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# Agricultural Land Withdrawals in Relation to Sustainable Land Use in Slovakia

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The area of agricultural land withdrawn for non-agricultural purposes is gradually increasing worldwide, which is mainly due to the conflicting interests of entities that are interested in the use of this natural resource. Between 2009 and 2020, agricultural land in the area of more than 16,000 ha was withdrawn in Slovakia for non-agricultural purposes. It can be considered a threat that the purpose of withdrawal is mostly industrial and subsequently housing, from which it is possible to predict the continuing intensification of industrial production and the growing agglomeration of regional cities. The role of the state in this regard is to introduce tools for its protection so that its production as well as ecological functions are ensured in a sustainable way. The aim of the paper is to evaluate changes in agricultural land use in Slovakia in the context of analysis of implementation tools aimed at protecting agricultural land, using descriptive and regression analysis of available primary and secondary sources. The result thus points to the increased need of protection and reduction of the rate of withdrawal of agricultural land from the agricultural land fund (at least within the highest quality groups with the highest impact for individual withdrawal purposes), more specifically the land belonging to groups 2 and 3, in order to stabilize the agro-sector, which is vital in terms of its functions, among other things, as well as in the field of biodiversity protection, food self-sufficiency and landscape maintenance. The protection of agricultural land as a component of the environment is not a priority interest of state policy, and therefore its implementation is vague and non-conceptual in terms of current progress and the needs of the society.

**Keywords:** agriculture, land, land withdrawal, land protection, sustainability.

## Introduction

The soil is a phenomenon *sui generis* influenced by interacting factors determined by global changes and socio-economic aspects: liberalisation, globalisation, decentralisation of decision-making, privatisation and the widening gap between developed and developing countries (FAO, 1999), as well as socio-political changes. Its understanding depends on the interpreting entity and its social or professional focus (Robins, 2016). While for the natural sciences the soil is an irreplaceable natural resource (Hraško, 2017) that is necessary to protect as a source of food, water and other ecological functions for society, economists emphasie the significance of land as a fundamental driver in economic socio-economic growth of society (Turanský, 2017). At the same time, human activities have been recognised as a major force shaping the biosphere (FAZAL, 2013). Land use is characterised by the arrangements, activities and inputs by people to produce, change or maintain a certain land cover type (di Gregorio and Jansen, 1998). Land use is currently under pressure from various interest groups (EEA) at the same time causing conflict in the use of its specific functions, and therefore its use and protection of key functions is becoming a key issue for its sustainability (SEA, 2017). In a causal context, the state's approach to land management will depend on the extent to which it is able to maintain a balance between competing interest groups. According to various authors, it is indisputable that improving the quality of life of society causes natural pressure to convert agricultural land into non-agricultural land (e.g., Harris and Road, 2015), even at the cost that its impact on non-agricultural use represents an irreversible degradation of agricultural land, loss of its functions and ecosystem services (SEP, 2016). Although the value of the use of agricultural land for non-agricultural use represents a real benefit in real time, the loss of agricultural land can have a far-reaching impact on the landscape and society (*Table 1*).

Research by Potapov, Turubanova, Hansen, et al. (2021) points out that the situation with total arable land declining as a result of population growth after 2003 is evident in Europe as well as in the other continents, in particular South and South-East Asia, Australia and New Zealand. On the contrary, an increase in arable land has been observed in South America (mainly Brazil, Argentina, Paraguay, Bolivia, and Uruguay).

**Table 1.** *Possible impact of the loss of 1 ha of agricultural land*

| Withdrawal of 1 ha of the agricultural land | Possible impact of the withdrawal |
|---|---|
| Withdrawal for non-agricultural purposes | Reduction of the potential for overall food sufficiency for 2 inhabitants. |
| | Reduction of employment in agriculture by 0.06 people. |
| | Reduction of the feed base for 1 cow, 3 pigs and 7 sheep. |
| Withdrawal for non-agricultural purposes by impermeable coverage, respectively complete removal | Reduction of water reserves in the soil by 10 000 hectolitres, which is the annual consumption for 18 inhabitants. |
| | Impossibility of physical and chemical cleaning 60 000 hectolitres of rainwater. |
| | Limitation of recovery, and transformation of 500 kg of solid waste produced (about 1500 inhabitants) |
| | Loss of soil microorganisms by 8 tons. |
| | Loss of living space for 10 pheasants, 5 birds, etc. |
| | Limiting the possibility of natural "disposal" of biowaste (slurry, manure, sludge, and manure) by about 30–50 tons, etc. |

*Source: Own processing based on Vilček, 2011*

Therefore, there is currently an effort to make the harmonious use of the main functions of the soil sustainable (SEA, 2017). Several authors agree that functional land management aims to optimise, rather than maximise, the supply of each of the soil functions in order to meet the societal demands for all functions simultaneously (Schulte, 2015).

National approaches to non-agricultural land use differ mainly based on their socio-economic development. Many countries in the world are committed to environmental soil protection commitments, declaring that the preservation of agricultural land is a prerequisite for the sustainable development of society

(Kanianska et al., 2014; Dizdaroglu, 2017; Jiang et al., 2017). Political commitments are often vague and only marginally reflect land functions. The problem is that the implementation practice of agricultural land protection is considered, in terms of the principle of subsidiarity, to be a local environmental problem (Nowak and Schneider, 2017; Bucała and Hrabia, 2017). Therefore, the implementation practice may be different. Legislative and economic instruments are used in the highest possible measure to protect agricultural land in each country in order to protect the acreage of agricultural land from impermeable coverage (Mazzocchi et al., 2017).

However, as some authors points out, insufficient protection of the soil functions can cause an immediate threat to the life of the population in the area (e.g., Jánošovský, 2010). One of the current threats is land grabbing, which is characterized by unregulated market investments in land through large-scale land acquisitions with the aim of so-called "speculative investment" in industrial agriculture (AGRI, 2016), or possibly other agricultural activities (Borras Jr. et al., 2011; Conigliani, Cuffaro and d´Agostino, 2018). Land grabbing is discussed in connection with the frequent occurrence of this issue, especially in the vicinity of larger cities which affect the investment attractiveness of nearby agricultural areas. The most important factor for potential inhabitants of this region is the proximity of the city and the associated availability of services or an attractive labour market. Li and Hu (2015) claim that rural areas are thus subject to significant changes, which require, in particular, the optimisation of the conversion of agricultural land to industrial land in order to ensure their sustainable development. At present, this issue is mainly addressed by studies from Poland (Busko and Szafranska, 2018) and Italy (Ceccarelli et al., 2014; Mazzocchi et al., 2017), which recommend to extend this research to other regions in Europe affected by the decline of agriculture due to urban sprawl (Van Vliet et al., 2015). Comparative research carried out within the project SULANET has analysed the individual procedures of the selected countries aimed at the protection of agricultural land in connection with its withdrawal from the land fund (*Table 2*).

**Table 2.** *Procedures for agricultural land protection during land withdrawals in selected countries of the EU*

| Country | Type of the tool | Procedure of agricultural land withdrawal |
|---|---|---|
| Bulgaria | Administrative | Decision of the Committee on Regional Agriculture and the Commission for Agricultural Land. |
| Poland | Administrative | Decision of the Mayor of the district, Marshal of the Voivodeship.<br>Consent of the Minister of Agriculture for withdrawals of quality groups 1–3. |
| | Economic | Annual land withdrawal fee. |
| Austria | Administrative<br>Legislative | Differentiation between land withdrawals for afforestation purposes or development including housing, industry and infrastructure. |
| | Administrative | Decision of land withdrawal for afforestation is based on forestry authority. |
| | Legislative | Land withdrawal for other development is regulated mainly by local spatial planning (usually 5–10 years validity) |
| | Political | Strong political priority to protection of forest land causes predominantly agricultural land withdrawals. |
| Spain | Legislative | Differentiation between rural and urban land. |
| | Economic | Agricultural land can be freely converted into non-agricultural land by the landowner as long as it remains rural land. |
| | Administrative | Decision of public authority (local, regional). |
| Italy | Legislative | Most decisions on land withdrawal are based on local spatial planning legislation, largely left to municipal self-government.<br>Zoning plans are processed based on national and European legislation.<br>Zoning plans are submitted to the Ministry of Historical Heritage. |

*Source: Own processing based on research results conducted in the project SULANET, 2022.*

In all the analysed countries, to some extent, particular legislative or administrative instruments exist for the protection of agricultural land in connection with its withdrawal from the land fund. In most countries, land use planning documentation plays a significant role in use of agricultural land in a sustainable way, taking into account the demand and suitability of construction in the proposed area. For example, Poland places increased emphasis on the protection of the highest quality agricultural land, the removal of which is subject to the consent of the Minister of Agriculture. On the other hand, Austria is primarily focused on the protection of forest land. As a result, agricultural land in particular is used for construction or other non-agricultural purposes, thus losing its size and quality.

The paper will focus on the changes in agricultural land, its acreage and its quality in connection with the specific purposes of its use in Slovakia in order to identify the weaknesses of the tools for agricultural land protection and outline specific measures for change towards public authorities. Research methods will be feasible in researches of other countries with similar problems, and the proposed measures at the end of the paper can contribute to public authorities in adopting new effective measures for the protection of agricultural land.

## Aim and Methods

Despite the fact that a certain decrease in the land withdrawal of agricultural land has been observed as a result of measures taken by the EU and individual Member States, the situation is still considered alarming (EEA, 2019). In order to contribute to a broad discussion on land use in the EU, the aim of the paper is to evaluate changes in agricultural land use in Slovakia in the context of analysis of implementation tools aimed at protecting agricultural land.

The paper was elaborated by using a combination of qualitative and quantitative research. From a qualitative point of view, we mainly used the method of in-depth analytical approach and comparison in the field of professional and legislative issues. Other used sources were data from the Eurostat database, the Statistical Office of the Slovak Republic and available data from the Office of Geodesy, Cartography and Cadastre of the Slovak Republic and the Ministry of Agriculture and Rural Development of the Slovak Republic (hereinafter referred to as MARD), the results of which were processed and presented in tables and graphs on the basis of which we subsequently built our interpretations.

In connection with the possibility of disruption or loss of functions, quality and volume of agricultural land, the effects of the amount of agricultural land withdrawn within all nine quality groups for the most common non-agricultural purposes, specifically housing and industry in Slovakia in the year 2020, were quantified based on the available sources. The agricultural land quality group is defined on a scale of 1–9, with groups 1–4 representing the highest quality soil, groups 5–7 representing medium quality, and groups 8–9 representing the lowest quality soil. The results were processed separately for the selected categories.

For research purposes, MARD data obtained through a guided interview method were used. The withdrawn agricultural land was evaluated at the spatial level of 41 districts of the Slovak Republic, subsequently divided into 3 categories: Western Slovakia, Central Slovakia, and Eastern Slovakia, reflecting the geographical and soil-climatic homogeneity of the area. At the same time, the data were obtained at the lowest possible level.

An overview of variables created on the basis of descriptive statistics is given in *Table 3*.

The research of the relationships between the purposes of taking away agricultural land and individual levels of its removed quality was carried out through regression analysis using the ANOVA model in Excel, where the dependent variable was the amount of withdrawn agricultural land in ha for individual purposes for which land in Slovakia is most often withdrawn, which is housing and industry. The independent, explanatory variables were the amounts of withdrawn agricultural land within the nine quality groups concerned.

**Table 3.** *Basic overview and descriptive statistics of variables in regression analysis*

| Variable | Variable description | Amount | Unit of measure | Median | Minimum value | Maximum value | Average |
|---|---|---|---|---|---|---|---|
| Household | the amount of agricultural land withdrawn for housing purposes | 41 | ha | 4.2919 | 0 | 39.757 | 6.85 |
| Industry | the amount of agricultural land withdrawn for industrial purposes | 41 | ha | 0.209 | 0 | 46.8822 | 2.65 |
| quality_1 | the amount of withdrawn agricultural land belonging to quality group 1 | 41 | ha | 0 | 0 | 2.8405 | 0.18 |
| quality_2 | the amount of withdrawn agricultural land belonging to quality group 2 | 41 | ha | 0 | 0 | 13.8242 | 1.04 |
| quality_3 | the amount of withdrawn agricultural land belonging to quality group 3 | 41 | ha | 0 | 0 | 4.3823 | 0.55 |
| quality_4 | the amount of withdrawn agricultural land belonging to quality group 4 | 41 | ha | 0 | 0 | 64.7239 | 1.95 |
| quality_5 | the amount of withdrawn agricultural land belonging to quality group 5 | 41 | ha | 0.3416 | 0 | 30.8156 | 1.79 |
| quality_6 | the amount of withdrawn agricultural land belonging to quality group 6 | 41 | ha | 1.1028 | 0 | 90.1177 | 5.99 |
| quality_7 | the amount of withdrawn agricultural land belonging to quality group 7 | 41 | ha | 0.7006 | 0 | 11.1883 | 2.40 |
| quality_8 | the amount of withdrawn agricultural land belonging to quality group 8 | 41 | ha | 0.6237 | 0 | 5.0345 | 1.16 |
| quality_9 | the amount of withdrawn agricultural land belonging to quality group 9 | 41 | ha | 0.2111 | 0 | 4.9208 | 0.87 |

*Source: Own processing, 2022*

## Results and Discussion

The basic political framework of the current state policy of protection of agricultural land areas is defined by the Principles of the State Land Policy of the SR adopted by the Resolution of the Government of the SR No 1141/2001. Their aim is to stabilise the area of the highest quality soils and to prevent unjustified withdrawal for non-agricultural purposes. Following the state soil policy and the requirements of Slovakia's accession to the EU, the framework law was adopted – Act No 220/2004 Coll. on the Protection and Use of Agricultural Land and amending Act no. 245/2003 Coll. on Integrated Prevention and Control of Environmental Pollution and on Amendments to Certain Acts as amended. The law defines both qualitative and quantitative protection of agricultural land, focuses mainly on the issue of changing the type of land and withdrawing agricultural land for non-agricultural purposes. From the point of view of land protection, maintaining the acreage of land is of key importance, because with increasing demands on land for non-agricultural purposes, it is important to maintain a balance between the interests of society on the one hand and environmental protection on the other. The qualitative aspect of land protection is regulated by the law only in a general and vague manner, and its legal regulation is left to special legal regulations. On the negative side, the law does not reflect the correlation between land withdrawal and soil functions.

The law was amended several times while the state's intervention in land withdrawal was mainly focused on the introduction and modification of economic instruments to protect the acreage of agricultural land. With the development of social demand for regionally significant areas, the state began to introduce

administrative tools to protect the acreage in the form of approvals and statements of relevant authorities.

*Fig. 1*. shows that withdrawal of agricultural land for non-agricultural purposes culminated in the years 2009– 2010. Since 2011, we can observe only slight differences in year-on-year withdrawal of land while the average annual withdrawal has represented the amount of 1000 ha of land for non-agricultural purposes. The decrease in the size of the agricultural land area withdrawn is an outcome of application of combination of legislative and economic measures aimed at the protection of the size of agricultural land area that had been elaborated since 2008. In order to limit the withdrawal of land, it is crucial to re-introduce the economic tool – levy obligation and gradual implementation of legislation which significantly limits or bans the withdrawal of agricultural land of the highest quality for non-agricultural purposes.

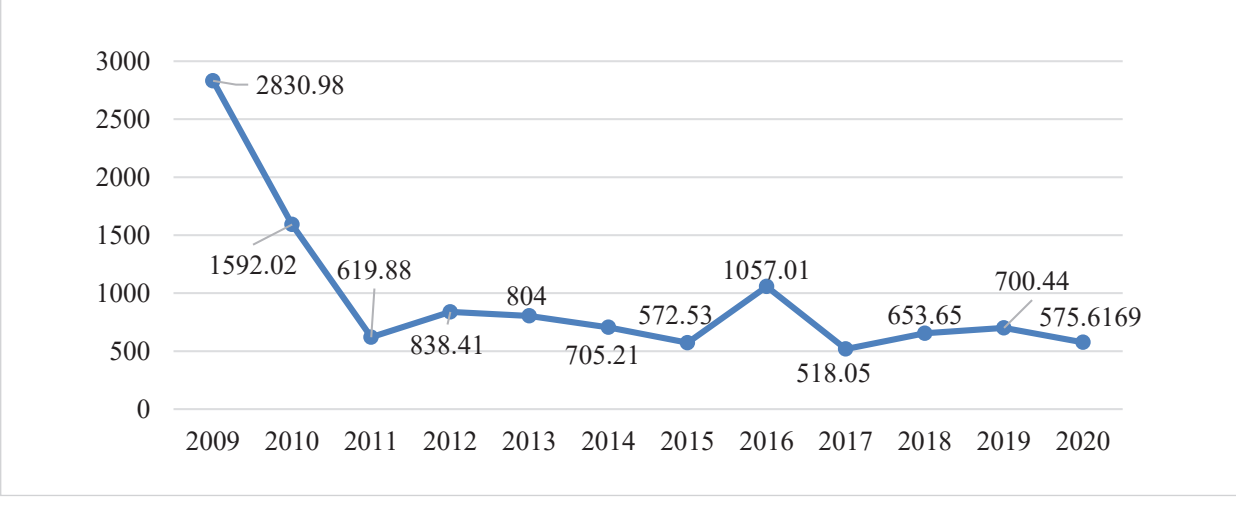
According to the European Environmental Agency, the decreasing trend in the withdrawal of land is visible in other EU member states, too, as there was 539 km$^2$ of land withdrawn annually in 2012–2018 in the EU. It represents a decrease in comparison with the period of 2000–2006 when it represented 1000 km$^2$ of land annually.

The motivating aspect of withdrawal of agricultural land for non-agricultural use is the purpose for which the land is withdrawn. It is also an important indicator of a possible future prediction of conflict in the use of agricultural land for agricultural purposes. It is true that where industry is concentrated, the settlement structure is also built, the price of real estate rises, and therefore the interest of entities in the sale of agricultural land for non-agricultural activities increases. The result is a decreasing area of agricultural land, loss of quality aspects of land and water and thus a reduction in agricultural activities (*Fig. 2*).

*Fig. 2*. identifies the development factors as the greatest motivation for the withdrawal of agricultural land for non-agricultural purposes, i.e., the purpose of housing and industry and to a lesser extent for transport. Leaving aside the year 2008, in which the enormous withdrawal was caused by the planned introduction of levies, the measures introduced by the state in the period under review do not have a significant impact on the motivation of subjects for land acquisition when deciding on housing or more specifically on the location of industrial production. This fact can be considered natural to the extent that the state also takes care of the protection of the highest quality agricultural land.

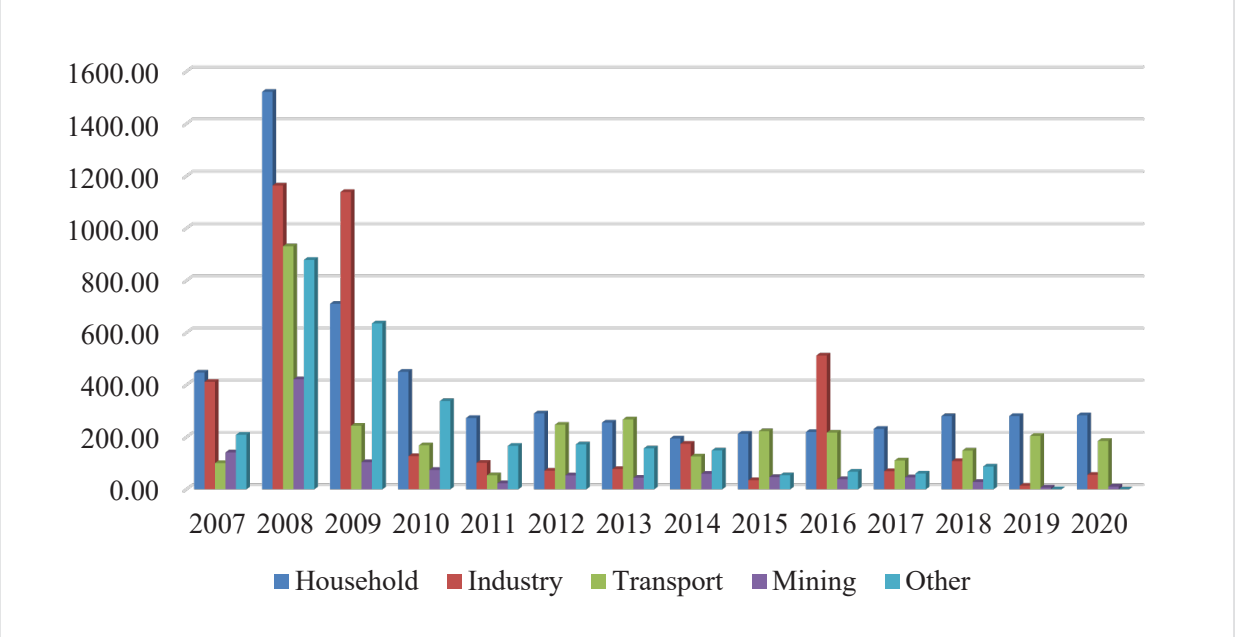
While analysing the soil types, according to Geodesy, Cartography and Cadastre Authority of the Slovak Republic, from the total area of 4 903 405 hectares, there

**Fig. 1.** *Evolution of agricultural land withdrawal in ha in Slovakia during the years 2009–2020*




*Source: Own processing based on the Electronic Land Service Yearbook and data from the Ministry of Agriculture and Rural Development of the SR, 2022*

**Fig. 2.** *Volume of withdrawn agricultural land according to the purpose of withdrawal in the Slovak Republic in the period 2007–2019 (in ha)*




*Source: Own processing based on the Electronic Land Service Yearbook and data from the MARD, 2022*

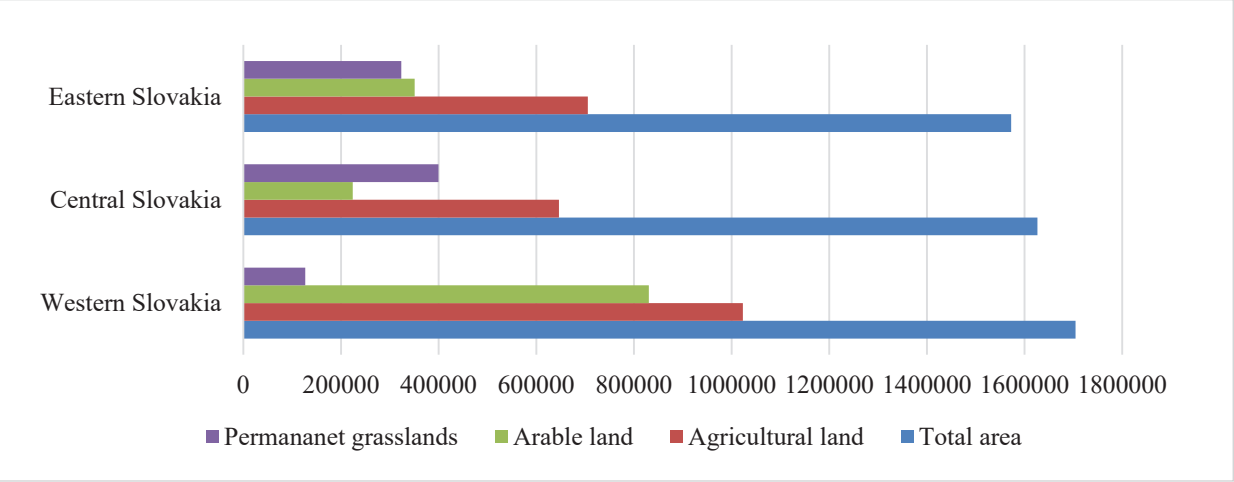
are 2 375 025 hectares (48.43%) of agricultural land and 2 027 852 hectares (41.36%) of forest land. The agricultural land is dominated by arable land of the area of 1 405 263 ha (59.17%) and permanent grassland of the area of 850 027 hectares (35.17%). From the data for the individual examined region categories (*Fig. 3*), agricultural land is the largest in Western Slovakia. Of the total area of this region, agricultural land represents 60.02%, of which up to 81.16% is arable land. The region represents the focus of agricultural production in Slovakia, as it comprises up to 59.1% of arable land of the total area of agricultural land in Slovakia. At the same time, the Western Slovakia region is an urbanized area and the seat of four of the eight regional capitals, including the capital city. In this perspective, the threat is that from the point of view of land withdrawal, in the observed period of 2009–2020, the total area of agricultural land decreased by 49 838 ha in proportion: 16 228 ha (32.56%) decreased in Western Slovakia, 18 016 ha in Central Slovakia (36.15%) and 15 594 ha in Eastern Slovakia (31.29 ha).

It means that in terms of the agricultural land protection, the state is able to relatively explicitly predict locality and, on the other side, the interest of entities in the purchase of agricultural land for housing and the investment purposes. For this reason, the impact of the amount of withdrawn agricultural land within the nine quality groups for the two most common purposes – the purpose of housing and industry – was also examined.

In 2020, a total of 28 394 ha of agricultural land of various qualities was withdrawn for housing purposes, which represents the highest value since 2012. *Table 4* shows the results of the regression analysis, specifically the ANOVA model, evaluating the impact of the land withdrawn within all nine groups of quality for housing purposes.

The results of ANOVA regression analysis model with several independent variables show that, for housing purposes, the highest impact resides within the withdrawn land from quality groups 1 (average 0.64 ha), 2 (average 0.72 ha), 4 (average 2.18 ha) and 8 (on average 7.25 ha). In central Slovakia, the influence of soil of quality groups 6 (on average 0.1 ha), 8 (on average 2.05 ha) and 9 (on average 1.06 ha) predominates. In Eastern Slovakia, it is the soil belonging to quality

**Fig. 3.** *Amount of the land types in the selected categories of regions (in ha)*




*Source: Own processing based on the Annual Report of The Geodesy, Cartography and Cadastre Authority of the Slovak Republic, 2022*

**Table 4.** *Impact of land withdrawal within individual quality groups for housing purposes*

| | Western Slovakia | | Central Slovakia | | Eastern Slovakia | |
|---|---|---|---|---|---|---|
| | Regression Statistics | | Regression Statistics | | Regression Statistics | |
| | Multiple R | 0.998776028 | Multiple R | 0.998984996 | Multiple R | 0.991240361 |
| | R Square | 0.997553554 | R Square | 0.997971023 | R Square | 0.982557454 |
| | Adjusted R Square | 0.993149951 | Adjusted R Square | 0.988840625 | Adjusted R Square | 0.943311725 |
| | Standard Error | 0.949063702 | Standard Error | 0.645174897 | Standard Error | 0.973441325 |
| | Observations | 15 | Observations | 12 | Observations | 14 |
| | Coefficients | P value | Coefficients | P value | Coefficients | P value |
| Intercept | 1.1457135 | 0.06508791 | −0.2627878 | 0.517744406 | 0.5557435 | 0.282664751 |
| quality_1 | 0.6394485 | 0.0810557** | 0 | 0 | 0 | 0 |
| quality_2 | 0.7157878 | 0.0030931*** | 0 | 0 | 0 | 0 |
| quality_3 | −0.2041012 | 0.78853164 | −18.338666 | 0 | 0 | 0 |
| quality_4 | 2.1810567 | 0.0464443** | −3.7630334 | 0.830254852 | 0 | 0 |
| quality_5 | 0.1601444 | 0.614296061 | 0.4391663 | 0.12343276 | 0.4773546 | 0 |
| quality_6 | −0.0209588 | 0.951509153 | 0.1090502 | 0.0769184** | 2.0985882 | 0.0038371*** |
| quality_7 | −0.77556 | 0.367567975 | 0.5609736 | 0.122870395 | −4.9680601 | 0.0024483*** |
| quality_8 | 7.2550807 | 0.0588092** | 2.0579298 | 0.08764** | −2.4418078 | 0.156131956 |
| quality_9 | 0.4316574 | 0.445395726 | 1.0670261 | 0.0638199** | 5.6889847 | 0.0010523*** |

*Source: Own processing, 2022*

groups 6.7 and 9 (medium to low soil quality).

Based on the R-square value, it can be stated that the model explains the impact of independent variables (land withdrawn within groups 1–9) on the dependent variable (land withdrawn for housing purposes) at the level of 99% in Western and Eastern Slovakia and 98% in Central Slovakia.

In 2020, a total of 55.79 ha of agricultural land of various quality was withdrawn for industrial purposes, while this trend was fluctuating during the observed period of 7 years. *Table 5* shows the results of the regression analysis, specifically the ANOVA model, evaluating the impact of land withdrawn within all nine groups of quality for industrial purposes.

The results of ANOVA regression analysis model with several independent variables show that, for industrial purposes, the highest impact resides within the withdrawn land from quality groups 3 (on average 2.89 ha), 4 and 9. In Central Slovakia, the influence of soil of quality groups 7 (on average of 0.8 ha) predominates. In Eastern Slovakia, it is the soil belonging to quality groups 6 to 9 (medium to low soil quality).

Based on the R-square value, it can be stated that the model explains the impact of independent variables (land withdrawn within groups 1–9) on the dependent variable (land withdrawn for industrial purposes) at the level of 90% in Western Slovakia, 98% in Central Slovakia and 97% in Eastern Slovakia.

The results point out that subjects interested in agricultural land withdrawal do not take into account the quality groups of land during the decision making process on the agricultural land use for non-agricultural purposes. The main driver for them is especially the stimulation of fulfilling own needs after one's own housing, or the business activity localisation. The implemented state instruments in this area, for example

**Table 5.** *Impact of land withdrawal within individual quality groups for industrial purposes*

| | Western Slovakia | | Central Slovakia | | Eastern Slovakia | |
|---|---|---|---|---|---|---|
| | Regression Statistics | | Regression Statistics | | Regression Statistics | |
| | Multiple R | 0.9537698 | Multiple R | 0.993576 | Multiple R | 0.9858027 |
| | R Square | 0.9096768 | R Square | 0.9871932 | R Square | 0.9718069 |
| | Adjusted R Square | 0.7470951 | Adjusted R Square | 0.9295625 | Adjusted R Square | 0.9083723 |
| | Standard Error | 1.8250427 | Standard Error | 0.5434231 | Standard Error | 0.1365541 |
| | Observations | 15 | Observations | 12 | Observations | 14 |
| | Coefficients | P value | Coefficients | P value | Coefficients | P value |
| Intercept | 0.0967852 | 0.921597 | –0.9475391 | 0.0794494 | –0.0970731 | 0.1973927 |
| quality_1 | –0.4232455 | 0.4867233 | 0 | 0 | 0 | 0 |
| quality_2 | 0.1171366 | 0.6686509 | 0 | 0 | 0 | 0 |
| quality_3 | 2.8874848 | 0.0918417** | –8.8743077 | 0 | 0 | 0 |
| quality_4 | –5.4653802 | 0.0186515** | –30.506871 | 0.143715 | 0 | 0 |
| quality_5 | 0.2317923 | 0.7027852 | –0.5511204 | 0.0616855** | 0.6182535 | 0 |
| quality_6 | –0.2684164 | 0.6880211 | 0.078812 | 0.1004475 | 0.2875748 | 0.0041805*** |
| quality_7 | 0.871752 | 0.5878422 | 0.8299516 | 0.0453068** | –0.9125686 | 0.0008812*** |
| quality_8 | –2.2585662 | 0.7093683 | 1.0756544 | 0.189652 | –0.53093 | 0.0539277** |
| quality_9 | 2.8997809 | 0.0340903** | –0.4258926 | 0.2162219 | 0.8872625 | 0.0007005*** |

*Source: Own processing, 2022*

fees for land withdrawals according to the quality groups do not seem to be effective enough. This approach of the state is not sustainable for maintaining the level of agricultural land and ensuring the fulfilment of its functions. On the contrary, it represents a real threat that the land of best quality mostly located in Western Slovakia will be further degraded by non-agricultural activities, which may endanger the state's food resources or disrupt other functions provided by the land.

## Discussion and Conclusions

The protection of agricultural land should be a priority for every country, not only in terms of general political declarations, but especially in order to ensure an effective system of instruments. On the one hand, withdrawal of land for non-agricultural purposes should be sufficiently discouraged; on the other hand, there should be proper motivation to seek solutions that do not harm the environment. Impermeable land cover is an irreversible interference with soil functions and sustainability of the soil for the further development of society. Regarding the overall development of the land fund structure in recent decades, Slovakia has been experiencing a significant decline in agricultural land (more than 380 000 ha have been lost since 1950) in connection with intensive housing and industrial construction and declining agricultural land and production in total gross domestic product (Jahnátek et al., 2014). This article strives to evaluate changes in agricultural land use in Slovakia in the context of analysis of implementation tools aimed at protecting agricultural land. In the observed period of 2009–2020, in terms of the removal of agricultural land, there may be a gradual reduction in land take. The reason is the introduction of economic instruments of countries in the form of levies and legislative-administrative instruments, on the basis of which the entity taking the land is obliged to apply for a decision of the district authority. These tools operate across the board, regardless of the regions, the degree of urbanisation, or the need to ensure the ecological functions of the soil. It is precisely the non-differentiation of soil protection from the point of view of its functions that means that the withdrawal of agricultural land for non-agricultural purposes is proportionally decreasing throughout Slovakia. The most common reasons for land withdrawal were housing and industry, while housing construction as well as concentration of industrial facilities is mostly situated in Western Slovakia due to urbanisation and internal migration, which is characterised by the highest quality agricultural land in the country (Infostat, 2010; Ministry of Economy of the Slovak Republic, 2018; Ministry of Transport and Construction of the Slovak Republic, 2019 and NAFC, 2019). The research confirmed that the soil with high to medium quality, according to the quality groups in groups 1–4 and 5–7, was occupied to the greatest extent.

It can be concluded that the various instruments of the state do not provide sufficient protection against land grabbing. The public authorities in Slovakia try to protect agricultural land primarily by maintaining its overall area, especially through legislatively enshrined economic instruments, which include, e.g., fee obligation for the agricultural land withdrawals for non-agricultural purposes. The amount of fees depends on the total area, the quality of the withdrawn land and also the method of land withdrawal (temporary or permanent). There are also certain exceptions that are not covered by the fee obligation.

In terms of research results, we recommend to the public authorities in Slovakia to adopt and implement a strategic document for agricultural land protection, in which they define specific areas of land use and establish new effective soil protection tools (e.g., the obligation to re-cultivate agricultural land used for non-agricultural purposes, organic fertilisation, etc.). We also recommend focusing on the analysis of the entities for which legislative and economic instruments for soil protection are intended, as they may not have an effective impact on them.

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