015). They proved the fact of sustainable use of certain agricultural crops, adapted to the conditions of the highlands of Altai and the Himalayas (Ivanov et al., 2016). For example, local residents of the Uimon Valley and Kinnaura Valley grow crops such as wheat and barley. In this regard, as never before, the words of famous Altai artist and cultural figure Choros-Gurkin (2015) from his essay “Altai and Katun” convey that “The migrant guests, summer visitors flew away long ago, leaving colorful memories of themselves. There are only peaceful Altaic settlers left, who are in a hurry to harvest their small, narrow strips of barley in the fields” (Gurkin, 1915, p. 4). Barley is a grain crop, which is the basis of nutrition for the population of the mountainous regions of India (haya-priya - literally "beloved by horses", Sanskrit), Tibet (tsampa, Tib.) and Altai (talkan, Alt.). The cultivation of barley, one of the oldest grain crops, requires hard work, and not a “dacha” relaxed regime of the inhabitant. Buckwheat is also widely used in the traditional cuisine of the Indians of the northern Himalayas and the Russian population of Altai. In the Himalayas, it is the most important raw material for baking traditional Himalayan flatbreads. Peas and beans are widespread in both regions, from vegetables - cabbage, turnips, pumpkin and some other types of vegetables. The most important problem for both regions is the development of new varieties of these grains and vegetables, which provide higher productivity and resistance to pests, as well as the testing of new technologies for their cultivation in high mountains and climate change.

As in Altai, local residents eat the seeds of the Siberian pine (pine nuts), so the inhabitants of Kinnaura use the seeds of the Himalayan pine, called the chilgoza nut. In terms of taste and appearance, our Altai pine nuts and seeds of the Himalayan pine practically do not differ from each other. It is almost impossible to distinguish between Himalayan and Siberian pine in general. Their phenotypes are so close. It is curious that the Himalayan pine (not to be confused with the Himalayan cedar!) grows only in Kinnaur - the coldest and highest mountainous district of the Indian state of Himachal Pradesh. One of the intriguing common themes for Indian and Altai scientists - how is it possible for such close species to exist in Altai and the Himalayas, separated by thousands of kilometers of lifeless deserts? According to one of the hypotheses that need to be tested, the entire region of Central Asia, primarily the Xinjiang Uygur Autonomous Region of China, was once well moistened and covered with cedar forests, connecting the north and south of Eurasia (Ivanov & Fotieva, 2017; Kolpakov & Fotieva, 2015).

Animal husbandry in Altai and in the Himalayas is also distinguished by significant similarities. Basically, it has a driving-pasture system, when livestock moves from summer to winter pasture during the year. Among the main breeds, both here and there we see goats and sheep, but the inhabitants of high-mountainous settlements also breed cows, yaks and sarlyks. The common problems of animal husbandry in the mountainous conditions of Altai and the Himalayas are its low productivity, lack of proper veterinary support, degradation of traditional pastures due to overgrazing. Optimization of livestock farming in mountainous conditions is the most important common task that faces the inhabitants of the

high-mountainous plains of Altai and the Himalayas, as well as agricultural scientists of the two countries.

It is curious that horticulture in the mountainous regions of Altai and in the Himalayas begins to develop at approximately the same time, from the end of the 19th century, and from the second half of the 20th century in the Indian Himalayas, it receives support from agricultural scientists. According to Singh (2020), after the formation of the state of Himachal Pradesh in 1948, great efforts were made to develop scientifically based horticulture. The post-war years also saw the most fruitful period of M.A. Lisavenko, one of the founders of Siberian gardening. Today Kinnaur is the largest supplier of apples for the whole India. The gardens are located on mountain terraces, and fruit production is an important branch of the local economy. Contacts between Altai and Himalayan gardeners, no doubt, can give weighty results that are significant for the economy of the two regions.

4. Purpose of the Study

The purpose of this article is to summarize the results of the Russian-Indian research, to outline the prospects for the future joint study of life and economic activity in the territories of Altai and the Himalayas, as well as to develop preliminary scientific recommendations that contribute to the transition to sustainable agriculture in high mountains and climate change.

5. Research Methods

Comparative biosphere, comparative economic and comparative sociological methods became the main ones in the study, which made it possible to compare the territories of the Uimon valley in Altai and the Kinnaura valley in the Himalayas by a number of common parameters and to find in the life activity of the population of these territories not only obvious similarities, but also differences. The work also used the extrapolation method, which makes it possible to predict trends in the development of territories, to assess the sustainability or, conversely, the locality and finiteness of the action of certain modern trends.

6. Findings

The rise in agricultural production in India in recent years, like in Russia, has led to a reduction in poverty and food imports, but the intensification of agriculture has led to the depletion of natural resources. This is especially noticeable in the Himalayan mountain valleys such as Kinnaur, where the optimal forms of interaction between man and nature have been taking shape for millennia. Today, under the pressure of the technogenic-consumer civilization with its cult of unlimited material consumption and predatory attitude towards the environment, significant changes have affected the area of traditional management and nature management. All this led to an increase in environmental problems. The most severe one is soil erosion.

This trend is all the more unfavorable, since the most important resource of the state of Himachal Pradesh, one of the most prosperous states of India, is soil. Today, only 21.4% of the land here is suitable for cultivation and harvest (Thakur, 2012). According to experts, massive deforestation and outdated

farming practices on the slopes are the main causes of soil erosion. As a result, the consequences of water and gully erosion increase, which is actively developing on a thin soil cover with abundant storm runoffs. State experts have developed a number of measures, including recommendations for special soil cultivation and the introduction of new agronomic methods for lands with a low erosion class; bioengineering measures (planning, step terracing, agroforestry methods, etc.) - for moderately eroded soils. Soils subject to a high class of erosion require complex protective measures, for example, such as the construction of facilities for the collection and storage of surface runoff, the allocation of soil protection areas, the creation of contour strips (Thakur, 2012, pp. 96-98). One of the promising soil protection methods is the strip placement of crops with different anti-erosion ability. As a result, strips with a high anti-erosion ability act as a buffer, i.e., trap soil, washed off from the upper strips with a low soil-protecting ability (Adinyaev & Dzheriev, 2009, p. 16).

A serious negative factor affecting the preservation of the biosphere resources of the Himalayas is also the arrival of large capital in the Indian highlands, interested in maximizing profits and not caring about the preservation of traditional Indian forms of life and farming. This is especially true of hydro-construction on Indian mountain rivers such as the Sutlej and the Beas. So, the creation of a cascade of dams on these rivers turned into a real disaster for the local population. It did not receive any material benefits, but the hydrological regime of Sutlej and Beas was completely changed. This entailed the destruction of floodplain lands, traditional pastures and sacred objects. The government was forced to resettle entire villages, which is a real disaster for the traditional Indian consciousness and which cannot be compensated financially (Handa, 2009, pp. 110-111).

In the Ust-Koksinsky district, as in the whole Altai, there is also an environmental disorder. The already mentioned Choros-Gurkin in his essay "Altai (Cry of an Altaian in a Foreign Land)" prophetically wrote: "An Altaian, this modest owner and keeper of Altai gorges and legends, will soon be forced out of the green valleys onto dry, sun-scorched cliffs. Others will come, and his son, an Altaian, will take away his property. They will take away the land he has cultivated, his meadows and his pastures, they will excavate and take out gold from the mountains, and the wonderful fragrant forests will chop down and burn" (Gurkin, 1907, p. 3). Fortunately, major projects for the construction of a cascade of hydroelectric power station on the Katun River, affecting the Uimon Valley were not implemented; however, the massive plowing of land, starting from the Soviet era, led to the almost complete disappearance of true - and forb steppes in the Ust-Koksinsky district. At the same time, the sale of grain on the market accounts for one third of its production in the Uimon Valley, since the natural conditions do not allow growing in large quantities strong and hard wheat varieties with a high market value (Meretskiy & Zhigulina, 2016, p. 95).

Deforestation, especially cedar deforestation, is also a negative anthropogenic factor. Cedar (Siberian pine) is one of the most valuable forest-forming species of Gorny Altai, playing a huge soil-protective and water-protective role. The cutting of cedar in the upper reaches of the rivers leads to intense floods, which causes enormous damage to agriculture, industry and transport.

The process of long-term degradation of forests, both due to commercial logging and due to fires, has led to a decrease in the biosphere potential in the Himalayan region, has affected local agriculture and the well-being of mountain communities.

The present landscape structure and function, – as Sitzia et al. (2010) in their article write – is the result of centuries of changes produced both by natural processes and human driving forces. For centuries many mountain and hillside areas have been the subject of deforestation to create space for agriculture and grazing, although the abandonment of traditional mountain agriculture has produced a natural forest recovery in many regions of the world (Sitzia et al., 2010, p. 1354).

For further sustainable development of agriculture in mountainous areas, it is also an urgent need to take into account the growing climatic changes. As practice shows in the Nepalese part of the Himalayas, changes in temperature and rainfall determine changes in the agricultural sector from changing crops to changing agricultural technologies. “Cultivation of crops and cereals depends strongly on monsoonal precipitation: Irregular mon-soon cycles directly affect crop yields, generating food insecurity for the people of Nepal” (Heider et al., 2018, p. 229). The same processes are characteristic both for the Indian Himalayas and for the Altai region. For example, the growing desertification processes in the Mongolian Altai, which in one way or another affect the Russian Altai, to which the Uimon Valley belongs, may lead to the fact that the advancing Gobi sands can destroy any economic and social activity in Western Mongolia by 2040.

All this makes us consider the preservation and restoration of forests and soils as the most important task of preserving life both in Altai and in the Himalayas.

7. Conclusion

The crisis of the modern technogenic-consumer civilization has shown that only those people who preserve their native nature and their spiritual unity with it will be able to ensure rational farming and environmental management of the earth and fully develop their human potential. Even Mahatma Gandhi put forward the idea of creating a new society, free from the exploitation of man and nature, which echoes modern ideas about the spiritual and ecological path of development of human civilization (Ivanov et al., 2014). The continuer of the Gandhi political dynasty, Maneka Gandhi, who was Minister of Environment and Forestry of the Government of India and a former member of the Indian Parliamentary Committee on Science and Technology, Environment and Forestry, gave an expanded ecological interpretation of the principle of ahimsa ("non-violence") introduced by her famous predecessor Mahatma Ganga.

Some truths are so simple and obvious that their stubborn rejection by people causes genuine amazement. This is, for example, the idea of ahimsa. After all, this is not some kind of "devotionalist philosophy", as some of our contemporaries derisively speak of calls to spirituality, considering spirituality to be an impractical eccentricity. On the contrary, ahimsa is at the heart of the economic strategy ... The economy based on ahimsa is the only model that in practice proves that breathing fresh air, living a long healthy life, eating healthy food, drinking clean water ... all people on Earth can simultaneously (Cremo & Goswami, 2004, p. 3).

It is clear that for the implementation of this ecologically extended principle of ahimsa, a significant reorganization of agriculture and the entire environmental management system is necessary, and, most importantly, the unity of all inhabitants of the planet on the basis of nature conservation, as the foundation of all human life.

Returning to the problems of sustainable farming by the inhabitants of the Uimon Valley in Altai and the Kinnaura Valley in India, it should be emphasized that in order to restore natural soil fertility, combat erosion and other processes of natural and anthropogenic degradation, it is imperative to withdraw a part of the most depleted lands from the arable fund. On the slopes of the Himalayas, where non-irrigated agriculture is developed, it is advisable to significantly expand the area of forests and cultivated pastures. It is also important to carry out appropriate bioengineering measures depending on the degree of erosion of the mountain slopes.

To maintain and increase the productivity of agrocenoses in the Himalayas, it is also necessary to use perennial grasses and break crops in crop rotation. More extensive mechanization and the reduce of heavy hand work are required in the Kinnaur Valley; breeding of new productive varieties of plants and animals. In the Ust-Koksinsky district, the low rate of land yield (0.19) in agricultural production determines the urgent need to change the structure of land use and land management (Meretskiy & Zhigulina, 2016, p. 97). It should be reoriented towards recreational use while preserving agricultural production as a service sector for the tourism industry. According to modern developments in the field of recreational zoning, modern natural complexes of the transboundary Altai can be integrated into recreational and nature protection, trade and recreational and recreational and commercial zones. Functional zoning and management in accordance with the selected priority zones is a tool for sustainable development of environmental management (Chernova & Sukhova, 2017).

Due to the remoteness of the mountainous areas of the Uimonskaya Valley and Kinnaura from the sales markets, it is important to develop deep processing of agricultural and natural products locally, to intensify the production of products according to historically traditional recipes, which makes them an exclusive product on the market. A common task for Russian and Indian village inhabitant living in unique natural landscapes is also the introduction of organic farming technologies (Semin, et al., 2018). So, Himachal Pradesh state, where the Kinnaur High Valley is located, is one of the pioneers who are resuming traditional farming and livestock farming methods. The concept of organic farming emerged as a response to health, environmental and climate change challenges (Altai and the Himalayas as unique cultural and biospheric regions of Eurasia, 2017, pp. 222-232). The introduction of an economic assessment of a mountain ecosystem and an assessment of the impact of agriculture on it, which is now widely used in European practice, is relevant.

A key task for territories like the Uimonskaya Valley and the Kinnaura Valley is the development of such profitable forms of management that would preserve the existing ecological balances and ensure the restoration of the natural environment.

This requires a wider use of new scientifically grounded agricultural technologies and methods of rational nature management. It should be noted that, in general, mountainous areas, despite their great vulnerability, have been preserved in a better ecological condition than flat ones. The purity of nature, a variety of landscapes, magnificent landscapes are fraught with tremendous opportunities for the physical

and spiritual recovery of a person. This resource is appreciated today all over the world, but it must be clearly understood and effectively used primarily by the local population itself. This is the key to the prosperity of Altai and the Himalayas, which can rightfully be called the most important Eurasian life-giving regions.

References

- Adinyayev, E. D., & Dzheriev, T. U. (2009). Ways of developing agriculture in mountain areas. *Sustainable development of mountain areas, 1*, 14-19. <https://eLIBRARY ID: 12568017>
- Chernova, E. O., & Sukhova, M. G. (2017). Recreational-commercial zoning of Altai mountains. *Sustainable development of mountain areas, 4(34), 9*, 362-368. <https://doi.org/10.21177/1998-4502-2017-9-4-362-368>
- Cremona, M. A., & Goswami, M. (2004). *Divine nature*. Moscow: "Mozhaisk polygraphic plant".
- Gambhirananda, S. (2003). *Bhagavadgita with the commentary of Sankaracarya*. Advaita Ashrama.
- Gurkin, G. I. (1907). Altai (Cry of an Altaian in a foreign land). *Siberian Life*. Typo-lithograph of the Siberian Printing Association, 196, 8.
- Gurkin, G. I. (1915). *Altai and Katun*. Index of G. I. Gurkin paintings exhibition. Typographic lithograph of the Siberian Printing Association.
- Handa, O. C. (2009). *Kinnaur. Unfolding Exotic Himalayan Land*. New Delhi.
- Heider, K., Weinzier, T., Schwab, N., Bobrowski, M., & Schickhoff, U. (2018). Future agricultural conditions in the Nepal Himalaya—a fuzzy logic approach using high resolution climate scenarios. *Die Erde, 4(149)*, 227-240. <https://doi.org/10.12854/erde-2018-382>
- Ivanov, A. V., & Fotieva, I. V. (Eds.) (2017). *Altai and the Himalayas as unique cultural and biospheric regions of Eurasia*. RIO Altai SAU.
- Ivanov, A. V., Fotieva, I. V., & Artamonova, T. A. (2016). Altai - Himalayas: biosphere-economic parallels and prospects of Eurasian cooperation. *Bulletin of Altai State Agrarian University, 7(141)*, 189-193.
- Ivanov, A. V., Fotieva, I. V., & Shishin, M. Y. (2014). *On the path to a new civilization (essays on the spiritual and ecological worldview)*. Publishing house of AltSTU.
- Kolpakov, N. A., & Fotieva, I. V. (Eds.) (2015). *Altai-Himalayas: traditional knowledge and innovations in the development of mountainous and foothill regions of Eurasia: materials of the 1st Russian-Indian-Mongolian seminar (2015, June 19-20)*. Publishing house of the "Altai-21 century" Foundation.
- Meretskiy, V. A., & Zhigulina, T. N. (2016). Prospects for land management and land use of territories of mountain landscapes (by the example of Ust-Koksinsky district of the Altai Republic). *Bulletin of Altai State Agrarian University, 7(141)*.
- Rybakov, B. A. (1987). *Paganism of Ancient Rus*. Science.
- Semin, A., Kundius, V., & Voronkova, O. (2018). Production of Organic Production as the Strategic Resource of Export-oriented. *Agriculture American Journal of Science and Technologies, 1(28)*, 108-136. Princeton University Press.
- Singh, M. G. (2010). *Himachal Pradesh: History, Culture & Economy*. Minerva Publishers & Distributors.
- Sitzia, T., Semenzato, P., & Trentanovi, G. (2010). Natural reforestation is changing spatial patterns of rural mountain and hill landscapes: a global overview. *Forest Ecology and Management, 8(259)*, 1354-1362. <https://doi.org/10.1016/j.foreco.2010.01.048>
- Thakur, P. (2012). Review of the soil erosion state in Himachal Pradesh. In S. S. Bansal, P. Gupta, S. V. Makarychev, A. V. Ivanov, M. Y. Shishin (Eds.), *Altai - Himalayas: two foundations of Eurasia: monograph* (pp. 90-99). Publishing house ASAU.
- The Arthashastra of Kautilya with the commentary Srimula of Mahamahopadhyaya T. Ganapati Sastri (The Sanskrit text only). (1924). Trivandrum. Part I – 1 and 2 Adhikaranas.