

REGIONAL DISPARITIES IN SLOVAK AGRICULTURE

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Abstract

Regional disparities can be perceived as a cross-cutting category of many disciplines, but most often they can be perceived as economic differences of regions' level of maturity. Regional disparities in business are addressed mainly by Asian countries. In European countries, research on regional disparities in agriculture is paying less attention. The article focuses its attention on the research of regional disparities in the field of agriculture. The analysis of the series of production and economic indicators showed that, instead of the expected convergence of the development of agriculture in the individual regions of Slovakia, the regions diverged in the monitored period. What is contrary to the European Union's endeavor to ensure convergence of regions under the regional and cohesion policy for 2014-2020.

Key words: regional disparities, regions, convergence, production and economic indicators

INTRODUCTION

The concept of regional disparities is defined as a measure of variation in the expression of the intensity of the economic phenomenon observed within the regions of a given country and with slight modification [23, 24]. The OECD definition focuses only on economic phenomena through which differences in the level of development of regions are most often perceived [19]. However, there are more comprehensive definitions of regional disparities. Regional disparities represent the existence of a number of regional disparities, which are ultimately reflected on the level of human development conditions of living in the region [1]. Regional disparities can be seen as differences in the quality of life, wealth, standard of living of people living and working in different regions [8]. Regional disparities can be understood as deviations from some imaginary division reference characters that are considered relevant to the different spatial levels of scale (boundary region) [31]. Regional disparities distances between regions can be considered in abstract metric space, which can be described either by one selected descriptive indicator of the region or by a set of these indicators, not only

statically but also dynamically [10]. Disparities can be measured by lack of cohesion, which is also the basis for European Union policies [21].

Regional disparities can be defined as differences or inequalities of features, phenomena or processes that have a clear territorial location (can be allocated within a defined territorial structure) and that occur in at least two entities of this territorial structure [18]. Regional disparities as the difference between regional development and the critical value of selected economic, social and territorial indicators, while the critical value is defined as the median value of the indicator for the whole country with $\pm 5\%$ tolerance limit [9].

Disparity is often seen as a negative phenomenon, which should be eliminated. However, not all disparities are undesirable phenomena, e.g. regional disparities can be seen as positive in terms of comparative advantages of a particular region, but also negative as unjustified differences in the level of economic, social and environmental development of regions [14]. Negative disparities are often referred in SWOT analyzes as weaknesses of the monitored object and positive disparities, which can be

described as strengths of the examined object. Several authors point out that examining the causes of regional disparities requires a multidimensional approach [18, 30, 12, 13]. Development disparities are the result of development differentiation of social systems, while the effectiveness of their regulation is determined by the degree of respect for the laws of their socio-geographical and socio-economic organization [30]. The causes of regional disparities can be seen in different natural-geographical conditions, the extent and quality of the socio-economic potential of regions, as well as the impact of diverse historical and socio-economic factors [6]. According to them, the individual regions due to different historical, geographical, socio-economic and social conditions have different starting capital, the quality of human capital, infrastructure and adequate to this progress their growth and development is being realized.

For the causes of disparities can be regarded the inability of the regions to adapt to economic and social transformation that may be due to the nature of the productive structure, accessibility and remoteness of the region from markets, poor transport and infrastructure, weak public administration, poor structure of labor supply, unfavorable demographic profile and absence of regional policy [4]. The main causes of regional disparities in Slovakia are the primary potential of the territory, the structure of the settlement network, the attractiveness of macro-positions, the economic specialization of regions, the impact of globalization, EU support, public administration and internal resources [16]. Some studies pointed out the importance of the EU membership on regional development from the enterprise point of view [15, 22]. Despite a large number of empirical studies, the results of investigating the causes of regional disparities are not clear [11].

Regional disparities in business are mainly researched by the authors of Asian countries, mostly from India and Nepal [2, 3, 26, 27]. In European countries, to the research on regional disparities in agriculture is paid less attention. While it is true that tertiary and secondary sectors are the key sectors of

regional development, agriculture still plays an important role in the development of rural areas. This is also evidenced by the EU Common Agricultural Policy, which has been a key policy of the European Union since the creation of the European Communities. Therefore article focuses its attention on the research of regional disparities in the field of agriculture, which has its importance in the European countries, especially in their rural areas.

MATERIALS AND METHODS

The article uses data from the Statdat and Datacube databases of the Statistical Office of the Slovak Republic. The first partial objective is to assess the current state of Slovak agriculture through a series of production-economic indicators (gross agricultural output, gross value added, sales of agricultural production, the average number of employees in agriculture, the number of natural and legal persons in agriculture and average monthly wage in agriculture) transformed for the need of comparability for the period 2001 to 2016 measured in individual regions of Slovakia (NUTS III). The following regions (Fig.1) were evaluated: Bratislava region (BA), Trnava region (TT), Trenčín region (TN), Nitra region (NR), Žilina region (ZA), Banská Bystrica region (BB), Prešov region (PO) and Košice region (KE).



Fig. 1. Map of NUTS III region in Slovak Republic
Source: Ministry of Agriculture and Rural development of Slovak Republic [20].

In the second sub-objective, we have compiled a model based on sixteen consecutive cluster analyzes, which monitor

the development of regional disparities in agriculture in individual regions of Slovakia for the period from 2001 to 2016. The identification variable of the cluster analyzes were eight regions of Slovakia; the homogeneous homogeneity and the individual indicators that entered the model did not show any significant correlation between them. The cluster analysis was realized with the use of Statistical Analysis System software.

We have based the research on six transformed indicators, namely gross agricultural output per 1 ha of agricultural land in EUR (GAO), the share of agriculture in total gross value added per 1 ha of agricultural land as a percentage (GVA), number of natural persons per 1,000 ha of agricultural land, number of legal persons per 1,000 ha of agricultural land, average monthly nominal wage in agriculture in EUR (Wage) and number of employees in agriculture per 1,000 ha of agricultural land.

RESULTS AND DISCUSSIONS

Development of regional disparities in the agricultural sector in Slovakia

One of the basic indicators of the series of production-economic indicators is agricultural production, whose status can be quantitatively evaluated on the basis of gross agricultural output (GAO in current prices in thousands of euros). In our research we have independently monitored gross agricultural output in crop and livestock production between 2001 and 2016.

The level of gross agricultural output in Slovakia (Fig. 2) reaches a value oscillating around EUR 2 billion per year, whereas the largest gross agricultural output fluctuation occurred during the economic crisis after 2008 and have been stabilized in the year 2011.

More interesting, however, is a concrete analyses of livestock and crop gross agricultural output, where it can be seen that since 2007, crop gross agricultural output has had a greater impact on overall gross agricultural output. In the short term, this trend prevailed in 2004, when crop gross agricultural output exceeded livestock gross agricultural output by almost EUR 30 million.

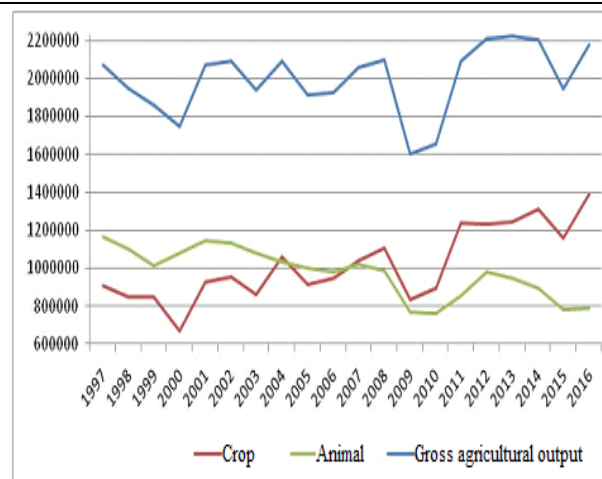


Fig. 2. Gross agricultural output at current prices in thousands of euros

Source: Own calculations based on Statdat data [28].

For better comparability of regions, we have calculated gross agricultural output per hectare of agricultural land in the given region and we have separately monitored crop and livestock gross agricultural production. Crop production as an essential part of agriculture is considered as a limiting factor in the development of livestock and crop production at all. The total production of crop products depends on harvested areas and hectare crops, which fluctuate in individual years. The key crop production sector with the greatest importance in the nutrition of the population is the cereals industry, which belongs to the group of crops with signs of lower costs per unit area. Wheat, barley and corn have the most important position in crop rotation in Slovakia [17].

Crop gross agricultural output (Fig. 3) in the observed period shows an increase in all regions of the Slovak Republic, but especially in the Bratislava region, where crop gross agricultural output increased almost 2.5 times and in the Trenčín, Žilina, and Košice regions, where it increased by more than 40% compared to 2007. However, the largest share in the total increase in gross agricultural output was observed in the Bratislava, Trnava and Nitra regions, which have a significant position in this area. The above figure shows that the differences in gross crop production in the observed period between individual regions deepen.

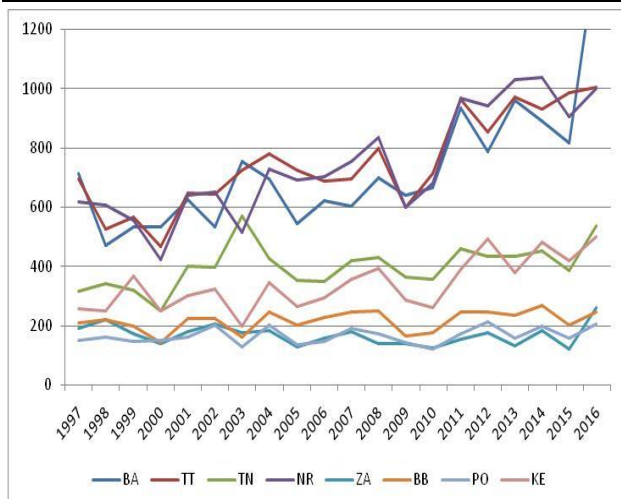


Fig. 3. Gross agricultural output in crop production in EUR per ha of agricultural land

Source: Own calculations based on Statdat data [28].

Individual products of animal origin have significantly different input requirements. This is influenced on the one hand by the biologically determined ability to use the energy of feed, but also by the different level of breeding and intensity of productivity. The main reserves for streamlining animal production are in the rational intensification of efficiency (reduction of costs per unit of production) and in the optimization of the species structure of animal according to available feed sources [5]. Livestock gross agricultural output (Fig. 4) shows a decrease in 2016 compared to 2007 in six regions of the Slovak Republic, with the exception of two, where livestock gross agricultural output increased by 67% in the Bratislava region and by 17% in the Prešov region. However, the largest contributors to the overall decrease in livestock gross agricultural output were the Trenčín region, where the decrease in livestock gross agricultural output was 44%, the Trnava region with a decrease of 23% and the Nitra region with a decrease of 36% in 2016 compared to 2007 and the Trnava region. The Košice region had a small impact on the changes with a decrease of 38.5%, but due to a longer period of time, compared to 2001. Differences in gross livestock production between the regions deepened during the observed period and from 2013 onwards these differences are starting to narrow, although they have still not reached

the minimum value of the 2001 standard deviation.

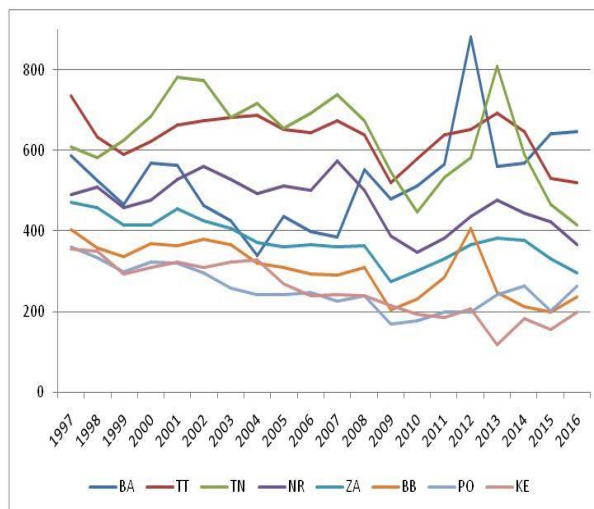


Fig. 4. Gross agricultural output in livestock production in EUR per ha of agricultural land

Source: Own calculations based on Statdat data [28].

The value added of the agricultural sector is the result of its production activity per calendar year, it is used to measure the performance of agriculture and is calculated as the difference between the resources created (value of total production) and consumption (production consumption, so-called intermediate consumption). This is gross value added in agriculture. After subsequent deduction of consumption of fixed capital we receive net value added [17].

In order to evaluate the overall level of Slovak agriculture in individual regions, we chose as another indicator the share of gross value added in agriculture in the region in the total gross value added of the region in terms of 1 ha of agricultural land for the period 2001 to 2016. In general, we can state (Fig. 5) that the share of agriculture in the total gross value added per 1 ha of agricultural land has declining trend in most regions. The most radical decrease in this share can be seen on the curve of the Trnava region, where the share of agriculture in the total gross value added per 1 ha of agricultural land decreased by up to 46%. The smallest decrease was recorded in the Bratislava region and the only region in the Slovak Republic in which the share of agriculture in the total gross value

added per 1 ha of agricultural land increases after 2007 is the Banská Bystrica region.

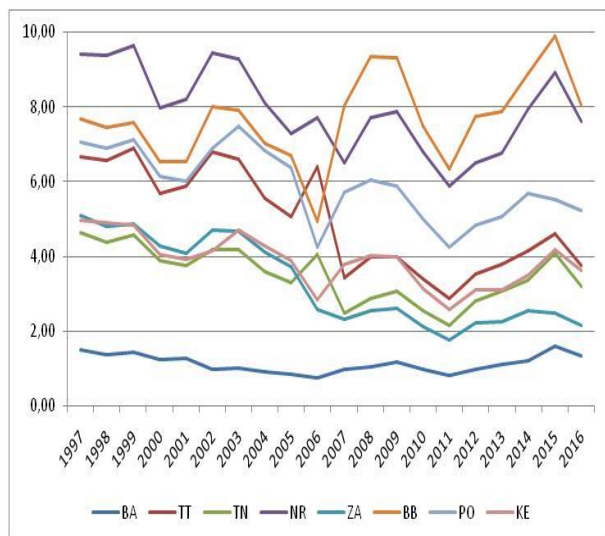


Fig. 5. Share of agriculture on Gross value added per ha of agricultural land
 Source: Own calculations based on Statdat data [28].

The decrease in net value added in Slovak agriculture was significantly due to a change in the structure of production, mainly due to a dramatic decrease in the share of animal production in total agricultural production (from 45% to 38% in 2011), which was the steepest decline among all neighboring countries [29].

Following on from the previous indicators, it is also appropriate to examine changes in agricultural sales, as a larger volume of production creates preconditions for a larger volume of sales. However, the development of this indicator is also influenced by the quality of finished production reflected in the different level of realization prices, which also depends on the regional possibilities of the region. We examined agricultural sales specifically for crop and livestock production in the observed period of sixteen consecutive calendar years 2001 to 2016. Fig. 6 also shows the impact of the economic crisis on agricultural sales, which was reflected in a decline in sales in 2008-2010. Analogous to gross agricultural output, we monitor separately sales from livestock and crop production.

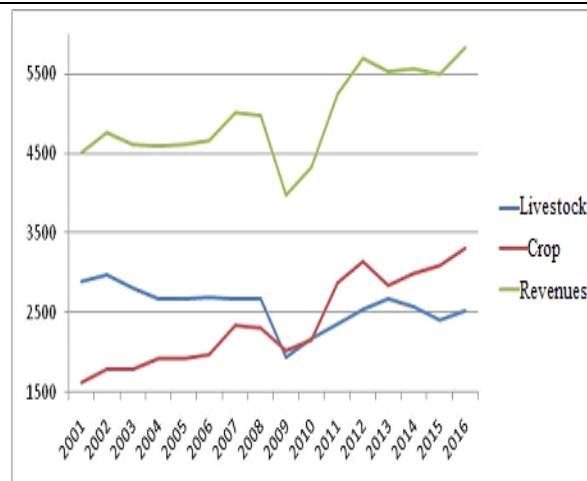


Fig. 6. Revenues from agricultural production in EUR per 1 ha of agricultural land
 Source: Own calculations based on Statdat data [28].

Revenues from crop production in EUR per 1 ha of agricultural land (Fig. 7) reflect the development of crop gross agricultural output and show an increase in all regions of the Slovak Republic. Assuming that we examine in more detail the increase in revenues in 2016 due to the period of economic crisis and thus 2009, we can say that the regions with the greatest impact on changes in agricultural sales are Bratislava, Trnava and Nitra region, of which in the Bratislava region 120%, in the Trnava region by almost 60% and in the Nitra region by 47%.

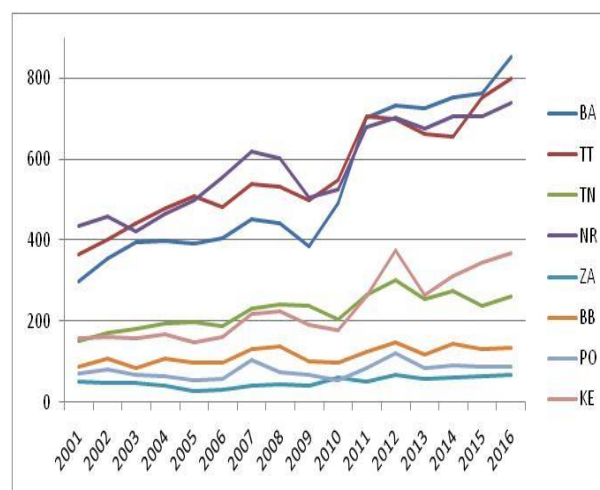


Fig. 7. Revenues from crop agricultural production in EUR per 1 ha of agricultural land
 Source: Own calculations based on Statdat data [28].

Although the Košice region has a weaker influence on changes in sales in agriculture and from a visual assessment it can be argued

that the economic crisis did not fully manifest itself here until 2010, when sales from crop production reached their minimum, but in 2016 sales in the Košice region were from crop production. more than doubled compared to 2010. Differences in revenues in crop production between individual regions deepen significantly during the observed period, similarly as in the case of gross crop agricultural output.

All regions of the Slovak Republic, with the exception of the Bratislava region (increase by 40%) and the Košice region (increase by 1.5%), show a declining trend in revenues from livestock production, similarly to the indicator of livestock gross agricultural output in the whole observed period 2001-2016. (Fig. 8). However, from the point of view of the impact of the economic crisis, which did not avoid even revenues from livestock production, we can speak of an increase in revenues in all regions of the Slovak Republic.

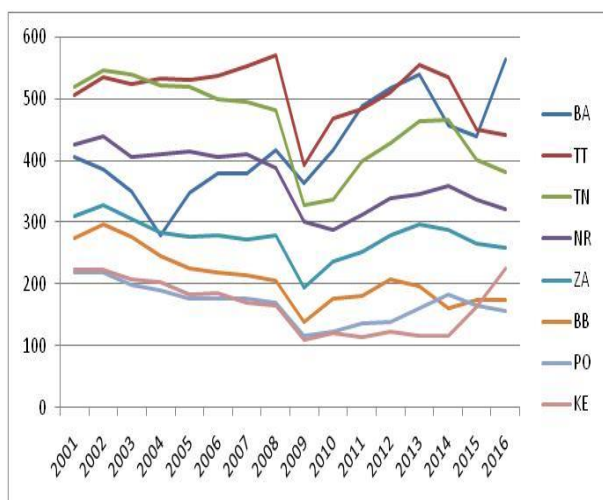


Fig.8. Revenues from livestock agricultural production in EUR per 1 ha of agricultural land
Source: Own calculations based on Statdat data [28].

In the Bratislava region, revenues from livestock production increased by more than 200 euros per 1 ha of agricultural land, in the Trnava region by almost 50 euros per 1 ha of agricultural land and in the Košice region it was by 117 euros per 1 ha of agricultural land but with little impact on changes in revenues of agricultural production. Differences in revenues from livestock production between

regions have a growing trend in the observed period, although with more moderate dynamics and in the case of crop production.

In addition to land and capital, the labor factor is an important production factor in agriculture, therefore when analyzing the level of agriculture, it is necessary to examine also the wages factor, which form a crucial component of labor costs, the number of employee in the sector and the number of agricultural subjects.

The number of employees in agriculture in the observed period 2001 - 2016 is decreasing. The most radical year-on-year decrease in employees is in the Nitra Region, where there is a decrease of more than 10,300 employees; resp. a decrease of 60%, in the Banská Bystrica region, where there is a decrease of almost 9,000 employees; resp. a decrease of 64% and in the Trnava region with a decrease of employees working in agriculture by about 8,500 employees; resp. a decrease of 62% compared to 2001.

In the context of the average percentage of employees working in agriculture with the average registered number of employees in individual regions (Fig. 9), it should be mentioned that in 2016 only 4.34% of the total number of employees in the region worked in agriculture in the Nitra region, which is or 7.01 pp. less than in 2001, in the Trnava region even by up to 7.23 pp. (3.75% in 2016) fewer employees and in the Banská Bystrica region by 5.28 pp. (3.42% in 2016) fewer employees working in agriculture.

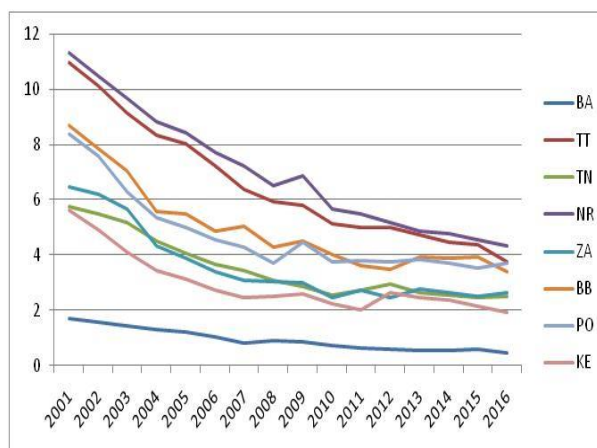


Fig. 9. Average number of employees in agriculture in individual regions of Slovak Republic (in %).
Source: Own calculations based on Statdat data [28].

This is one of the few indicators where regional differences between regions are gradually decreasing (the development of the standard deviation has a declining trend). From the above, it could be concluded that the attractiveness of employment in agriculture is still declining. However, this is not confirmed by the growing trend in the number of businesses in agriculture. The highest number of natural persons per 1,000 ha of agricultural land during the whole monitored period 2001-2016 were identified in the Prešov region and the least in the Nitra region (Fig. 10). After 2007, only the Žilina region shows a continuing trend of dynamic growth in the number of natural persons, where the number increased by approximately 5 natural persons per 1,000 ha of agricultural land after 2007 and the Bratislava region with a year-on-year increase of 1 person per 1,000 ha of agricultural land after 2007. The Nitra and Trnava regions report year - on - year stability of the number of natural persons per 1,000 ha of agricultural land, and in the remaining regions of Slovakia is this number decreasing year - on - year compared to 2007. In the Prešov region, this decrease represents 3.36 of natural persons per 1,000 ha of agricultural land.

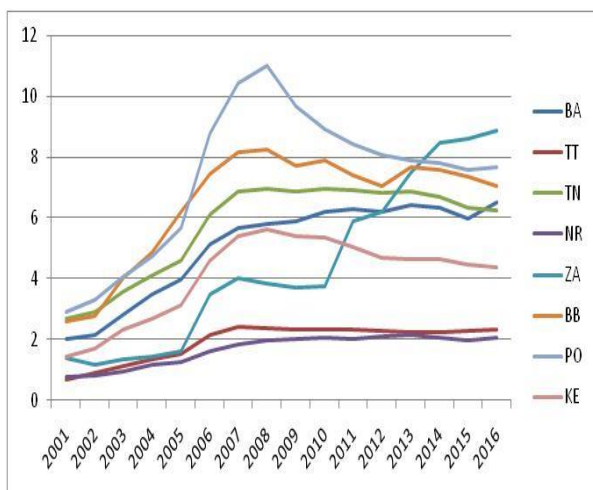


Fig. 10. Number of natural persons per 1,000 ha of agricultural land in individual regions of Slovak Republic.
 Source: Own calculations based on Statdat data [28].

In the run-up to the economic crisis, regional disparities increased in the number of natural persons in agriculture. After the crisis, the

number of natural persons in agriculture has stabilized, as have the differences between regions (the standard deviation has not changed significantly over the last four years). The growth in the number of natural persons in all regions of Slovakia before 2005 can be considered stable and comparable in all regions of Slovakia (Fig. 11). After 2005, the number of natural persons in all regions began to rise more radically, but this trend lasted only 2 years. Consequently, it can be said that the growth in the number of natural persons per 1,000 ha of agricultural land has stabilized.

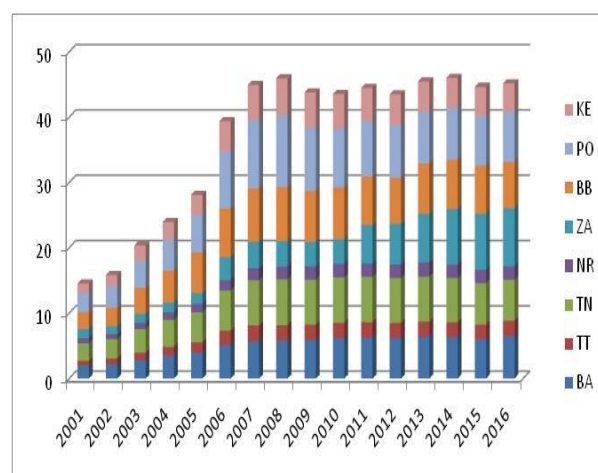


Fig.11. Number of natural persons per 1,000 ha of agricultural land in individual regions of Slovak Republic.
 Source: Own calculations based on Statdat data [28].

The increase in the number of natural persons per 1,000 ha of agricultural land since 2001 has been mainly influenced by the Žilina region (7.5 natural persons per 1,000 ha of agricultural land), the Bratislava region (4.5 natural persons per 1,000 ha of agricultural land) and the Nitra region (1.3 natural persons per 1,000 ha of agricultural land). The number of legal entities per 1,000 ha of agricultural land (Fig. 12) shows a growing trend during the whole monitored period 2001-2016 with the largest growth in Bratislava (4.24 legal entities per 1,000 ha of agricultural land) and the Žilina region (2.32 legal entities per 1,000 ha of agricultural land). It can be said that after 2014, this growth stabilized. The least dynamic increase in the number of legal entities per 1,000 ha of

agricultural land in the entire monitored period 2001 - 2016 was recorded by the Nitra region.

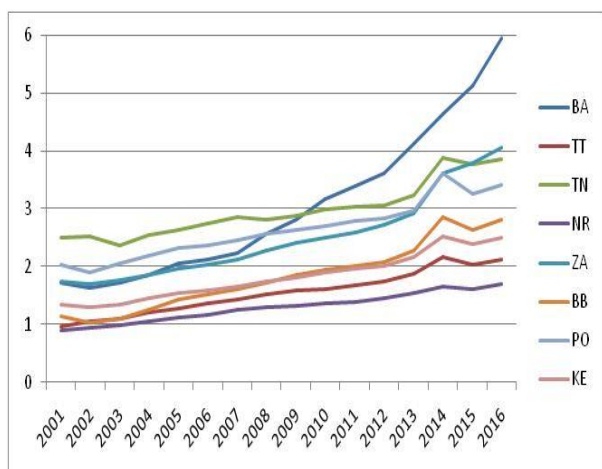


Fig. 12. Number of legal entities per 1,000 ha of agricultural land in individual regions of Slovak Republic.

Source: Own calculations based on Statdat data [28].

Differences in the number of legal entities between regions increase exponentially during the period under review (Fig. 13).

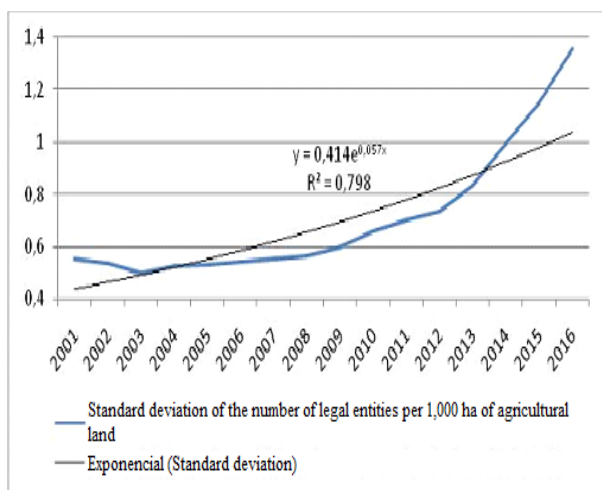


Fig.13. Standard deviation of the number of legal entities per 1,000 ha of agricultural land between individual regions of Slovak Republic.

Source: Own calculations based on Statdat data [28].

The agricultural sector does not attract capable and creative workers if there is no fair social reward on which the social status of qualified agricultural professionals is based [25]. It is needed to support such a programs focusing on the promotion of employment and income for young people, especially in the most vulnerable regions because of low wages

in agriculture, quite logically, do not attract the younger generation, qualified and skilled workers who move to other employed attractive sectors and professional activities [7].

Wages in agriculture are constantly increasing with increasing average gross nominal monthly wage of an employee in Slovakia (Fig. 14). In the Banská Bystrica region, a phenomenon can be seen in 2007, which manifested itself in a short-term higher (by 5.20 EUR) average gross nominal monthly wage of an employee in agriculture. The economic crisis has also affected a short-term decline in wages in this area of agriculture in the period 2008-2010. The average gross nominal monthly wage of an employee in agriculture in the observed period increased mainly in the Košice region, where it reaches 84% of the average gross nominal monthly wage of an employee in the region (increase by 8 pp.), the Nitra region to 97.7% in 2016 (increase by 7.13 pp.) and the Banská Bystrica region to 95.2% (an increase of 7.07 pp.). The average gross nominal monthly wage of an employee in agriculture in the observed period decreased (by 2.4 pp.) only in the Žilina region, where it reaches 85.3% of the average gross nominal monthly wage of an employee in this region.

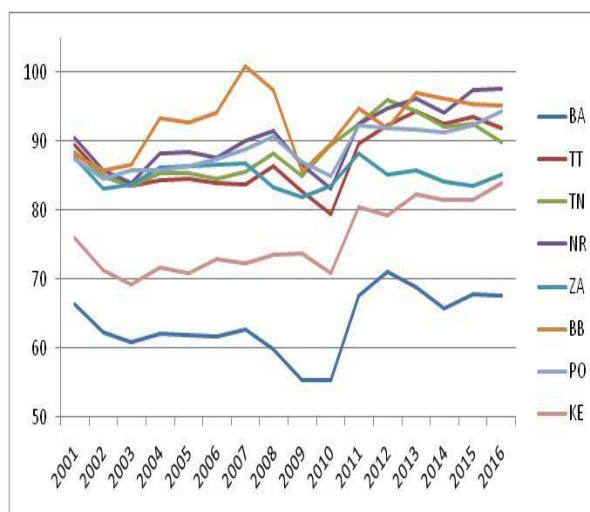


Fig. 14. Percentage expression of the average gross nominal monthly wage of an employee in agriculture with respect to the average gross nominal monthly wage of an employee in individual regions of Slovak Republic.

Source: Own calculations based on Statdat data [28].

The lowest average gross monthly wages compared to the average wage of the region are in agricultural workers in the Bratislava region, only 67.7% of the average gross nominal monthly wage of an employee, despite the fact that these wages are the highest among the evaluated regions [7].

However, the phase of wage modesty in agriculture should be overcome and preferring higher wages is the new strategy. In the past, job retention was preferred to wage increases. When increasing innovations by introducing new technologies, labor productivity and the substitution of live labor will increase significantly, and this will subsequently enable the diversification of production into other activities and thus the improvement of the overall economic result.

Evaluation of regional disparities in the agricultural sector of Slovakia

Based on a series of production and economic indicators, which we evaluated in the previous chapter, we compiled a model based on sixteen consecutive cluster analyzes monitoring the development of regional disparities in agriculture in individual regions of Slovakia for the period 2001 to 2016.

During sixteen consecutive years, the regions of Slovakia on the basis of a series of production-economic indicators divided into 2 statistically significant clusters (groups). The first group includes the regions of Central and Eastern Slovakia (Banská Bystrica, Žilina, Prešov and Košice region) and the second group includes the regions of western Slovakia (Bratislava, Trnava and Nitra region). The Trenčín region initially belonged to the second group of regions, but over the years it regrouped into the first group of regions. To illustrate the results of the cluster analysis, we use a dendrogram (Fig. 15 and Fig. 16).

The first group of regions does not show significant differences over time, but the second group has undergone minor changes. In 2003, the Trnava region began to be separated from the Bratislava, Nitra and Trenčín regions towards the first group, and in 2005 the Nitra region joined it, but in further development the Trnava region again caught up with the results of the Bratislava region.

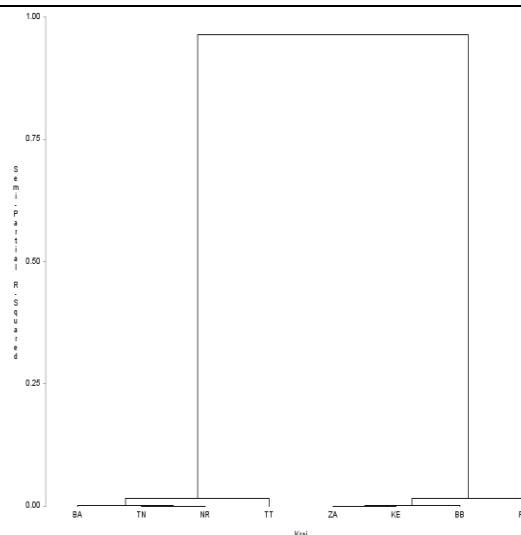


Fig. 15. Dendrogram with the results of the cluster analysis of regions in Slovak Republic for the year 2001

Source: Own calculations with the use of SAS software.

The Trenčín region began to lag behind the Bratislava region together with the Nitra region. This lag was more pronounced in 2011 and 2012, when the Trenčín region was already one of the first group regions. He managed to improve his position vis-à-vis the others from the first group for two years, and again the mentioned production and economic indicators are closer in value to the more developed second group of regions in Slovakia.

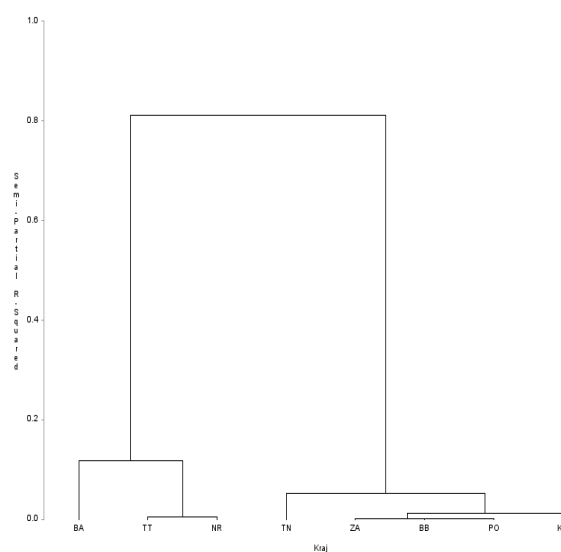


Fig.16. Dendrogram with the results of the cluster analysis of regions in Slovak Republic for the year 2016

Source: Own calculations with the use of SAS software.

In 2015, the results of these indicators in the Trenčín region were again closer to the indicators from the first group of Slovak regions.

The development of regions and the results of the regions of the second group of Slovakia from 2016 even suggest that in the future we can expect a complete separation of the Bratislava region from the Trnava and Nitra regions in terms of production and economic indicators of agricultural development in Slovakia.

Based on the development of the standard deviation of production and economic indicators, it can be stated that in the following indicators: gross agricultural production per 1 ha of agricultural land in euros, share of agriculture in total gross value added per 1 ha of agricultural land, number of natural persons per 1,000 ha of agricultural land and the number of legal entities on the 1,000 ha of agricultural land regions of Western Slovakia (the second group) demonstrate a higher degree of regional diversity as the region Central and Eastern Slovakia (the first group). However, the regions of Central and Eastern Slovakia (first group) show greater diversity in the following indicators, the average monthly nominal wage in agriculture and the number of employees in agriculture per 1,000 ha of agricultural land, in comparison to the regions of western Slovakia (second group).

CONCLUSIONS

Based on the evaluation, we can state that there are differences between the regions of western Slovakia and the regions of central and eastern Slovakia, and these differences even deepen in the observed period. In the near future, we can even expect the creation of the third separate cluster, which will include the Bratislava region, if there are no significant positive changes in the monitored indicators in the Nitra and Trnava regions (especially in the indicators of gross agricultural output and wages). Instead of the expected convergence of agricultural development in individual regions of Slovakia, it turned out that the regions

diverged from each other. The lowest differences between regions in most of the monitored indicators were in the observed period in 2001 and the highest in 2016. It can therefore be concluded that regional disparities between regions are currently deepening, which is in contrast to the European Union's efforts to ensure the convergence of regions within the framework of regional and cohesion policy for the years 2014-2020. Based on the research results, it could be concluded that the attractiveness of employment in agriculture is still declining. However, this is not confirmed by the growing trend in the number of businesses in agriculture. After the crisis in the year 2008, the number of natural persons in agriculture has stabilized. In order to reduce regional disparities in agriculture, more attention should be paid to EU support measures in agriculture targeting more effectively in order to provide more support options for young, small and individual farmers farming in areas with Natural Constraints f.e. with the focus on increasing innovations by introducing new technologies promotion of employment and income for young people.

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