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Theses of PhD dissertation

MAIN TENDENCIES AND ISSUES OF THE MANAGEMENT OF SMALL- AND MEDIUM-SIZED FARMS IN JÁSZ-NAGYKUN-SZOLNOK COUNTY

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1. ANTECEDENTS AND GOALS OF THE RESEARCH

In Jász-Nagykun-Szolnok County agricultural production was dominantly carried out in large-scale farms till the beginning of the 1990's, while there were very few private farms. After the change of the political and economical system the co-operative farms of the county, which had a significant area of land, assets and staff, either collapsed or were reorganised. Parallel to this process the number of landowners, who were mainly smallholders, considerably increased. The Acts of Compensation, legislated between 1991 and 1993, established the basis of the new property relations. These processes, facts and events reforming Hungarian agriculture, led me when I determined the goals of my research work.

- ***One goal*** was to examine the factors over at least a decade, which affected the small- and medium sized farms located in six subregions of Jász-Nagykun-Szolnok County. My investigations were mainly focused on the farms that were of sufficient scale to be self sufficient under previous market conditions.

- ***A further goal*** was to process land-size data and to examine farms according to their size and type of management the six subregions of Jász-Nagykun-Szolnok County. Among private farmers increasing the area of land by a merger process was initiated by the forcing effect of the market. During this process farmers – according to the market forces of the sector – continuously enlarged the size of their plough-lands (via purchase, rent or the combination of both purchase and lease). Farm sizes are basically determined by political and capital conditions, the market, the infra- and settlement structure. The major agricultural activity in the six subregions of the county is crop production, while animal husbandry and horticulture are much less characteristic.

- ***Emphasized goals of my research*** were to analyse the education level and age-composition of the investigated group of farmers and study the effect that this had on land use, type of crop production, animal husbandry, type of mechanization and farmers perceived future status.

For the fulfilment of the above listed goals a data basis and supplementary surveys were required, in order to carry out the analysis on the investigated group of farmers. Nevertheless gaining reliable and satisfactory data in this field of research is very complicated. Even the Hungarian Central Statistical Office (HCSO) has no detailed database about the results of farming activity of small- and medium sized farms over a long term, hence ***I created my own one*** database that was based on a survey which was carried out for several years. I completed these survey data with the database of the General Agricultural Register (GAR) of 2000, the county- and settlement level data of the census taken in 2001 and other official GIS databases. By using this ***complex database*** I revealed correlations, which are of increasing importance to all the levels of the agricultural sector.

I tried to focus on the goals listed above when I created the database, analysed and statistically assessed the natural and calculated indexes selected according to an own aspect system and applied GIS methods. I believe that my results can help to reveal more reliable correlations useful for the implementation of the structural change of agriculture and for rural development both at local and subregional as well as at regional level.

I do hope that the ***complex procedure*** *I used, together with the data available from central sources, can be an effective tool for experts working at local and subregional level to aid decision-making, and also to help them identify and solve problems.*

2. METHODS APPLIED

The small and medium sized ***private farms*** that were the focus of my research ***had got at least 10 hectares*** in Jász-Nagykun-Szolnok County. Research goals similar to my goals are quoted in several scientific papers, but very few studies deal with this topic at county or subregional level and these studies are less detailed. When I initiated my questionnaire-based survey all of the farmers surveyed had uncertainty and distrust. This atmosphere characterised the service of agricultural data too.

The investigated group of farmers was selected from all the six subregions of the county. I made surveys three times (1997, 2000 and 2002) and processed 111 questionnaires after appropriate filtering. After the creation of the principal database and the first analyses it became obvious that the three categories of HCSO were not suitable for scientific examinations as this size category system, taking the Hungarian circumstances into consideration, is too broad. Therefore ***the creation of an own, multilevel size-category system*** was essential (Table 1.).

Table 1.

Average sizes and ratios of farmlands according to my own category system

Size categories		1997		2000		2002	
HCSO GAR	**Own**	**Average size (ha)**	**%**	**Average size (ha)**	**%**	**Average size (ha)**	**%**
0,1-10 ha	0,1-10 ha	4.5	**0.1**	0	**0**	7.3	**0.3**
10,1-50 ha	**10,1-30 ha**	20.8	**2.5**	20.8	**3.0**	19.1	**3.8**
	30,1-50 ha	39.6	**8.3**	42.2	**7.0**	35.6	**2.4**
50,1-100 ha	**50,1-100 ha**	68.9	**20.0**	73.1	**15.7**	77.5	**13.0**
100,1-300 ha	**100,1-200 ha**	139.8	**14.6**	137.5	**20.7**	142	**24.9**
	200,1-300 ha	256.7	**13.4**	269.6	**15.5**	255.8	**19.5**
> 300 ha	**> 300 ha**	790	**41.2**	885	**38.1**	1186.7	**36.2**
			100.0		**100.0**		**100.0**

Nevertheless own survey means a limit in using up-to-date mathematical and statistical assessment as such an extended database could not be created which is necessary for multivariable (principal component- and cluster-) analyses. Completing the own data originating from GAR and census ones and valid for all the 77 settlements of the county

ensured the application of the above mentioned statistical methods. The database was divided into three groups according to the resources:

Group I.: **natural resources**
Group II.: **human resources**
Group III.: **other resources.**

All of the three groups were filled with 7-9 variables associated to each of them. I calculated the Standard Gross Margin (SGM) values for settlement level using the SGM values of plant production and animal husbandry published by the Research Institute for Agricultural Economy and Informatics and I used SGM' s as target variables. By means of principal component analysis (PCA) I individually analysed each of these groups with the aim of elimination. This meant that I could skip those variables, which as expected did not closely correlate with the target variable, so the only variables with close correlation or with importance from professional viewpoint remained in the final PCA. As it is widely accepted, I only took those components, which account for 80 % of the variation, in my case two of the five variables (85.03 %). Table 2. shows the principal component values calculated for the variables.

Table 2.

Component matrix

Indexes	Component			
	1	2	3	4
Agricultural land/worker	**.931**	.024	.054	-.227
SGM/worker (target index)	**.914**	.140	.134	-.256
Rate of agricultural land	**.849**	-.206	-.477	.088
Rate of agricultural land larger than 50 ha	**.705**	-.603	.271	.256
Total domestic income per worker	.631	**.713**	.064	.300

By means of the cluster analysis, the settlements grouped into clusters, using the mapping and attributive databases together with the GAR database of the county, I displayed in maps as layers.

The goal of the application of PCA and the cluster analysis is to identify common and complex background variable(s). Two background variables could be identified after the extended processing of data. The first one, regarding agricultural land and workers

involved in agriculture, clearly reflexes the critical situation of the farmers in 2000. The data of my own database also back up this: disordered property status, high number of farms with hopelessly small size, disharmony between plant production and animal husbandry, and the extreme weather of the last five years all indicate crisis within agriculture in the county. As high number of people getting direct or indirect incomes from agriculture characterises Jász-Nagykun-Szolnok County, taking the other background variable, *the total domestic income per workers*, into account also supported drawing the conclusions of the study.

3. MAIN RESULTS

Reviewing the state of peasantry I established that until the change of the political and economical system in Hungary, farms could only be characterised with small-scale production level (household farming) on small farm size and strong dependence on large-scale (co-operative and state) farms and integrators. This is unlike in Western-Europe, where farm sizes were permanently increasing and embourgeoisement was taking place. In Hungary new opportunities arose for farmers from the beginning of the 1990's. The principle of the change was that ***the two poled farm structure changed:*** as *well as the large and small farms medium sized,* ***enterprise-type private farms*** *were created.* Unlike the private farms with several hundred years of history in the European Union, the Hungarian farmers of today are only making the first steps on a long and stony path. Despite the distressing situation of agriculture the events of the recent past let us to conclude that the Hungarian agriculture – building on the bases of the former large-scale farms – is moving towards private forms. My studies made for Jász-Nagykun-Szolnok County also strengthen the above statement:

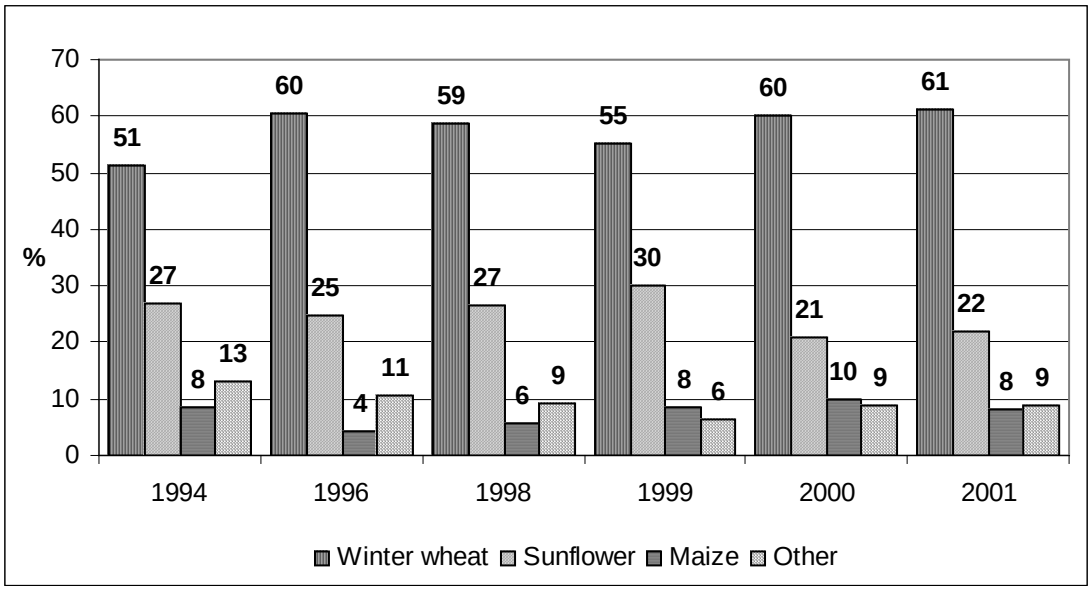
1. Studying the investigated farmers I established that, similarly to the other parts of Hungary, the situation of the agriculture in Jász-Nagykun-Szolnok County became critical during the last fifteen years. Among the reasons I consider the omission of the governments to be the first: ***lack of a consistent agricultural strategy.***

2. On the base of the available data regarding the age and education of the farmers of the county I established that ***the average age of the farmers is high and increasing***. The majority of the older generation of farmers, with the lowest level of education work on smaller farms, while mainly younger, middle aged people have an occupation on farms with larger territory, just like people with higher qualification. On the area of Szolnok and Törökszentmiklós subregions farmers owning more than 50 hectares have the highest level of agricultural qualification. Similarly to the national situation, in Jász-Nagykun-Szolnok County the rate of farmers having only elementary school qualification is alarmingly high.

3. A very important element of capability of progress of enterprises is the ***quality of human factor***. In this respect the farmers of the investigated county have serious backlogs compared to the EU-farmers. According to my own survey only a fraction of them is familiar with computers. Cruel competition for resources, which is not usual for the Hungarian farmers, characterises the agricultural market of the EU, hence not only the smaller, but also the larger farms can get into trouble due to the lack of sufficient information and up-to-date knowledge. All these indicate that the training of farmers is necessary, mainly in the areas of *agro-environmental management and protection and sustainable production;* without this kind of knowledge the Hungarian farmers can miss considerable financial sources provided by the EU.

4. Winter wheat is grown in all of the subregions and it occupies approximately 60 % of the total sown area (Fig. 1.), which shows that ***the plant production is getting more extensive with narrower crop-pattern***.

Fig. 1.: **Sown area of main crops, 1994-2001**



Analysing the data of crop production and animal husbandry of the investigated farms according to their sizes, I established that in the case of the majority of farms ***these two branches of agriculture have separated from each other***. Only a fraction of the farmers deals with animal husbandry, while the rate of farmers with self-sufficient production is very high. The larger farms can ensure the

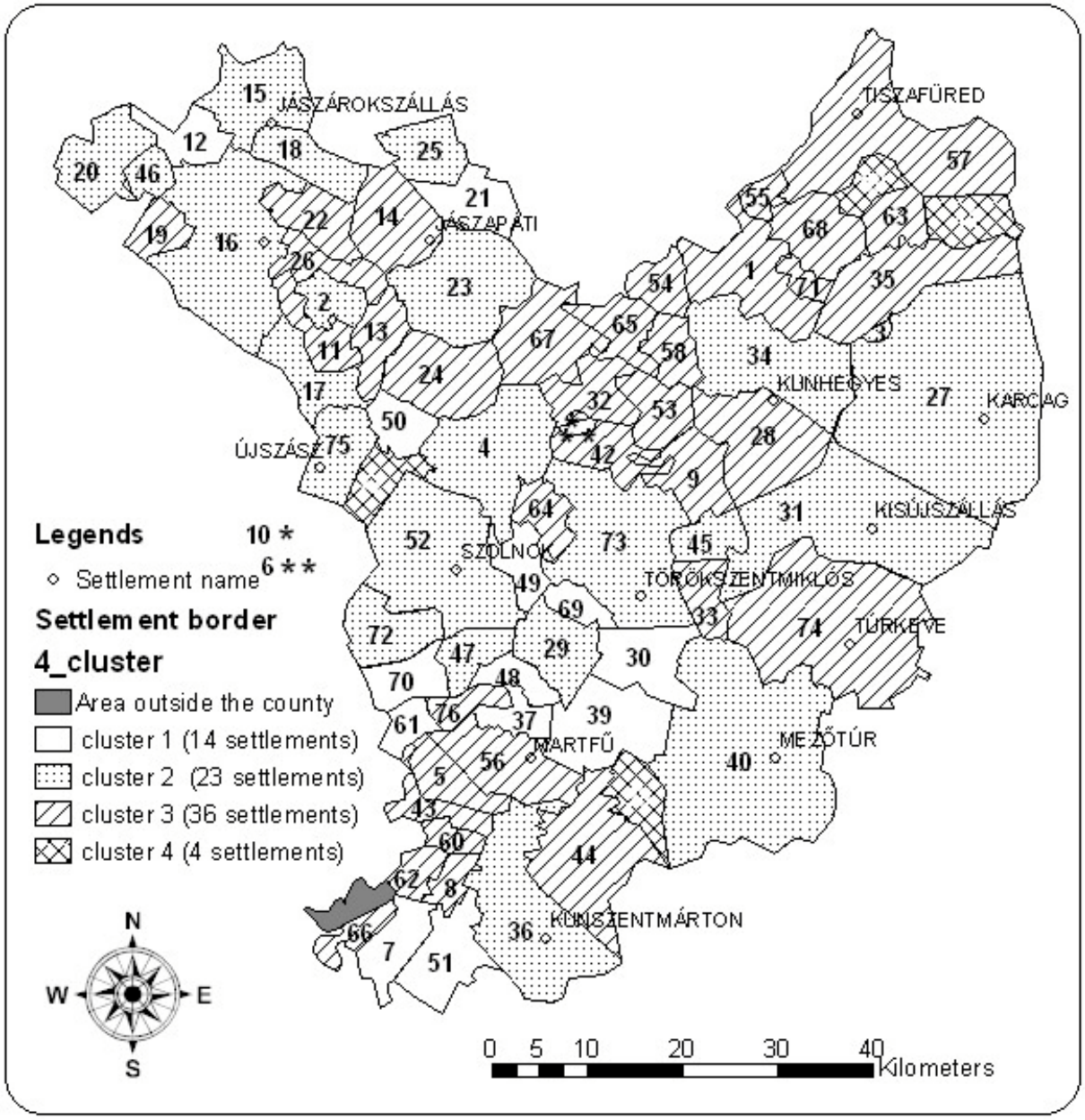
survival of animal husbandry within the county, although the dominance of plant production is massive even in this size category.

5. Researching the fate of the final products of plant production and animal husbandry it turned out that more than two-third of the farmers involved in the own survey sold their products without further processing between 1997 and 2002. In my opinion market positions, quality and processing level of products and cost-efficiency can only be improved ***if the farmers form alliances by subregions and by product lines.***

6. Examining the mechanization level of the farms of the county *I found that machinery park is old, mainly based on out-of -date, depreciated MTZ tractors of medium performance.* I also established that the farmers belonging to the upper two farm-size categories have already stabilised their situation regarding mechanization. Only these farmers could create such large plots that can ensure the production homogenous final products of high quality; this also leads towards the direction of lower machinery costs. A rational alternative of decreasing high machinery costs due to over-mechanisation and the high rate of old machines is ***the forming of machine-alliance.*** This could also lead to an increase in diversification as well.

7. The borders of the settlement clusters according to the cluster analysis involving the data of the final PCA do not fit to the subregional boarders determined by either the HCSO or the SAPARD (Fig.2.). This emphasizes the importance of initiatives and the alliances of subregional and local levels: ***the settlements belonging to the clusters of poor results can find the breakthrough points only together with the settlements of clusters with better performance***, hence their chances to gain sources by proposals also gets higher. The results of the farms belonging to clusters No. 2 and 3 (in Fig. 2.) and the analysis of the size categories determined in the own and the GAR databases also strengthen the conclusions drawn by means of the cluster analysis.

Fig. 2.: **Spatial distribution of settlement groups determined by cluster analysis in Jász-Nagykun-Szolnok County, 2000**



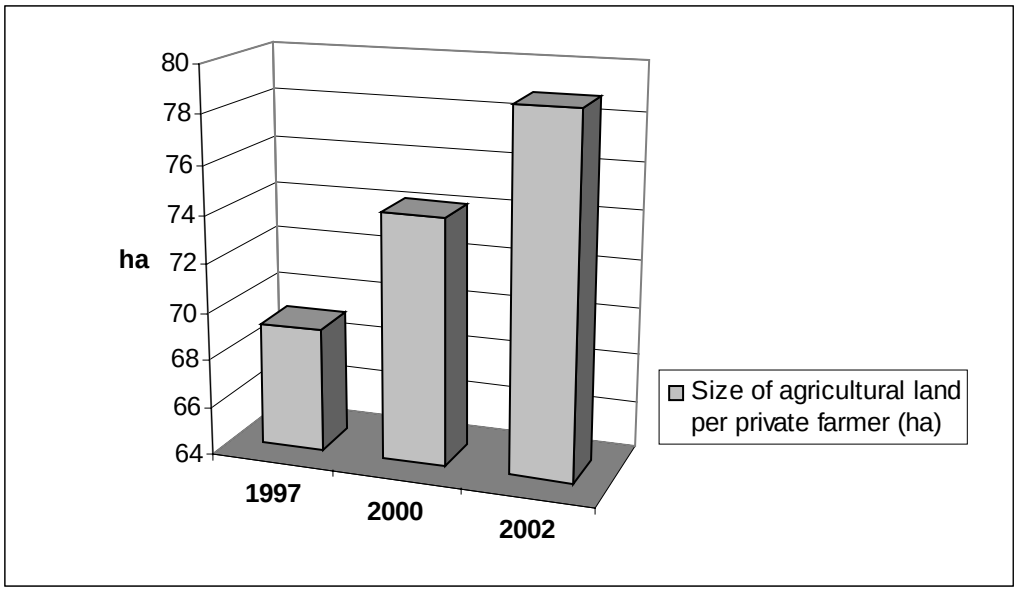
4. NEW SCIENTIFIC ACHIEVEMENTS

My research provided mainly methodological achievements: I determined the methods optimal for the analysis of a group of farmers working in a given economical environment, taking the local (county-, subregion-, settlement level) specifications. These methods also help to choose among the wide variety of resources (natural, human and others) in order to combine them for optimum utilisation.

1. I definitely recommend ***using of a multilevel size category system*** for the exact examination of the settlements of several subregions.

2. During my land use studies I established that a ***farm concentration process is taking place*** in the county, mainly in the form of renting: the larger the farm size, the higher of the proportion of rented lands (Fig. 3.).

Fig. 3.: **Size of agricultural land per private farmer, 1997- 2002**



By means of my own database this process can be monitored: the farmland area per private farmer was 69.1 ha in 1997, 74.2 in 2000 and 78.8 ha in 2002 in the size category of 30-300 ha. ***The expected losers of this concentration process are the farmers having medium size farms (10.1-30.0 ha).*** According to my own data base I established that most of the farmers got ruined were clustered in the farm size category of 10.1-30.0 ha. Knowing the EU rules and subsidy systems I predict the drastic decrease in the number of farmers belonging to this size category.

3. My research has also proved that ***the farmers of this medium size category do not clearly produce for the market, but partly for own consumption.***

4. I divided the investigated private farms into two groups: farms with part-time jobs (auxiliary farms) and farms with full-time jobs. On the base of this division I established that ***full-time employment is dominant in the case of farms with more than 50 ha territory.***

5. The continuous and joint processing and comparative analysis of my own database and the database of the GAR was done according to the main viewpoints of the investigation (cultivation branches, crop pattern, parameters of crop production and animal husbandry). Production of field crops is definitely the dominant land use type.

6. Among private farmers enlarging land-size and a merger process was initiated by the forcing effect of the market. On the base of the results of the principal component- and cluster analysis I figured out that ***the lower size boundary of economically viable farms is between 50 and 100 hectares taking the natural and economical conditions of the county into consideration.***

7. I have developed the method of multilevel PCA further. The examination of the separated parameter-groups created with the same target variable in the elimination stage of the explorative analysis involving several variables and the parameters having strong correlation with the target variable then being united in the evaluation stage provided professionally acceptable results. Nevertheless I figured out that the application of this method is not reasonable in the lack of sufficient database (fundamental databases created from several sources, revision, filtering redundancies and false data out are all prior conditions). The use of ***the total value of Standard Gross Margin*** determined for settlement level as a common target variable provided the possibility of comparison of all the settlements of the county.

8. On the base of the results of the final PCA extended to all the settlements of J-NK-SZ County I established that ***the area of agricultural land per workers***, ***the rate of agricultural land*** and ***the total domestic income per workers*** are the indexes that have the greatest influence on the value of the target variable (**SGM/worker**).

5. UTILISATION POSSIBILITIES OF THE ACHIEVEMENTS

The greatest difficulty of a study or a proposal surveying county-, subregional-, settlement level is the creation of the fundamental database. The ***combined application and processing of the database sources*** I used in my research is a solution possibility that can be used in other studies.

The ***complex procedure*** I used – arranging the own data according to a suitable viewpoint system and completed with the available data available from central sources – can be an effective tool for experts working for authorities, proposal-offices, scientific workshops and educational institutions at local and subregional level to aid decision-making, and to identify and solve problems.

1. ***For detailed analyses the size category system I used in the dissertation is recommended.*** In case of database purchase, it is recommended to order the required data according to a preliminary determined size category system. In this way the use of the combined database sources is ensured, furthermore the results of the statistical analyses done by means of own databases can be validated using databases valid for any area units.

2. ***The complex analysis as a method is a good tool for the analyser itself.*** In most of the cases this method reliably filters the empirical examinations. The processing and display of the results of the two statistical methods using the tools of GIS can contribute to their exact professional assessment (determination of background variables). ***The combined use of PCA, cluster analysis and GIS can be recommended*** to validate those mainly empirical, scientifically and statistically non-significant conclusions that are drawn on the base of studies of different levels. The results of the complex analysis also can be used as a source of general SWOT analyses.

3. ***The further development of principal component analysis for elimination purpose is widening the options of analyses.*** By the means of the properly chosen and applied target variable, the clustering of the variables according to their correlation

can be carried out. An important advantage of the method is the option to decrease the number of the variables skipping those, which are non-significant from the viewpoint of the analysis. The main condition of the application of the method is that there must be at least three times more cases than the number of the variables.

4. The processing of the analysis results combining with GIS methods is definitely recommended. Nowadays the use of GIS methods for examinations extended to a certain geographical environment is indisputable and this was proven by my research as well. The application of these methods does not mean the use of only one tool: ***the processed attributive data are displayed by GIS database for the investigated area.***

The results of the analyses and the conclusions drawn on the base of them can mainly aid the decision making of the farmers and the governing authorities in agriculture:

5. A practical recommendation can be given to the farmers of the county is related to ***the farmland concentration.*** Further enlargement of land is wise for all farmers, but especially for those who own a farmland belonging to the smallest size category. As they suffer from the lack of money, the only possibility to do this is ***long-term renting***.

6. It is necessary, even essential, for small farms ***to increase the quality and the degree of processing of their products of plant and animal origin*** (conservation, milk products etc.).

7. Despite the lack of sufficient experiences concerning ***diversification*** in Hungary, ***it provides breakaway for the farmers having small- and medium sized farmlands*** if they recognize this possibility: employment can be enlarged and the profitability of private farms can be increased.

8. Following the idea chain started above it can be concluded as a summary that organizing new-type co-operatives, which results in higher quality and processing level for products and higher cost efficiency, ***can ensure the survival of farms belonging to the smaller size categories*** (mainly category 10-50 ha).

6. LIST OF SCIENTIFIC PUBLICATIONS ISSUED IN THE TOPIC OF THE DISSERTATION

1. **Czimbalmas R**.- Józsa Á. - Kurucz Gy. (1998): Karcag város fejlesztési koncepciója.

2. Blaskó L. – **Czimbalmas R**. (1999): Jász-Nagykun-Szolnok megye agrárstruktúra- és vidékfejlesztési stratégiai programja (Chapters 1., 2.6, 2.8, 3.1.,5.3).

3. **Czimbalmas R.** (1999): A Közép-Tiszamente térség mezőgazdasági tevékenységének vizsgálata, (poster) Debrecen, DAB székház, Ph.D. Conference.

4. **Czimbalmas R**. - Józsa Á. (1999): A Karcagi Stratégiai Kistérség fejlesztési stratégiájának földhasznosítási programja, 1999. szeptember.

5. **Czimbalmas R.** (1999): A Közép-Tiszamente gazdálkodóinak vizsgálata, Mezőtúr, II. Alföldi Tudományos Tájgazdálkodási Napok, I. kötet, 78.-84. p.

6. **Czimbalmas R. –** Blaskó L. – Forgács L. (2000): A törökszentmiklósi kistérség agrárstruktúra és vidékfejlesztési programja helyzetértékelő fejezetének agrárstruktúrák értékelésére vonatkozó résztanulmány.

7. **Czimbalmas R.** (2002): A Közép-Tiszamente kis- és közepes méretű gazdaságai tevékenységének vizsgálata 1989-2000 között (Examination of Agricultural Activity in the Middle-Tisza region, among the private farmers); Agrártudományi Közlemények, Debrecen; 22-26. p.

8. **Czimbalmas R.** (2002): A közepes méretű gazdaságok tevékenységének reprezentatív vizsgálata 1989-2000 között, Jász-Nagykun-Szolnok megye hat kistérségében (poster); Welmann Oszkár Tudományos Konferencia, Hódmezővásárhely; 89. p.

9. **Czimbalmas R.** (2002): Többcélú kataszteri térinformatikai adatállományok előállítási problémái és elemzési lehetőségei a karcagi kistérségben. DE Mezőgazdaságtudományi Kar, Víz és Környezetgazdálkodási Tanszék, Debrecen.

10. **Czimbalmas R.** (2002): Egyéni gazdaságok birtokszerkezetének, gazdálkodásának vizsgálata Jász-Nagykun-Szolnok megyében; Tessedik Sámuel Jubileumi Mezőgazdasági Víz- és Környezetgazdálkodási Tudományos Napok; Szarvas; 261-263. p.

11. **Czimbalmas R. –** Forgács L. – Tuba G. (2002): Talajvédő talajhasználati rendszer alkalmazásának tapasztalatai a karcagi kistérségben; EU konform mezőgazdaság és élelmiszerbiztonság, szakmai konferencia, Debrecen; 164-169. p.

12. **Czimbalmas R. –** Forgács L. – Tuba G. (2002): Talajvédő talajhasználati rendszer eszközei és üzemeltetésük tapasztalatai; A műszaki fejlesztés és versenyképesség összefüggései a magyar mezőgazdaságban, Jubileumi Országos Mezőgazdasági Gépesítési Tanácskozás, Gyöngyös;

13. **Czimbalmas R.** – Tuba G. (2003): Talajvédő művelési rendszerek hatása a talaj néhány fizikai tulajdonságár; Talajvédelem-talajjavítás, Debrecen; 185-189.p. (ISBN: 963 9274 42 9)

14. Blaskó L. – **Czimbalmas R. –** Tamás J. (2003): Szikes talajon folyó tartamkísérlet értékelése térinformatikai módszerekkel; Agrárgazdaság, vidékfejlesztés és agrárinformatika az évezred küszöbén (AVA) nemzetközi konferencia, Debrecen ATC; 204. p. (ISBN: 963 472 721 2)

15. Blaskó L. – **Czimbalmas R.** – Tamás J. (2003): Anyagforgalmi folyamatok elemzése térinformatikai eszközökkel Közép-Tiszamente kötött talajain; III. Növénytermesztési Tudományos Nap, „Szántóföldi növények tápanyagellátása”, Gödöllő, Szt. István Egyetem; 144-148. p. (ISBN: 963 9483 24 9)

16. Balogh I. – **Czimbalmas R**. – Forgács L. – Nyiri L. – Radócz L. – Tuba G. – Zsembeli J. – Zsuposné O. Á. (2003): Talajvédő talajművelési eljárások

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17. Blaskó L. – **Czimbalmas R. –** Tamás J. (2003): Evaluation of a long-term experiment on a salt affected soil with structural B-horizon (solonetz) by means of GIS methods. Timisoara’s Academic Days VIII th edition, 22-23. May 2003; 369-375. p. (ISSN: 1221-5279)

18. **Czimbalmas R**. - Fehér A. (2003): A mezőgazdaság diverzifikációja Jász-Nagykun-Szolnok megyében; A falu; Társadalmi és kulturális folyóirat; XVIII. évfolyam, 4. szám. 59-67. p.

19. Juhász Cs. **– Czimbalmas R. –** Koczor T. (2004): Biztonság modul III.; Oktatók felkészítése az integrált menedzsmentrendszerek alkalmazására. Debreceni Egyetem Agrártudományi Centrum, Debrecen, 149. p. (in press)

20. Juhász Cs. – **Czimbalmas R.** – Koczor T. (2004): Modulul despre protecție III.; Pregătirea profesorilor în direcția aplicării sistemelor integrate de management. Debreceni Egyetem Agrártudományi Centrum, Debrecen, 149. p. (in press)

21. Juhász Cs. – Koczor T. – **Czimbalmas R.** (2004): Biztonság mintakézikönyv; Oktatók felkészítése az integrált menedzsmentrendszerek alkalmazására. Debreceni Egyetem Agrártudományi Centrum, Debrecen, 150. p. (in press)

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