

# Resource potential for the sustainable development of agriculture in the Kyrgyz Republic

*Nurzhamal Parpieva*<sup>1,\*</sup>, *Nazgul Matikeyeva*<sup>2</sup>, *Zhanyl Sheralieva*<sup>1</sup>, *Nurzat Adylbekova*<sup>1</sup>, and *Urmatkan Amatova*<sup>2</sup>

<sup>1</sup>Kyrgyz National Agrarian University named after K. I. Skryabin, Bishkek, Kyrgyz Republic

<sup>2</sup>Osh State University, Osh, Kyrgyz Republic

**Abstract.** The sustainable development of agriculture is closely related to the quantity and quality of the resource potential and the conditions for reproduction. The paper analyzes the totality, quantitative set and qualitative parameters of labor, land and material and technical resources in the Kyrgyz Republic. The proportions of the reproduction of the resource potential in rural areas depend on the financial condition of an economic entity, the strategy and tactics of its development, the market conditions, and the stage of the economic cycle. There are some problems in realizing the resource potential of the sustainable development of the Kyrgyz Republic, including the lack of a developed innovation market infrastructure for agricultural producers. The uneven development of various components of the resource potential in agriculture is an inevitable factor that determines the specifics of its reproduction. Therefore, the efficiency of the resource potential should be enhanced through the formation of sufficient governmental support aimed at the innovative development of manufacturing, making of environmentally friendly agricultural products and introduction of advanced technologies that will ensure the competitiveness of agricultural enterprises in the context of the need for sustainable development.

## 1 Introduction

The level of development of the agricultural sector has always been a determining factor in the economic and socio-political stability of society. It is the agrarian sector of the national economy that to a decisive extent determines the socio-economic living standards and is the consumer of a large amount of material and technical resources. But, at the same time, it is characterized by a high degree of risk. Agriculture faces serious threats such as climate change, deforestation, degradation of natural resources and protracted crises. Stress can occur in any part of the agricultural system, making it more vulnerable to shocks. Therefore, increasing the sustainability of the development of the agricultural sector is the

---

\* Corresponding author: [nrparpieva@mail.ru](mailto:nrparpieva@mail.ru)

most important factor in its stability in connection with the risks caused by multiple stresses.

In matters of sustainable development of the agricultural sector, it is of particular importance to find ways to make the best use of available resources, since their solution will ensure maximal use of production facilities, costs reduction and product quality improvement.

Currently, both theoretically and in practice, insufficient attention is paid to the development of resource potential in the management of domestic agricultural enterprises, especially in the context of the current global trend of revising the main approaches to choosing ways and tools to improve the resource policy of the government. The world and domestic prices for resources are rapidly changing, the leading countries are moving to a fundamentally new paradigm of socio-economic development of society, based on innovative development.

The purpose of this study is to consider the efficiency of using the resource potential in agriculture in the context of sustainable development. In accordance with the goal, a set of main tasks seeking to achieve it was indicated:

- study of the essence of the resource potential in agriculture as an economic category;
- assessment of the availability and efficiency using the resource potential in agriculture in the Kyrgyz Republic;
- identification of factors for increasing the efficiency of resource potential for sustainable development.

Increasing the level of competitiveness of the national agrarian economy, solving socio-economic issues of rural development, securing a foothold in the international agricultural market today is impossible without enhanced use of the resource potential in agriculture, increasing the effectiveness of agribusiness.

## **2 Materials and methods**

The methodological basis of this study is the research of foreign and domestic scholars on the efficient use of resource potential, including in agriculture. At all stages of the study, dialectical, systemic and synergistic approaches were used with the methods of general scientific knowledge: comparison, analysis and synthesis, induction and deduction. Statistical analysis was used as a specific method.

## **3 Results**

The resource potential, on which the development of the economic and social spheres of human society depends, is formed on the basis of a combination of natural conditions, and organically associated labor and material and technical resources, creating integrated favorable conditions for agricultural production. Therefore, the need to consider the category of “resource potential” relates to the fact that the goals and objectives for achieving effective development results are largely caused by the need to transition to a sustainable development model. As structural elements, the authors will consider labor, land, material resources and conditions for their reproduction.

Human potential is formed and developed under the influence of demographic, economic, environmental, scientific, technical and climatic factors and is in close interaction with other elements. The population, as an independent element of the resource potential, acts, on the one hand, as a producer, and on the other, as the main consumer. Therefore, as part of the resource potential, the population is considered in the context of

providing the regions with labor resources of the required quality and in the required quantity.

**Table 1.** Dynamics of the population of the Kyrgyz Republic, thousand people

Population	2016	2017	2018	2019	2020
urban	2,029.5	2,073.9	2,121	2,173.6	2,231
rural	3,990	4,066.3	4,135.7	4,215.9	4,292.5
Total	6,019.5	6,140.2	6,256.7	6,389.5	6,523.5

*Source:* National Statistical Committee of the Kyrgyz Republic [1]

The population of the Kyrgyz Republic in 2020 amounted to 6,523.5 thousand people (Table 1), of which 65.8% lived in rural areas. The efficiency of agricultural production depends to the greatest extent on the availability, structure, skill level and efficiency of the use of labor resources. 446.6 thousand people were employed in agriculture of the Kyrgyz Republic in 2020, and compared to 2016, their number decreased by 29.5% (Table 2).

**Table 2.** Labor resources and average monthly wages in agriculture of the Kyrgyz Republic for 2016-2020

Indicators	2016	2017	2018	2019	2020	2020 to 2016, %
Average annual number employed in agriculture, forestry and fisheries, thousand people	633.3	541.4	482.7	443.2	446.6	70.5
Average monthly salary of agricultural workers, soms	9,010	9,643	10,084	10,186	10,479	116.3

*Source:* National Statistical Committee of the Kyrgyz Republic [1]

The average monthly salary in 2020 amounted to 10,479 soms, which is 55.32% of the average monthly salary in the whole country (in 2020, 18,940 soms). This factor affected the qualitative and quantitative indicator of qualified personnel, which led to an acute shortage of agronomists and livestock specialists in the republic.

The use of digital technologies, as well as the high demand from high-tech employers for skilled staff with digital competencies in agriculture, create an urgent need to form and update existing competencies among industry workers [2].

The employment of the rural population continues to decline, as a result of which many able-bodied and skilled rural residents work on leased land plots or on their own land plots, engaged in own small-scale production, or migrate abroad to work [3].

The presence of such specific features as fertility and territorial limitations, the physical and chemical composition of soils, the indispensability and impossibility of movement, resilience (subject to compliance with all agrotechnical measures) make land resources a determining factor affecting the efficiency of agricultural production.

**Table 3.** Area of agricultural land in the Kyrgyz Republic, thousand ha

Agricultural grounds	2017	2018	2019	2020	2021
Total,	10,608.1	10,607.2	10,607.7	10,607.7	10,606.1
including:					
arable land	1,287.8	1,287.8	1,287.6	1,287.4	1,287.3
perennial plantations	75.8	75.9	76.5	76.6	76.7
deposits	34.8	34.8	34.8	34.8	34.7
hayfields	202.2	202.2	203.1	203.5	203.7
pastures	9,007.5	9,006.4	9,005.8	9,005.4	9,003.7

*Source:* National Statistical Committee of the Kyrgyz Republic [1]

The Kyrgyz Republic has 12.8 million hectares of arable land, of which 9.0 million hectares are pastures, 0.2 million are hayfields (Table 3), 1.4 million are sown areas, including 1.077 million of irrigated land. Kyrgyzstan is among the countries that have limited arable land for agricultural production and limited potential to increase it. Arable lands make up 1,205.0 thousand hectares, or only 11% of the total agricultural land and 6.0% of the total land of the republic's administrative territories. The current trend of growing transformation (more than 3.0% of agricultural land has been transformed) and degradation of arable land (more than 35.0% of arable land has degraded), a high proportion of pastures that have reduced productivity (about 80.0% of pastures have degraded), in the future may create problems of sustainable supplying the population with food [4].

Geographically, arable land is located in areas with an arid climate, and Kyrgyzstan's water resources are unevenly distributed throughout the country. This requires the creation of a permanent irrigation system, given the mountainous landscape and the high cost of construction, maintenance of reservoirs and off-farm irrigation systems, which creates a constant financing problem and increases costs. Hazardous natural phenomena, including floods, landslides, mudflows, freezing causing natural disasters are a real threat to vegetation, and withdrawal of land from agricultural circulation create global threats such as crop loss and death of animals, providing a risk to the sustainable development of agriculture.

The area of secondary saline soils is increasing and makes up 75% of the total area of arable land of the republic, more than half of the sown areas of the republic are subject to water and wind erosion, and soil degradation. About half of the pastures are classified as degraded in terms of vegetation and soil conditions. The area of perennial plantings and vineyards has significantly decreased. There is a shortage of organic and mineral fertilizers on irrigated lands, the use of which mainly depends on financial problems associated with the acquisition, transportation, use and storage. Soil degradation associated with climate change causes significant economic damage to Kyrgyzstan. Soil degradation to some extent reduces crop yields by 20-60%. In the republic, grain crops are mainly grown, the yield of which is very unstable and ranges from 5 to 12 centners per hectare. Climate change causes widespread degradation of various types of agricultural land, crops, erosion of stony and wet lands. All this create a comprehensive, often unfavorable state of restoration of usable soils in the Kyrgyz Republic.

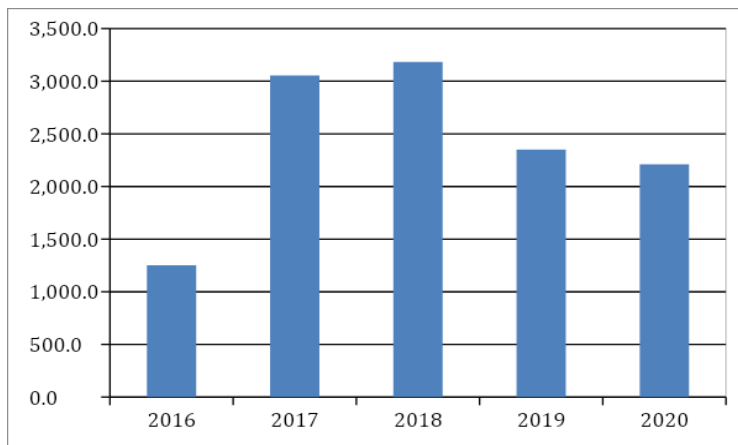
Another negative point worth paying attention to is the low level of organic and mineral fertilizers, which results in the nutrient deficiency in soils. In the process of extensive development of agriculture and water and chemical reclamation, erosion, compaction of the arable soil layer, decrease in its fertility, and weakening of the stability of natural landscapes of the Kyrgyz Republic are rapidly developing. The greatest danger is soil contamination with radionuclides, heavy metals, pathogens.

The physical infrastructure of agriculture is the most important, the most significant component of the resource potential. Engineering and technological factors of production, power supply, progressive methods of using equipment and materials contribute to the most effective involvement in the production process of other factors – land and labor.

The provision of agricultural producers with agricultural machinery at the beginning of 2020 was: tractors – 21,519 (21,499 in 2019), grain harvesters – 2,191 (2,219 in 2019), corn harvesters – 59 (73 in 2019), forage harvesters – 387 (387 in 2019). In 2019, one tractor accounted for 57 hectares of arable land. The sown area per one harvester accounted for: grain crops – 250 hectares, corn – 1,457 hectares [1].

The fleet of agricultural machinery, despite the ongoing renewal, first of all has a high degree of depreciation – more than 90%, the renewal of fixed assets is very difficult due to the high costs and conditions of financing/leasing, unbearable for small farms.

The lack of mineral and organic fertilizers and plant protection products does not allow intensive cultivation of agricultural crops. 30% of the harvest is already lost during the transportation of agricultural products from the field to the consumer. The weak financial and economic standing of agricultural enterprises does not allow modernizing the technological operations in growing crops, slows down the renewal of the physical infrastructure and the introduction of innovation.



**Fig. 1.** Investments in the fixed capital of agriculture (million soms). *Source:* National Statistical Committee of the Kyrgyz Republic [1]

As can be seen from Fig. 1, investment in agriculture after 2019 has declined markedly. Due to the low profitability of production in agriculture, there was a reduction in the production and technical potential. The lack of necessary investments led to a multiple decrease in the purchase of new machinery and equipment and physical depreciation of most of the fixed assets at agricultural enterprises.

One of the most important factors that can contribute to sustainable development is the effective use of their internal potential, the components of which are agricultural enterprises, farmer households, personal subsidiary plots. As of January 1, 2021, more than 462 thousand business entities operating in agriculture, forestry and fishing were registered in the republic. Of these, 349.2 thousand or 75.5% of the total number of such entities fall on farms, 112.4 thousand or 24.3 percent – on sole traders engaged in agricultural production. A significant number of such economic entities accounted for Osh region – 128.0 thousand, or 27.7% of the total, Jalalabad region – 105.9 thousand, or 22.9%, and Chui region – 68.8 thousand, or 14.9% [1].

**Table 4.** Number of active economic entities in agriculture, forestry and fisheries

	2016	2017	2018	2019	2020
<b>Total,</b>	<b>415,509</b>	<b>429,291</b>	<b>440,316</b>	<b>453,127</b>	<b>462,483</b>
including:					
Agriculture	415,433	429,217	440,055	452,803	462,129
including: state-run farms	33	27	26	31	31
collective farms	481	460	427	464	517
farmers	312,833	323,245	332,909	342,153	349,159
sole traders	102,086	105,485	106,693	110,155	112,422
Forestry	53	53	62	112	116

Fisheries	23	21	199	212	238
	<i>In % to Total</i>				
<b>Total,</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
including:					
Agriculture	99.98	99.98	99.95	99.92	99.92
including: state-run farms					
collective farms	0.01	0.01	0.01	0.01	0.01
farmers	0.1	0.1	0.1	0.1	0.11
sole traders	75.3	75.3	75.6	75.5	75.5
including:	24.6	24.6	24.2	24.3	24.3

Source: National Statistical Committee of the Kyrgyz Republic [1]

As can be seen from Table 4, small farms make up 75.5% of economic entities, most of which have small land shares and are mainly engaged in subsistence farming. The presence of a large proportion of small farms, the decline in the level of managerial skills in the countryside, the dominance of primitive ways and methods of farming, in many ways contribute to a decrease in the quality of products. The small-scale agriculture is one of the main obstacles to the export of agricultural products, which makes it impossible to conclude supply contracts in large volumes and for the long term.

From the point of view of public interest, indicators of land use efficiency should correspond to the needs of the population in agricultural products through domestic production [5].

**Table 5.** Economic efficiency of agricultural enterprises of the Kyrgyz Republic

Indicators	2016	2017	2018	2019	2020
Gross output per 100 ha of agricultural land	161.54	168.37	164.24	176.58	197.85
Share of agriculture in the country's GDP, %	12.5	11.7	11.7	13.6	14.7
Productivity, thousand soms/person	285.4	274.5	267.3	291.5	371.5
Capital-labor ratio, thousand soms/person	0.3	0.3	0.2	0.3	0.3
Return on assets, soms	3.2	3.4	4.4	3.9	3.7
Capital intensity, soms	3.2	3.4	4.4	3.9	3.7

Source: National Statistical Committee of the Kyrgyz Republic [1]

Over the period 2016-2020, the share of agriculture in GDP increased from 12.5% to 14.7%. The dynamics of gross output per 100 hectares of agricultural land show a positive trend, having increased from 1161.54 thousand soms/ha in 2016 to 197.85 thousand soms/ha in 2020 (Table 5). The volume of gross output of agriculture, forestry and fisheries in 2020 as a whole in the republic amounted to more than 249 billion soms. At the same time, the index of physical volume of production in 2020 in relation to the level of the previous year amounted to 101% [1]. There was an increase in industry productivity in 2016-2019, but due to restrictions related to the COVID-19 pandemic, labor productivity in 2020 decreased by 9% compared to the previous year.

According to the National Statistical Committee, in 2021 the harvesting indicators of grain crops (excluding legumes, rice and buckwheat) were harvested from an area of 230.7 thousand hectares, which is 3.3% less than in 2020 and about 285 thousand tons of grain were harvested, or 52% less. Due to abnormal high temperatures in the summer of that year and lack of irrigation water during the growing season, the gross harvest of wheat decreased by 41.4%, barley – by 57.9%, fruit and berry crops – by 31.2%, potatoes – by 6.3% and

gourds – by 3.5% [1]. Against the same background, the COVID-19 pandemic and the closure of borders played a role in the development of the national economy. The volume of imports and exports of agricultural products decreased, which led to a rise in the price of food throughout the country.

Significant potential of the agricultural sector is created by further prospects for the development of exports. The domestic market for agricultural products in Kyrgyzstan is small, but the country is part of the Eurasian Economic Union (EAEU) and creates attractive export opportunities. But the realization of the export potential depends on the active position of business, the efficiency and consistency of the efforts of local authorities seeking to create favorable conditions for the development of entrepreneurial activity.

The intersectoral disparity in prices and incomes remains an unresolved problem. In the context of the liberalization of the economy, agriculture turned out to be particularly vulnerable to monopolized resource suppliers. The price pressure from the mass of intermediaries and resellers has led to a multiple reduction in the share of agricultural producers in the retail price of the final product.

According to experts, the system of education and retraining is still insufficiently effective and adapted to the needs of agricultural producers. The republic lacks a developed innovation and market infrastructure for the agribusiness, such as service and logistics centers, innovation and technology centers, technology incubators, agrotechnical and consulting facilities.

The main reasons for the low efficiency of the implementation of resource potential include:

- Lack of qualified personnel and population outflow from rural areas;
- Irrational use of land resources;
- Outdated physical infrastructure;
- Small scale agricultural production.
- Deformation of price proportions;
- Imperfect agricultural market infrastructure;
- Lack of mechanisms to regulate the agricultural market.

The innovative direction of business development, combined with the actualization of social and environmental aspects, requires a change in strategic approaches to the use of the resources available. The participation of the government in the creation and use of resource potential is determined by the functions of state regulation of the economy through monetary and fiscal policy, labor and economic legislation, the implementation of state programs for the development of particular sectors of the national economy, or state programs for regional development, as well as foreign policy. The task of the government is to promote the development of resource potential through attracting investments, stimulating manufacturing, introducing innovations and marketing, and conserving resources and the environment.

Thus, the efficient functioning and use of resource potential becomes a prerequisite for the agricultural sector. The resource potential, with a more complete, rational and efficient use, can ensure sustainable multi-sectoral development, full employment, a high level and quality of life for the rural population. The innovative direction of business development, combined with the actualization of social and environmental aspects, requires a change in strategic approaches to the use of the resources available.

## **4 Discussion**

Considering the problem of ensuring and improving the efficient use of resource potential, the sustainability of its development and the reproduction of agricultural resources, scholars note that the main elements of the resource potential of agricultural production are: land

resources, labor resources, physical and engineering, financial and information resources. In academic literature, “resource potential” refers to the totality of engineering, technological, energy, information, innovation, investment and labor resources of an enterprise [6]. However, it would be wrong to draw a clear boundary between individual potentials, since they are in a very close relationship, interdependence and intersect in the structure of elements [7]. In general, the resource potential of the region is an optimization combination of production resources (land, labor, physical, innovative and financial), in which they give the maximum return without harming the environment [8].

In the economic literature there is no single point of view in the interpretation of the “resource potential” category. In fact, the resource potential of agricultural enterprises is a comprehensive system that combines groups of resources into a single whole, which, when used in organic unity, enables to obtain proper performance results. Various points of view on the essence and components of the resource potential of agricultural enterprises can be divided into the following two groups. The first group includes academic studies, in which the potential is identified with the provision of enterprises with resources and the efficiency of their use. The second includes studies, the authors of which consider the potential as the ability of a set of resources to achieve the expected end result.

That is, some scholars use the resource oriented approach, while others use the efficiency oriented one [9]. An attempt to link the totality of available resources with the result of economic activity has formed the resource-efficiency approach, according to which the production potential is a set of jointly functioning resources that have the ability to make a certain volume of products [10].

In a broad sense, the resource potential of agriculture is understood as the total potential of the resources that it possesses, and ensuring its functional and structural integrity and reproduction of both the system *per se* and its elements in accordance with the established goals.

Thus, the potential of agriculture is the ability of the sector to make products of a given volume and the required quality based on the effective use of a system of balanced natural, material and human resources [11].

## 5 Conclusion

The resource potential plays an important role for the economy of any country, as it is a means to maximize profits and increase competitiveness. Agricultural production in the Kyrgyz Republic today has a number of problems in the creation and use of resource potential, caused by the peculiarities of its past and modern development.

Current agriculture is characterized by a decrease in production efficiency as a result of the exhaustive use of extensive factors that form the resource potential. The consequence of the low efficiency of agricultural production is the state and nature of slow changes in production relations, which undermine the development of productive forces, including the resource potential. The discrepancy between the resource potential and its return has led to a significant decrease in the efficiency of using the potential of agricultural land, since some engineering facilities do not meet modern technological requirements due to insufficient reliability and low productivity. Meantime, the machinery and tractor fleet of farms lacks many types of agricultural machines and tools for comprehensive, multi-operational maintenance of crop, livestock and other sectors of agro-industrial production due to high cost.

Practically in all countries of the world, there is a shift in employment to higher income sectors, and the Kyrgyz Republic is no exception in the global trend.

First of all, the dynamics of agricultural employment are associated with changes in the agricultural sector, an increase in labor productivity, through the use of engineering



innovations, extensive mechanization of production, as well as the use of fertilizers and pesticides, irrigation systems, the introduction of more sustainable productive crops, the use of new types of tillage, etc. [12].

The changes are caused not only by the dynamics in the agricultural sector, but also by the general nature of socio-economic development, demographic changes occurring in countries and regions. As countries become richer, their demand for non-food goods and services increases, and the labor force moves from agriculture to more stable and highly paid sectors of the economy [13].

In the agricultural sector of the Kyrgyz Republic, there is a low level of efficiency in the use of agricultural land, the main reason for this process being the weak financial and economic situation at agricultural enterprises. This does not allow to modernize the technological operations of growing crops, slows down the renewal of the physical infrastructure and the introduction of innovation into production.

In most countries, governmental support plays a crucial role in the implementation of the state agri-food policy [14]. The creation of a favorable investment climate and governmental support for concessional lending to agrarian entities should become the economic basis for the reproduction of resources. Modernization of agricultural production, saving production resources and increasing the level of competitiveness of domestic agricultural products will ensure the sector's sustainable development.

At the same time, the lands that will continue to be cultivated and plowed annually need regular erosion control, crop rotations and other sustainable land management practices that will maintain both high crop yields and soil fertility [15].

Obviously, in a transition to the digitalization of the agricultural sector, the workforce must be characterized by significant mobility, flexibility and digital competence. Most of the tasks cannot be solved in the new conditions without knowledge in the field of innovative developments, creating the need for agricultural production in the training of specialists with innovative thinking.

The combination of all directions for improving the level of resource provision and increasing the efficiency of their use should take place on the basis of the economic interest of each stakeholder in agricultural production, since it is the human factor that determines the rational use of the resource potential of agrarian entities.

## References

1. National Statistical Committee: official website (2022). Accessed on: February 19, 2023. [Online]. Available: <http://www.stat.kg>
2. I.G. Kuznetsova, Prof. Edu. Mod. World, **11(1)**, 55-65 (2021)
3. N.R. Parpieva, N.K. Esirkeyva, Econ. Vector, **2** (2022)
4. Cabinet of Ministers of the Kyrgyz Republic. The concept of agricultural development of the Kyrgyz Republic for 2021-2025 (2021). Accessed on: February 19, 2023. [Online]. Available: [http://admin.koombtalkuu.gov.kg/uploads/npa\\_versions/6141ebd0033fa1.48745238.pdf](http://admin.koombtalkuu.gov.kg/uploads/npa_versions/6141ebd0033fa1.48745238.pdf)
5. Kh. Grischuk, Acad. Papers: Manag., Econ. Eng. Agr. Rural Areas Devel. **19(3)** (2019)
6. E.V. Sokolova, Bul. Kemerovo State Univ. Ser.: Polit., Soc. Econ. Sci. **1(19)**, 129-135 (2021)
7. I.O. Vlasova, Probl. Mod. Econ. **1(57)**, 207-209 (2016)
8. L.N. Krapchina, L.G. Kotova, N.A. Mishina, S.A. Vlazneva, Food Pol. Sec. **2(4)**, 199-208 (2015)
9. S.N. Gavrichenko, Bul. Belarus. State Agric. Acad. **2**, 40-43 (2018)

10. T.V. Yurchenko, O.Yu. Pavlova, *Bul. SPb State Agr. Univ.* **45**, 190-195 (2016)
11. G.M. Galieva, *Bul. Kursk State Agr. Acad.* **9**, 188-195 (2019)
12. A.S. Stokov, A. Deppermann, V.Yu. Potashnikov, A.A. Romanovskaya, P. Gavlik, *Econ. Pol.* **15(6)**, 140-165 (2020)
13. A. Polukhin, T. Grudkina, M. Grudkina, *IOP Conf. Ser.: Earth Envir. Sci.* **274(1)**, 012113 (2019)
14. A.S. Naumov, A.A. Potapova, M.A. Topnikov, *Outl. Glob. Transf.: Polit., Econ., Law*, **15(1)**, 128-150 (2022)
15. J.E. Taylor, D. Charlton, *The Farm Labor Problem: A Global Perspective* (Academic Press, 2018)