SZENT ISTVÁN UNIVERSITY, GÖDÖLLŐ

Management and Business Studies Doctoral School

DOCTORAL (PHD) THESISES

THE ECONOMIC VALUE AND MARKET PRICE OF THE AGRICULTURAL LAND

Written by: Naárné Tóth Zsuzsanna Éva

Gödöllő

2006

DOCTORAL SCHOOL

DESCRIPTION: Management and Business Studies Doctoral School

SCIENTIFIC FIELD: Management and Business Studies

THE HEAD OF THE SCHOOL: Dr. Szűcs István
professor, doctor of Economics
SZIU, Faculty of Economics and Social Sciences
Department of Economic Analysis and Methodology

SUPERVISOR: Dr. Farkasné Dr. Fekete Mária
senior lecturer, PhD of Economics
SZIU, Faculty of Economics and Social Sciences
Institute of Economic

…….…….. ……

Approval of the head of the school Approval of the supervisor

INTRODUCTION

The value of land and its income was already dealth with in economic literature in the late feudalism, the early days of capitalist production. As an important production factor, land had a very important role in economic theories (Smith, Ricardo, Marx) related to the detemination of its contribution to taxation and income. As the significance of agriculture in the economy started to decrease, the economic theories related to the research on land evaluation also lost some of their importance.

In our days the issue of land evaluation (responsible farming, environmental aspects, sharp competition) has also gained importance both in developed or transition countries. In Hungary – where the lack of an operating land market really hindered the emergence of a real market value and therefore land can not be used as a collateral – several factors made it important to investigate the economic value of land.

The importance of the topic in our days

The important role that land plays in production and the economical utilization of its productivity make it important to evaluate land. Land evaluation is both important on a national economy level but also on the level of individual farms.

The transition to a market-oriented economy poses a new challenge to the determination of the value of land. Being aware of the value of land is necessary in taxation, credit collateral and inheritance concerns, important in the subsidy system of agriculture, used in exchange of its ownership or leasing rights, necessary in determining its efficient allocation (different types of utilization), significant in state intervention prices and very important in agricultural policy decisions.

The field of land evaluation may cover different activities all over the world. Firstly, it can mean the determination of soil and land values (value numbers), secondly it can mean the determination and the estimation of the market value and the price of agricultural land and last but not least it can deal with the evaluation of plots. The above-mentioned three fields of land evaluation significantly differ from each other both in terms of theoretical and methodological aspects. This thesis focuses on the economic evaluation of agricultural land and the economic factors affecting its price.

In order to set up a reasonable system for land evaluation it is important to investigate of the price of land. The market price of land is in close relation to its ecological attributes. In contrast, the method for the determination of land price is based on the theory that is value is determined by the demand-supply relations of the crops that are produced on it. Therefore the investigations focuses on the development of the capital value of land rather than the analysis of ecological factors.

I came up with this research topic during my university studies when I investigated land-based mortgage loans as a possible tool of the improvement of the capital supply of agriculture. In the framework of that research I dealt with the land evaluation activity and method of the Földhitel és Jelzálogbank (Land Credit and Mortgage Bank, FHB). When investigating this topic in depths I came to a conclusion that the lack of the deremination of the economic value of land does not only hinder land-based mortgage loaning but affects several other fields as well.

As a result I took up the topic of land evaluation. Then I had the opportunity to join program NKFP-2004-4/015 named ”Land quality, land value and sustainable land use in the European Union” in which now I am working as a member of a research group aiming to work out a new land evaluation method. The importance of the topic is also proved by the sustainable strategy of the EU promoting the more responsible utilization of natural resources.

The aim of the literature overview of my thesis is to investigate the specialities of land as a natural resource from the aspect of land evaluation, and in addition to that to give an overview on the history of land rent theories and the system of land evaluation. I also aim to deal with introducing – the currently still operating – golden crown system and the new method – which is curently under working out – D-e-METER which will probably replace the old system. I also focus on comparing land evaluation on an international level and to investigate the development of the economic evaluation and the price of land. I also concentrate on introducing the methods of the determination of land price, of which I will put special emphasis on the complete land price estimation system that combines land income with land rent – which is the most frequently applied in our country – and, in this case I also investigated the correction factors that can be taken into account when determining land base value. I also analysed the currently applied land evaluation methods in our country.

The research aims of this thesis are as follows:

- To introduce the land evaluation systems in international theories and practice, show their aims and investigate their applicability.
- To contribute to the working out of a new land evaluation method with special emphasis on potential rent by taking an active part in research program NKFP-2004-4/015 named ”Land quality, land value and sustainable land use in the European Union”
- To collect the factors affecting the economic value of land based on primary and secondary sources.
- To investigate the factors affecting land price in Hungarian practice by empirical data collection and applying statistical methods. To investigate the realtion between economic land value and parket price.

1. MATERIAL AND METHOD

1.1. Material used for the investigations

The main aim of my research is to introduce and investigate the factors that make the most infcuence on the development of land price and to find out whether the economic value and the price of land significantly differ from each other or not. To achieve my aims it is required to set up a database that reflects land prices.

In order to *achieve my aims* it is imortant to:

- determine the factors that influence land price based on primary and secondary data;
- set up a database of land prices;
- investigate the relation between land price and the factors that influence it by applying statistical methods;
- compare the price and the economic value of land calculated by land evaluation methods that institutions use in practice.

There are no official data on current Hungarian land prices therefore I collected the data for this research myself.

During this research I chose the **non-random sampling method** to collect the required data. I used the homepages of Földbróker Kft. (www.foldbroker.hu) and Földcentrum (www.foldcentrum.hu) to collect data from advertisements published until August 2005 (the first data was from 2003). Then I chose advertisements that related to agricultural field land, because the investigation of field land price and the influencing factors are in the centre of my thesis.

When setting up the sample I applied the **subjective selection method**. Then I only investigated field land from all the types of agricultural land.

The data related to the individual elements of the sample was gained by **personal interviews**. Altogether there were 320 advertisements related to field land on the two homepages of which I was able to make an interview with 296 land owners. In order to obtain the data for my investigations I simply called the number given in the advertisements or in some cases made contact with the owners by e-mail.

All of the owners hat I interviewed were private persons (and 90 percent of them lived in the same town where the offered land was). Since It was not possible to gain all the necessary data for my investigation form the land owners, then another type of data collection was also necessary which will be dealt with later.

1.2. The factors included in the investigations, their explanation and calculation

As a part of the program NKFP–2004-4/015 my research aimed at the investigation of the correction factors of land price to implement the economic evaluation of land. In my opinion the most important factors that affect land price is as follows:

- **The supply (advertised) price of land [HUF/ha]**: is one of the most important factors in terms of my research, because land price is has the highest effect on the development of the land market. In cases, where it was possible I also investigated the **original supply price of the given land compared to the price at it was finally sold**. [*Own collection.*]
- **The supply (advertised) size of field land for sale [ha]:** I found this factor important because it was necessary to analyse the size of land that their owners sold (proof for the existence fragmented land ownership). [*Own collection.*]
- **The golden crown value of field land [golden crown/ha]:** this figure is still the one in use in Hungary to make a difference between the quality of lands. [*Own collection.*]
- **The rent of the field land [HUF/ha]:** this is also a very important factor for the land market. Since these figures were not given by the owners as a common number therefore I had to recalculate them. [*Own collection.*]
- **The distance of the advertised field land from the nearest town [km]:** lands that are nearer to the border of a town or city (that are liokely to be a part of the town in the near future) are considered more valuable than ones that are furter. [based on CHICOINE (1981), DUNFORD et al. (1985), (ESTABLISHING THE VALUE OF LAND 1993), SHI et al. (1997) and SZŰCS (1998).] [This figure was calculated by applying a *scale map*.]
- **The advertised date of the sale of field land and the final date of sale [month, year]:** this figure is required for the invesigation of the velocity of the land market (although no useful conclusions can be drawn based on the data of only three consecutive years.) [*Own collection.*]
- **The intensity of labour per active population in the town where the offered land lies [%]:** it may directly affect land price but also make an influence on it by affecting the economic development level of the given town. The affect of labour force on land price was also a part of the investigations by PHIPPS (1984) and SZŰCS (1998). I attempted to collect data related to labour force density but fortunately there was not any useful data on town level. (I also tried to ask for data from labour offices but they could not help either). Therefore I finally investigated

labour intensity per active population on a town level. [Since there are no officially collected or published data on town level related to this field either therefore I collected the data on my own and calculated the figures from the *database of the T-STAR from 2003*]

- **The population within 30 kilometres of the town where the offered land lies [number of people]**: in my opinion the higher the population in a 30 km circle around the given town the higher the demand for the offered land is and the higher its price may be. The reason why I chose the number of people in 30 kilometres because this was the highest distance of the lands in my investigations from the nearest town (except for only some cases). (In my opinion this figure is the most suitable for describing the saleability of the lands) [I calculated this figure by using the *ESRI ArcView 3.2 geographic information software.*]
- **Net income per one hectare of field land [HUF/ha]:** this figure – as a factor that affecst land price – was also examined by MELICHAR (1979) [*AKI*]
- **The yield of the latest crop grown on the given field land [t/ha]:** this figure – as a factor that affecst land price – was also examined by ALSTON (1968) and FALK (1991). [*AKI*]
- **The figures for economic development:** from this group of figures I chose the number of enterprises and limited liability partnerships per 1000 persons, based on the assumption that the figures for economic development will be in close relation to land price, because in a developed economy where the number of enterprises is higher and the intensity of labour per active population is also firm, land price should also be high. The reason why I included the number of Ltd's in the investigations was that a minimum required amount of starting capital for an Ltd is a lot higher than or smaller enterprises, therefore their number can also relate to economic development. [*T-STAR 2003*]

1.3. Methods used for the investigations

In order to examine the confidence of data I made a **statistical analysis** since the own collection of data cannot always be considered representative. This method aims to preliminarily analyse the variables. The investigation was carried out by using an *SPSS program.*

The statistical analysis shows whether the datas are appropriate for carrying out the investigations or not.

The correlation coefficient is the most common figure for the level of linear relations. In order to examine the factors for the examination of land price (size of the advertised field land, the golden crown value of field land, the rent of the field land, the distance of the advertised field land from the nearest town, the population within 30 kilometres of the town, the intensity of labour per active

population in the town, net income per one hectare of field land, the yield of the latest crop grown on the given field land, and the (number of enterprises and limited liability partnerships per 1000 persons) I chose to use the **correlation matrix** of the *SPSS program.*

In order to show the relations between the variables I applied the **principal component analysis** which makes possible the combined analysis of the variables, not only the correlation between pairs of factors. This method is based on the assumption that the close relation between variables or a certain group of them originates from the fact that the variables belonging to the same group depend on one, underlying factor or reason, the principal component. The *SPSS program* was used for this investigation as well.

After that by applying the **hierarchical clustering method** (that was the best solution based on the data) I aimed to determine whether the given land parcels (which were grouped according to golden crown value) are similar to each other or not. The *SPSS program* was used for this investigation as well.

Based on the results of the above-mentioned methods and investigations I managed to determine the factors that correlate with land price and only continued to investigate these factors and excluded the others. First of all, I made a **correlation analysis** by applying *Microsoft Excel* to examine land price, golden crown value, population in 30 kilometres, the distance of land from the town and the intensity of labour per active population in order to determine the level of their relation.

Then by **regression analysis** I investigated how more independent variables (golden crown value, population in 30 kilometres, the distance of land from the town and the intensity of labour per active population) affect the value of one dependant variable (land price). This investigation will explain what the effect of each factor on the target value. Then I made a **variance analysis** aiming to determine how the regression equation is appropriate for showing the relation between target variables and explaining valuables at a given confidence level. Then I fit a **linear estimation function** and a **modified Cobb-Douglas function** with five variables (four factors) to the database. These fittings seemed to be the most appropriate for my data in order to measure the level that these factors affect land price. Then by fitting a **quadratic polinomial regression function with more variables** on the data I investigated the relation between the variables (CSÁKI-MÉSZÁROS 1981). The calculations were carried out by applying *Microsoft Excel program*.

After analysing the factors affecting land price I investigated whether the **market prices** I collected and the **economic land values** calculated by applying the land evaluation methods that different organisations use in practice, **differ from each other or not**. The calculations were carried out by applying *Microsoft Excel program*.

After that is created a **PIVOT-table** from my database focusing on price per hectare by applying *Microsoft Excel program.* The aim of the method is to group the data and make a table from the whole database related to the target factor (price per hectare). This methods helps determine average land prices by counties and the average supply price of land per hectare.

Then finally I finished my investigations by *comparing tha advertised land prices and the land prices in the final contracts to determine the extent they differ from each other*. I also investigated *how large is the size of the offered lands*. In addition to that I created a tabulation on determining whether the *rent prices* I collected are comparable to data in professional literature or not.

2. RESULTS

2.1. The results of the investigations

The data that I collected show that the **average supply price of land per hectare in Hungary is 455.000 HUF** (in case of average prices per hectare below 1 million HUF) which masks very big differences. The statistical analysis of the factors affecting land price gave the results as follows.

2.1.1. The results of the analysis of the correlation matrix

By applying the correlation matrix I investigated the level relation between the factors included in the examination of land price (size of the advertised field land, the golden crown value of field land per hectare, the rent of the field land, the distance of the advertised field land from the nearest town, the population within 30 kilometres of the town, the intensity of labour per active population in the town, net income per one hectare of field land, the yield of the latest crop grown on the given field land, and the number of enterprises and limited liability partnerships per 1000 persons) pair-by-pair by applying *SPSS program.* The values for the correlation coefficients are shown in the table for correlation matrix. The values with a * indicates that they are significant on a 5 percent signifance level, while those with ** show that they are significant on a 1 percent significance level. The latter one indicates a very significant value because in this case the confidence level is 99 percent. Values between 0,3 and 0,7 show medium, while values above 0,7 show strong correlation.

A) Firstly I analysed the relation between the components *if the price of land per hectare is below 1 million HUF* (n=234). In my opinion it was necessary to filter data by this criteria, because if the price of land per hectare is higher than 1 million HUF then the investment would not aim to implement agricultural purposes. ***The price of land per hectare shows weak positive** (0,172**) **correlation with the population within 30 kilometres of the town***. In my opinion the reason for that is that the increase in the population of the town boosts the price of land. As population increases, the demand for land also rises which gives a boost to land price since the demand for land is inelastic.

B) Secondly I analysed the correlation between the factors if the lands with a price per hectare above 1 million HUF are also included in the investigations (n=296). It is clear that ***price per hectare shows a medium positive correlation** (0,373**) **with the population within 30 kilometres of the town, with the number of enterprises** (0,430**) **and limited liability partnerships** (0,376**) **per 1000 persons and weak positive correlation** (0,192**) **with the intensity of labour per active population***.

The explanation for those results may be the integration of fiels lands into the territory of the town. The latter correlation proves that the database is also useful for the investigations because in a town, where the number of enterprises is high, and the intensity of labour per active population is also high, land prices are also firm. In my opinion the high activity of enterprises and the intensity of labour per active population are two factors that influence the demand for land since the increase in the number of enterprises and the improvement is employment boosts the price of land.

C) Thirdly, I analysed the correlation between the factors if the price of land is below 1 million hectare but I excluded the lands where the rent was not given (n=225). The results clearly show that ***rent price*** does not depend on any of the factors. (In this case I excluded golden crown value from the factors to be examined, because I assumed that there is a relation between land price and rent, but this time i focused on investigating the relation between rent and other factors.) The relation between rent and land price was also examined by SZELÉNYI-VINOGRADOV (2002) but no correlation was found between the two factors in there research either. ***In this case only an weak positive correlation*** *(0,233**)* ***was found between land price per hectare and the population within 30 kilometres of the town.***

D) Finally I only investigated land data where the rent and the golden crown value were given and the price of land per hectare was below 1 million HUF (n=71). In this case no correlation can be shown between land price and golden crown value. Since SZELÉNYI –VINOGRADOV (2002) proved that there is a strong positive correlation between rent and land price therefore I kept on examining the data (see principal component analysis). The latter method shows a ***weak positive*** *(0,130*)* ***correlation between land price per hectare and golden crown value***. This proves the research results of SZELÉNYI –VINOGRADOV (2002) to be wrong which says that there is no correlation between land price and golden crown value. In my opinion the reason for the correlation between the two factorsis that golden crown value despite the fact that it is not the best measure for the value of land still affects market land price.

There was no correlation found between land price and net income per one hectare and yield, and they even distorted the results. Therefore these factors were not included in the factors used in the principal component analysis. In my opinion the reason for this result was that due to the lack of appropriate database regional data was added to town level data. (This problem is examined later in the framework of the NKFP program).

2.1.2. The results of the principal component analysis

My investigations with principal component analysis – by applying *SPSS program* – aimed to determine the relation between the factors and their groups included in the examination of land price (size of the advertised field land, the golden crown value of field land per hectare, the rent of the field land, the distance of the advertised field land from the nearest town, the population within 30 kilometres of the town, the intensity of labour per active population in the town, net income per one hectare of field land, the yield of the latest crop grown on the given field land, and the number of enterprises and limited liability partnerships per 1000 persons) and to find out which principal components determine them.

All the results of the principal component analysis met the criteria of this methos so I only concentrated on the most important results which are as follows.

A) Firstly I analysed the relation between the components when the database only included those pieces of data when owners gave the golden crown value and the rent of the land and the price of land per hectare is below 1 million hectare (n=71).

   In this case only the first four components have an own value higher than one and they altogether include 72 percent of the whole information content which is considered az a good value.

   The results (Table 1) show that principal component 4 is the most impotrant factor that affects land price, which also shows a weak positive correlation with the purchase power within 30 kilometres. This means that there is a ***weak positive correlation between the price of land per hectare and purchase power within 30 kilometres***. The principal component analysis proves the correlation analysis to be right. In the case of principal component 3 ***golden crown value*** became a part of the same group of variables as ***rent***. The reason for that is the fact that the level of rent is based on golden crown value. Despite the fact that there is a srtong positive correlation between these two factors, this statement is not always true because the rent of land with similar quality in another town may be higher or lower.

Table 1

The matrix of the principal component weigths in the case of land price per hectare below 1 million HUF (when golden crown value and rent is given)

	Component			
	1	**2**	**3**	**4**
the supply (advertised) price of land (HUF/ha)	,065	,275	-0,71	,821
the golden crown value of field land (golden crown/ha)	-,092	,030	,787	,189
the rent of the field land (HUF/ha)	,069	-,356	,572	-,296
the population within 30 kilometres of the town where the offered land lies (number of people)	,481	,244	,077	,439

Source: own research

B) Secondly I examined the change in the results if the land price per hectare is below 1 million HUF (n=234).

In this case the first four components have an own value higher than one and they altogether include 78 percent of the whole information content which is considered az a good value.

The results (Table 2) show that price per hectare is also determined by principal component 4, which has no significant correnation with any other variables.

Table 2

The matrix of the principal component weigths in the case of land price per hectare below 1 million HUF

	Component			
	1	**2**	**3**	**4**
the supply (advertised) price of land (HUF/ha)	,060	,083	-,353	,856
the population within 30 kilometres of the town where the offered land lies (number of people)	,513	,233	-,322	,262
the distance of the advertised field land from the nearest town (km)	,002	,067	,675	,385

Source: own research

C) Finally, I also made the analysis in the case when the *price of land is higher than 1 million HUF per hectare* but I excluded the lands where *the rent and the golden crown value were not given* (n=211).

In this case the first three components have an own value higher than one and they altogether include 72 percent of the whole information content which is considered az a good value.

It is interesting that in this case (Table 3) – where I took into account the land sales/purchases that may not aim at agricultural purposes – there was a ***weak positive relation*** between ***price per hectare*** (which is determined by comonent 1) and ***economic development***. Where land price is high the intensity of employment az the enterprises per 1000 persons are also high. This should be the case in every economically developed area. It is also clear that there is a **strong positive correlation between price per hectare and population within 30 kilometres**.

Table 3

The matrix of the principal component weigths in the case of land price per hectare higher than 1 million HUF (excluding the lands where golden crown value and rent is not given)

	Component		
	1	2	3
the supply (advertised) price of land (HUF/ha)	,471	,541	,019
the population within 30 kilometres of the town where the offered land lies (number of people)	,660	,224	-,109
the intensity of labour per active population in the town where the offered land lies (%)	,894	-,414	-,020
the number of enterprises per 1000 persons	,647	,516	,180
the number of limited liability partnerships per 1000 persons	,512	,663	,164

Source: own research

2.1.3. Results of the cluster analysis

Cluster analysis is a method for grouping data which was carried out by applying *SPSS program*. The lands offered in my database (n=296) were put in five groups (5-20 golden crowns, 20-25 golden crowns, 25-30 golden crowns, 30-35 golden crowns and 35-40 golden crowns) and I investigated whether these groups show any similarities or not based on the investigated variables (size of the advertised field land, the golden crown value of field land per hectare, the rent of the field land, the distance of the advertised field land from the nearest town, the population within 30 kilometres of the town, the intensity of labour per active population in the town where the offered land lies, net income per one hectare of field land, the yield of the latest crop grown on the given field land,

and the number of enterprises and limited liability partnerships per 1000 persons). In order to carry out this investigation I applied the *group average method, the wight point method ans the full chain method*. This method did not give any important new results. The results of the method lead to a grouping of data which is very similar to a grouping based on land price.

Based on the results provided by the correlation matrix, the principal component analysis and the cluster analysis I reduced the factors to be investigated to the four factors (golden crown value per hectare, the distance from the land from the town, population within the distance of 30 kilometres and the intensity of labour per active population) that show the highest correlation to land price. In order to make the analysis more relevant based on these results I made a ***correlation calculation***, then based on my database I made a ***regression analysis*** and a ***variance analysis*** then I fitted a ***linear estimation function vith more variables, modified Cobb-Douglas function with five variables (four factors) and a quadratic polinomial regression function with more variables to these four factors***.

2.1.4. The results of the investigation of the factors affecting land price by correlation calculation, regression analysis, variance analysis and fittings of a linear estimation function with more variables, a modified Cobb-Douglas function with five variables (four factors) and a quadratic polinomial regression function with more variables.

A) Firstly I investigated the ***correlation*** between the variables (golden crown value, the distance from the land from the town, population within the distance of 30 kilometres and the intensity of labour per active population) with price per hectare when *all land price data* and their *golden crown value* is included in the database.

   The significance analysis of the correlation coefficient showed that at a 95 percent confidence level (where r*=0,195, α=5% and szf=294) ***there is a weak medium positive*** *(0,3418)* ***correlation between land price per hectare and the population within 30 kilometres***. This development proves the results of the investigations by SPSS program in case A) of the correlation matrix and the results of the principal component analysis in cases A) and C) right.

B) Secondly I investigated the correlation between the variables (golden crown value, the distance from the land from the town, population within a distance of 30 kilometres and the intensity of labour per active population) with price per hectare when *all land price data* and their *golden crown value* is included in the database, but where golden crown value was missing, it was replaced by the average values of the database (20,5 golden crowns).

The significance analysis of the correlation coefficient in this case also showed that at a 95 percent significance level (where r*=0,195, α=5% and szf=294) ***there is a weak medium positive*** (0,3718) ***correlation between land price per hectare and the population within 30 kilometres***, but the weak correlation is still showed. This also proves the results my investigations in case A) of the correlation matrix and the results of the principal component analysis in cases A) and C) right.

C) Thirdly I investigated the results of investigating those cases if land price per hectare is below 1 million HUF and golden crown value was given for all of them. A **linear estimation function** with more variables was fitted to the database. The fitting gave as a result the linear estimation function is as follows:

$$\hat{y} = 374139{,}7 + 4350{,}38 \cdot x_1 - 1177{,}04 \cdot x_2 + 0{,}03 \cdot x_3 + 120{,}26 \cdot x_4$$

where:

$\hat{y}$ = the supply (advertised) price of land (HUF/ha);

x_1 = the golden crown value of field land (golden crown/ha);

x_2 = the distance of the advertised field land from the nearest town (km);

x_3 = the population within 30 kilometres of the town where the offered land lies (number of people);

x_4 = the intensity of labour per active population in the town where the offered land lies (%).

The attributes of the linear estimation function with more variables related to land price and the factors affecting it are shown in Table 4-6:

Table 4

The regression statistics of the linear estimation function related to land price and the factors affecting it

REGRESSION STATISTICS	
Value of r	0,255997
Square r	6,55%
Corrected square r	4%
Standard error	166.141
Relative error	36,19%
Number of elements	154

Source: own research

Table 4 shows that based on the relative error the fitting is not good and square r of the model is also low (6,55%). It means that the golden crown value of land, the distance of land from the nearest town, the population within 30 kilometres and the intensity of labour per active population only explain in 6.6 percent the change in land price.

Table 5

The variance analysis of the linear estimation function related to land price and the factors affecting it

VARIANCE ANALYSIS					
	df	*SS*	*MS*	*F*	*Significance*
Regression	4	2,88E+11	7,21E+10	2,6123	0,037715
Remainder	149	4,11E+12	2,76E+10		
Total	153	4,4E+12			

Source: own research

Table 5 shows on a 95 percent significance level test F is significant, which means that the estimation function provides a better explanation to the variance of data than the chance effect. However the test statistics are not strongly significant, because on a 99 percent confidence level the results of the test are not significant ($p>\alpha$, $p=0,0377$ $\alpha=0,019$). It means that the results of the test are likely to be significant.

Table 6

The coefficients of the linear estimation function with more variables related to land price and the factors affecting it

	Coefficients
Section	374139,7
x1 (the golden crown value of field land)	4350,383
x2 (the distance of the advertised field land from the nearest town)	-1177,042
x3 (the population within 30 kilometres of the town where the offered land lies)	0,0323
x4 (the intensity of labour per active population in the town where the offered land lies)	120,2556

Source: own research

The regression coefficients (Table 6) show how land price reacts to a change (increase) in one unit of the variables. A rise of one unit in golden crown value results in an increase of 4350,38 HUF in land price, a one kilometre rise in the distance from the town results in a drop of 1177,04 HUF in land price, a one person rise in the population within 30 kilometres results in an increase of 0,03 HUF in land price, a one percent rise in the intensity of labour per active population results in an increase of 120,26 HUF in land price. It is important to emphasize that there is a *negative correlation* between land price and the distance of land from the town. It means that *the lower the distance of the land fromthe town is, the more expensive the land is*. This proves thünen's land rent theory to be right.

Since the fitting of the linear estimation function with more variables was not good, therefore I continued my investigations by fitting the modified Cobb-Douglas function with five variables to the database.

D) Finally I investigated the results of investigating those cases if land price per hectare is *below 1 million HUF and golden crown value was given for all of*

them. I fitted **a modified Cobb-Douglas function with five variables (four factors)** to the database. In order to calculate the parametres of the Cobb-Douglas function first I logarithmized the functionas follows:

$$\ln y = \ln a + b_l \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4$$

and then I carried out a multiple linear function fitting for variables lny and x_1, x_2, x_3, x_4,

where:
$\hat{y}$ = the supply (advertised) price of land (HUF/ha);
a = constant;
x_1 = the golden crown value of field land (golden crown/ha);
x_2 = the distance of the advertised field land from the nearest town (km);
x_3 = the population within 30 kilometres of the town where the offered land lies (number of people);
x_4 = the intensity of labour per active population in the town where the offered land lies (%);
b_1, b_2, b_3, b_4 = calculated parametres.

The multiple linear function fitting gave the following modified Cobb-Douglas function with five variables as a result:

$$\hat{y} = 10{,}87 \cdot x_1^{0{,}1629} \cdot x_2^{-0{,}002} \cdot x_3^{0{,}074} \cdot x_4^{0{,}1407}$$

where:
$\hat{y}$ = the supply (advertised) price of land (HUF/ha);
x_1 = the golden crown value of field land (golden crown/ha);
x_2 = the distance of the advertised field land from the nearest town (km);
x_3 = the population within 30 kilometres of the town where the offered land lies (number of people);
x_4 = the intensity of labour per active population in the town where the offered land lies (%).

The attributes of the modified Cobb-Douglas function with five variables related to land price and the factors affecting it are shown in Table 7-9:

Table 7
The regression statistics of the modified Cobb-Douglas function with five variables

REGRESSION STATISTICS	
Value of r	0,2634
Square r	6,94%
Corrected square r	4,44%
Standard error	0,3962
Relative error	3,06%
Number of elements	154

Source: own research

The table above shows that the fitting in terms of the relative error can be considered good, but it only gives a little explanation to the change in land

price. It means that the golden crown value of land, the distance of land from the nearest town, the population within 30 kilometres and the intensity of labour per active population only explain in 6,94 percent the change in land price.

Table 8

The variance analysis of the modified Cobb-Douglas function with five variables

VARIANCE ANALYSIS					
	df	*SS*	*MS*	*F*	*Significance*
Regression	4	1,743691	0,435923	2,777438	0,029073
Remainder	149	23,38575	0,156951		
Total	153	25,12944			

Source: own research

Table 8 shows on a 95 percent significance level test F is significant, which means that the estimation function provides a better explanation to the variance of data than the chance effect. However the test statistics are not strongly significant, because on a 99 percent confidence level the results of the test are not significant ($p>\alpha$, $p=0,029$ $\alpha=0,01$). It means that the results of the test are likely to be significant.

Table 9

The function exponents of the modified Cobb-Douglas function with five variables

	Coefficients
Section	10,87068
x1 (the golden crown value of field land)	0,162925
x2 (the distance of the advertised field land from the nearest town)	-0,002671
x3 (the population within 30 kilometres of the town where the offered land lies)	0,074912
x4 (the intensity of labour per active population in the town where the offered land lies)	0,140793

Source: own research

The function exponents (Table 9) show how land price reacts in percent to a one percent change (increase) in variables. A rise of one percent in golden crown value results in an increase of 0,163 percent in land price, a one percent rise in the distance from the town results in a drop of 0,002 percent in land price, a one percent rise in the population within 30 kilometres results in an increase of 0,074 percent in land price, a one percent rise in the intensity of labour per active population results in an increase of 0,1407 percent in land price.

The analysis of the **Cobb-Douglas function** led to the conclusions as follows:

- **If the golden crown value of land rises, its price per hectare also increases.** This proves the results of my investigations in case D) of

the correlation matrix and the results of the correlation analysis in cases A) and B) and the linear estimation function with more variables right.

- **If the distance of land from the town rises, its price per hectare decreases.** This proves the results gained by the linear estimation function with more variables right and at the same time indicates the existence of ***helyzeti járadék***.
- **If the population within 30 kilometres rises, then land price per hectare also increases.** This proves the results of my investigations in case A) of the correlation matrix and the results of the principal component analysis in cases A) and C) and the linear estimation function with more variables right.
- **If in the intensity of labour per active population rises, then the price of land per hectare also increases**. This proves the results of my investigations in case B) of the correlation matrix and the linear estimation function with more variables right.
- **The golden crown value of land and its distance from the nearest town have reverse effect on its price per hectare**. The favourable change in one of them can offset the unfavourable effect of the other one.

My investigations clearly show that the fitting of the modified Cobb-Douglas function was better than the fitting of the linear estimation function with more variables. However, since it still provides a low explanation (6,94%) to the changes in land price, it means that 93,06 percent of the differences in land prices are explained by other factors or the non-linear effects of the factors included in this investigation. Therefore I fitted **quadratic polinomial regression functions with more variables** to my database in the case when land price per hectare was below 1 million HUF and golden crown value was given for them. The results of the fitting gave the polinomial regression functions with more variables as follows:

$$\hat{y} = 390462{,}65 + 10{,}76{,}042 \cdot x_1 + 76{,}919 \cdot x_1^{\,2} - 1629{,}035 \cdot x_2 + 17{,}856 \cdot x_2^{\,2} - 0{,}10 \cdot x_3 + 1{,}48E - 008 \cdot x_3^{\,2} + 510{,}789 \cdot x_4 - 3{,}354 \cdot x_4^{\,2}$$

where:

$\hat{y}$ = the supply (advertised) price of land (HUF/ha);

x_1 = the golden crown value of field land (golden crown/ha);

x_2 = the distance of the advertised field land from the nearest town (km);

x_3 = the population within 30 kilometres of the town where the offered land lies (number of people);

x_4 = the intensity of labour per active population in the town where the offered land lies (%).

The attributes of the quadratic polinomial regression function with more valuables related to land price and the factors affecting it are shown in Table 10 and 11:

Table 10

The regression statistics of the quadratic polinomial regression function with more variables related to land price and the factors affecting it

REGRESSION STATISTICS	
Value of r	0,26
Square r	0,06789
Corrected square r	164286,98
Relative error	35,78%
Number of elements	154

Source: own research

The results show that the fitting of the quadratic polinomial function with more variables was not better than the linear function with more variables.

Table 11

The variance analysis of the quadratic polinomial regression function with more variables related to land price and the factors affecting it

VARIANCE ANALYSIS				
	df	***SS***	***MS***	***F***
Regression	9	327609860	364010955	128,7
Remainder	145	410250582	282831436	
Total	154	368634918	32,268	

Source: own research

The results (Table 11) show that ($F_{emp}>F_{krit}$, $F_{emp}=128,7$, $F_{krit}=1,94$) the result of the test is strongly significant. The function gives a good explanation to the relation between the variables. It is also statistically proved that there is a a quadratic polinomial relation with more variables between the variables. It means that I proved my assumption which said that a part of the differences in land prices are explained by the non-linear effects of the factors included in this investigation.

2.1.5. The results of the mathematical calculations related to land price

During the investigation of the factors affecting land price I made a comparison between market prices and the economic land value that was calculated by applying the land evaluation methods that institutions use.

My database made it possible to compare the land evaluation methods used in practice as follows.

The determination of the offer value and the market value of lands in the National Land Fund. According to government decree 101/2002 – entered into force on 5 May 2002 – the market value of lands in the National Land Fund have to be determined as follows:

$$Fé = \frac{Á * P * tbá}{i} - bé$$

Fé = the value of 1 hectare of land
Á = golden crown value of 1 hectare of land
P = the normative income of land per 1 golden crown expressed in kilograms of wheat
tbá = the average future market price of 100 kg milling wheat for three years before the time of land evaluation
i = the capitalization interest rate that Földhitel és Jelzálogbank t. applies at the time of the determination of market value
bé = the market value of rent in the case of land on lease

According to government decree 254/2002 – entered into force on 13 December 2002 – the National Land Fund uses the formula as follows for the determination of land offer price:

$$Fá = \frac{A * P * IR * Má}{i}$$

Fá = the offer value of one hectare of land, HUF/ha
A = the net income of one hectare of land, golden crown/ha
P = the normative income of one hectare of land expressend in kilograms of milling wheat, kg/golden crown
IR = the target price of milling wheat at the year of the evaluation, HUF/100 kg
I = capitalization interest rate %
Má = multiplication factor that relates to the type of land use

From the land evaluation maethods applied by Földhitel and Jelzálogbank Rt. I chose the method based on yield calculations without taking into account the correction factors since the bank applies a lot of subjective factors during the determination of the collateral value which I was unaware of. According to decree 54/1997 by the Ministry of Agriculture and Rural Development – entered into force on 1 august 1997 – the market value of land should be calculated by the formula as follows:

$$F_{té} = \frac{(P_j + B) * p}{2 * i} * (1 + k)$$

$F_{té}$ = the market value of land
P_j = the rent-type income of land, that the Ministry of Agriculture and Rural Development published in milling wheat kg/golden crown for every county until 20 July 1997. The current value for P_j is given by multiplying the own golden crown value of the land and the published values (milling wheat kg)
B = land yield calculated by multiplying rent (milling wheat kg/golden crown) which can be considered as relevant in the surroundings of the land and the own golden crown value of the land (milling wheat kg)
p = the average domestic future market price of milling wheat in the previous year to the land evaluatuion (HUF/kg)
i = capitalization interest rate
k = a correction factor that in one number includes the effect of the factors modifying the calculated value of land (percent)

There were some methods that I could not use for the evaluation of land (land evaluation based on expropriation law, land evaluation methods in the practice of the registry of title deeds, land evaluation by taking into account land protection charge) since these methods are based on the quality classification of land and the data that would have been required for these methods were not available.

Table 12 shows some cases that I found inportant to emphasize from my calculations.

Table 12

The comparison of land values calculated by the method of the National Land Fund (NFA) (market value, offer value calculation) and Földhitel- és Jelzálogbank (collateral value calculation) to offer market prices

Town	County	Golden crown value [golden crown/ha]	Rent [HUF/ha]	Land value calculated based on the market land value calculation of the NFA [HUF/ha]	Land value calculated based on the offer value calculation of the NFA [HUF/ha]	Land value calculated based on the market land value calculation of the NFA [HUF/ha]	Land value calculated based on the collateral value calculation of the NFA [HUF/ha]	Offer market price [HUF/ha]
Füzes-gyarmat	Békés	26	13 083	**301 134**	**241 486**	**316 087**	**221 261**	**440 000**
Csongrád	Csongrád	20	11 070	**176 828**	**144 395**	**189 480**	**132 636**	**496 000**
Besnyő	Fejér	28	25 000	**389 914**	**318 851**	**418 486**	**292 940**	**500 000**
Hatvan	Heves	25	16 250	**313 640**	**253 512**	**332 212**	**232 548**	**600 000**
Martfű	Jász-Nagykun-Szolnok	22	11 000	**277 424**	**221 646**	**289 996**	**202 997**	**300 000**
Jászfény-szaru	Jász-Nagykun-Szolnok	20	9 057	**208 734**	**167 367**	**219 085**	**153 360**	**500 000**
Bakony-tamási	Veszprém	24,5	15 410	**316 252**	**254 874**	**333 864**	**233 705**	**900 000**

Source: own research

It is clear that these values in the table are much lower than offer market prices The land value calculated by the market value calculation of FHB is the closest to the offer market price. However taking into account that only 70 percent of this value can be considered as collateral value then this result is not that good. The results of the FHB is followed by the market and then the offer price calculation of the NFA. These values are even more below the market offer prices.

By making a comparison between calculated land values and the sales price information that owners gave (which is assumed to be the contract value) the result is the same, because lands were sold on the offered price (for example in martfű) or 10 percent below that (for example in Csongrád).

It would be interesting to decide whether land ofer prices are high or it would be necessary to modify the calculation methods. In my opinion the latter one would be very important.

As a part of my investigations I created a **PIVOT-table** from my database by applying *Microsoft Excel program*. The table creates groups of the data and makes a tabulation from them (Table 13). As a result I was able to review the average land prices by counties (when land price per hectare is below 1 million HUF) based on my data collection and to compare them to data in professional literature.

Table 13

The offer land prices by counties in hungary between 2003 and 2005

COUNTY	AVERAGE PRICE (HUF/ha)
Bács – Kiskun	**481 667**
Baranya	**476 364**
Békés	**497 396**
Borsod – Abaúj - Zemplén	**452 647**
Csongrád	**439 556**
Fejér	**550 000**
Győr – Moson - Sopron	**440 000**
Hajdú - Bihar	**332 143**
Heves	**452 539**
Jász – Nagykun - Szolnok	**421 333**
Komárom - Esztergom	**463 500**
Nógrád	**441 190**
Pest	**455 611**
Somogy	**455 000**
Szabolcs – Szatmár - Bereg	**210 000**
Tolna	**491 500**
Vas	**521 250**
Veszprém	**497 150**
Zala	**378 333**

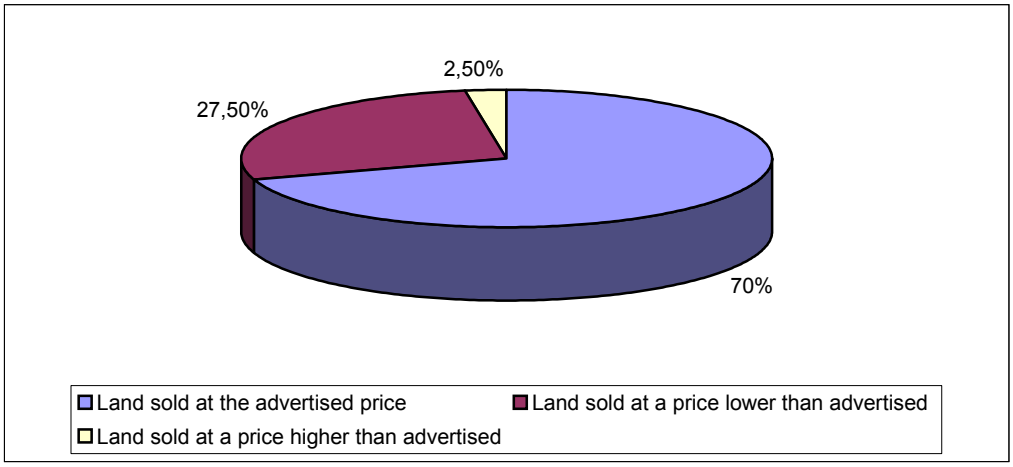
Source: own research

Based on my data collection (which gave 455 000 HUF for average offer land price as a result), I strengthened the results of KELEMEN (2005 b), KAPRONCZAI (2006 a) which says that one has to pay 400.000 HUF in Hungary for a hectare of land, but their examinations did not prove this price. (In my opinion the reason for that is they used real land purchase prices for their calculations which might have been below the offer market prices. On the other hand, my investigations are in contrast to the data collection of TÓTH (2000) (even if the dime difference between the two examinations is taken into account), which says that the estimated price of land is between 60 000 and 120 000 HUF (still taking into account that this examination was carried out in 1998), but this also strengthens the fact that although the activity of the land market has not improved a lot but in some places land prices have risen significantly and tripled or even quadrupled. It does not prove the calculations by SZŰCS (1998) either, which say average land price is about 257 240 HUF/ha and LÁSZLÓ (1999) (veen taking into account that there has been a rise in prices since then) which say that the value 1 hectare of field land in Hungary is between 80.000 and 150.000 HUF or 300.000 HUF in some places.

Table 13 showes that the highest average offer land price is in Fejér county, followed by Vas, Veszprém and then Békés county. Land prices in these counties vary between 550-490 thousand HUF. Land prices are the lowest in Szabolcs-Szatmár-Bereg county, where it only reaches 210 thousand HUF, followed by Hajdú-Bihar and Zala counties.

My data collection proves the research of KAPRONCZAI (2006 a) and his partners which says that the prices in 2004 remained the same as they were in 2003. My investigations proved that land owners who intend to sell their land

usually give only a very low (10-15 percent) price reduction. Table 1 shows that 70 percent of the owners sold their land at the price they advertised it, but there is one case when the sales price was even higher. He owner explained it by the fact that there were more buyers who made an offer for his land and they gradually increased their offer.

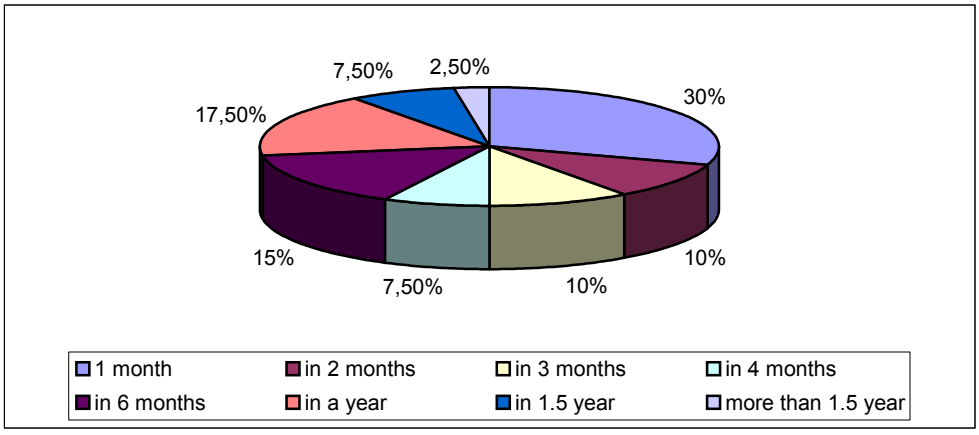


Source: own research

Figure 1

The relation between the price of advertised lands and sold lands

Several publications in this field (SZŰCS 1998, MAGDA 1998) say that *land turnover* in Hungary is very low. My database shows that *only 37 of the 296 advertised lands were sold in two years* (10 in 2003, 14 in 2004 and 13 in 2005). These figures may suggest that the accession of Hungary to the European Union may result in an improvement in land turnover, but the data are insufficient to draw any further conclusions from them to prove this assumption. However it is surprising that most of the lands mentioned earlier were sold only in a couple of months time as Figure 2 shows:



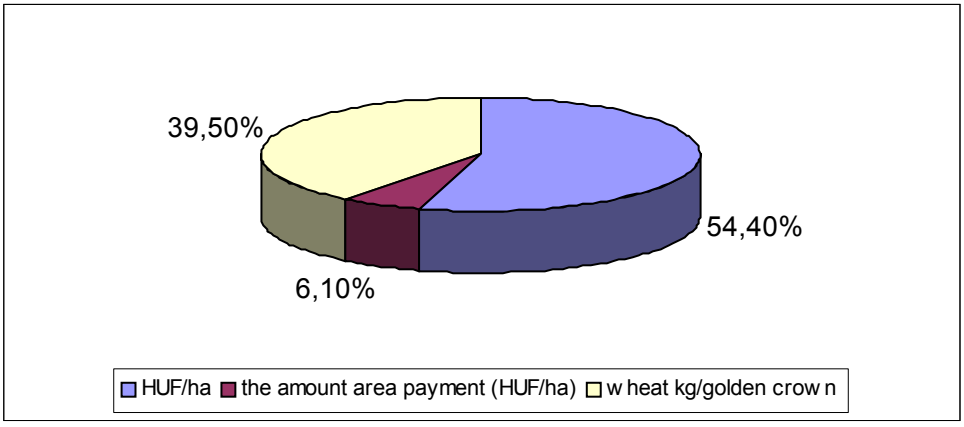
Source: own research

Figure 2

The date of sale of the advertised lands

Taking a look at the collected data they clearly show that both sold and advertised lands are small in size. The data prove the statement of (SZILÁGYI (2005 a 17 p.) right which says that ”it is hard to find purchasers for small field lands that are less that 1 ha in size”, since no lands that fell in this category were sold. On the orther hand, however, the data are in contrast of the statement of SZILÁGYI (2005 a 17 p.) which says the ”a land has to be at least 50 hectares to be marketable” since the largest land that was sold was only about 30 hectares. These results are strengthened by the research results of the researchers of the Agricultural Economics Research Institute (AKI) (KAPRONCZAI 2006 a) which say that out of individual farms that bought land small enterprises only bought 5 hectares, medium ones bought 12 hectares and large enterprises bought 24 hectares of land on average.

My question related to rent was answered by 42 percent of owners and 63 percent of those who answered gave their lands on lease. The remaining land owners cultivated their land on their own or did not ask for rent. *However rent was not given by owners as a single measure*, so I had to calculate it in several cases. Rent was givenin every case for one year. In most cases it was given in HUF6ha, but wheat kg/golden crown was also freaquent, while in some cases rent was givel int the proportion of the area payment. The composition of the answers is shown in Figure 3:



Source: own research

Figure 3

The composition of answers related to the determination of rent

KAPRONCZAI (2006 b) and his research colleagues found similar results in their investigations. 60,2 percent of the farmers they interviewed gave the rent in crop per golden crown, 25,3 percent of them in the proportion of the area payment, 7,6 percent of them in HUF per hectare and 6,9 percent of them gave rent in another form. Making a comparison between the results and information provided by professional literature it is clear that there are different opinions on the determination of rent. SZŰCS (1998) says that the current Hungarian rent system is based on golden crown and rent is expressed in wheat kg paid for 1 golden crown almost everywhere in our country. SZILÁGYI (2005),

(Unchanged land prices 2005), says that in the current Hungarian practice owners who lease their lands ask for 40-50 percent or even the whole amount of the subsidies (even if the subsidies can only be claimed by the user of the land). Figure 3 shows that there have been little differences between rent given in wheat kg6golden crown and rent given in HUF/ha since 1998 but the practice is still not that owners ask for a certain part of subsidies as rent, but KAPRONCZAI (2006 b) says that this trend may become stronger in the future. The question is that is it possible that the the determination of rent in cash will be more popular in Hungary, similarly to France, where the current law – that entered into force on 23 December 1994 – says that land rent has to be determined in cash and not in agricultural crops (DÁVID 2001), AND THEN THE ROLE OF GOLDEN CROWN IN Hungary will decrease. This is also proved by recent developments which show that lease contracts that have been recently concluded determine rent for one year (despite the fact that lease contracts that cover more than 5 years are free of taxes) and in a fixed amount of money in HUF/ha SZILÁGYI (2005 b). this is also proved by my data collection.

Based on my database the average rent in Hungary is between 10 000 and 25 000 HUF/ha/year. SZILÁGYI (2005 b) found the same results saying that rent in our country is 25-30 wheat kg/golden crown/year, 500-700 golden crown/year.

2.2. New scientific results

- In the framework of this research I carried out a primary data collection to analyse the economic value of land and the factors affecting land price, which data, by applying modern mathematical and statistical methods made it possible to prove that:
    - The land evaluation system based on golden crown is to a certain extent out of date, but still appropriate for the rough estimation of the defference between the quality of lands.
    - In spite of that the calculations (and the current practice) show that it would be very necessary to introduce a new and modern land evaluation system.
- My investigations proved that Thünen's theory is still still true. Potential rent has a significant effect on land price. Statistical analyses proved that in Hungary there is a strong positive correlation between population within 30 klometres and shows negative correlation with the distance of land fromn the nearest town. The investigations also proved that enterprise density (the number of enterprises per 1000 persons) and the the intensity of labour per active population also has an effect on land price.

- I set up a modified Cobb-Douglas function for the offer land price with more variables in order to estimate the effect of the factors included in my investigations on the offer price of land.
- The results of my calculations show the land evaluation methods that Hungarian institutions (NFA and FHB) use for determinig collateral and for land ownership issues underestimate the economic value of land. The land evaluation of these institutions is assumed to have an effect on land price as well.
- My research proved that one of the reasons for low land turnover in Hungary in the years investigated was the low tendency of owners to sell their property which can be explained by the favourable effect of area payments on income or the expectation related to the price increase that the EU accession may result in.

3. CONCLUSIONS AND RECOMMENDATIONS

- The investigation of the development of theories related to the value and the income of land proved that the intensity and the direction of land value research depend on the functions of land and their significance.
- Economy has not yet been able to provide an appropriate solution for the contribution of land as a production factor to production value (i.e. the decoupling of the contribution of land from production value). As a consequence of that there are several methods applied in practice. The most popular methods are based on the income of land.
- My investigations proved that there is no common land evaluation system which would meet all land evaluation requirements.
- The review ogf the hungarian land evaluation system definitely proved the necessity for replacing the golden crown system which is more than 100 years old, but still plays a very significant role in the determination of land price because of the lack of a better system.
- As a result of research program coordinated by the Research Institute for Soil Science and Agricultural Chemistry the D-e-METER land evaluation system can be a very useful tool for both promoting efficient land utilization and economic land evaluation.
- In our present times there are several land evaluation methods in Hungarian practice. The FHB, the NFA and the land registry offices all apply different evaluation methods. Subjective factors are also dominant (in the case of the method of the FHB). It is also a problem that the factors in the evaluation sístems frequently change. A good example for that development is that two decrees entered into force in one year including different land evaluation methods (government decree 101/2002 and 254/2002 in the case of the NFA). Land quality classification is applied in three of the land evaluation methods (land evaluation based on expropriation law, land evaluation methods in the practice of the land registry offices and land evaluation by taking into account land protection charge). In the case of land evaluation based on these methods the multiplication factors in each class are different. It is clear that any interest in land evaluation as a purpose of land used as collateral and debenture or land ownership issues has an effect osf the result of the value, so these methods cannot be considered as ratios that express the real value of land.
- In the transitional period and the and later the changes in the Common Agricultural Policy and institutional factors (subsidies, taxes, monopolies, state interventions, infrastructure, extension, land ownership issues and

regional development plans) also have a significant effect on land prices. This was also proved by professional literature in addition to my data collection. It is assumed that the restrictions on the size of land ownership could not be maintained. Land market in Hungary will suffer from low turnover until business companies are not allowed to purchase land. In addition to that lands in Hungary will not have real value until there is enough turnover on the market in the longer term. If land market improves and there is a a real value for land then land mortgage activity may gain significance again.

- Based on the reasons mentioned above it would be necessary to set up a land information system.

PUBLICATION CONNECTED DOCTORAL THESIS

a) Journal

in hungarian language

1. **Tóth Zsuzsanna** - Orlovits Zsolt: A termőföldtulajdon és –használat agrárjogi vonatkozásai. Gazdálkodás, 2003. XLVII. évf. 5. sz. különkiadás 94-100.pp. HU ISSN 0046-5518
2. **Naárné Tóth Zsuzsanna**: A földértékelés nemzetközi összehasonlítása. Gazdálkodás, 2006. Megjelenés alatt áll, a megjelenés várható időpontja: 2006 nyara.
3. **Naárné Tóth Zsuzsanna –** Orlovits Zsolt – Pethő György: Járadékelméletek a termelési tényezők szerepéről, a földjáradék jövedelemeloszlási jelentőségéről. Agrártörténeti Szemle, 2006. Megjelenés alatt áll. A megjelenés időpontja: 2006. december.

in foreign language

4. **Zsuzsanna Tóth –** Maria Fekete Farkas – Istvan Szucs: Land market, prices and rent in the agricultural instead of CEECs. ANNALS of The Polish Association of Agricultural and Agribusiness Economists. Vol. VI, No.6. Warszawa-Poznan-Pulawy 2004. september 22-24 Presentation, 79-83.pp. ISSN: 1508-3535 79-83
5. Judit Villányi – **Zsuzsanna Tóth** – Balázs Péter – Tamás Tóth: Hungarian agricultural economy in the European Union. Conselho Científic da Revista de Agrarias de Portugal, 2004 (megjelenés alatt)
6. Judit Villányi – **Zsuzsanna Tóth** – Balázs Péter – Tamás Tóth: Hungarian agriculture in the farme of the European Union – possibilities, advantages of the accession. Medium on Internet for Agrarinformatics in Hungary No. 62. October 2003, ISSN 1419-1652, 1-7.pp. http://interm.gtk.gau.hu/miau/62/index.html

b) Delivered presentation in scientific conference

IN FOREIGN LANGUAGE

7. **Zsuzsanna Tóth** - Villányi Judit: Effect of International on Hungarian Agriculture. International Scientific Days 16-17 May 2002, Section Economics, Nitra. Presentation, 1439-1443.pp. ISBN 80-8069-030-8
8. **Zsuzsanna Tóth**: Export Stimulation of Small and Middle-sized Enterprises. 2nd International Conference for Young Researchers, 17-18 oktober 2002, Gödöllő, Hungary. Poster, 298-301.pp. ISBN: 963 9483 05 2ö. ISBN: 963 9483 06 9

9. Aranka Baranyi - Zsuzsanna Széles - **Zsuzsanna Tóth**: Family Farms in Hungary. NewScience 2002 Preacesion Strategies in the National Economy of Accession Country Toward EU, 3-4 oktober 2002, Racskova Dolina. Presentation. ISBN 80-89162-02-9
10. **Zsuzsanna Tóth** - Zsolt Orlovits: Theoretical frames of the changes of Property-relation in Hungary, from the change of regime to nowdays. MendelNet 2002/3 Sborník príspevku z konference studentu doktorského studia, 23-24 januar 2003, Brno. Presentation, 293-296.pp. ISBN 80-7302-046-9. ISBN 80-7302-046-7
11. **Tóth Zsuzsanna** - Villányi Judit: Possibilities of Hungarian agriculture in the frame of the European Union. The 5th International Conference of Young Researchers, New Science 2003, Challenges of Sustainable Development in the National Economy, 2-3 October 2003, Pol'ana. Presentation, 299-303.pp. ISBN 80-89162-03-7
12. Németh Péter – **Tóth Zsuzsanna**: Possible influence of changing agricultural policy on agricultural production. 3rd International Conference for Young Researchers. 28-29 September 2004, Gödöllő. Presentation. 81-85.pp. ISBN 963 9483 44 3

IN HUNGARIAN LANGUAGE

13. Ladányi Orsolya - **Tóth Zsuzsanna**- Farkasné Fekete Mária: A jelzáloghitelezés szerepe a magyar és az olasz mezőgazdaságban. XLIII. Georgikon Napok Keszthely, 2001. szeptember 20-21. Poszter, 628-632.pp. ISBN 963 9096 78 4
14. Joború Margit - **Tóth Zsuzsanna**: A takarékszövetkezetek és a Földhitel- és Jelzálogbank szerepe a vidék tőkeellátásában. VIII. Ifjúsági Tudományos Fórum Veszprém, 2002. március 28. Előadás. CD kiadvány: Vallalati_gazdasagtan/411.pdf
15. Joború Margit - **Tóth Zsuzsanna**: A pénzintézeti rendszer szerepe a vidék tőkeellátásában. VIII. Nemzetközi Agrárökonómiai Tudományos Napok Gyöngyös, 2002. március 26-27. Poszter, 298-303.pp. ISBN 963 9256 89 7 Ö. ISBN 963 9256 89 7
16. Fogarassy Csaba - **Tóth Zsuzsanna**: A Nemzeti Földalap létrehozásának agrárközgazdasági. Vonatkozásai. VIII. Nemzetközi Agrárökonómiai Tudományos Napok Gyöngyös, 2002. március 26-27. Előadás, 256-262.pp. ISBN 963 9256 89 7 Ö. ISBN 963 9256 89 7
17. Széles Zsuzsanna - **Tóth Zsuzsanna**: A családi gazdaságok jövője az uniós csatlakozás tükrében. XXIX. Óvári Tudományos Napok

Mosonmagyaróvár, 2002. október 3-4. Előadás. CD kiadvány: sec4/szeles.pdf

18. **Tóth Zsuzsanna** - Németh Péter: A termelési szerkezet és a termelési érték megoszlásának összefüggése két kistérségben az ÁMÖ 2000 adatbázisa alapján. IX. Ifjúsági Fórum Keszthely, 2003. március 20. Előadás. CD kiadvány: Gazdasagtan_videkfejlesztes/612.pdf
19. Németh Péter - **Tóth Zsuzsanna**: Mezőgazdasági támogatás-birtokszerkezet-termelési szerkezet. Agrárgazdaság, vidékfejlesztés és agárinformatika az évezred küszöbén (AVA), Debrecen 2003. április 01-02. Előadás, 273-284.pp. CD kiadvány: cd/pdf/D336.pdf
20. **Tóth Zsuzsanna** - Novák Zoltán - Farkasné Fekete Mária: A várakozások, a beruházások és a finanszírozás összefüggése a magyar mezőgazdaságban. Agrárgazdaság, vidékfejlesztés és agárinformatika az évezred küszöbén (AVA), Debrecen 2003. április 01-02. Előadás. CD kiadvány: cd/pdf/D337.pdf
21. **Tóth Zsuzsanna** - Villányi Judit: Az agrárgazdaság helyzete, a termelők lehetőségei és a támogatások az EU csatlakozás tükrében. Gazdálkodók esélyei az Európai Unióban, EU napi konferencia, Mosonmagyaróvár, 2003. május 8-9. Poszter. CD kiadvány: 5
22. Orlovits Zsolt – **Tóth Zsuzsanna**: A járadékképződés hatása a beruházások megtérülésére a földhasználat egyes alrendszereiben. Földminősítés és földhasználati információ országos konferencia, Keszthely, 2003. december 11-12. Előadás, 273-284.pp. ISBN: 963 9495 25 5
23. **Tóth Zsuzsanna** - Novák Zoltán: A mezőgazdasági vállalkozások hitelfelvételi lehetőségeinek és hajlandóságának közép-kelet-európai összehasonlítása. IX. Nemzetközi Agrárökonómiai Tudományos Napok konferencia, Gyöngyös, 2004. március 25-26. Poszter. ISBN 963 214 313 2 CD kiadvány: poszterek/Tóth, Zsuzsanna – Novák, Zoltán
24. **Tóth Zsuzsanna** – Novák Zoltán – Farkasné Fekete Mária: A kelet-közép-európai országok mezőgazdaságának esélyei az EU csatlakozás tükrében. XXX. Óvári Tudományos Napok, Mosonmagyaróvár, 2004. október 7. Előadás. ISSN 0237-9902 CD kiadvány: aokonomia/TOTH_F
25. **Tóth Zsuzsanna** – Novák Zoltán: Új fejezetek az agrárfinanszírozásban – Agrár- és vidékfejlesztési operatív program. XXX. Óvári Tudományos Napok, Mosonmagyaróvár, 2004. október 7. Előadás. ISSN 0237-9902 CD kiadvány: aokonomia/TOTH_N
26. Szűcs István – **Naárné Tóth Zsuzsanna**: A földértékelés vagyoni és hitelfedezeti szempontból. Agrárgazdaság, Vidékfejlesztés és

Agrárinformatika nemzetközi konferencia, Debrecen 2005. április 7-8. Előadás. CD kiadvány: www.agr.unideb.hu/events/ava2/absztrakt/212.doc

27. **Naárné Tóth Zsuzsanna** – Szűcs István: A helyzeti járadék számbavételének módszertani problémái. X. Nemzetközi Agrárökonómiai Tudományos Napok, Gyöngyös 2006. március 30-31. Előadás. CD kiadvány: Nemzetközi Kutatási és fejlesztési Program/krf200 1-8 p.

c) Research report

28. **Naárné Tóth Zsuzsanna –** Pethő György: Földjáradék-elméletek résztanulmány az NKFP 2004/014 program 1. altémájához
29. Szűcs István – Csendes Béla – Farkasné Fekete Mária – **Naárné Tóth Zsuzsanna** – Vinogradov Szergej – Takácsné György Katalin: NKFP – 2004 – 4/015. számú, a „Földminőség, földérték és fenntartható földhasználat az európai Uniós adottságok között" című kutatás Résztanulmány. Gödöllő, 2005. 78 pp.

d) Other journal

30. **Naárné Tóth Zsuzsanna** – Tóth Tamás: Földtulajdon és földhasználat főbb összefüggései hazánkban. Agro Napló, 2005. 10. sz.
31. **Naárné Tóth Zsuzsanna** – Tóth Tamás: A hazai birtokszerkezet várható változásai. Agro Napló, 2005. 11-12. szám 45-46 pp.

e) Other publication

32. Mária Fekete-Farkas – József Molnár - **Zsuzsanna Tóth**: Hungarian Agriculture, oral presentation, 2001 ACCELERATES-ACCELCEEC 1th Workshop, Bucharest, 2002 Working paper
33. **Zsuzsanna Tóth**: Main socio-economics indicators of agricultural land use in Poland Assessing Climate Effects on Land Use and Ecosystems: from Regional Analysis to the European Scale, 3rd ACCELCEEC Workshop, Gödöllő, 2003 October 9-11 Working paper
34. **Zsuzsanna Tóth** – István Szűcs: Main socio-economics indicators of agricultural land use in Romania Assessing Climate Effects on Land Use and Ecosystems: from Regional Analysis to the European Scale, 3rd ACCELCEEC Workshop, Gödöllő, 2003 9-11 October Working paper
35. **Zsuzsanna Tóth** – Judit Vas: Main socio-economics indicators of agricultural land use in Bulgaria Assessing Climate Effects on Land Use and Ecosystems: from Regional Analysis to the European Scale, 3rd ACCELCEEC Workshop, Gödöllő, 2003 9-11 October Working paper

f) References

Zsuzsanna Tóth – Maria Fekete Farkas – Istvan Szucs: Land market, prices and rent in the agricultural instead of CEECs. ANNALS of The Polish Association of Agricultural and Agribusiness Economists. Vol. VI, No.6. Warszawa-Poznan-Pulawy 2004. september

36. Adam Sadowski: Land property reconstruction in Hungarian agriculture. ANNALS of The Polish Association of Agricultural and Agribusiness Economists. Vol. VII. No.4. Warszawa-Poznan-Pulawy 2005. Presentation. 382-36-86 pp. ISSN:1508-3535