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# Research Relationship of Rural Population and Number of Agricultural Enterprises

Maria A. PANTELEEVA<sup>1</sup>, Natalia V. KLIMOVA<sup>2</sup>

## Abstract

The aim of the study is to find out whether the decline in the number of agricultural enterprises is the reason for the decline in the rural population. For this, the dynamics of statistical indicators, their correlation, as well as the influence of indicators through factor analysis are investigated. The results of the study showed that there is a strong relationship between the decline in the rural population and the number of agricultural enterprises. The novelty of the study lies in the fact that previously the problem of the outflow of the rural population was not directly associated with a decrease in the number of agricultural enterprises.

*Keywords:* outflow of the rural population, agricultural enterprises, correlation analysis, reasons for the decrease in the number of agricultural enterprises.

## Introduction

Agriculture plays an important role for the country's economy and its food security. But agriculture has many problems that hinder its development (Bundina, 2018). One of them is the decrease in the number of agricultural enterprises. First of all, this affects the decrease in competition in agriculture, which is one of the factors in the development of any industry.

The decrease in the number of agricultural enterprises can be caused by various factors. Some authors believe that this is due to the outflow of the population from the countryside to the cities. Over the past 20 years, the population in rural areas in Russia as a whole has decreased by more than 2 million people (Federal State Statistics Service, 2021). The state seeks to attract the population to live and work in rural areas, implementing various state programs, but their results are not yet impressive. According to Voronin, Chupina & Voronina (2019) the reason for the outflow of the population is unemployment, as workers are forced to look

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for work in nearby cities and larger settlements. Nefedova and Mkrtychyan note that the population is leaving villages due to low wages and a small selection of vacancies (Nefedova, Mkrtychyan, 2017). The rural population is trying to find better living and working conditions and is moving to cities, since the available places of employment offer job seekers low wages (Derevianko, 2019). However, when studying the dependence of the outflow of the rural population on various factors, Volkova and Svistelnik found that the dependence of the outflow of the rural population on the development of the road network is even higher than the dependence of the outflow of the population on the average monthly payment in the countryside, which is claimed by some authors as the main reason for the movement of the population to the city (Volkova & Svistelnik, 2018).

An interesting point of view is when it is argued that not only the low standard of living in rural areas contributes to the outflow of the population, but also vice versa. The outflow of the population affects the degradation of the rural population and the emergence of depressed rural areas. This point of view is shared by Vartanova and Bezverbny, who note that the outflow of people from the countryside and the degradation of the rural environment is a strategic threat to business and the state. This not yet fully realized risk affects everyone, from investors hoping to make money on the long-term horizon to the government setting ambitious goals such as achieving food independence, a multiple increase in the export of agricultural products and the transition of the agro-industrial complex to a digital system. People are a key asset of the agricultural sector, the quality of which has been falling for decades in a row and which is becoming less and less physically (Vartanova & Bezverbny, 2019).

The rural employable population moves to the city and, as a result, agricultural enterprises cannot find qualified personnel for the development of enterprises. This, in turn, affects the prospects for the work of the remaining enterprises. Over 20 years, the number of enterprises in agriculture has decreased by almost 70% (Federal State Statistics Service, 2021). The consolidation of some agricultural producers can be traced, but in general, a decrease in the number of agricultural producers carries negative consequences for the country. According to Gulyaeva and Buraeva (2017) the economic consequences of the migration of rural youth are quite significant. This is due to the fact that young people are the most employable and have a high level of professional education, strive to improve their qualifications, advance in the service, which can act as factors in increasing labor productivity. Thus, the researchers argue that the closure of businesses in rural areas leads to unemployment and population outflow. It is necessary to find out whether the decrease in the number of agricultural enterprises specifically affects the number of rural population and the number of employees of agricultural enterprises. It is possible that the impact will be weak, since workers could move from closed agricultural enterprises to enterprises with a different type of economic activity or to enlarged agricultural enterprises, and then the closure of agricultural enterprises will not cause a decrease in the number of the rural population.

## Methodology

The purpose of the study is to identify the relationship between the number of agricultural enterprises and the number of the rural population. Is the closure of agricultural enterprises the reason for the outflow of the rural population to the city?

The tasks of the study are to identify the dynamics of the main indicators that reveal the living conditions in rural areas, to study the relationship between the indicators and to analyze the influence of factors. In the course of the study, the growth rate of statistical indicators was calculated to understand the dynamics of changes in indicators. Correlation analysis was also applied to identify the relationship between the number of the rural population, the number of agricultural workers and the number of agricultural enterprises. A graphical method was used to visualize the correlation. To study the influence of the number of rural residents on the number of agricultural enterprises, factor analysis using the method of absolute differences was applied (Shmoilova, Minashkin, Sadovnikova & Shuvalova, 1998). For the study, the data of the Federal State Statistics Service of Russia for 2000-2019 were used (Federal State Statistics Service, 2021).

Some statistics are reflected not only for agriculture, but they include agriculture, forestry, hunting, fisheries and fisheries. This is due to the fact that the statistics service combines indicators for these types of economic activities. However, this assumption should not affect the understanding of the general trend of changes in the number of agricultural enterprises and the number of the rural population, since the share of enterprises engaged in hunting, forestry, fishing and fishery is so small that even the statistics service does not separate them into separate indicators.

## Results

Table 1. *Dynamics of the main indicators of the standard of living in rural areas*

Indicators	2000	2005	2010	2015	2019	Deviation	
						+/-	%
Urban population, thousand people	107072	104719	105421	108282	109563	2491	2.33
Rural population, thousand people	39232	38755	37444	37985	37186	-2046	-5.22

Average annual number of people employed in agriculture, forestry, hunting, fishing and fish farming, thousand people	8996	7381	6622	5507.3	4765	-4231	-47.03
The number of enterprises in agriculture, thousand	329	293.2	193.4	146.8	102.9	-226.1	-68.72
Average monthly nominal accrued wages of employees in Russia, rubles	2223	8555	20952	34030	47867	45644	2053.26
Average monthly nominal accrued wages of workers in agriculture, hunting and forestry, rubles	985	3646	11109	19721	31728	30743	3121.12
Share of average monthly wages of agricultural workers in average monthly wages in Russia, %	44.31	42.62	53.02	57.95	66.28	21.97	x

Source: *Federal State Statistics Service, 2021*

The dynamics of the indicators indicates a decrease in the rural population by 2 million people. The average annual number of people employed in agriculture has decreased over 20 years by 4.2 million people. The number of enterprises decreased by almost 70%. If 329 thousand agricultural enterprises worked in the country in 2000, then their number decreased to 146.8 thousand by 2019. At the same time, the average nominal wage in Russia as a whole was 34 thousand rubles in 2019, and the average wage of agricultural workers was lower - about 20 thousand rubles in 2019. But it should be noted that the growth rate of wages at agricultural enterprises is higher than in the country as a whole. Wages in the country increased 2 thousand times, and at agricultural enterprises - 3 thousand times. In 2000, agricultural workers' wages were only 44% of the national wages,

and this figure had increased to almost 58% by 2019. As a result, even a high growth rate did not allow wages at agricultural enterprises to reach the all-Russian level.

Thus, we are witnessing a decrease in the rural population, the number of agricultural workers and the number of agricultural enterprises. To study the dependence of these indicators, we will conduct a correlation analysis.

Correlation coefficient of the number of agricultural enterprises and the average annual number of people employed in agriculture in Russia in 2000-2019 is 0.8982 (Figure 1), which indicates a strong relationship between these two factors.

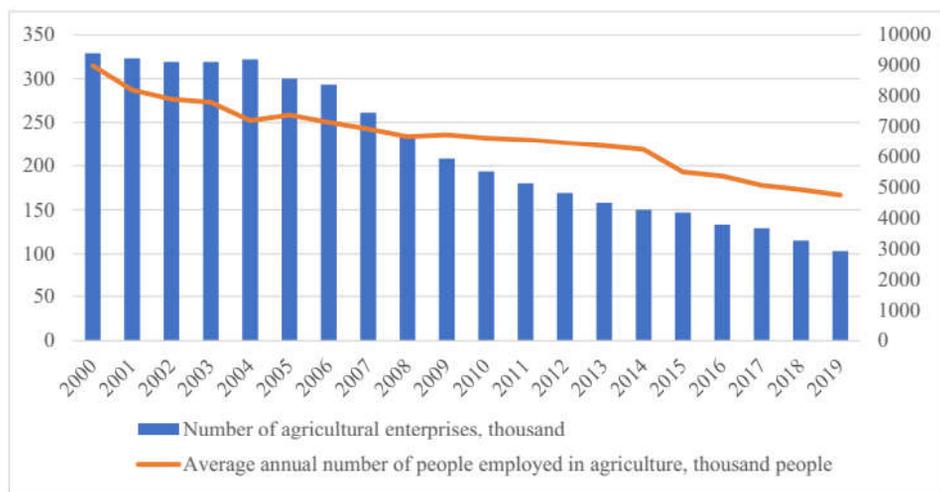


Figure 1. Correlation of the number of agricultural enterprises and the average annual number of people employed in agriculture in Russia in 2000-2019.

Source: (Federal State Statistics Service, 2021)

And the coefficient of correlation between the number of agricultural enterprises and the number of the rural population in Russia from 2000 to 2019 is 0.9248 (Fig. 2). That is, the relationship between the number of agricultural enterprises and the number of the rural population is even greater than the relationship between the number of agricultural enterprises and the number of people employed in agriculture.

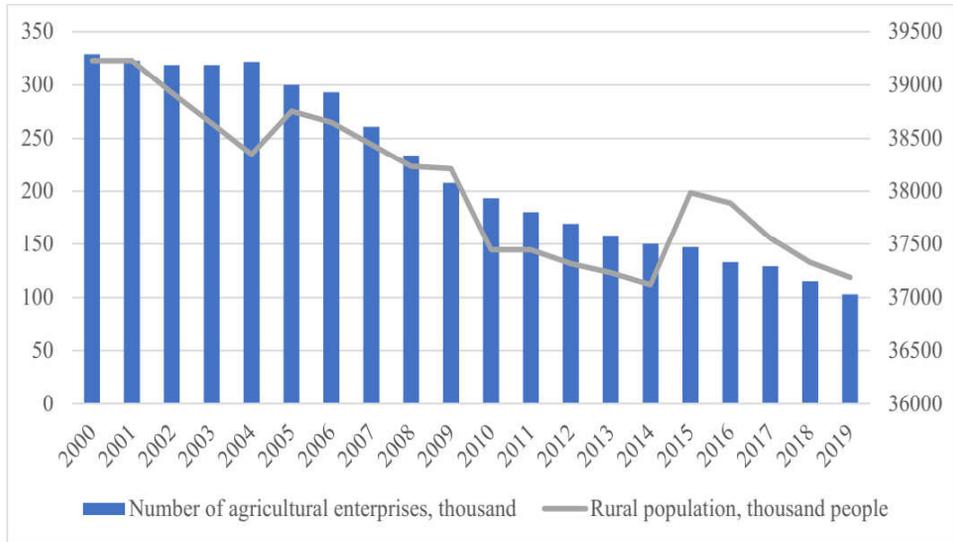


Figure 2. Correlation of the number of agricultural enterprises and the number of rural population in Russia from 2000 to 2019.

Source: (Federal State Statistics Service, 2021)

To understand the extent to which the decrease in the number of agricultural enterprises affects the number of the rural population, we will conduct a factor analysis. Factor analysis will be performed by the method of absolute differences using the following formula:

$$\text{Rural population} = \text{Number of agricultural enterprises} \times \text{The number of rural residents per 1 agricultural enterprise} \quad (1)$$

Table 2. Data on factor analysis of the rural population

Indicators	2015 year	2019 year	Deviation	Influence on the resulting factor
Rural population, thousand people	37985	37186	-799	-799
The number of rural residents per 1 agricultural enterprise, people per enterprise	258,75	361,38	102,63	10560

The number of enterprises in agriculture, thousand	146,8	102,9	-43,9	-11359
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*Source: compiled by the author.*

The decrease in the number of agricultural enterprises had the greatest impact on the change in the number of the rural population. Its influence was -11359 thousand people. While the change in the number of rural residents had a positive impact - 10560 thousand people. This is confirmed by the example of Breitovskaya Poultry Farm LLC, which was a town-forming enterprise in the Breitovo village, Yaroslavl region, Russia. The poultry farm has been operating since 2008 and was engaged in breeding broiler chickens, pigs, and also cultivated regional fields. The poultry factories employed about 100 employees. In 2016, the largest agricultural enterprise of the Breitovsky district suspended its activities and people were left without work (Channel One Yaroslavsky, 2021). At the same time, there was a decrease in the population. The population of Breitovsky district in 2007 was 8,535 people, and by 2017 the number had decreased to 6,340 people. (Federal Statistics Service, 2021). People were forced to change their place of residence in order to be able to find work.

## Discussion

The findings suggest that the rural population is indeed declining. For 20 years, it has decreased by 2 million people. The average annual number of workers in agricultural enterprises has decreased twice as much - by 4.2 million. This suggests that during the study period not all workers of closing enterprises moved to the city, since 2.2 million fewer people moved to the city during this period. The relationship between the number of rural population and the number of working agricultural enterprises is higher than the relationship between the number of agricultural enterprises and the number of workers employed in agriculture. At the same time, the number of agricultural enterprises decreased by 226.1 thousand.

Some authors argued that low wages were the reason for the outflow of the population from rural areas. In 2019, rural wages were 33.72% lower than urban wages. However, during the study period from 2000 to 2019 its growth rate is 1.5 times higher than wages in the city. Thus, rural wages are growing faster than urban wages and are rapidly closing the gap, which gives rise to doubts that wages are the only reason for the outflow of rural populations to cities.

Regarding the study of the decrease in the number of agricultural enterprises per the number of the rural population, the study confirmed this opinion. The correlation between the rural population and the number of agricultural enterprises was 0.9248. Factor analysis showed that a decrease in the number of agricultural enterprises led to a decrease in the number of rural population for 5 years by 799

thousand people. The example of Breitovskaya Poultry Farm LLC in practice confirmed the dependence of the rural population on agricultural enterprises.

The study confirms the assumption that the decline in agricultural enterprises directly affects the rural population. It is necessary to pay attention to this problem, since it, in turn, leads to an outflow of young people from rural areas and deprives working agricultural enterprises of qualified personnel. Thus, the problem is exacerbated even more.

## Conclusion

In the course of the study, the tasks of analyzing statistical data and identifying their dependence and influence on each other were completed. By means of which the aim of the study was achieved and the influence of the number of agricultural enterprises on the number of the rural population was revealed. The data obtained confirm the assumption that the number of the rural population and the number of agricultural enterprises are interdependent indicators. A decrease in the number of agricultural enterprises leads not only to a decrease in the number of agricultural workers, but also to a decrease in the number of the rural population. The practical significance lies in the fact that the data obtained confirm that the rural working population depends on agricultural enterprises. The data obtained can be used to further investigate this problem. In the future, it is necessary to conduct a study of the reasons for the termination of the activities of agricultural enterprises within the framework of the stated problem.

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