DEMAND FOR AGRICULTURAL LAND IN SLOVAKIA

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In general, soil is perceived as an unreplaceable and unrenewable natural resource that allows plants, animals and man to live. It is significant in several ways out of which the most important is the production of food for population, the production of fodder for livestock and the production of raw materials for food and light industry. Due to these as well as the other reasons, land becomes the object of competition between different subjects which are trying to get it and use it. The aim of the paper is to map and to characterise the demand for agricultural land at the agricultural land market based on the certificates on fulfilment of the requirements on purchase of agricultural land. Based on the data collected throughout 31 months, it was proved that the demand for agricultural land is influenced by price, land quality, area, fragmentation of land ownership, distance of the offered plot from a county seat and localisation of a given land plot.

Keywords: agricultural land, land market, demand, logistic regression

The European Soil Charter (1972) states that a land is one of humanity's most precious assets, which allows plants, animals and man to live on the Earth's surface. The land is indispensable condition of man's existence and it is a cultural heritage. Lazíková et al. (2015) emphasizes that agricultural land is an important natural resource and wealth of each country. Land is the key to future economic and social development (Schwarcz et al., 2013). Lazíková, Takáč and Buday (2012) state that the agricultural land market is usually defined as the purchase of agricultural land. Richards (2013) claims that land has no value itself. It only gains value when it enters social relations of production and reproduction, for example, when it serves to grow the products that are demanded. Šlosár et al. (2004) emphasizes that the demand for agricultural land is derived from the final products, which are produced on the land. Each country should secure the land protection via appropriate legislative instruments. For instance, countries should ensure that land would be in the hands of those who protect and cultivate it (Lazíková and Bandlerová, 2014). Bandlerová and Marišová (2003) point out that the agricultural land market in Slovakia falls behind and it depends on the prosperity of Slovak agriculture. Nowadays, much attention is paid to the price of agricultural land and the factors that affect it (Dirgasová, 2017). Many authors (Blažík et al., 2014; Hopfer and Żuk, 2002; Lazíková, 2010) emphasize that the factor, which significantly affects the price of agricultural land is a buyer's subjective decision-making. Therefore, one of the factors affecting the price of agricultural land is demand. Thus, there is the question about the demand for agricultural land in Slovakia.

Material and methods

The main aim of the paper was to evaluate and characterise the demand for agricultural land at the agricultural land market based on the certificates on fulfilment of the requirements on purchase of agricultural land (hereinafter referred to as the certificates). In order to fulfil the main aim, two partial objectives were defined. The first one is to characterise the certificates on fulfilment of the requirements on purchase of agricultural land. The second partial objective is to identify the factors affecting the demand for agricultural land in Slovakia.

In order to fulfil the first partial objective, we used the data from the Register of Offers of Agricultural Land (the data on supplies on purchase of agricultural land) and the data from the district offices (the data on certificates on fulfilment of the requirements on purchase of agricultural land). The data for the fulfilment of the objective were acquired from the district offices during the period from June 1, 2014 to December 31, 2016. The performance of the first partial objective was realized by the general scientific methods, methods of descriptive statistics and the graphical method.

The logit model with the binary dependent variable was used for the fulfilment of the second partial objective. Cox (1958) claims that the logistic regression is a specific case of generalised linear model and it has a wide application e.g. in microeconomics, banking, economics and other fields. The dependent variable in model is the categorical variable, i.e. the variable that has limited amount of variations. It is the modelling of conditional probability of one variation of categorical variable depending on the other variables. The

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independent variables can be continuous or categorical. Therefore, the logistic regression was used for the fulfilment of the second objective. The dependent variable was binary variable issue of certificate, which has two variations – the certificate was issued and the certificate was not issued. The other variables entering the model are listed in Table 1. The equation of the performed logit model is:

$$y_i = \beta_0 + \sum \beta_j x_{ij} + u_i \tag{1}$$

For the fulfilment of the partial objective, we used the data from the Register of Offers of Agricultural Land during the period from June 1, 2014 to November 30, 2016 and the data from the district offices during the period from June 1, 2014 to December 31, 2016. There was the total number of 17,406 observations from the Register of Offers of Agricultural Land for construction of the logit model. The observations were divided into two groups:

- observations, when the Land and Forest Department of district office issued the certificate (4,237 observations),
- observations, when the Land and Forest Department of district office did not issue the certificate (13,169 observations).

From each group, 2,000 observations were selected by a random selection with a repetition; so finally, there were 4,000 observations, which entered the logistic regression. The verification of the correctness of the logit model was done via an ex post forecast on a new sample of observations. From the rest of the observations, which were retained, we again selected 2,000 observations by a random selection with a repetition from each group. The logit model was verified on the sample of 4,000 observations. The calculation of the probability of certificate issue was done by the equation of logistic regression:

$$P(Y = 1) = \frac{1}{1 + \exp\left(-(\beta_0 + \sum \beta_j x_{ij})\right)} \tag{2}$$

where:
$P(Y = 1)$ – the probability of issue of certificate on fulfilment of the requirements on purchase of agricultural land
β_0 – constant
β_j – estimated parameter on independent variable
xij – independent variable
$i = 1 \dots N; N = 4,000$ – (number of observations)
$j = 1 \dots J; J = 20$ – (number of independent variables entering the model)

In ex post forecast of probability of certificate issue, we set the following criterion: if the result of the logistic regression equation will be higher than 0.5 (i.e. 50%), the certificate will be issued, on the other hand, if the result will be lower than 0.5, the certificate will not be issued. The logistic regression as well as the verification of the model was performed via the statistical software STATA. Multicollinearity of independent variables entering the logistic regression was diagnosed via the variance inflation factor (VIF).

Table 1   Overview of variables entering the logistic regression

Variable	Description (assumed impact on the level of price)*	Source of data
issue of certificate	certificate on fulfilment of the requirements on purchase of agricultural land (Y)	district office
supply price	price required by the landowner via the publishing in the Register of Offers of Agricultural Land (-)	Register of Offers of Agricultural Land
price according to Tax Act	administrative price according to the Act no. 582/2004 Z. z. (-)	annex I of the Act no. 582/2004 Coll. on Local Taxes and Local Fee for Municipal Waste and Minor Construction Waste
price according to CSEU	administrative price according to the credit soil-ecological units (-)	Decree of Ministry of Agriculture no. 38/2005 Coll. on the determination of land value and overgrows value for the purpose of the land consolidation
sold area	size of the plot in m² (+)	Register of Offers of Agricultural Land
coefficient of proportion of sold area	coefficient of the proportion of the sold area on the total area of land (+)	own calculations based on data from Register of Offers of Agricultural Land
distance from district city	distance of the plot from a district city in km (-)	website www.vzdialenosti.sk
distance from regional seat	distance of the plot from a regional seat in km (-)	website www.vzdialenosti.sk
type of soil	type of soil according to the Decree of the Ministry of Agriculture of the Slovak Republic no. 508/2004 Coll. (-)	annex VIII of the Decree of the Ministry of Agriculture of the Slovak Republic no. 508/2004 Coll.
type of parcel register	categorisation of parcel in register C (+)	Register of Offers of Agricultural Land
region	location of the plot within regions in Slovakia (-)	Act no. 302/2001 Coll. on Self-Government of Higher Territorial Units

Source: own elaboration
* (Y) dependent variable; (+) the increasing probability of issue of the certificate is expected with increasing value of the variable; (-) the decreasing probability of issue of the certificate is expected with increasing value of the variable

Results and discussion

Certificate on fulfilment of the requirements on purchase of agricultural land

Nowadays, there is no statistical tool to map the demand for agricultural land at the land market. The Register of Offers of Agricultural Land allows carrying out a partial mapping of the supply for agricultural land at the land market. For a transfer of ownership right to the agricultural land, which is offered for a sale via the Register of Offers of Agricultural Land, a certificate on fulfilment of the requirements on purchase of agricultural land have to be issued. It is a necessary annex of the contract on the transfer of the ownership right to the agricultural land. Based on the certificate, the Cadastral Registry is allowed to create a new property right to the agricultural land. The certificates issued allow us to map the demand for the agricultural land in Slovakia. If the certificate is issued for the agricultural land, which was offered for the sale via the Register of Offers of Agricultural Land, it indicates that the demand exists. For the purpose of this paper, the agricultural land on which the certificate was issued will be referred to as the demand for agricultural land.

Act no. 140/2014 Coll. on Acquisition of Ownership to Agricultural Land and amending and supplementing regulates the competence of state bodies in the field of acquisition of the ownership right to the agricultural land. The district office in which the agricultural land is situated verifies the fulfilment of the requirements on purchase of agricultural land. Within the district office, it is the Land and Forest Department that is responsible for the issue of the certificate.

The acquirer of an agricultural land is obliged to submit an application for fulfilment of the requirements on purchase of agricultural land to the district office before a contract on the transfer of ownership right to the agricultural land is signed.

The content of the application is laid down in the legal regulation. The district office is obliged to issue the certificate within 30 days, or within 60 days in particularly complex cases.

The certificate is an obligatory annex to the contract for the transfer of ownership right to the agricultural land. The Cadastra+l Registry is allowed to create a new property right to the agricultural land based on the submission of the certificate.

During the period from June 1, 2014 to December 31, 2016, the total of 691 certificates was issued in Slovakia. The largest number of certificates was issued in the Bratislava region, where are only four Land and Forest Departments located. In average, each Land and Forest Department in Bratislava region issued 47 certificates since the Act on Acquisition of Ownership to Agricultural Land had come into force. At the same time, it is the highest average number of certificates per one Land and Forest Department. The smallest number of certificates was issued in the Žilina region, where from the total number of seven Land and Forest Departments, the certificates were issued just by three of them. Therefore, in the Žilina region, there are two issued certificates per one Land and Forest Department in average. The largest number, i.e. nine Land and Forest Departments, is located in the Prešov region, where four Land and Forest Departments issued 67 certificates during the selected period. In Table 2, there is an overview of certificates issued in NUTS III regions during the period of 31 months.

From June 1, 2014 to December 31, 2016, the certificates were issued for the total of 4,237 offers for the sale of agricultural land published via the Register of Offers of Agricultural Land, i.e. for 4,237 plots of agricultural land. The largest number of land plots for which the certificates were issued was in the Bratislava region (937 land plots), the Banská Bystrica region (842 land plots) and the Nitra region (754 land plots). The certificates which were issued in these three regions covered 59.78% of the land plots from the total amount of the land plots for which the certificates were issued. Similarly, in these three regions, there was issued 48.48% of the certificates from the total number of issued certificates. The highest average number of land plots per one issued certificate was in the Banská Bystrica region (15 land plots / 1 certificate) and the smallest average number

Table 2   Overview the certificates on fulfilment of the requirements on purchase of agricultural land issued in NUTS III regions during the period from June 1, 2014 to December 31, 2016

Region	Number of issued certificates	Number of parcels on which the certificates were issued	Average number of parcels per one certificate
Bratislava	186	937	5
Trnava	40	117	3
Trenčín	137	587	4
Nitra	92	754	8
Žilina	11	48	4
Banská Bystrica	57	842	15
Prešov	67	443	7
Košice	101	509	5
Slovakia	691	4,237	6

Source: own calculation according to data from the Land and Forest Departments
* green – the highest value; red – the lowest value (values are evaluated in columns)

in the Trnava region (3 land plots / 1 certificate). The smallest number of land plots for which the certificates were issued was in the Žilina region (48 land plots). It represents 1.13% of the land plots from the total number of land plots for which the certificate was issued. In Figure 1, there is an average number of certificates per Land and Forest Department in NUTS III regions.

Factors affecting the demand for agricultural land

The logit model, which was created from the data collected during the period from June 1, 2014 to December 31, 2016, identified the factors affecting the demand for agricultural land in Slovakia.

Table 3 and Table 4 describe the descriptive characteristics of quantitative independent variables entering Model 1-1 and Model 1-4. The basic difference between the two models is in the number of observations that entered the model. In Model 1-1, there were 4,000 observations, which were selected by a random selection with a repetition. These observations include 2,000 observations, when the certificate was issued (i.e. the demand for the agricultural land exists), and 2,000 observations, when the certificate was not issued (i.e. the demand for the agricultural land does not exist). Model 1-4 includes observations from Model 1-1 except of the observations, when the price according to Tax Act was 0 €.m^{-2}.

The total number of four models was created during the process of modelling. The results of all models are summarized in Table 5.
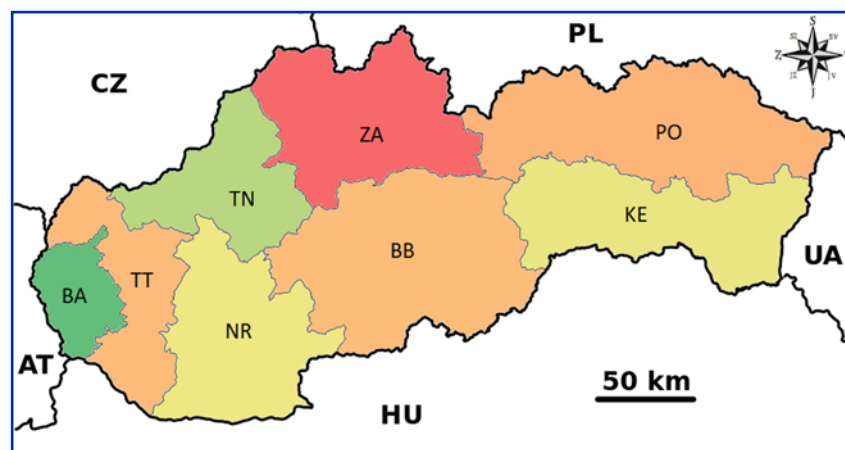

Figure 1   Average number of certificates per one Land and Forest Department in NUTS III regions
Source: own elaboration based on data from Land and Forest Department
* green – the highest number of issued certificates; red – the lowest number of issued certificates (concrete numbers of certificates are shown in Table 2);
** BA – Bratislava region; TT – Trnava region; TN – Trenčín region; NR – Nitra region; ZA – Žilina region; BB – Banská Bystrica region; PO – Prešov region; KE – Košice region

Table 3   Descriptive characteristics of quantitative independent variables entering Model 1-1

Quantitative variable	N	mean	min	max	p 50	sd
Dupply price	4,000	0.96	0.00	50.00	0.30	3.23
Price according to Tax Act	4,000	0.31	0.00	1.16	0.30	0.25
Price according to CSEU	4,000	0.11	0.00	0.70	0.11	0.08
Dold area	4,000	4,254.73	0.06	841,904.00	773.67	24,007.15
Coefficient of proportion of area sold	4,000	0.35	0.00	1.00	0.20	0.37
Distance from district city	4,000	16.73	1.00	65.60	16.40	9.75
Distance from county seat	4,000	63.41	1.00	145.05	57.47	34.86

Source: own elaboration, STATA
* N – count; mean – average; min – minimum; max – maximum; p 50 – median; *sd* – standard deviation

Table 4   Descriptive characteristics of quantitative independent variables entering Model 1-4

Quantitative variable	N	mean	min	max	p 50	sd
Supply price	3,885	0.96	0.00	50.00	0.30	3.26
Price according to Tax Act	3,885	0.31	0.02	1.16	0.31	0.25
Price according to CSEU	3,885	0.12	0.02	0.70	0.11	0.07
Sold area	3,885	4,321.61	0.06	841,904.00	762.00	24,353.05
Coefficient of proportion of area sold	3,885	0.35	0.00	1.00	0.20	0.37
Distance from district city	3,885	16.66	1.00	65.60	16.38	9.73
Distance from county seat	3,885	63.46	1.00	145.05	57.30	34.86

Source: own elaboration, STATA
* N – count; mean – average; min – minimum; max – maximum; sd – standard deviation

Table 5   Summary of results for Model 1

Variable	Model 1-1		Model 1-2		Model 1-3		Model 1-4	
	coeff.	*p*-value	coeff.	*p*-value	coeff.	*p*-value	coeff.	*p*-value
Supply price	-0.1672	0.000***	-0.1549	0.000***	-0.1568	0.000***	-0.1525	0.000***
Price according to Tax Act	0.7479	0.254	x	x	x	x	x	x
Price according to CSEU	2.9352	0.108	2.5854	0.008***	2.8955	0.002***	2.7599	0.004***
Sold area	-7.3E-6	0.001***	-6.5E-6	0.003***	-6.6E-6	0.002***	-6.4E-6	0.004***
Coefficient of proportion of area sold	-0.6883	0.000***	-0.6644	0.000***	-0.6496	0.000***	-0.6148	0.000***
Distance from district city	-0.0132	0.004***	-0.0094	0.049**	-0.0089	0.060*	x	x
Distance from county seat	0.0222	0.000***	0.0220	0.000***	0.0219	0.000***	0.0210	0.000***
Vineyards	-0.0275	0.949	x	x	x	x	x	x
Hop gardens	omitted		x	x	x	x	x	x
Gardens	0.3940	0.407	x	x	x	x	x	x
Fruit groves	1.2077	0.117	x	x	x	x	x	x
Permanent grasslands	0.3210	0.027**	0.8866	0.000***	0.8838	0.000***	0.9027	0.000***
Plot of register	-0.4213	0.001***	-0.3616	0.006***	-0.4015	0.002***	-0.4343	0.001***
TT region	-3.1804	0.000***	-2.9762	0.000***	-2.8790	0.000***	-2.8278	0.000***
TN region	-0.2413	0.170	-0.3019	0.095*	x	x	x	x
NR region	-0.4203	0.011**	-0.5770	0.001***	-0.4599	0.003***	-0.4502	0.004***
ZA region	-3.3601	0.000***	-3.0616	0.000***	-2.8978	0.000***	-2.7501	0.000***
BB region	-3.2557	0.000***	-3.3324	0.000***	-3.1762	0.000***	-3.1869	0.000***
PO region	-2.1603	0.000***	-2.1404	0.000***	-1.9786	0.000***	-1.8622	0.000***
KE region	-0.8008	0.000***	-0.7677	0.000***	-0.6198	0.000***	-0.7208	0.000***
Transformed price according to Tax Act	x	x	-0.0467	0.000***	-0.0466	0.000***	-0.0482	0.000***
Transformed distance from district city	x	x	x	x	x	x	-0.4966	0.049**
constant	0.6748	0.004***	1.0800	0.000***	0.9331	0.000***	0.9169	0.000***
N	3,999		3,885		3,885		3,885	
R²	0.2313		0.2373		0.2368		0.2369	

Source: own elaboration, STATA
* coeff. – coefficient; N – number of observations; R^2 – coefficient of determination; ** notes: * α – 0,10; ** α – 0,05; *** α – 0,01

The interpretation of coefficients for variables is as follows:

Sold area (x_{1i}) – variable is statistically significant and it decreases the probability of issue of certificate.

Transformed price according to Tax Act (x_{2i}) – variable is in €.m⁻². A parameter of this variable indicates that the small change of the variable at small prices has a relatively small, negligible importance. Since the taxes on agricultural land are in general a several hundred euros, the small change of the variable has a negligible impact on the issue of the certificate.

Price according to CSEU (x_{3i}) – variable is statistically significant and it decreases the probability of issue of certificate.

Sold area (x_{4i}) – variable is statistically significant and it decreases the probability of issue of certificate.

Coefficient of proportion of area sold (x_{5i}) – variable is statistically significant and it decreases the probability of issue of certificate.

Transformed distance from district city (x_{6i}) – variable is in m². A parameter of this variable indicates that the small change of the variable at small distances has a relatively small, negligible importance. Since the localisation of the agricultural land from a district city is in general in several tens kilometres, the small change of the variable has a negligible impact on the issue of the certificate.

Distance from county seat (x_{7i}) – variable is statistically significant and it increases the probability of issue of certificate.

Permanent grasslands (x_{12i}) – variable is statistically significant and it increases the probability of issue of certificate.

Table 6   Descriptive characteristics of quantitative independent variables used for the verification of Model 1-4

Quantitative variable	N	mean	min	max	p 50	sd
Supply price	4,000	0.89	0.00	162.00	0.31	3.45
Price according to Tax Act	4,000	0.30	0.00	1.11	0.29	0.25
Price according to CSEU	4,000	0.11	0.00	0.37	0.10	0.07
Sold area	4,000	4,119.04	1.00	559,353.00	736.00	19,612.11
Coefficient of proportion of area sold	4,000	0.36	0.00	1.00	0.21	0.38
Distance from district city	4,000	17.28	0.65	65.60	17.08	9.48
Distance from county seat	4,000	64.37	1.00	145.05	59.44	34.78

Source: own elaboration, STATA
* N – count; mean – average; min – minimum; max – maximum; *p* 50 – median; *sd* – standard deviation

Plot of register (x_{13i}) – variable is statistically significant and it decreases the probability of issue of certificate.

TT region (x_{14i}) – variable is statistically significant and it decreases the probability of issue of certificate.

NR region (x_{16i}) – variable is statistically significant and it decreases the probability of issue of certificate.

ZA region (x_{17i}) – variable is statistically significant and it decreases the probability of issue of certificate.

BB region (x_{18i}) – variable is statistically significant and it decreases the probability of issue of certificate.

PO region (x_{19i}) – variable is statistically significant and it decreases the probability of issue of certificate.

KE region (x_{20i}) – variable is statistically significant and it decreases the probability of issue of certificate.

After the construction of logit model, its practicality was tested via the ex post forecast on another sample of observations. In Table 6, there is the descriptive characteristics of quantitative independent variables of observation, which were used for the verification of Model 1-4.

The sample for the verification of logit model includes 4,000 observations. At first, we excluded the observations with the price according to Tax Act of 0 €.m². Thus, there were 3,855 observations for the ex post forecast. The logit model predicted that from the total number of 3,855 observations, the certificate would be issued in 2,133 cases and in the remaining 1,722 cases the certificate would not be issued. In fact, there were 1,945 issued certificates and in 1,910 cases the certificate was not issued. The logit model correctly estimated and ranked 77.85% of observations. The results also prove that if the logit model determines the plot of agricultural land as sold (i.e. the certificate will be issued on the land plot), it will be sold at 75.57%. Simultaneously, if the model determines that the land plot would not be sold (i.e. the certificate would not be issued on the land plot), it will not be sold at 80.66%. At the same time, if the agricultural land plot was sold, the logit model would define it as sold at 82.88% and if the agricultural land was not sold, the model would define it as unsold at 72.72%. The influence of selected factors on the demand for the agricultural land was successfully quantified via the logit model. It was also proved that the logit model is sufficiently reliable as it correctly determined whether the plot of agricultural land would be sold or unsold in three of the four cases.

Conclusion

Current state of the land ownership in Slovakia is affected by unjustified land ownership caused by inconsistent registration in the past and by the extreme fragmentation of the land ownership (Bandlerová and Lazíková, 2016). In spite of that, the demand for the agricultural land still exists from both the domestic as well as the foreign investors, despite the controversial legal regulation – the Act no. 140/2014 Coll. on Acquisition of Ownership to Agricultural Land and amending and supplementing. Odkladal (2015) stresses that the investing in real estate is no longer as profitable as it used to be in the past. The much more attractive is land, especially the agricultural land. However, there is also no available statistical tool to map the demand for agricultural land at national or regional levels. Due to the Act on Acquisition of Ownership to Agricultural Land, there is a partial tool for mapping of the demand. However, it is insufficient. The certificates on fulfilment of the requirements on purchase of agricultural land are issued only in a very limited extent. The legal regulation conditioned the creation of new property right to the agricultural land by submission of the certificate, but on the other hand, there are many exceptions when the certificate is not required.

The demand for land in Slovakia is enormous especially because it is quite affordable and still relatively inexpensive for investors from Western Europe (Odkladal, 2015). In the old Member States of the European Union, it is problematic to buy arable land for agricultural purposes. The agricultural land in these countries is several times more expensive in comparison to Slovakia. We can conclude that the demand for agricultural land is affected primarily by the land price. This assumption was confirmed by the results of the logistic regression. It was proved that the demand for agricultural land is increasing if the supply price and the price according to the Tax Act are decreasing. The results also confirmed that the demand is increasing if the quality of agricultural land is increasing (the indicator of land quality is the price according to credit soil-ecological units).

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