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SOIL AS AN IRREPLACEABLE PRODUCTION FACTOR UNDER CONDITIONS OF SLOVAK REPUBLIC

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The economic theory distinguishes mainly three production factors, namely labour, soil, and capital. Soil, as a product of nature, is not a free good – its amount is not unlimited. It can be used for agricultural purposes, as energy and non-energy source, and for minerals. Soil is one of the factors of production and at the same time the most important natural resource. We have used three indicators, namely the degree of plowing, the degree of agricultural use and area of agricultural and arable land per capita. The result of the work was the finding that in the observed period (10 years), the area of agricultural and arable land in Slovakia is decreasing. To improve the situation in agriculture, the following could be done: merging fragmented land into larger units, changes in the system of inheritance or a change in allocation of subsidies. Especially the inhabitants of the territory should support the state buy buying on the domestic market and supporting domestic production.

Keywords: soil; agricultural land; arable land; soil fund; Slovak Republic

Land can be defined as one of the determinants of economic growth (Dobeš, 2003) and together with natural resources dominates the long-run pattern of productivity growth (Foley, 2003). Alongside capital and labour, it is one of the production factors which makes it possible to produce. Pflüger and Tabuchi (2010) state that contrary to its importance in practice, land use for production has received little attention in the branches of economy. The main components of the environment are agricultural land and forest land. They are natural sources of a country's national wealth and their protection is necessary. Soil quality essentially means the capacity of a soil to function (Larson and Pierce, 1991, Doran and Parkin 1994, Karlen et al., 1997 in Shukla et al. 2006). The organizing of complex land relations also helps to improve the care of the land fund. The area of agricultural land in Slovakia (as of January 1, 2019) was 2,379,101 ha, out of which arable land area was 1,407,729 ha, and forest land area 2,023,027 ha. The development of the land fund in Slovakia is marked by the decline of agriculture and arable land in favour of forest, non-agricultural and non-forest lands (Statistical Yearbook of the Slovak Republic, 2019). Depending on the total area of arable land in Slovakia, it is understandable that arable land was sold the most, then permanent grassland, and only a small proportion of the land transfers was with vineyards and orchards. The plots were sold on size of 0.22 ha (Dömötörová and Repka, 2020).

One of the key factors shaping contemporary land use in Central and Eastern Europe has been the change of ownership, with the collapse of the nationalized sector and restitution of farmland to owners giving rise to such changes (Bański, 2017). The current form of land relations in Slovakia is extremely complicated. The fragmentation and ambiguity of ownership and user relationships prevail. The solution is landscaping. There are currently 8.4 mil. ownership plots, 4.4 mil. registered landowners and 100.7 mil. co-ownership relations. The average number of co-owners per plot is 11.93 (Ministry of Agriculture and Rural Development).

The monitoring of land cover provides important information on actual land use and landscape dynamics. Land cover research results depend on the size of the area, purpose, and applied methodology (Faltan et al., 2020). A reduction and disappearance of traditional agricultural landscape structures (TALSs) have been taking place throughout Europe. TALSs is a mixture of small arable fields with trees, vineyards with and without trees, orchards, and field margins, and represent an important component of green infrastructure (Skokanová et al., 2020).

LPIS is a useful tool for determining the eligibility of agricultural land. However, its management could be improved. In recent years, the results of the studies have shown that shortcomings related to LPIS in the member states have been addressed through action plans and financial corrections (European Court of Auditors, 2016). Under the conditions of the Slovak Republic, applications for land support are submitted for land registered in the register of land blocks LPIS. This register is managed by the PPA. Farmers are concerned about the scope, frequency, and unsystematic nature of the ongoing update of the LPIS (Slovak Agriculture and Food Chamber, 2018).

Recent spikes in food prices and the high liquidity in international financial markets have boosted the demand for land. As a result, agricultural land prices have steadily increased over the past decade in many parts of the world (Yang, Ritter and Odening, 2017). In agricultural land pricing, several factors should be taken into consideration, of which the most important is the land rent and legislative regulations related to agricultural land. Land rent is an important component of the land price-determining formula. On the other hand, the essential part of the rent of agricultural land is land capacity (Koguashvili and Ramishvili, 2018). The share of rented land in the total utilized agricultural area varies considerably among member states. In the old member states, the share of rented land ranges between 18% (in Ireland) and 74% (in France), while in the new member states it ranges from 17% (in Romania) to 89% in Slovakia (Ciaian et al., 2012).

Material and methods

Soil is an irreplaceable natural resource that has been used for thousands of years in all over the world. The natural conditions in the Slovak Republic are very suitable, so that we can carry out agricultural activity. Nevertheless, only a relatively small part of the total area is used. The aim of the paper is to provide a detailed overview of the situation with the land fund in Slovakia during the period 2009–2019 and to determine factors affecting this development. Using analysis of soil types in Slovakia in individual regions, calculation of indicators such as: degree of plowing, degree of agricultural use, area of agricultural and arable land per capita.

For the paper elaboration there were used publicly available sources (secondary sources), such as data from the Geodesy, Cartography and Cadastre Authority of the Slovak Republic and the Statistical office of the Slovak Republic. To evaluate the processed data there were used methods of analysis, synthesis and comparison. When evaluating the agricultural land fund in Slovakia, we observed a development extent of agricultural and arable land, degree of plowing of agricultural land, degree of agricultural use and area of agricultural and arable land per capita, using following formulas:

Degree of agricultural land plowing

It represents what percentage of arable land is used as a percentage of total agricultural land:

$$\frac{arable\ land}{agricultural\ land} \cdot 100\ (\%) \qquad (1)$$

Degree of agricultural use

It represents what percentage of the selected area is made of agricultural land:

$$\frac{agricultural\ land}{total\ area} \cdot 100\ (\%) \qquad (2)$$

Area of agricultural and arable land per capita:

$$\frac{total\ area\ of\ agricultural\ (arable)\ land}{inhabitans}\ (\text{ha}) \qquad (3)$$

Results and discussion

From the table 1 "Development of land structure in the Slovak Republic in the years 2009–2019 " we can see that the area of the Slovak land fund has gradually decreased over the past ten years. Arable land, vineyards and permanent grassland have recorded only a declining trend since 2009, with the exception of hop gardens, which recorded slight increase areas in 2011. Agricultural land as a whole, the necessary basis for the cultivation of agricultural crops, has fallen every year on average by 0.2%, with 1% of the land fund representing land with an area of approximately 49 035 hectares. From 2009 to 2019, agricultural land recorded a decrease of 44 377 ha soil fund. The highest losses are marked by permanent grassland, which in 2019 decreased by 28 168 ha compared to 2009, and arable land, whose area was in 2019 lower by 14 123 ha compared to 2009. At the expense of decreasing agricultural land there is an increase in non-agricultural land. Annual area of non-agricultural land increases on all types of land, except water bodies, which decreased by 0.02% in 2017. From 2009 to 2019, non-agricultural land expanded by 26 310 hectares.

In the development of agricultural land in individual regions of the Slovak Republic, we can state that there is recorded a declining trend (table 2). The most significant decline in agricultural land in 10 years can be seen in the Bratislava region. While in 2009 it was 45.2%, in 2019, it was 43.8% – the difference is 1.4%. In 10 years, other regions have changed their acreage of agricultural land to approx. 1%.

The Nitra Region has the largest share of agricultural land on the total area of regions in Slovakia – 73.2% (2019). The region with the second largest share of agricultural land on the total area is the Trnava Region – 69.4% (2019). The Žilina region is the region with the smallest share of agricultural land – 35.1%. Other regions use their territories from 40–50% for agricultural purposes.

The next table represents the amount of agricultural land and arable land per capita within the Slovak Republic during the analyzed period of 2009–2019. During this period, we recorded the decrease in this value in both, agricultural and arable land available for 1 inhabitant of the SR. While in 2009 there was available 0.4457 ha of agricultural land per 1 inhabitant, in 2019, it was 0.4365 ha. The same trend is recorded within the arable land.

Tables 4 and 5 describe the area of agricultural and arable land per capita. In 2009, almost 5 424 925 inhabitants lived in Slovakia. In 10 years, the population increased by 32 948, which means that in 2019, there were 5 457 873 inhabitants living in the Slovak Republic. In 2009, there was 0.4457 ha of agricultural land and 0.2614 ha of arable land per capita. In 2019, there was 0.4355 ha of agricultural land and 0.2577 ha of arable land fell per capita. The Nitra region has the highest share of agricultural and arable land. There was 0.6629 ha of agricultural land and 0.5754 ha of arable land per capita in the Nitra Region in 2009, and in 2019, it was already 0.6884 ha of agricultural land and 0.6005 ha of arable land. The second region, where there

Table 1 Development of land structure in the Slovak Republic in 2009–2019 (in ha)

	Hop garden	Vineyards	Yards	Orchards	Permanent grasslands	Forest land	Arable land	Agricultural land	Non-agricultural land	Total area of land in SR
2009	520	27 258	76 636	17 360	879 853	2 008 257	1 421 852	2 423 478	471 969	4 903 704
2010	519	27 140	76 563	17 257	878 470	2 008 843	1 417 983	2 417 933	476 942	4 903 717
2011	520	27 091	76 529	17 034	876 484	2 011 250	1 416 633	2 414 291	478 103	4 903 644
2012	517	26 997	76 563	16 858	874 224	2 012 336	1 415 653	2 410 812	480 465	4 903 613
2013	515	26 964	76 568	16 861	871 324	2 014 059	1 413 739	2 405 971	483 526	4 903 557
2014	513	26 750	76 447	16 793	868 061	2 015 368	1 413 129	2 401 693	486 470	4 903 531
2015	512	26 513	76 362	16 744	864 681	2 017 105	1 412 228	2 397 041	489 345	4 903 491
2016	511	26 359	76 287	16 565	858 601	2 020 116	1 411 294	2 389 616	493 726	4 903 459
2017	511	26 266	76 206	16 685	855 882	2 022 522	1 409 778	2 385 328	495 584	4 903 435
2018	510	26 258	76 111	16 658	853 757	2 024 374	1 408 660	2 381 953	497 093	4 903 420
2019	503	26 237	75 996	16 951	851 685	2 026 027	1 407 729	2 379 101	498 279	4 903 407

Source: Geodesy, Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

Table 2 Share of agricultural land on the total land of regions of the Slovak Republic in 2009–2019 (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bratislava Region	45.2	45.1	44.9	44.7	44.5	44.4	44.3	44.1	44	43.9	43.8
Trnava Region	70	69.9	69.9	69.8	69.7	69.6	69.6	69.5	69.4	69.4	69.4
Trenčín Region	41.1	41	40.9	40.8	40.6	40.6	40.5	40.5	40.5	40.4	40.4
Nitra Region	73.7	73.7	73.7	73.6	73.5	73.4	73.3	73.2	73.2	73.2	73.2
Žilina Region	36	36.1	36	35.8	35.8	35.6	35.4	35.3	35.2	35.1	35.1
Banská Bystrica Region	44.1	43.9	43.9	43.8	43.7	43.6	43.3	43.2	43.2	43.2	43.1
Prešov Region	42.7	42.6	42.6	42.4	42.4	42.3	42.1	42	41.9	41.7	41.6
Košice Region	49.9	49.8	49.7	49.7	49.6	49.6	49.5	49.4	49.4	49.3	49.3

Source: Geodesy, Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

Table 3 Area of agricultural and arable land (in ha) in the Slovak Republic per capita in 2009–2019

	Area per capita (ha)	
	agricultural land	arable land
2009	0.4457	0.2614
2010	0.4442	0.2606
2011	0.4426	0.2599
2012	0.4447	0.2613
2013	0.4434	0.2609
2014	0.4421	0.2605
2015	0.4404	0.2601
2016	0.4389	0.2594
2017	0.4376	0.2588
2018	0.4365	0.2583
2019	0.4355	0.2577

Source: Geodesy, Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

Table 4 Area of agricultural and arable land (in ha) in the regions of the Slovak Republic per capita in 2009

	Area per capita (in ha)		Population
	agricultural land	arable land	
Bratislava Region	0.149	0.1179	622 706
Trnava Region	0.5173	0.4642	561 525
Trenčín Region	0.3088	0.1629	599 214
Nitra Region	0.6629	0.5754	705 661
Žilina Region	0.351	0.0879	697 502
Banská Bystrica Region	0.6382	0.2544	653 186
Prešov Region	0.4748	0.1845	807 011
Košice Region	0.433	0.2619	778 120
SR	0.4457	0.2614	5 424 925

Source: Geodesy, Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

Table 5 Area of agricultural and arable land (in ha) in the regions of the Slovak Republic per capita in 2019

	Area per capita (in ha)		Population
	agricultural land	arable land	
Bratislava Region	0.1343	0.1066	669 592
Trnava Region	0.5091	0.4567	564 917
Trenčín Region	0.311	0.1652	584 569
Nitra Region	0.6884	0.6005	674 306
Žilina Region	0.346	0.0864	691 509
Banská Bystrica Region	0.6315	0.2546	645 276
Prešov Region	0.4518	0.1785	826 244
Košice Region	0.4157	0.2544	801 460
SR	0.4355	0.2577	5 457 873

Source: Geodesy. Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

Table 6 Indicators of evaluating the agricultural land in 2009–2019 (in %)

	Degree of plowing	Degree of agricultural use
2009	58.7	49.42
2010	58.6	49.31
2011	58.7	49.23
2012	58.7	49.16
2013	58.8	49.07
2014	58.8	48.98
2015	58.9	48.88
2016	59.1	48.73
2017	59.1	48.65
2018	59.1	48.58
2019	59.2	48.52

Source: Geodesy, Cartography and Cadastre Authority of the Slovak Republic, Authors' own processing

is also a large area of agricultural land per capita, is the Banská Bystrica Region. In 2009, it reached the value of 0.6382 ha and in 2019, it was 0.6315 ha per 1 inhabitant. The Bratislava Region has the lowest area of agricultural land and the Žilina Region has the lowest quantity of arable land per 1 inhabitant. Although the Trnava Region has the lowest number of inhabitants, it has a large area of agricultural land and arable land per inhabitant, 0.5091 ha and 0.4567 ha, respectively.

From the table 6 we can see that in the 10 years, the degree of plowing in Slovakia has increased. While in 2009, arable land was actively used in 58.7%, in 2019, it was used by 0.5% more, in up to 59.2%. During the period under review, its share was approximately about 59%

The highest degree of agricultural use was achieved during the observed period in 2009. The degree of agricultural use was declining in the following period. The decrease in the degree of agricultural use in 2019 compared to 2009 represents 0.9%. Between 2009 and 2019, there was an increase in utilized agricultural land only in 2011 (7 737 ha), 2013 (1 058 ha) and 2018 (8 887 ha). While in 2009 agricultural land was used in 49.42%, in 2019 it was used by about 0.9% less, at the level of 48.52%. During the period under review, the total area of agricultural land shows a declining trend with an average loss value of 4 437 ha per year. A decrease in an average of 1 462 ha per year, despite the above-mentioned increases, is also observed in the used agricultural land. However, we can say that during the analyzed period, it was used on average at 49%.

Conclusion

The Slovak Republic has agricultural land spread over almost a half of its total area. In this paper, we focused on the comparison and evaluation of soil fund data of the Slovak Republic. Based on the development of individual groups of land, we can notice that arable land and agricultural land are gradually declining, but the forest land is increasing. For the observed period (2009–2019), agricultural land decreased by 44,377 ha and forest land increased by 17,770 ha. The biggest change we recorded was the decrease in agricultural land in the Bratislava region. Overall, the highest share of agricultural land on the overall land is in the Nitra Region – 73.2% and the Trnava Region – 69.4%, and the lowest share is in the Žilina Region – 35.1%. Although the population increased by 32,948 over the last 10 years, the area of agricultural and arable land has decreased. After elaboration of the degree of agricultural use, we found out that despite the relatively high percentage of agricultural land we still find reserves that show that it is not being used to its full potential. Actually, the utilized agricultural area share was on average 50%. From this reason we can state that up to 50% of the total area remains unused and its production potential does not earn interest. The largest part is occupied by agricultural land in the Nitra and Banská Bystrica regions; on the contrary, the lowest share of agricultural land area is in the Bratislava region. When calculating the degree of plowing indicator, we calculated that the soil was utilized the most in 2019 – 59.2% but overall, it is an approximate degree of plowing about 59% for the observed period. Based on the above results, we can state that the Slovak Republic is able to increase the level of self-sufficiency in the nutrition of its inhabitants, e.g. through the management of the unused part of agricultural land, or by increasing the consumption of cultivated agricultural crops for food purposes.

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