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# THE REASONS OF THE REGIONAL DIFFERENCES OF AGRICULTURAL LAND PRICES – HUNGARIAN CASE STUDY FROM HUNGARY[1]

## *POWODY REGIONALNEGO ZRÓŻNICOWANIA CEN ZIEMI ROLNICZEJ – STUDIUM PRZYPADKU WĘGIER*

**Key words: agricultural land prices, multiple linear regression analysis, regional differences**

*Slowa kluczowe: ceny zmieni rolniczej, wielokrotna regresja liniowa, zróżnicowanie regionalne*

**Abstract.** Agricultural land market in Hungary is in process of development, the prices of land is times lower compared to land prices in old member states of the EU. Because of their lower income Hungarian nationals do not have substantial possibilities to acquire ownership over land like nationals of the old member states of the EU. In order to preserve the agricultural sector from shocks that might arise from the differences in land prices and income with the rest of EU, Hungary as the others Central and Eastern European new member states countries (the Czech Republic, Estonia, Latvia, Lithuania, Poland and Slovakia) during the accession negotiations in 2003 was granted the possibility to maintain existing national provisions restricting the acquisition of agricultural land or forests.

Based on the data provided by the Hungarian Farm Accountancy Data Network and by the Hungarian Central Statistic Office the authors examined the specific impacts of factors influencing on arable land prices.

## Introduction

The long-term development of socio-economic systems requires the sustainable use of natural resources. In order to fulfill the important tasks related to the optimization of land use system − which is necessary due to the responsible management of land. The importance of this issue is very high in Hungary, where 63% of the total land area consists of agricultural area, in contrast to the 43% of EU-25 countries.

As in other Central and Eastern European Countries, the change of political and economic regime virtually tore into the Hungarian agriculture in beginning of 1990s, destroying the existing structure of land estates by privatization, restitutions or restoration of ownership rights resulting in fragmentation of land ownership. In Hungary land privatization impacting on more than 50% of the total area of the country, creating approximately 2.5 million new properties and through a process involving compensation and land privatization affecting some 20% of the population with 2.2 ha in average. Only a small number of the new owners were actually able and willing to rely on agriculture as their main occupation.

Due to some socio-economic and regulation issues in Hungary – as in the EU-12 generally – the volume of land market was very low at the time of starting the EU accession negotiations. Owing to the low productivity of agricultural production and market imperfections the current land prices were far below the land prices in the EU-15. During the accession negotiations in 2003, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland and Slovakia were granted transitional periods during which they could maintain existing provisions of their legislation restricting the acquisition of agricultural land or forest, in derogation to the freedom of capital movement enshrined in Art. 56 of the EC Treaty. The candidate countries considered these derogations necessary in order to preserve the agricultural sector of the countries from shocks that might arise from the differences in land prices and income with the old member states of the EU, and to be able to pursue an effective agricultural policy.
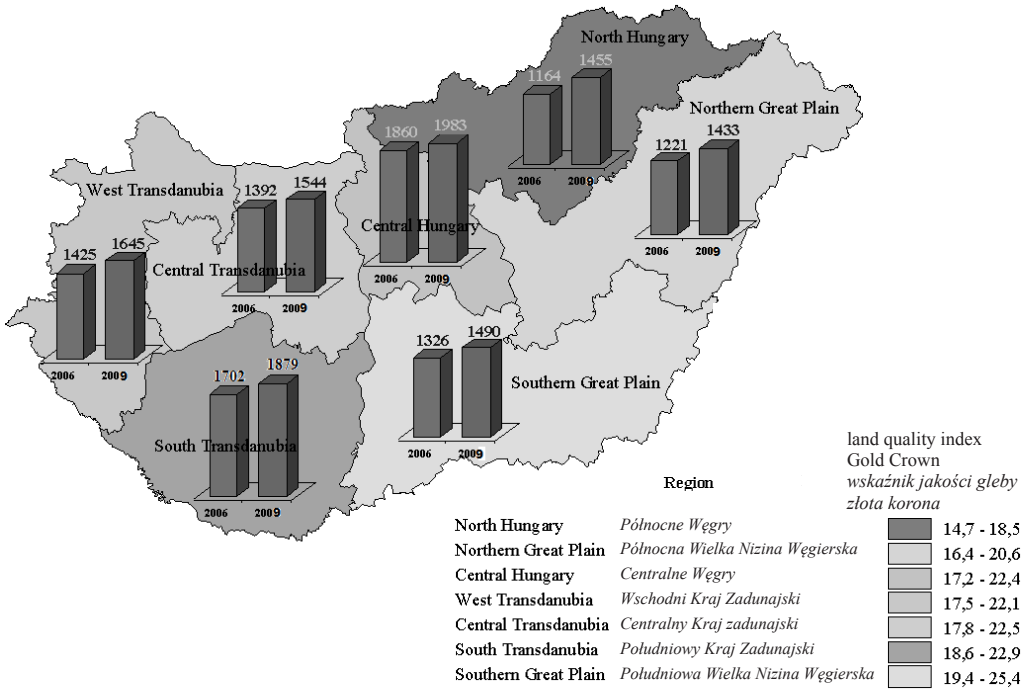
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Figure 1. Regional average market prices of arable land in 2006-2009, EURO per hectare
*Rysunek 1. Ceny ziemi rolniczej w regionalch w latach 2006-2009 [euro/ha]*
Źródło: obliczenia własne na podstawie Wębierskiego FADN
*Source: own construction based on the data of Hungarian FADN*

Huge differences between Hungary and the old member states of the EU in agricultural land price level did not decrease significantly until seven years since the accession. As example, the actual average market prices of arable land in EUR/ha are as follows: in Hungary: 1600, in Poland: 848, in Bulgaria: 1202 in comparison with 4370 EUR/ha in France and 24 888 EUR/ha in Belgium [EU-DGARD 2010]. The average land prices have increased due to the connection, the regional differences are significant.

The slow growth of land prices can be explained with a lot of reasons, but basically it can be led back to low land market turnover (the land market turnover is 2-3% in some years [FVM 2009]. The weak land market turnover can be due to supply and demand factors at the same time.

The average real income per capita also shows significant spatial disparities: the income is lower in regions with higher agriculture's share of employment.

Figure 1. shows differences between Hungarian region in land prices. Based on the results of the ANOVA (p<0.01) the regional differences in prices of arable land are significant.

The main objective of this study was the selection of factors influencing regional differences in prices of arable lands.

## Material and methods

The data processing and statistical analyses were made with the help of SPSS 18.0 for Windows statistical software package.

The relations among indices involved in the examination were analysed with multiple regression analysis and correlation calculation.

During examinations, the authors paid special attention to the preliminary examination and correction of data because the implementation of a statistical method or test is subject to strict conditions. For example, the t-test presumes normal dispersion of variables.

In case of regional-level analyses, the normal dispersion of numeric variables were examined with Kolmogorov-Smirnov test – since the samples had appropriately large empirical sizes.

Multiple regression analysis was used to evaluate the relationship between a set of factors and the arable land price in 2009 as a dependent variable. The regression model involved the following factors:

– net value added, NVA (EUR),
– intensity of crop production (EUR/ha),
– land quality index (Gold Crown/ha),
– access index (%),
– transport index (%),
– migration balance (‰),
– rental fee, 2009 (EUR/ha),
– unemployment rate (%),
– population density index (inh./km$^2$).

The economic data required for the research and the land quality indices were provided by the Hungarian Farm Accountancy Data Network (FADN).

The authors picked the net value added defined in FADN [Keszthelyi, Pesti 2008] as an appropriate index for the evaluation of profitability situation of farms dealing with field crop production. The net value added (NVA) is the difference of output (production value) produced by the farms and the value of products and services used for production – current production input – increased by amortization.

The intensity of crop production was examined on the basis of total size of sowing seed, fertilizer, pesticide and fuel costs.

The farming data and the Gold Crown$^2$ values were available in micro-region division. The farming data of years from 2004 to 2007 were averaged in the form of simple mathematical average for the analysis.

The land prices and land rental fees for 2009 were also taken from the Test Farm System.

The demographic situation of geographical units was evaluated by the population density index (number of inhabitants per one square kilometre), the social-economic situation by migration balance (difference of numbers of constant immigration and emigration per permanent inhabitants, calculated per thousand and the unemployment rate (percentage rate of the unemployed within population aged from 18 to 59). The single settlement basic data required for the calculation of the above listed derived data are from the Settlement Statistical Database System (T-Star) of KSH (Central Statistical Office).

The accessibility of geographical units was evaluated by Access index, while the extension and quality of public road network was evaluated by Transport index. The idea of Access index was given by the work of Faluvégi [2004] in which the author analysed the accessibility of microregions by reviewing the factors which affect the settlement of foreign capital. The basic data used for deriving the indices came from the Digital Topographic Database in the form of map objects.

The treatment of geographical information data and the construction of maps was solved by the use of ArcView GIS 3.2a program of ESRI (Enviromental System Research Institute).

When forming the Transport index – by weighted averaging of values of partial indices – the author puts the distance to railway with 30%, the distance to main road with 30% and the distance to motorway with 40% weight. The Transport index evaluates the transportation conditions of examined geographical objects (microregions, micro-landscapes) on a scale from 0 to 100%. The value of the index near 0% refers to the underdeveloped road network, while the near 100% value means developed transportation infrastructure.

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2    Golden Crown – land quality index used in Hungary. The Gold Crown system was introduced in Hungary in the second half of the XIX century.

The analysis of traffic conditions shows that the transportation infrastructure of two Southern regions – Southern Transdanubia and Southern Great Plain – is less developed compared to the other parts of the country, and their microregions show greater heterogeneity.

In the construction of Access index, the author puts the distance to the closest county town with 20%, the distance to Budapest with 35%, while the distance to the Western border (Hegyeshalom) with 45% weight. The near 100% value of Access index refers to the more favorable, while the value near 0% to the less favourable economic-geographical location.

The analysis of accessibility and traffic conditions is very important from the aspect of foreign capital attraction: those microregions where the value of both indices is low cannot really be considered when speaking about the increasing demand of foreigners on land after 2011. Extended the moratorium until 2014.

## Results and Discussion

In the first step correlation analysis was made, the aim of this analysis was the selection of factors which significantly influence arable land prices, on the basis of farm management, social-economic and infrastructural indices. The relationship between land quality measured in Gold Crown and net value added weak-moderate, r = 0,43. Indirectly it allows to conclude that the ratio of returns on land has decreased within the income of crop production. By analyzing the competitiveness of agricultural and food industry production, Módos et al. [2004] came to the same conclusion, that is the weight of advantages from natural qualities diminishes very much compared to other factors.

On the basis of values of linear correlation coefficients we cannot speak about statistically proved relation between land prices, land rental fees as well as infrastructural (indices of transport, accessibility), social-economic (migration difference, unemployment rate) indices and population density.

In the second step a hierarchical multiple linear regression analysis was performed by Hungarian regions.

The results of examinations made at regional level in as shown by Table 1 are „multi-colored". As regards arable land prices, different factors are put in the foreground by each region. The effect of land quality on arable land price can be clearly observed only in the Southern Great Plain region. In case of Central Transdanubia, only the impact of gold crown is significant out of the two land quality indices. The technical level of crop production is important arable land price forming factor in the Central Hungarian region. In the Southern Transdanubia, the profitability measured in net value added of crop production has proved to be considerable arable land price factor. As regards the Northern Great Plain region, the arable land price is explained by only one important factor in almost 53% that is the land rental fee.

The level of land rental fees is significantly determined by the land quality) in the Central Transdanubian, Southern Transdanubian and Southern Great Plain regions, that is in those regions where the quality of arable land is better than the average. It can be due to the fact that in this region the determination of rental fees per one gold crown is especially widespread.

Table 1. The results of the multiple regression analysis by Regions
*Tabela 1. Wyniki wielokrotnej analizy regresji według regionów*

| Region/*Region* | Model/*Model* | Unstandardized coefficients/ *współczynniki niestandardowe* | Standardized coefficients/ *współczynniki standardowe* | p-value/ *wartość p* | $R^2$ |
|---|---|---|---|---|---|
| Central Hungary/ Centralne Węgry | constant/*stała* | 279,50 | | 0,441 | 0,71 |
| | intensity of crop production/ *intensywność produkcji roślinnej [EUR/ha]* | 31,99 | 0,844 | 0,004 | |
| Central Transdanubia/ *Centralny Kraj zadunajski* | constant/*stała* | 709,89 | | 0,000 | 0,53 |
| | land quality index [Gold Crown/ ha]/*wskaźnik jakości gleby [złota korona/ha]* | 31,99 | 0,727 | 0,000 | |
| | constant/*stała* | 750,19 | | 0,000 | 0,65 |
| | land quality index [Gold Crown/ ha]/*wskaźnik jakości gleby [złota korona/ha]* | 30,33 | 0,689 | 0,000 | |
| | migration balance/*saldo migracji [‰]* | 18,16 | 0,347 | 0,028 | |
| Southern Transdanubia/ *Południowy Kraj Zadunajski* | constant/*stała* | 449,55 | | 0,328 | 0,28 |
| | NVA/*NVA [EUR/ha]* | 14,60 | 0,526 | 0,017 | |
| Northern Hungary *Północne Węgry* | constant/*stała* | 2730,85 | | 0,000 | 0,46 |
| | access index/*wskaźnik dostępności [%]* | -27,70 | -0,678 | 0,001 | |
| Northern Great Plain/Północna *Wielka Nizina Węgierska* | constant/*stała* | 142,08 | | 0,656 | 0,53 |
| | rental fee, 2009/ *renta dzierżawcza [EUR/ha]* | 55,76 | 0,726 | 0,001 | |
| Southern Great Plan/*Południowa Wielka Nizina Węgierska* | constant/*stała* | 598,19 | | 0,056 | 0,29 |
| | land quality index/[Gold Crown/ ha]/*wskaźnik jakości gleby [złota korona/ha]* | 34,37 | 0,539 | 0,008 | |

Dependent variable: price of arable land, 2009 [EUR/ha], independent variables: the net value added, NVA [EUR], the intensity of crop production [EUR/ha], land quality index [Gold Crown/ha], Access index [%], Transport index [%], Migration balance [‰], Rental fee, 2009 [EUR/ha], Unemployment rate [%], Population density index [inh./km$^2$]/*Zmienna zależna: Ceny gruntów ornych, 2009 [EUR/ha], zmienne niezależne: wartość dodana, NVA [PLN], intensywność produkcji roślinnej [PLN/ha], indeks jakości gruntu [Gold Crown/ha] wskaźnik dostępności [%], wskaźnik transportu [%], saldo migracji [‰], renta dzierzawcza, 2009 [PLN/ha], stopa bezrobocia [%], indeks zaludnienia [inh./km$^2$]*
Source: own calculation
*Źródło: obliczenia własne*

## Conclusions

According to the results of a multiple regression analysis the arable land prices are influenced by different factors in each region of Hungary. The impact of land quality on arable land prices has been clearly observed only in the Southern Great Plain region. The development level of infrastructural environment and the social-economic situation has no significance regarding the arable land prices.

It leads to the conclusion that the local supply-demand conditions, the specific features of the given land unit have considerable impact on arable land prices, although these are not expressed either in gold crown value. These features are the accessibility of the area, its size, structure, irrigation possibilities, etc.

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### *Streszczenie*

*Na podstawie danych z węgierskiego FADN i Centralnego Biura Statystycznego zbadano szczegółowe oddziaływanie czynników wpływających na ceny gruntów ornych w różnych regionach Węgier. W badaniach prowadzonych przy pomocy analizy regresji wielokrotnej wykazano, że na ceny gruntów ornych wpływają różne czynniki, w zależności od regionu Węgier.*

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