Industrial and agricultural production in the Perm Territory: economics and organization aspects

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Abstract. The article considers a methodology for analyzing the organization of industrial and agro-industrial production in the region using the method of correlation pleiades. This allowed the authors to draw conclusions regarding the interconnectedness of spatial and temporal data in the region’s space, as well as to identify quantifiable groups of indicators that are crucial in the region’s economy, in the sustainable development of individual territories, and general trends that form the directional path of the region’s development.

1. Introduction
Many authors asked the question of the study of the relationships in the development of individual indicators, groups of indicators, processes in the development of territories and regions. So, in particular, Belyakov S.A., Shpak A.S. a methodology for assessing the scientific and technological development of the regions of the Siberian Federal District is proposed [1]. The methodology for assessing production relationships in the territory is disclosed in the work of T P Likhacheva, O V Ryzhkova, Yu V Ulas [2] Investment and technological aspects of development under the conditions of macroeconomic changes are disclosed in detail in the works of O S Sukharev, E N Voronchikhina [3,4]. The investment component in the development of production is noted in the works of A Yu Fedotova [5,6]. Technologies of agricultural production and the method of their improvement are also presented in a number of works [7,8]. Nevertheless, the issues of balanced development of territories based on diagnostics of the interconnections of production and economic components remain almost unexplored from a methodological point of view and are of particular interest to us, since the Perm Territory is one of the leaders in the Russian Federation in the field of industrial and agricultural production.

2. Main part
In order to identify whether there is an interdependence (or similarity) in the dynamics of indicators characterizing the main economic and production indicators of the municipalities of the Perm Territory in the period from 2014 to 2018, the method of correlation analysis was applied.

Since all indicators are quantitative (the scales are metric), and the distribution of indicators is normal, Pearson’s parametric correlation coefficient was calculated to identify and evaluate the closeness of the relationship between the series of comparable quantitative indicators of the questionnaire.
Pearson's correlation coefficient is a parametric method that is used to statistically study the relationship between phenomena. When using the correlation coefficient conditionally assess the tightness of the relationship between the signs, considering:

- coefficient values equal to 0.3 or less - indicators of weak communication tightness;
- values of more than 0.4, but less than 0.7 - indicators of moderate tightness of communication,
- values of 0.7 or more - indicators of high communication tightness.

When calculating the correlation coefficients, the average values of the main indicators for the period from 2014 to 2018 were taken as a basis. So, the average values for the given period were calculated for the following indicators:

- the volume of agricultural production;
- the volume of crop production;
- the volume of livestock production;
- the amount of local budget revenues;
- the amount of local budget expenditures;
- the volume of investment in fixed assets;
- the profit margin of manufacturers;

The results of the correlation analysis of these indicators among themselves are presented in table 1.

**Table 1.** Correlation analysis of the average values of production and economic indicators of municipalities of the Perm region in the period from 2014 to 2018.

| Correlations                  | Agriculture products (in actual prices), thousand rubles | Crop products (in actual prices), thousand rubles | Livestock products (in actual prices), thousand rubles | Local budget revenues actually implemented, thousand rubles, indicator for the year | Local expenses of the budget actually executed, thousand rubles, the value of the indicator for the year | Investments in fixed capital at the expense of the budget of the municipality, thousand rubles | Investments in fixed capital made by organizations located in the territory of the municipality, thousand rubles | Investments in fixed capital of organizations of the municipal form of ownership, thousand rubles | Profit (loss) before tax for the reporting year, thousand rubles |
|------------------------------|----------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Agricultural products (in actual prices), thousand rubles | Pearson Correlation Value (double sided) | 1 | .945\textsuperscript{a} | .997\textsuperscript{a} | .763\textsuperscript{a} | .764\textsuperscript{a} | .569\textsuperscript{a} | .013 | .408\textsuperscript{b} | .567\textsuperscript{a} |
| N                            | **Pearson Correlation**                                  | 40 | 40 | 40 | 40 | 35 | 35 | 35 | 35 |
Table 1. Correlation analysis of the average values of production and economic indicators of municipalities of the Perm region in the period from 2014 to 2018.

|                        | Agriculture products (in actual prices), thousand rubles | Crop products (in actual prices), thousand rubles | Livestock products (in actual prices), thousand rubles | Local budget revenues actually implemented, thousand rubles, indicator for the year | Local expenses of the budget actually executed, thousand rubles, value of the indicator for the year | Investments in fixed capital at the expense of the budget of the municipality, thousand rubles | Investments in fixed capital made by organizations located in the territory of the municipality, thousand rubles | Investments in fixed capital of organizations of the municipal form of ownership, thousand rubles | Profit (loss) before tax for the reporting year, thousand rubles |
|------------------------|--------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| thousand rubles        | Value (bilateral)                                      | .000                                              | .000                                                   | .000                                                                             | .001                                                                             | .891                                                                             | .024                                                                             | .000                                                                             |                                                                                  |
| Livestock products     | Pearson Correlation                                    | .758a                                              | .997a                                                  | .916a                                                                            | .560a                                                                            |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| (at actual             | N                                                       | 40                                                | 40                                                     | 40                                                                                | 35                                                                                | 35                                                                                | 35                                                                                | 35                                                                                |                                                                                  |
| prices), thousand       |                                          |                                                   | .758a                                                  | .916a                                                                            | .560a                                                                            |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| rubles                 |                                          |                                                   |                                                         |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| Local budget revenue   | Pearson Correlation                                    | .763a                                              | .735a                                                  | .758a                                                                            | .784a                                                                            | .784a                                                                            | .716a                                                                            | .664a                                                                            |                                                                                  |
| actually implemented.  | N                                                       | 40                                                | 40                                                     | 40                                                                                | 35                                                                                | 35                                                                                | 35                                                                                | 35                                                                                |                                                                                  |
| , thousand              |                                          |                                                   | .763a                                                  | .735a                                                                            | .758a                                                                            | .784a                                                                            | .716a                                                                            | .664a                                                                            |                                                                                  |
| rubles, indicator      |                                          |                                                   |                                                         |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| value for the year     |                                          |                                                   |                                                         |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| Local budget expenses  | Pearson Correlation                                    | .764a                                              | .735a                                                  | .759a                                                                            | .784a                                                                            | .784a                                                                            | .715a                                                                            | .662a                                                                            |                                                                                  |
| actually implemented.  | N                                                       | 40                                                | 40                                                     | 40                                                                                | 35                                                                                | 35                                                                                | 35                                                                                | 35                                                                                |                                                                                  |
| , thousand              |                                          |                                                   | .764a                                                  | .735a                                                                            | .759a                                                                            | .784a                                                                            | .715a                                                                            | .662a                                                                            |                                                                                  |
| rubles, indicator      |                                          |                                                   |                                                         |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| value for the year     |                                          |                                                   |                                                         |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |                                                                                  |
| Fixed capital          | Pearson Correlation                                    | .569a                                              | .535a                                                  | .569a                                                                            | .784a                                                                            | .784a                                                                            | .761a                                                                            | .427b                                                                            |                                                                                  |
| investments from the   | N                                                       | 40                                                | 40                                                     | 40                                                                                | 35                                                                                | 35                                                                                | 35                                                                                | 35                                                                                |                                                                                  |
| year                   |                                          |                                                   | .569a                                                  | .535a                                                                            | .569a                                                                            | .784a                                                                            | .761a                                                                            | .427b                                                                            |                                                                                  |
Table 1. Correlation analysis of the average values of production and economic indicators of municipalities of the Perm region in the period from 2014 to 2018.

| Correlations | Agriculture products (in actual prices), thousand rubles | Crop products (in actual prices), thousand rubles | Livestock products (in actual prices), thousand rubles | Local budget revenues actually implemented, thousand rubles, indicator for the year | Local expenses of the budget actually executed, thousand rubles, the value of the indicator for the year | Investments in fixed capital at the expense of the budget of the municipality, thousand rubles | Investments in fixed capital made by organizations located in the territory of the municipality, thousand rubles | Investments in fixed capital of organizations of the municipal form of ownership, thousand rubles | Profit (loss) before tax for the reporting year, thousand rubles |
|--------------|--------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| budget of the municipality, thousand rubles | Value (bilateral) | .000 | .000 | .000 | .000 | .300 | .000 | .011 |
| N | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Fixed capital investments made by organization located in the territory of the municipality, thousand rubles | Pearson Correlation Value (bilateral) | .013 | .024 | .010 | .151 | .148 | .180 | 1 | .191 | -.277 |
| N | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Investments in fixed capital of organization of municipal ownership, thousand rubles | Pearson Correlation Value (bilateral) | .408 | .382b | .409b | .716a | .715a | .761a | .191 | 1 | .194 |
| N | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Profit (loss) before tax for the reporting year, thousand rubles | Pearson Correlation Value (bilateral) | .567a | .560a | .560a | .664a | .662a | .427b | -.277 | .194 | 1 |
| N | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |

a The correlation is significant at the 0.01 level (bilateral).

b The correlation is significant at the 0.05 level (bilateral).
We have managed to build correlation pleiade of production and economic indicators on the basis of the correlation analysis of the average values of production and economic indicators of the municipalities of the Perm Territory.

**Figure 1.** Correlation pleiade of production and economic indicators of municipalities of the Perm Territory in the period from 2014 to 2018.

**Table 2.** Explanation of the designation in the correlation pleiade of production and economic indicators of municipalities of the Perm Territory.

| Indicator No. | Indicator Name                                           |
|---------------|---------------------------------------------------------|
| 1             | Agricultural output                                      |
| 2             | Crop production                                         |
| 3             | Livestock production                                    |
| 4             | The value of local budget revenues                       |
| 5             | The amount of local budget expenses                      |
| 6             | Volume of budget investments                            |
| 7             | Volume of investments of organizations and enterprises  |
| 8             | The value of the profit of production in the territory   |
3. Conclusion
The study has shown that the strongest and most stable relationships were formed between the indicators of agricultural production (in the totality of sub-sectors) (over 0.9). While the profit of production is entirely dependent on the volume of all types of investments. This situation can be explained by the very close interweaving of agricultural and food industries in the Perm Territory. This field of activity is represented by more than 300 agricultural organizations. Moreover, in the total volume of the manufacturing sector, agricultural products account for about 50%, which also confirms the results of the study. At the same time, we note the general growth in production indicators of key food industry enterprises, which brings it to the position of increasing its share in gross regional product.

Acknowledgments
This work was financially supported by a grant from the President of the Russian Federation for state support for research by young Russian candidates of science (project MK-536.200.6).

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