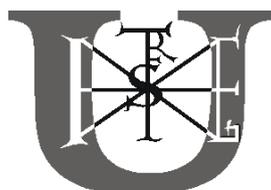


Szent István University, Gödöllő
Management and Business Studies Doctoral School

Doctoral (PhD) Thesis



**THE INSTITUTION OF AGRICULTURAL MORTGAGE CREDIT
AND ITS APPLICATION POTENTIAL IN THE HUNGARIAN
AGRICULTURE**

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Gödöllő
2009

Doctoral School

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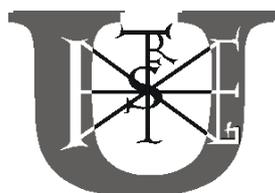
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1. INTRODUCTION

1.1. Topic selection and background

In my dissertation I analyse the reasons for the low level use of land mortgage credit in Hungary, as well as the opportunities of extending it following the Accession to the EU. **In order to provide an objective picture on the land mortgage credit** I determined the role of land mortgage credit on the basis of the international literature, by analysing the international experience and collecting information on the Hungarian situation. Following the introduction of the subsidy schemes providing more calculable and increasing subsidies the profitability of the agriculture has increased and the tensions of the property structure have eased. Finally the process has started in agriculture in which **the resources required for the financing of the investments are in accordance with the duration of the investments**. By the decreasing profits from other investments opportunities were provided for the long term agricultural investments.

In land mortgage credits the **value of the land** is the basis of the credit connecting the credit with farming. Long term financing can only be expected from profitable production. A further advantage is that land mortgage assists the expansion of the competitive farms. In the Union **the use of agricultural land mortgage** is adjusted to the subsidies due to the high support rate resulting in increased profitability. The agricultural production is closely connected to households; therefore agricultural credits are based on the assets of the households, the significant part of which is the agricultural land. In some Member States there are land funds which orientate the land market. Integrated land consolidation is a modern form of it, where the requirements of the various sectors are managed jointly.

A summary evaluation on the development of the Hungarian agricultural production as stated by Némethi (2003): „The role of property will further strengthen, the market effects will increase and the production structure will modify”. The **resources for the financing have to be established**. One of the fundamental principles of lending is that credits can only be granted to those who are able to pay it back. On long-term to young people, or to those who have adequate incomes or assets and collaterals. **The application of land mortgage is difficult** due to the determination of land prices in the long term, the uncertainties of the subsidies and expectations; sometimes even the survival of the holdings taking the credits is doubtful. A large part of the holdings are worried of credits; however **they will gradually be forced to take credits** for financing the developments or for the takeover or rescheduling the short-term credits accumulated.

1.2. Relevance of the topic, objectives of the dissertation

The **evaluation of the role of agricultural mortgage credit** was made difficult by the fact that the commercial banks consider their market share as confidential information and in the reports the agricultural mortgage credits are not separated. The long term agricultural liabilities decreased by 20% between 2004 and 2007 and this was not a promising sign for evaluating expansion potentials of the agricultural mortgage credit in Hungary. However, during the period analysed the short term liabilities increased by one fourth which indicates the opportunities of the increase of agricultural mortgage credit.

The dissertation consists of three parts. In the first part the fundamental principles and the relevant literature are presented. In the second the methodological questions are discussed and the analyses required are determined in accordance with the objectives. The third part contains the achievements.

The main objective of discussing the literature is **to provide an objective evaluation - the first objective - on the agricultural mortgage credit, which is a tool to provide financing to agriculture**. For this both the narrow and wide environment of agricultural mortgage credit had to be analysed. In the analysis of the wider environment of agricultural mortgage credit I examined the reasons and characteristics of agricultural financing. By analysing the narrow environment I performed the evaluation of the mortgage credit institution by the factors influencing the granting of the credit. Following this I present the Hungarian and international background of agricultural financing and mortgage as well as the agricultural mortgage credit, by covering also the developments in the Union and the selection of the main factors influencing the application of the agricultural mortgage credit in Hungary.

In agriculture in order to overcome difficulties due to the lacking capital the expansion of the mortgage credit is also required. **The second objective is the discussion and evaluation of the factors determining the expansion of mortgage credit**. Therefore, I determined and evaluated the impediment and facilitating factors of mortgage credit in agriculture, the changes required and the opportunities. I analysed in detail the developments of the factors influencing the use of agricultural land.

Since there is no detailed land price and land rent statistics available, in order to implement the second objective perfectly I developed an expert system to reach the **third objective; that is to determine detailed current land prices and land rents**.

As for the **fourth objective I aimed at determine the relations between land prices and land rents as well as between land prices and the influencing factors**; since these relationships may assist the expansion of agricultural mortgage credit and the opportunity of extending it also to rented land.

The fifth objective was to determine the present and potential future distribution of agricultural mortgage credit. For this I presented the potential of mortgage credit and the potential participants. Owing to lacking data I restricted the analysis to the holding with long term liabilities. This did not mean the limitation of the implementation of the objective since agricultural mortgage credits are part of the long term liabilities.

My hypotheses:

1. Mortgage credit assists **the development and restructuration of the holdings** and it contributes to the **establishment of rational land use**.
2. The relationship between land prices and land rents provide opportunity to extend the mortgage credit also to **rented lands**.
3. The **positive relationship** between the quality/size of the land and the specific value of the land makes the consolidation of the parcels possible.
4. A certain **group of holdings** can be defined, which can successfully apply the institution of mortgage credit for implementing developments.

2. MATERIAL AND METHOD

Regarding the role and importance of mortgage credit it affects first of all the agricultural production; therefore through the access of these credits the adjustment to the conditions is first of all the task of the agricultural producers. By analysing the opportunities of the application of mortgage credit I aimed at answering two questions. The first question was whether the holdings increased? The second one was whether the land prices increased? Both questions are complex; are interrelated and are also in close relation to the agricultural mortgage credit.

2.1. Expansion of agricultural mortgage credit

I evaluated the **factors determining the expansion of agricultural mortgage credit** by statistical analyses. For the analysis of the capital market integration of **agricultural land as a collateral** the data base of the Department of Land and Mapping of the Ministry of Agriculture and Rural Development (MARD), the FADN data of the Agricultural Economics Research Institute (AKI), the main accountancy reports of agricultural holdings with double book keeping of the Tax Office (APEH) as well as the statistics of the Central Statistical Office (KSH) were used. I also analysed the regulation of the Act on Agricultural Land No. LV of 1994. By taking into account the results of the analyses I determined the **opportunities of mortgage credit** and added my analysis on the **development of the parcel size and market bargaining power**; the basis of which was the database of producers applied for direct payments registered to the Agricultural and Rural Development Authority (MVH). I analysed the **development of the land prices and rents** on the basis of the data collected regularly in accordance with the obligatory surveys and supplied to EUROSTAT (data supply by the KSH, AKI, FADN and the Central Agricultural Office). In order to **analyse the measures aiming to develop the land use** I used the report on the credits balance of agricultural developments of the Agricultural Regulation Department of MARD and the Department of Land and Mapping support data base as well as the Agricultural Report of 2007 of the MARD and its background materials.

2.2. Land prices and rents

In order to determine the land prices and rents **I developed a consulting network** by the help of the County Offices of the Central Agricultural Office (MgSzH) and I myself carried out a data collection which includes and processes experts' estimates based on registries and market information. By using the data collected in 2007 for examining the relationship between arable land prices and rents I performed **variation analysis and correlation analysis, which I also checked by significance analysis** on regional and county level. Finally I presented the results of the survey obtained.

2.3. Market price and conditions of agricultural land

The market price **data base of the National Land Fund (NLF)** was established for registering the **provisory land purchase declarations**. Among others the data base includes the land-use category, area, land quality [measured in Golden crown (Gc) value] and the (estimated) market price applied in the evaluation of the collateral. The variables included in the database on arable land of NFA (n=2391). I estimated **linear function** of the market value of the arable land (VL) (dependent variable) and the area of land (parcel) (AL), quality of the land (QL), mode of the parcel use¹ (TL) and the dummy of the regional situation (DR) (independent variables) **on the basis of the following regression**:

$$VL = \beta_0 + \beta_1AL + \beta_2QL + \beta_3TL + \beta_iDR + v$$

where VL – value of the land;

AL – area of the land;

QL – quality of the land (Golden crown value);

TL – mode of the parcel use;

DR –regional dummy;

$\beta_0, \beta_1, \beta_2, \beta_3$ and β_i (i = 4, 5, 6, 7, 8, 9) - parameters, and

v – error term.

The regions were determined in accordance with the statistical regions of Hungary: Northern Hungary (ÉM), Northern Great Plain (ÉA), Southern Great Plain (DA), Middle Hungary (KM), Middle Transdanubia (KD), Western Transdanubia (ND) and Southern Transdanubia (DD).

2.4. Holdings with long-term credits

For the analysis I used the **database of the FADN operated by AKI**, which include more than 1900 agricultural holdings. The basic unit of the database is the holdings; the selection is based on the legal form, the size of the holding, production line, regional situation. The lower threshold of the selection is 2 ESU². For the analysis I selected two years: the year of the Accession to the EU (2004), when the impact of the Accession could not be measured yet and the most recent time series (2007). I applied the **multicollinearity test, factor analysis and cluster analysis**. By the test of multicollinearity I restricted the variants. In the factor analysis I analysed the robustness of variance for the selected factors. By the help of the cluster analysis I formed groups from the holdings and from among the methods applied the cluster formation procedure of K centre.

¹ Detached arable land by the ownership on the basis of the parcel registry or connected to other cultures (for example forest, grassland).

² ESU: European Size Unit, a unit similar to the Standard Gross Margin (SGM) used in the EU to characterise the economic size of the holding. SGM is primarily the normative gross margin per unit (one hectare, one head of livestock). 2 ESU equals to EUR 2400, that is HUF 600 thousand SGM.

3. RESULTS

In Hungary the deficiencies of the land market information, the uncertainties originating from the land qualification and evaluation lead to significant risks for the financing, which are made manifest in the determination of the collateral ratio and in the form of extra interest rate. The extra interest rate and the low credit collateral value raise significantly the cost of financing in the agricultural sector. The underdevelopment of our agricultural mortgage credit institution hinders also the effectiveness of the integration to the credit market of the Union. Significant financing cost reduction can only be expected from a transparent, free and unlimited land market.

3.1. Evaluation of the land as collateral

By increasing the land market information the lacking information of mortgage credit can be decreased, the risks of granting credit can be reduced which will lead to moderate risks and costs of agricultural financing. As for agricultural production on the long term only the agricultural land can represent a value, which could be suitable to ensure the collateral for the credit. Agricultural land can only be a good collateral if it represents an acceptable value and is easily marketable. Therefore, besides the price development, the land market has also to be evaluated.

Intensification of the land market

Since the Accession to the EU the **land market** has been **growing slowly** in Hungary. In the land market (without inheritance) the ownership of about 120-130 thousand hectares of land is changed annually. The transitions are balanced among the participants: 35-40% by inheritance; about 40% the land is purchased on the basis of pre-emption rights, the half of it is purchased by the joint owners, close relatives and the other half by renters or by local farmers (15%), and the purchases by the NFA accounts for 5-6%. The purchases without pre-emption rights, exchange, present and other forms account for about one fifth (15-20%) of the total transactions. The **intensification of the land market** and the increase of the demand are indispensable for the expansion of the agricultural mortgage credit.

In the cases of **undivided properties** (1.3 million ha) instead of the division the **establishment of land ownership communities** – cooperation aiming at achieving higher rents and assets – **would be recommended** to which granting of agricultural mortgage credit would be possible. **The allowance of land acquisition by corporations** by a similar extent than by private persons (integrated on the basis of ownership) could intensify the land market. In the rental system also the renting right could be pledged, for which the collateral would be the income of the producer and the **creation of the rental right transference**. By the **land purchase of foreigners** the land market could be consolidated, however, the bargaining power of the domestic producers would decrease. By the intensification of the land market the increase of the

land prices and rents might speed up; the competitiveness, the profitability of the Hungarian producers will decrease as well as the chances of purchasing land.

Land use concentration is significant, 12 thousand holdings of using more than 50 hectares of land; that is 1.9% of the total, uses 74.5% of the total agricultural land and the **number and average area** of these **increases only slowly**. Land ownership did not approach to land use among both the corporations and individual farms **the share of rented land increased** (with 5.7% and 3.0%, respectively). The expansion of the agricultural mortgage credit will make the inclusion of rented land in collateral necessary.

Development of land market competition

The expansion of agricultural mortgage credit is basically influenced by the type of the land market competition. A producer with appropriate bargaining power will not decide upon land purchase or rent if it does not provide **advantages on the long term**, if it does not decrease their income outflow³. I analysed the agricultural holdings with more than 50 ha land registered in 2007 by the Agricultural and Rural Development Authority (MVH) for direct area payments by settlements; and regarding the land market demand and the competition I found significant differences. As for the number of producers with more than 50 ha in the majority of the settlements (87.5%) and in more than half (55.2%) of the registered agricultural land **the conditions of the land market competition are not provided**; that is, there are not enough holdings of appropriate size (Table 1). The land market competition is stronger in the regions of the Great Plain, while in Southern Transdanubia and Western Transdanubia the competition is limited. In the future land purchase in the Great Plain regions, while the maintenance of the rental system can rather be expected in the Transdanubia.

Table 1

Settlements and registered agricultural land by the group of holdings with more than 50 hectares of land

Number of holding with over 50 ha in the settlements	Settlements		Registered agricultural area		Holdings using more than 50 hectares
	Number	%	Thousand ha	%	Average number
No holdings (over 50 ha)	639	20.3	284.0	5.6	0.0
Between 1 and 5 holdings	1635	51.9	1530.5	30.1	2.5
Between 6 and 10 holdings	482	15.3	993.1	19.5	7.5
More than 10 holdings	392	12.5	2273.0	44.7	20.2
Total	3148	100.0	5080.6	100.0	5.0

Source: Based on the 2007 data of MVH

³ In addition to the increase of the assets originating from the capitalization of the life annuity and the expectations estimated by each market player almost similarly.

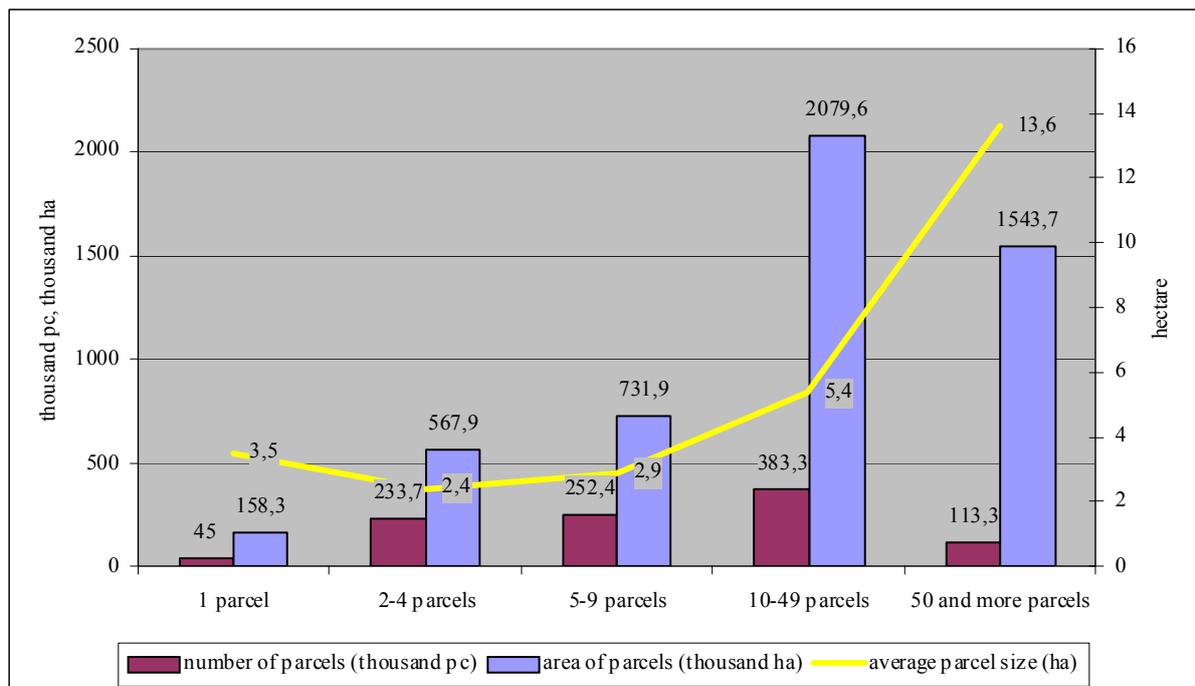
Increasing the parcel size

The size of the parcels included in the collateral of the mortgage credit is also determinant. The average size of the agricultural parcels registered for direct area payments at the MVH was 4.9 hectares in 2007. The majority of the parcels (84.4%) are used by individual farms (4.7 parcel/holding), with an average size of 3.3 hectares. The parcels of the corporations (25.5 parcels/corporation) are on average of 13.9 hectares; which is 4.2 times more than the average of the individual farms. A more efficient land use than the national average can only be found at the holdings using more than 50 hectares; where the average parcel size is 13.6 ha (Figure 1). In their case the separation of the parcels leads to significant disadvantages since 91.1 different parcels are cultivated on average. The significant increase of the size of the parcels and the consolidation of ownership can be expected by land purchases, land exchanges and by land consolidation. The land purchases of foreigners will also be expected following the lifting up of the land purchase moratorium.

The categories by parcel size indicate the possible directions of land use organization and land consolidation. By the **land use organization** – by the exchange of the parcels used – the **large holdings** using more than 10 parcels of 154.2 hectares on average could improve their **land use efficiency** significantly. The typical **small farms** cultivating their own land of 2-9 parcels and with 10.5 hectares on average **could improve rather the value of their own land by land exchanges and land consolidation**.

Figure 1

Size of registered agricultural parcels, 2007



Remark: Parcel registered as one piece, planted by one type of crop.

Source: Based on data of MVH. 2008

Opportunities in agricultural mortgage credit

In agricultural mortgage credit the direct area payments can provide an additional guarantee for paying back the credit. By analysing the distribution of the land registered for direct payment by the MVH in 2007 by the size of the parcels three fourth (77.6%) of the parcels are below 5 hectares which accounts for one fourth (25.3%) of the total area registered (Table 2). The average area of the **parcels of smaller than 5 hectares** is 1.6 hectares, which does not provide sufficient credit source for the farming (the value of the collateral is only HUF 370 thousand) so **it could not be acceptable as collateral**.

Table 2

Number and distribution of the agricultural parcels registered for direct area payments, 2007

Denomination	Number		Area		Average area pc/ha
	Thousand pc	(%)	thousand ha	(%)	
Not more than 1 ha	348.1	33.9	215.9	4.2	0.6
Between 1 and 5 hectares	448.6	43.7	1073.9	21.1	2.4
Between 5 and 10 hectares	115.7	11.2	823.8	16.2	7.1
Between 10 and 50 hectares	104.4	10.1	2094.2	41.3	20.1
More than 50 hectares	10.9	1.1	873.6	17.2	80.1
Total	1027.7	100.0	5081.4	100.0	4.9

Source Based on data of MVH, 2008

In the case of **parcels more than 5 hectares** – accounting for more than one fifth of the parcels (22.4%) and three fourth of the parcels registered for direct area payments (74.7%), that is 3.8 million hectares – the situation is different. The average area of the parcels is 16.4 hectares, which constitutes a collateral value of about HUF 4 million⁴.

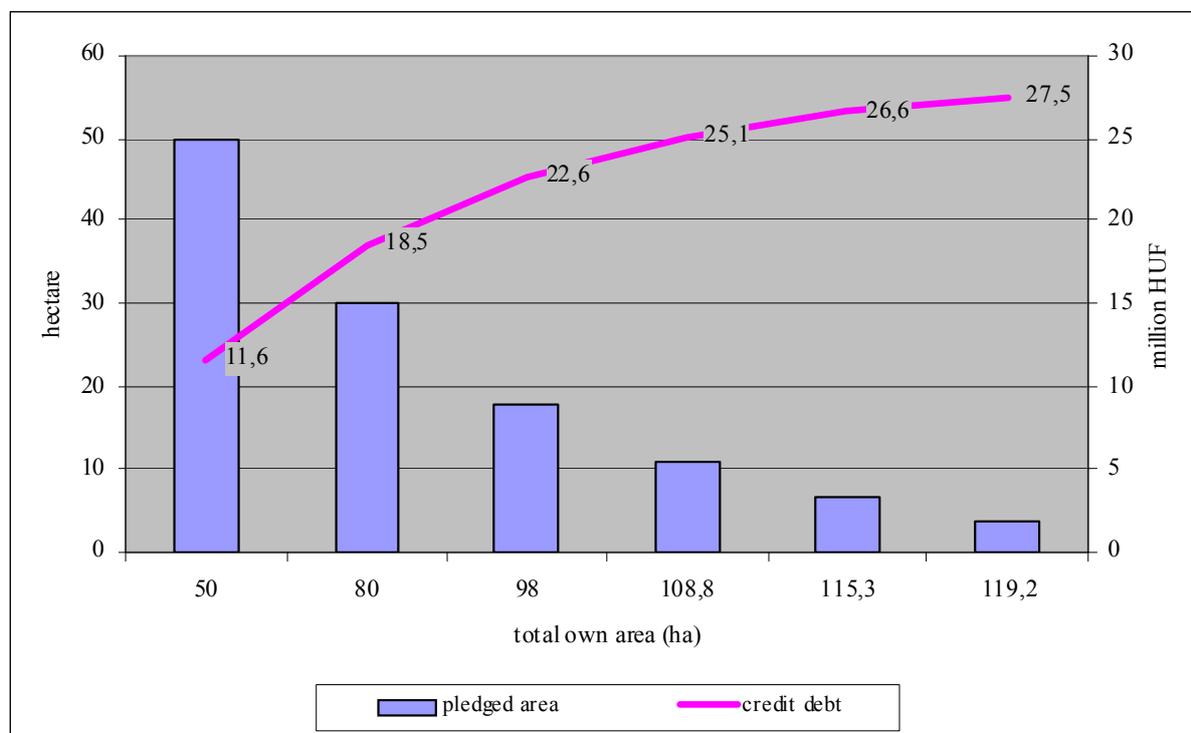
By considering the parcels more than 5 hectares **suitable for collateral** 3.8 million hectares; but by considering only the parcels larger than 10 hectares then 3.0 million hectares can be included in the agricultural mortgage credit. In the case of parcels over 50 hectares only 17.2% (873.6 thousand ha) of the land registered for direct payments can be the total amount of the potential collateral.

If the amount of additional **own capital** required for the **subsidy** (for example machinery purchase of HUF 30 million) could be ensured for the mortgage credit; in the case of 40% own capital 3 parcels of 16.4 hectares would be required. This means that the size of the own area should be of at least 50 hectares on average. We could also consider the **enlargement of the area**. That is the own area (50 hectares) are pledged and the further land purchase is financed from the agricultural mortgage credit. In this way a 1.4 times enlargement compared to the original area can be reached (Figure 2).

⁴ For HUF 231 thousand/ha (estimated by the data of the Hungarian FADN of AKI for 2006-2007, calculating by average agricultural land prices of HUF 380-390 thousand and by 60% collateral ratio).

Figure 2

Land purchase by mortgage credit



Source: Own calculation

The institution of land mortgage credit can by itself **manage or eliminate the problems deriving from the scattered property structure efficiently**. It can be operated in accordance with the analogy of the investment multiplier and can be considered as an efficient instrument of the restructuring of scattered land property. However, its application can be an advantage first of all for the large-scale holdings with own land.

The debts of the holdings

The agricultural mortgage credit can be increased by increasing the debts of the holdings and by redemption of the short-term credits. On the basis of the analysis of the FADN data it can be seen that the liabilities of individual farms provide one third (35-36%) of the long-term liabilities of agriculture. 12.7 thousand individual farms (5.6% of the individual farms of over 2 ESU) had long-term liabilities

The own area of the individual farms with long-term liabilities totals 462.3 thousand hectares. The liabilities per one hectare of agricultural land are HUF 192.1 thousand⁵. The present debts of the individual farms can be covered only by pledging their own land. The total debts per own area of agricultural land (1.3 million hectares)

⁵ By neglecting other collaterals (e.g. machinery, houses, plantations etc.).

in the cases of individual farms over 2 ESU equals HUF 66.2 thousand/ha; that is a debt with 17.2 % of collateral value. This indicates that by calculating with **constant land prices the long-term credits of individual farms can be increased 3-4 times**. By the expansion of agricultural mortgage credit further inclusion of individual farms the land market can be intensified. In order **to increase the land transactions by 5% on mid-term** it is necessary to include in addition to the holdings with long-term credits **further 10-15 thousand individual farms of 150-200 thousand hectares of own land**.

3.2. Analysis of land prices and rents

In agricultural mortgage credit the determination of the value of the collateral is decisive for the land prices. The rents show the mortgage ability of the agricultural land being in the property of non-agricultural producers since this can provide a collateral for paying back the credit. By comparing to the period before the Accession to the EU (between 2003 and 2007) **land prices and rents increased** significantly (50-60%) in Hungary. However the significant differences by region and by quality were maintained. **The land prices and rents did not approach to those of the EU-15 in Hungary**. In the agricultural production Hungary's „advantage” in this respect was maintained. The magnitude of the Hungarian rents corresponds to the calculated values of land prices on the accepted basis of the capitalization ratios (2-5%) in Western-Europe (Posta et al., 2008). By the capitalization of the land prices and rents I obtained similar results.

By using my data collection of 2007 at the County Directorates of Central Agricultural Office (MgSzH) I carried out **analysis of variance** for determining the relationship between the **current prices of arable land**⁶ in long term agricultural use and the **rents**, by two factors, that is the quality of the land (poor, average, good and excellent) and by the geographical regions⁷ (Table 3).

Table 3

Result of the variance analysis, regional land prices and rents 2007

<i>Factors</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F emp.</i>	<i>p-value</i>	<i>F crit.</i>
Regional land prices						
Geographical region	673071.43	6	112178.60	9.05	1.22E-04	2.66
Quality of land	1358609.80	3	452869.90	36.54	7.27E-08	3.16
Error	223071.43	18	12392.86			
Total	2254752.70	27				
Regional rents						
Geographical region	1231.05	6	205.18	18.82	7.41E-07	2.66
Quality of land	1483.89	3	494.63	45.37	1.35E-08	3.16
Error	196.23	18	10.90			
Total	2911.18	27				

Source: Based on the data of MgSzH, own calculation, 2008

⁶ By calculating average prices from the experts' range estimates.

⁷ The results by counties are not presented – due to similarities.

I obtained the result that all of the factors analysed are acceptable even at the level of 1% significance (in the case of region n=28; in the case of county=72; $F_{emp.} > F_{crit.}$). This means that the differences in the land prices and rents are due not only to the quality of land but also to the geographical location, which indicates the **regional diversification of the land market**. The analysis of variance justified the fact that there are **regional differences in the land market**. This was confirmed by the results obtained by Naárné (2006) in the analysis of the land prices demanded and the distances from large towns.

The **correlation analysis of the land prices and rents** by quality categories showed that there is a **strong positive correlation** among all the variables (Table 4). This justified that the **higher rent result higher land prices and conversely**. The analyses of the earlier periods [(Szelényi and Vinogradov, 2002); (Naárné, 2006)] could not find relationship between the land prices and the rents. **The result proves the existence and development of the land market and the strengthening of its market character**. Correlation analysis also showed that in certain regions of the country the land prices and rents are much higher independent of the regional classification of the area.

Table 4

Correlation analysis of the average prices of arable land and the new rents

(thousand HUF/ha)

<i>Denomination</i>	<i>f_poor</i>	<i>f_average</i>	<i>f_good</i>	<i>f_excellent</i>	<i>b_poor</i>	<i>b_average</i>	<i>b_good</i>	<i>b_excellent</i>
<i>f_poor</i>	1							
<i>f_average</i>	0.9017*	1						
<i>f_good</i>	0.6887	0.9141*	1					
<i>f_excellent</i>	0.7192*	0.9195*	0.9831*	1				
<i>b_poor</i>	0.7625*	0.6513	0.6255	0.6175	1			
<i>b_average</i>	0.8723*	0.8353*	0.7903*	0.7772*	0.9594*	1		
<i>b_good</i>	0.8501*	0.8642*	0.8276*	0.8026*	0.9021*	0.9723*	1	
<i>b_excellent</i>	0.9427*	0.8135*	0.64402	0.6392	0.8977*	0.9454*	0.9304*	1

* acceptable coefficient by a significance level of 5%

Remark: f (land price); b (rent)

Source: Based on the data of MgSzH, 2008 own calculation.

The **different opportunities of agricultural mortgage credit** are showed by my survey of 2008 indicating significant differences by regions and land qualities. Between the best quality lands in Northern Great Plain and the poorest quality in Northern Hungary the difference might be of fifteen folds (Table 5). Based on an **average quality arable land** the prices are **the highest (HUF 400-900 thousand/ha)** in Northern Great Plant and in Transdanubia and **the lowest (HUF 250-400 thousand/ha)** in Northern Hungary and Southern Transdanubia, while the prices of the other regions are more balanced; fluctuating between **HUF 350 and 600 thousand/ha**.

Table 5

Arable land prices by regions and quality, January, 2008

(thousand HUF/ha)

Region (county)	Poor	Average	Good	Excellent
	(not more than 17 Gc/ha)	(17-25 Gc/ha)	(25-30 Gc/ha)	(more than 30 Gc/ha)
Central Hungary	190-320	350-400	600-800	800-1000
Middle Transdanubia	276-460	400-625	500-800	800-1025
Western Transdanubia	200-400	300-600	450-800	500-1200
Southern Transdanubia	300-510	400-750	600-1000	800-1500
Northern Hungary	150-250	240-400	300-550	370-650
Northern Great Plain	200-800	350-900	450-1800	550-2300
Southern Great Plain	165-260	285-400	425-600	590-850
Country average	150-800	240-900	300-1800	370-2300

Source: Based on the data supply of MgSzH, 2008

3.3. Relationship between the market value and the conditions of the agricultural land

In the analysis of the market value of the arable land and the conditions by testing the original model the dummy variables, in contrast to my expectations showed negative sign⁸. Therefore, in order to eliminate the contradiction I enlarged my model and examined the **cross effect of Golden crown value and the regional location on the market value of the arable land** on the basis of the following regression equation:

$$VL = \beta_0 + \beta_1AL + \beta_2QL + \beta_3TL + \beta_iDR + \beta_jDRQL + v$$

where DRQL - cross effect of Golden crown value and the regional location;

β_j (j = 10, 11, 12, 13, 14, 15) - additional parameters.

I obtained the result that the size of the agricultural land and its quality are in positive relationship with the value of the land; both variables can be accepted at the significance value of 1% (Table 6). This means that the **specific values of large size good quality lands are higher**. In this case positive relationship can be seen between the regional distribution and the market value; therefore compared to the reference region by taking into account also the quality of the land the price of arable land is in fact higher in the other regions. The mode of the parcel use⁹ (TL) is in negative relationship with the value of the land but since it is not significant it does not determine the market value. This means that the **mode of the parcel use does not have any impact on the market value**.

My results obtained support the results obtained by Naárné (2006) according to which the market value calculation determines approximately even at present the quality differences of land. It is a new result that the relationship regarding the size of

⁸ This would mean that the market value of the other regions are lower than the market value of the Northern Hungary reference region.

⁹ Separated arable land or connected to other type of cultivation.

the parcel proved to be true, that is, a **large parcel of land has a higher specific market value**. This encourages the consolidation of parcels and enlarges the area, which could enlarge the area under agricultural mortgage credit.

Table 6

Results of the regression analysis

Variables	Parameters
AL	0.1054*
QL	0.6011*
TL	-0.0555
DR _{EA}	-1.3014*
DR _{DA}	-0.6519
DR _{KM}	-0.3184
DR _{KD}	-1.1189
DR _{ND}	-0.1334
DR _{DD}	-0.9115**
DRQL _{EA}	0.2231**
DRQL _{DA}	0.0992
DRQL _{KM}	0.0269
DRQL _{KD}	0.2407*
DRQL _{ND}	0.0284
DRQL _{DD}	0.1784***
CONST	11.7231*
Corrected R ²	0.7446

*Variables accepted also in the cases of 1% of significance; ** 5% of significance;*** 10% of significance
Source: Own calculation based on the data of the National Land Fund, 2008

3.4. Evaluation of the measures aiming at the development of land use

The expansion of land mortgage credit can be encouraged indirectly by the land policy by grants provided to land purchase, by the sale of lands in state property and by promotion of land consolidation.

From among the grants provided to land purchase the expansion of mortgage credit was encouraged significantly before the Accession to the EU by the **loans granted for farm holding development**, where the development of individual farms became available through interest rate subsidies **by pledging the agricultural land**. **Subsidies provided for land purchase for property consolidation** raised only attention in land purchase due to the low rate (20%) of the support and to the uncertainty of the available financial resources. The total commitment of the **agricultural land property development loans** of HUF 18 billion available came standstill in the first half of 2008, accounted for only 7.7%; indicating the biding of the customers and the **showing the speculation, the expected land price decrease due to the likely introduction of the Single Payment Scheme (SPS)**.

Agricultural mortgage credit is significantly set back at present since following the Accession the EU limited the interest rate subsidies and the subsidies granted for land purchase. The partial support of land purchase connected to investments (accounting for 10% of the value of the investment) is still available but Hungary does not apply this type of the subsidy since corporations cannot purchase land even if it would be important to increase the area of the holdings. **Subsidized land purchases**

are also decreasing; however, there is an urgent need for this. Without subsidies mortgage credit is also more expensive and only fewer holdings can make use of it.

The **public land sale of the National Land Fund** intensified the land market yearly by 8.5 thousand hectares of land, that is averaged an additional 5-6% trade on the land market between 2002 and 2007. A similar degree stimulation was reached by the programme of **land for life annuity**, in the frame of which 54 thousand hectares of land was purchased by the National Land Fund. NLF by its selling and leasing activity can **strengthen the competition** for land and this may assist the increase of the land prices and rents. NLF – due to the long lease status of the state land property – might have an outstanding role in the establishment of **the market of rented land** by assisting the restructuration and the intensification of the land market.

In land use **land consolidation** for assisting the **better use of internal resources and the production based on own property for operation security** will get more and more important. The farmers by consolidating their own and rented land can establish larger property units and this way can increase their efficiency and can distribute the multifunctional agriculture also in the unfavourable regions. The **land banking activity** connected to land consolidation of the NLF may result the implementation of successful projects, especially if it can manage the land requirements of the development of various sectors in an integrated way. In land acquisition the application of mortgage credit can be an advantage.

The distribution of land mortgage credit was put back significantly as the measures aiming at the development of the land use achieved only **moderate successes** following the Accession to the EU and the land consolidation measure has not even been started yet. Following the accession the **land policy** did not assist the closing of land property to land use. The main reason of this is that in Hungary's most important **advantage in the competition derives from the low land prices and rents**. The pre-emption and pre-leasing rights protect efficiently the interest of the land users. This also assists their agreement and lead to making use of their bargaining power on the land market. Consequently this limits the competition on the land market. If the land prices and rents are low the mortgage credit cannot function properly.

3.5. Analysis of farms with long-term credits

First of all I selected the **variables** which might **have an impact on the agricultural mortgage credit**, as well as the balance and the profit and loss statements, the indicators obtained from these data (for example profitability, liquidity) as well as the data on the land. By determining the relationship between the variables, on the basis of **multicollinearity test** I could draw the conclusion, that **agricultural mortgage credit can be limited only to arable land** since the holding's own agricultural land is mainly arable land and so the value of this determines the value of the land.

Results of the factor analysis

In the **factor analysis** performed for the analysis of the database of 2004 in accordance to the size of the database eight factors were accepted, where the eigenvalue was always more than one (Table 7). Explanation was received for 59.5% of the total of the variances.

From among the factors regarding long term credits the seventh factor can be selected, in which there were three variables. From which two characterize the lands in own property, which provide the **collateral for the mortgage credit**, the production subsidy can prove useful in the case of indebtedness and in taking credit. **Production subsidy may supplement the collateral of own area, which might serve as a further collateral security for the land mortgage credit.** On the basis of the above three variables I separated the **mortgage collateral factor**. [*Variables: Direct production subsidy to increase the income and/or to decrease the production costs; Arable land (own property); Value of own agricultural area.*] The factor explains 5.6% of the total variance.

Table 7

Main results of the factor analysis on the basis of the data of 2004

Factor	Denomination*	Eigenvalue	Variance (%)	Total of variance (%)
1	Resources	15.63	19.54	32.84
2	Subsidies and production costs	8.53	10.67	17.93
3	Operation	6.58	8.22	13.82
4	Size	4.36	5.45	9.16
5	Investment	3.69	4.61	7.75
6	Stable individual farms	3.61	4.51	7.58
7	Mortgage collateral	2.68	3.35	5.63
8	Leasing (out)	2.52	3.15	5.29

* In the solution variables with a value of more than |0.5| were accepted.

Remark: Principal Component Analysis by Varimax rotation and Kaiser normalization.

Source: FADN data of AKI 2004, own calculation

Based on the results of the **factor analysis of the database of 2007** eight factors was accepted. In this case too the eigenvalues obtained was always more than one. This method explained 54,0% of the total of the variances, a smaller part than in the analysis of 2004 (Table 8).

In the years selected there are significant overlapping of the factors. In both cases the factor with the largest explanatory power was the ‘Resources’; however the factor of ‘Operation’ was also important. From among the deviances I emphasize from the production factors the **breaking though of the role of land** as it proved to be dominating in 2007 regarding several factors. It has to be mentioned too that in 2007 the profitability indicators formed a separated group.

Table 8

Main results of the factor analysis on the basis of the data of 2007

Factor	Denomination*	Eigenvalue	Variance (%)	Total of variance (%)
1	Resources	16.21	21.9	40.58
2	Operation	6.04	8.16	15.12
3	Large-scale corporations	5.02	6.79	12.58
4	External resources	3.17	4.28	7.93
5	Leasing (out)	2.84	3.84	7.12
6	Rent (in)	2.33	3.15	5.84
7	Profitability	2.19	2.96	5.48
8	Land quality	2.13	2.89	5.35

* In the solution variables with a value of more than |0.5| were accepted;

Remark: Principal Component Analysis by Varimax rotation and Kaiser normalization.

Source: FADN data of AKI, 2004, own calculation

Results of the cluster analysis

In the analysis of the holdings with long term liabilities the cluster analysis was performed by using the results of the factor analysis. In both years I separated three clusters¹⁰. For determining the opportunities of land mortgage credit in the cases of the clusters besides the **size of the holdings**, the characteristics of the **developments**, **indebtedness** and **land use** were used.

Based on the cluster analysis of 2004:

- The first cluster consists of **medium size individual farms engaged in crop production** (average farm size is 16.2 ESU). The farms of the cluster can **increase the security of their operation** by purchasing the land rented by the mortgage credit.
- The second cluster consist of **small size individual farms** (average farm size is 4.9 ESU) **operating with losses**. By the mortgage credit the holdings of the cluster in the case of necessity **may extend their operation** by providing collateral by their own land. They slightly have chance to develop.
- In the third cluster there are the **large-scale profitable holdings** (average farm size is 146.7 ESU). In addition to the subsidies mortgage credit may provide them **additional resources to finance** the further enlargements and **developments**.

Based on the cluster analysis of 2007:

- The first cluster consists of **extremely large, profitable holdings** (average farm size is 172.8 ESU; that is, **10.7%** of the holdings over 2 ESU). In the cases of the holdings in the cluster the main goal of the application of mortgage credit

¹⁰ For supporting the cluster formation of K centre procedure I performed also the analysis by the hierarchical method, where the dendrogram in both years proved the existence of the three separated clusters.

the is to **receive the additional resources to supplement the subsidies to the financing of the developments.**

- The second cluster consists of **medium size holdings** (average farm size is 22.0 ESU; that is, **3.2%** of the holdings over 2 ESU). I called this cluster as '**stable and profitable**' holdings. Their credits for land purchase are limited and their primarily strategy could be to **increase the area of own land.**
- In the third cluster there are mainly **smaller-size individual farms** (12.8 ESU, **1.9%** of the holdings over 2 ESU). Based on their characteristics these holdings are not able to develop and the land **mortgage credit can only extend their operation.**

Following the Accession to the EU the **improvement** in the clusters was ensured by the subsidies. The amount of the interest to be paid and the interest rate also decreased. The holdings of the **first two clusters** have already taken credits, even at small amounts for land purchase; however, they have **potentials to increase.** **The advantages deriving from leverage** can mainly be used by the large-scale holdings.

In order to **test the results** or to generalize at a larger scale I selected the **holdings, which do not have any long-term liability** to be the control group. In accordance with the results of the cluster analysis on the basis of the size I categorized the holdings into three groups. In first group were the large-scale holdings (average size 69.2 ESU), in the second one the medium-size holdings (average size 15.9 ESU), while in the third the small-scale holdings (average size 5.9 ESU). **The common characteristic of the control groups** was that on the basis of their favourable financial-income situation by leverage they could significantly increase their sizes.

- From the control groups in the cases of the **large-scale and medium-scale holdings** (**17.6%** of the holdings over 2 ESU) **the investment was significantly smaller than in the indebted clusters.** They rather extract the income and on the long-term may even abandon farming. Based on their own properties they could catch up their **lagging behind** by the help of the mortgage credit.
- The **control group of the small-scale holdings** (**63.4%** of the holdings over 2 ESU) in the present situation (without development) **does not need in fact long-term credits.**

The **overall result** of the analysis of the control group is that even these holdings might need **long-term credits** either for developments or for **size increase**; actually to ensure the security of the production, that is, **to ensure the chance for survival.**

3.6. New and novel scientific findings

My new and novel scientific results can be summarized as follows:

1. **I developed an expert system**, which is based on interval estimation and is applied **for determining the market prices and rents of agricultural land** by the quality categories.
2. By calculating the average price from the ranges of the regional and country-level arable land prices of experts' estimates, I examined by correlation analysis the relationship between the land prices and rents by land quality categories. In contrast to the analyses performed before the Accession to the EU and shortly afterwards, I found a **strong positive correlation between the land prices and rents**, which is confirmed by analysing the significance of the correlation coefficients. The result shows the **strengthening market character and the establishment of the land market as well as its development**.
3. The estimation of the multiple variable regression was performed based on the land market value database of the NLF. I found that **the size of the parcel is in positive relationship with the market value**. Consequently, **the specific land market price of large parcels (price per hectare) is higher than that of small parcels**. This encourages the formation of large contiguous property units.
4. On the basis of the FADN data, by applying the data of the holdings with long-term liabilities as factor variables **I showed by multicollinearity test that for credits only arable lands can be included**, which is due to the fact that own land is mainly arable land; therefore, the value is determined basically by the value of arable land.
5. In the factor analysis of the FADN holdings with long-term liabilities, within the solution of eight factors **I selected the mortgage credit factor, which is important for the long-term credit**, including the own area and its value as well as the production subsidies. **Production subsidies may supplement the collateral on own areas and this can provide a further security for the mortgage credit**.
6. By the separation of clusters – the basic separation of which is justified by the size categories of the holdings – I proved the **necessity of mortgage credit** and, by comparisons to the control groups generalized it. In the cases of **large-scale holdings** agricultural mortgage credit may assist the **increase of the development resources**; in the cases of **medium-size holdings** it may facilitate the purchase of the rented land to **maintain their production security**; while the **small holdings might apply** agricultural mortgage credit **for solving their liquidity problems**.

4. CONCLUSIONS AND RECOMMENDATIONS

1. Following the Accession to the EU, the increasing subsidies and the improvement of the profitability made it possible in agriculture to **make use of the benefits deriving from the leverage deriving from the expanding agricultural mortgage credit**, generating a development which is of a greater rate than the one allowed by the internal resources.
2. In my research I applied up-to-date methods in the analysis and determined the opportunities of agricultural mortgage credit. **There is a strong positive correlation** between the **specific** (per hectare) **land price** and the quality of the land/size of the parcel. **The expansion of agricultural mortgage credit may by itself assist the consolidation of the parcels**. The large-scale holdings may use the mortgage credit first of all for **production development**, the medium-size ones **for maintaining the production security** (by purchasing the rented land) and the small ones **for maintaining their liquidity**.
3. **Land mortgage credit** is a modern and indispensable element of agricultural development. Agricultural mortgage credit is a market institution which encourages **efficient agricultural production, the establishment of market prices, and rational land use**. However, by the use of mortgage credit only a few small and medium size enterprises will have a chance to increase their size of the area used.
4. By decoupling the subsidies from production, market orientation will strengthen. By maintaining sustainability the task of the **land market** is to **decrease and eliminate the limiting factors**; the basis of which is **to increase the liquidity of the land market**. **The expansion of the agricultural mortgage credit** can be expected first of all from using the **rented land** as the collateral of mortgage credit, from the simplification of the present **pre-emption right** system and from lifting the ban on the **land purchase of corporations** of Hungarian residence.
5. **The expansion of mortgage credit** (by the sale of the insolvent holdings) will lead to the **intensification of the land market**. According to my calculations, to increase the land market by 5% the inclusion of 150-200 thousand hectares of own land of 10-15 thousand individual farms in the mortgage credit system would be required.
6. In order to **establish the competition on the land market** as soon as possible, I recommend to concentrate land consolidation and land purchase subsidies to those settlements and holdings, in which the holdings are of viable sizes missing or where the opportunity is provided to increase the limited number (from 4-6) of viable holdings. Three quarters of the settlements (72.2%) and one third of the agricultural area receiving direct payments (35.7%) are involved.

5. PUBLICATIONS CONNECTED TO THE DISSERTATION

a) Scientific book or section of scientific book

In foreign language

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In Hungarian language

2. **Biró, Sz.** (2007): Agrár-vidékfejlesztési támogatások felhasználása a tesztüzemi adatok alapján (The use of the agricultural and rural development subsidies based on the FADN data). In Tóth, E. (ed.): Az agrár-vidékfejlesztési programok megvalósulásának a támogatások felhasználásának főbb tapasztalatai (Lessons learnt from the use of the agricultural and rural development subsidies). Information on Agricultural Economics, 2007 No. 6, AKI, Budapest. pp. 51-68.
3. **Biró, Sz.** – Dorgai, L. (ed.) – Varga, P. (2006): Táj és földhasználat váltás a Tisza hullámterében (VTT első ütemében tervezett beavatkozások) (Scenery and land use transition in the flood area of Tisza, interventions planned in the first phase of VTT). Information on Agricultural Economics, 2006 No. 5, AKI, Budapest. p. 97.
4. **Biró, Sz.** – Dorgai, L. (ed.) (2006): Az EU vidékfejlesztési politikájának jövője (Future of the rural development policy of the EU). In EU-tanulmányok VI. Nemzeti Fejlesztési Hivatal Integrációs és Fejlesztéspolitikai Munkacsoport Agrár- és Vidékfejlesztési Témacsoportja, Budapest. pp. 225-255.
5. **Biró, Sz.** – Dorgai, L. – Varga, P. (2004): A kedvezőtlen adottságú területek támogatása és magyarországi adaptációja (Subsidies for less favourable areas and the adaptation for Hungary). In EU tanulmányok V. Agrárpolitika és vidékfejlesztés. Nemzeti Fejlesztési Hivatal, Budapest. pp. 381-409.
6. **Biró, Sz.** – Dorgai, L. (ed.) – Dömsödi, J. – Fenyő, Gy. – Hamza, E. – Hőna, E. – Kovács, H. – Kovács, M. – Márkus, B. – Miskó, K. – Osskó, A. – Riegler, P. – Romány, P. – Szabó, Gy. – Székely, E. – Szűcs, I. – Tóth, E. – Varga, P. – Vincze, L. (2004): A magyarországi birtokstruktúra, a birtokrendezési stratégia megalapozása (The foundation of the Hungarian strategy on property structure and land consolidation). Agrárgazdasági tanulmányok, AKI, 2004 No. 6, Budapest. p. 199.

b) Scientific journal

In foreign language

7. **Biró, Sz.** (2007): The Hungarian Land Market after EU Accession. Studies in Agricultural Economics No. 107, Research Institute of Agricultural Economics, Budapest. pp. 61-78.
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11. **Biró, Sz.** (2006): Objectives and Priorities of Sustainable Rural Development in Hungary in the 2007-2013 planning period. International Conference on Sustainable Rural Development: Applied Science For Knowledge Driven Governance, University of Florence Faculty of Economics, 16-17 November 2006, Florence. Italy. (www.irpet.it)
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d) Other publication

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