



SZENT ISTVÁN UNIVERSITY
GÖDÖLLŐ

**The criteria system and results of sustainable
agriculture in Denmark and Hungary**

PhD THESIS

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GÖDÖLLŐ
2011

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1. INTRODUCTION, RESEARCH OBJECTIVES

1.1. The criteria system for sustainable development

The significance of this dissertation is that the leading European countries have arrived at the crossroads: they have to make emergency decisions as productivity seems to slow down, the slowing rate of development and a critical level of pollution coincide.

My dissertation examines performance and efficiency on the one hand, and sustainability on the other hand in the selected two countries, Denmark and Hungary. If the agriculture of a given country is considered in an efficiency/sustainability coordinate system, then a U-shaped curve is obtained, where at one of the endpoints underdeveloped, therefore not polluting, third world countries can be found and at the other end there are the most developed wealthy nations. These countries, like Denmark or the Netherlands, have reached a level of development at which enough income is available for not only self-sufficiency but allowing for sustainability as well. At this stage of the curve, however, the increase of sustainability cannot be enforced by market mechanisms. Market incentives are not suitable, therefore, only institutional solutions, i.e. regulations, coercion, external resources or a combination of all these could ensure an environmentally sound, productive and sustainable agriculture. I assume that Denmark is at the upward phase in the curve, while Hungary is located around the inflection point.

My research aims to examine the results of sustainable agriculture in Denmark and Hungary. For this reason sustainability and efficiency are examined separately then in combination to search for answers to my research questions.

Sustainability can be defined as enhancing relationship between man and nature. My thesis aims to show that the three-pillar model of sustainability does not take into account the modern components of economic equilibrium. A truly sustainable agricultural development, according to the results of my research, is based on four pillars, the natural, economic, social and political pillars. This is the main conclusion of my research, this was examined by

theoretical concepts, and illustrated by the lessons of Danish and Hungarian agricultural development, and so I got to the critical elements of sustainability, the real means of the expanded and reformed European agricultural policy, which can provide sustainable agricultural development. To create a transparent institution for an acceptable, just and sustainable Common Agricultural Policy is not an easy task. My thesis, therefore, was not intended to precisely define the parameters, but only to define the basic criteria of the institution of a Common Agricultural Policy, which could enable agricultural sustainability.

In summary:

1. The notion of agricultural sustainability has two dimensions: sustainability and efficiency
2. Instead of the three-pillar approach, sustainability should be based on four pillars. Besides the natural, social and economic pillars the key element could be the political pillar.
3. The Common Agricultural Policy should become a political tool that is able to provide a high level of environmentally, socially and economically sound, sustainable production through its incentive system.

1.2. The structure of the dissertation, objectives and hypotheses

The present comparative dissertation on the results of Danish and Hungarian sustainable agriculture has been organised in the following way:

1. The first section examined the criteria system of sustainability and sustainable agriculture is described, a review of recent scientific literature on the notion of sustainability is presented, and some indicator systems used for measuring the sustainability of agriculture and finally some innovative procedures which have successfully been implemented in sustainable farming is presented.
2. In the following sections Danish and Hungarian agriculture was investigated. the literature on agricultural efficiency (productivity) was reviewed then the similarities and the differences of the historical development of the two countries were highlighted.
3. The performance of Danish and Hungarian agriculture over the past decade was examined, then a possible measurement procedure was developed, the difference in efficiency was

calculated and the reasons for the differences were highlighted, and finally the measurable results of sustainable agriculture was examined.

4. I analyzed whether the EU's common budget could be considered the fourth pillar of sustainability and I studied how the agricultural subsidies are utilized in the existing distribution system. The EU has provided substantial subsidies to the agricultural sector, therefore, I considered the Common Agricultural Policy, its history, the ongoing conflicts of interests, changing targets, with special regard to sustainable agriculture.

5. The research questions were answered and the scientific results were summarized:

Research objectives:

RO1 the interpretation and the criteria of sustainable development and sustainable agriculture was reviewed and reorganised

RO2 the lessons of the historical development of agriculture in Denmark and Hungary was examined

RO3 the similarities and differences in the efficiency of the two countries and the possible explanations were dealt with

RO4 the possibilities of measuring and assessing the sustainability of agriculture in Denmark and Hungary was investigated

RO5 it was looked at how the agricultural subsidies in the EU could be distributed with keeping sustainability in mind and the ways of reviewing the current funding system in a way that could enhance sustainable agricultural production. In Hungary, the support system should help the development of rural areas resulting in a more efficient agricultural production. The aim of this study was to formulate some conclusions which could draw attention to some aspects of sustainable agricultural development.

The following hypotheses summarize my expectations:

With regard to sustainability:

H1 The three pillars of sustainability cannot ensure sustainable development on the long run.

H2 Sustainable agriculture is significantly more expensive and can be achieved only by applying external, non-market forces, however, it has long-term benefits for the society.

With regard to efficiency:

H3 The performance of Hungarian agriculture is higher than that of the agricultural sectors in central and eastern European countries.

H4 In Denmark, agriculture is more efficient than agriculture in most western European countries.

H5 The higher productivity of Danish agriculture in relation to Hungarian agriculture is due to improved capital supply.

H6 Agriculture in Denmark is not only more efficient but more sustainable as well.

H7 The EU funding system could provide the fourth pillar of sustainability, and a more targeted distribution system could increase the maximum total utility.

2. MATERIAL AND METHODS

In my dissertation I examined the notion of sustainable agriculture through the example of Hungary and Denmark. Following the literature review, sectoral comparative analysis was carried out at a macro level, then the economic, environmental and social aspects of sustainability were examined. I examined whether a) Danish agriculture is outstanding, b) whether Hungarian agriculture shows a significantly lower performance, c) what is the explanation for the better performance in (c/1 productivity, c/2 efficiency, c/3 competitiveness, c/4 sustainability), d) what is sustainable development. My recommendations are the following: with its transformation the EU's Common Agricultural Policy could contribute to improving the sustainability of agriculture.

My research results come from secondary research. For the examination of the formulated objectives a wide-ranging, especially English and Hungarian scientific literature was reviewed, with special regard to the issues of sustainable agriculture. On the basis of the literature scientific results were formulated.

To be able to understand the current situation of both countries, a comparative historical analysis of the two countries also proved necessary. On the basis of the analysis of the CAP, its history and reform processes I endeavoured to formulate proposals for the future.

The following research methods were used:

1) My research is based on the literary exploration, organization and critical analysis of a wide range of domestic and international resources.

Processing of the literature does not form a separate chapter, rather runs through the chapters, because of the diverse nature of the study as well as the structure of the dissertation, the literature review is closely linked to the given topics.

The topics discussed in the chapters are more and more narrow. I systematized and analyzed the literature on the concept of sustainability with special regard to the sustainability of agriculture, and then I summarized and compared the developmental path of Danish and Hungarian history of agricultural, and after that explored the selected literature on agricultural efficiency and productivity. Later, the Danish and Hungarian agricultural performance were compared applying statistical methods, and by the application of agricultural production functions. Finally the results of sustainable agriculture by involving environmental indicators were considered.

2) The available data (eg, Central Statistical Office, EUROSTAT, FAO, OECD and Statbank series) were identified then the next step was the selection and consistent processing and analysis of the data.

3) To compare the agricultural performance of the two countries statistical analysis and correlation and regression calculations were performed, and then the performance of the two countries were compared by two and three factor agricultural production functions, supplemented by data from other EU countries.

4) To compare and analyse the efficiency of the two countries a few indicators were used, then a seven-category system was applied. An expanded version of the system with the main focus on the examination of environmental risks caused by agriculture was used to evaluate the results by involving data from additional countries. The impact of CAP subsidies on the performance was also considered.

3. RESULTS

3.1. Research findings

3.1.1. The notion of sustainable agriculture

The primary objective of my dissertation was to compare the results achieved in the sustainability of Hungarian and Danish agriculture. The concept and criteria of sustainable agriculture that has natural, social and economic components was surveyed, systematized and defined followed by defining sustainability with special regard to the three-pillar approach. The definition is essential for thought, since only within this conceptual framework can the sustainability of agriculture be interpreted. Since the three main aspects of sustainability (3 pillars) together ensure social and natural reproduction, the other areas like economic development, growth, population and social policy, education system, health, etc. cannot be examined in isolation.

3.1.2. Historical review of agriculture in Hungary and Denmark

To evaluate performance it is necessary to recognize the development paths of the two EU countries, as they highlight the similarities and differences that led to the current features characterizing the agricultural sectors. In this study only the particularly relevant elements are considered which I believe have a powerful impact on performance and sustainability. I considered the similarities in the development paths, and the performance (efficiency and productivity) with special focus on the institutional and cultural factors.

The historical comparison of the two countries indicates the following: In Denmark the development was encouraged by the institutions. The favorable conditions made market access easier, and the appropriate knowledge management resulted in fast development and competitiveness. In Denmark, development is assisted by the distribution of property and by land policy. When the agricultural sectors of the two countries are compared,

we must not forget that the grants are helpful in successful management, and since joining the EU the CAP subsidies have ensured profitability.

3.1.3. Efficiency of agriculture in Denmark and Hungary

3.1.3.1. A metric system for comparing efficiency

A comparative analysis was performed relating to agriculture in Denmark and Hungary. Denmark is now one of the world's most competitive, most advanced countries, with the highest employment rate. The factors determining agricultural production can be grouped into two broad categories: the modernity of technology, as well as the quantity and quality of the inputs used, and the way they are used (technological efficiency). My research focused on the second category. I wanted to know which country could achieve higher output levels if the two countries applied the same technology and same level of inputs. With the simple method of comparison, I considered the per capita (total population) gross value-added, the per capita (employed in agriculture) gross value added and per hectare gross value added figures.

Next, a seven-category (functioning of institutions, infrastructure, culture, technology, agricultural inputs, physical environment) system was applied to investigate the efficiency of the two countries, with strong emphasis on the institutional environment.

Table 1. Factors determining agricultural efficiency in Denmark and Hungary, 1990-2007 (Ratio of Danish and Hungarian values)

Factors of efficiency	DK/HU
Weighted averages of the influencing factors	1.61
Gross output	1.46

Source: own compilation

As can be seen from the data in Table 1, with the same amount of capital and opportunities Hungary could be 10% more efficient ($1,6 - 1,46 = 1,1$).

The results of this study show that in Denmark the generated income and the appropriate level of support ensure reproduction, efficiency, and a more advanced level of production, however, in Hungary the low level of supports result in problems, e.g. farmers are vulnerable, they

produce loss and the supports perpetuate the existing conditions, allowing little room for improvements, investments and innovation.

3.1.3.2. Statistical methods for evaluating agricultural performance

The mathematical and statistical relationship between the influencing factors (dependent variables) and the performance of agriculture was studied and calculations were performed using multiple regression, and an attempt was made to investigate the relationship between the factors and the output of the sector by using correlation analysis. The results of the regression analysis are shown in Table 2.

Table 2. The relationship between a dependent variable (output) and the independent variables for Denmark and Hungary

Variables	DK	HU
Inputs: a)Land	-3.291	0.450
b)Machinery	0.057	0.010
Technology	410.108	2907.095
Culture	556.535	-83.751
Infrastructure	-1.035	4.221
Physical environment	- 0.691	-0.762

Source: own compilation

From the data in Table 2 it is apparent that based on correlation calculations technology (R&D expenditures) values show a strong positive correlation both for Denmark and Hungary. The number of years spent in education shows strong positive correlation in for Denmark, however, it shows weak negative correlation for Hungary.

3.1.3.3. Comparative study of the two countries by applying agricultural production functions

Real and potential outputs were estimated by two-factor (land and labour) agricultural production functions after that extended production functions (land, labour, capital) were used and finally the relative performance was examined since performance can only be understood through the comparison of each individual country to group of countries at similar levels of development.

**Table 3. The deviation from the potential agricultural output in Denmark and Hungary
(land, labour and capital involved)**

Denmark							Hungary					
Year	Land	Labour	Capital	Y	Y'	Y/Y'	Land	Labour	Capital	Y	Y'	Y/Y'
1997	2781,90	86,05	10598,90	6087,81	5760,87	1,06	4710,80	735,10	6328,29	10194,70	9763,25	1,04
1998	2802,10	82,03	10524,94	5545,84	5758,27	0,96	4709,50	700,78	6277,53	9900,75	9775,71	1,01
1999	2821,50	77,93	10450,98	5379,49	5754,17	0,93	4708,00	723,49	6226,76	9448,11	9866,10	0,96
2000	2778,70	75,54	10377,01	5919,65	5777,84	1,02	4499,80	676,05	6176,00	9768,59	9916,11	0,99
2001	2493,60	75,79	10303,05	6260,76	5890,16	1,06	4516,10	642,94	6125,23	10855,02	9923,00	1,09
2002	2478,80	72,18	10229,09	5761,93	5897,61	0,98	4515,50	646,74	6074,46	10305,78	9990,33	1,03
2003	2445,50	69,99	10155,12	5449,69	5921,44	0,92	4515,50	581,91	6023,70	9213,32	9948,24	0,93
2004	2470,20	66,90	10081,16	5706,08	5919,58	0,96	4510,30	553,79	5972,93	10007,77	9963,35	1,00
2005	2480,80	62,90	10007,20	5631,84	5912,61	0,95	4513,10	522,25	5922,17	8956,74	9967,83	0,90
2006	2475,80	60,47	9933,23	5870,52	5923,59	0,99	4500,00	480,72	5871,40	9202,28	9953,42	0,92
2007	2477,10	58,40	9859,27	6460,10	5935,61	1,09	4493,80	459,29	5820,64	9715,30	9974,33	0,97
2008	2407,13	60,40	9785,31	6376,05	6010,34	1,06	4487,80	437,07	5769,87	11618,48	9991,85	1,16
average						1,00						1,00

Source: own compilation

These results suggest that - as it has been mentioned above - low performance is due to the lack of capital in Hungary. As can be seen in Table 4, when the amount of capital available to the sector was taken into consideration, it was found that the performance of both countries is similar to the path determined by the 6 Western European countries. Consequently, the efficiency of the two countries is nearly identical. The Danish and the Western European model can be called intensive agriculture, the Hungarian and the Eastern European model can be called extensive agriculture. In the study the two models were examined separately.

The results are as follows:

- Hungary is not lagging behind at her own level of development (relative efficiency is +2%), whereas it is not true for Denmark, although in the 10-year test period it was only around 7%. If the average deviations are added up, then Hungary's performance was 9% higher than Denmark's performance. The intensive agriculture (with little work, lots of equipment) and extensive (lots of work, few machines) is irrelevant in terms of the growing scarcity of land. The per hectare agricultural outputs in the two countries are insignificantly different from each other.
- Performance in Denmark is not considerably high. Compared to countries at similar levels of development Denmark in the test period exceeded its potential output by 9%, while the other countries showed a significantly higher positive (116%) difference.
- In Hungary, it was the lack of capital that caused a nearly 60% shortfall compared with the developed countries. The output level was 8% higher than the potential output. Compared to the output of Eastern European countries, it was 2% better than the average (105%).
- When Denmark and Hungary are compared, we can say that 3 out of the 5 Western European countries show better performance than Denmark, therefore, according to the results of our study, Danish agriculture is not exemplary. The lack of the necessary capital and technology results in a lower level of performance compared to the Western European countries. Compared to the Eastern European countries, the performance of Hungary is also the 3rd out of the 5 Eastern European countries. Only Romania and Slovakia showed weaker performance.

3.1.4. Environmental criteria of sustainable agriculture in Denmark and Hungary

In the third stage of my research the seven-category system was expanded, and the main focus was on the examination of environmental risks caused by agriculture. Furthermore, the study aimed to examine whether the widely accepted view of Denmark's exceptionally high performance is true or only true in comparison to other countries having similar features.

The model applied in the previous study was slightly modified and a 7th factor was involved to elaborate a new metric system. The environmental factors quantifying environmental pressure were: nitrogen balance, water contamination, water abstraction, air pollution,

animal density and waste generated by agricultural activities. Another important modification was that only one year (2006) was studied instead of a time series of 20 years. The results of the study are summarised in Table 3.

Table 3. Efficiency ratios in Denmark, the Netherlands, Hungary and the Czech Republic (2006)

Studies	DK/NL	DK/ HU	HU/CZ
Original study	0,36	1,07	1,19
Original study with environmental pressure	0,36	1,04	1,02

The weights were the following: 0,1 0,1 0,3 0,05 0,4 0,05; weight with environmental pressure: 0,1 0, 1 0,3 0,05 0,35 0,05 0,05; order of factors were: culture, infrastructure, technology, institutions, inputs, physical environment and pollution.

When the performance of **Denmark and Hungary** is compared, the two countries show similar results. However, when environmental pressure is taken into consideration Denmark's advantage is less considerable.

3.1.5. The Common Agricultural Policy

The main issue addressed in Chapter is the Common Agricultural Policy. One reason is that European agriculture cannot be interpreted without considering the CAP on which about 40% of the common budget is spent. The other reason is that the Common Agricultural Policy is increasingly attentive to the issue of sustainability. One of the main ideas in my research is that the CAP should be formed into a political tool which is able to ensure sustainability in the long run, i.e. through its incentive measures the CAP should permit natural, social and economic sustainability. A historical overview of the Common Agricultural Policy and the summary of the effects of the reforms point out that the CAP is still illegitimate, incoherent and unsustainable.

3.2. New scientific results

The present study was designed to outline a possible sustainability criteria system. It was decided that the best method to adopt for this investigation was to develop a methodology to compare the different levels of efficiency and sustainability of agriculture in different

countries. I have concluded that agriculture can only be sustainable if it is either very immature (but in this case has low efficiency, and can ensure only self-sufficiency) or has a high level of development where there is an opportunity to preserve the environment without a significant loss of efficiency.

My main conclusion is that the sustainability of agriculture in developed countries can be ensured by only four pillars, and this fourth pillar can be called the political pillar. With this name I suggest that the governments of the countries and/or a supranational (EU) institution could provide the resources and the regulatory environment to ensure sustainability, which no doubt would require some sacrifice (e.g. lower levels of development).

The results concerning the research objectives (RO) and the hypothesis (H) are summarised as follows:

C1 This paper has given an account of the systematized notion and criteria of sustainable development and sustainable agriculture and the ways of interpreting the criteria. The three main aspects of sustainability (3 pillars), the economic, social and the environmental aspects together can create sustainability, and only together can they ensure the social and natural reproduction. In other words, sustainability is a decision-making process which search for the economic equilibrium of economic, social and environmental factors.

H1, H2 Sustainable agriculture is still remote and difficult to reach. Because market mechanisms in themselves do not contribute to the sustainability of agriculture, supports are necessary. Sustainable agriculture and the rural economy are influenced by food production, services and the service industry, trade, agricultural research, university education and even by politics, government and local government activities.

Consequently, to ensure sustainability, a 4th pillar, the pillar of politics - institution, or a supranational (EU) institution - would be required. The political pillar would make it possible to set the rules, without which only short-term interest decisions are possible, managers are not interested, because there is no political gain, the result can not be guaranteed, i.e. on the short-term the tragedy of the commons occurs. The results of sustainability provide the whole of society benefits only on the long-term.

C2 I examined the lessons of the agrarian development in the two countries. My research results show that in Denmark favorable conditions for the increase in production and

economic development were the result of the supporting institutional framework, whereas in Hungary institutional development was less advanced obstructing development. The level of gross agricultural output is much higher in Denmark, but this is achieved by significantly more input and among more favorable social circumstances. The national consensus-based operational agricultural strategy would be arguably important for Hungary to exploit its potentials.

C3 The third goal of the research was to compare and contrast efficiency of the two countries. The results are as follows:

H3, H4 The hypothesis that the Hungarian and Danish performance within their income peer group is better was only partially confirmed. According to my calculations, over the past decade, in Hungary the difference from the potential output and resource use (land and labour) is 2% higher than the group average. Contrary to the hypothesis, Denmark was 7% below the average for the Western European group. When the rate of the actual and potential outputs (Y/Y') were examined in Denmark 109, in Hungary 108% values were found.

H5 The differences between the efficiency of two countries were examined and an explanation was given to the results obtained. In summary, the results are the following: the difference in productivity is largely explained by the techniques used in the production and the superiority of quality, and the Danish producers use a much higher level of intermediate consumption. The role of the social, cultural and institutional framework is reflected in the performance of agriculture. In Denmark, the farmers can easily and quickly reach the most appropriate assistance, so the income produced in conjunction with appropriate support ensure reproduction and efficiency.

C4, H6 The possibility of measuring the achievements of agricultural sustainability was examined for Denmark and Hungary. Environmental pressure indices were also involved in the comparison. Without the environmental impact Denmark by was 7% more effective, however, taking into account the environmental impacts the difference between the values decreased to 4%. As a result, the initial hypothesis must be rejected that Danish agriculture is more sustainable than Hungarian agriculture. Since all seem to imply the contrary (eg, the proliferation of organic farming or renewable energy use, etc.), this result suggests that the hypothesis was correct, however, the applicability of the measurement system is questionable, and further justification is necessary. An increasing number of indicators are available (for

further reference see Table 1 or EPI Index), however, due to their complex nature, use is limited in assessing the sustainability of agriculture. The exploitation of natural resources and pollution is a serious global problem, but the need to integrate them into economic statistics has not been established according to my results.

C5 The results of the comparative study is as follows: in agricultural performance the cultural and institutional factors have a high importance. Agriculture in Denmark is more efficient due to the higher rate of capital input. Subsidies can be regarded as capital input – in Denmark farmers receive subsidies in an easy way so profit and the subsidies together can ensure reproduction and the necessary tools. In Hungary subsidies do not facilitate innovation and investments.

H7 After I concluded that in the EU the CAP could play the role of the fourth pillar of sustainability, the current distribution system of agricultural subsidies were analyzed. The reformed and restructured agricultural policy should incorporate sustainability and competitiveness together. This process has already started with an ever greater proportion of resources which are devoted to the axes of rural development that support sustainability.

3.3. Conclusion and recommendations for future research

My conclusion is that the fourth pillar of sustainability could be the Common Agricultural policy in Europe, therefore, further investigation and experimentation is strongly recommended to explore what the ideal distribution and allocation mechanism of the EU funds for agriculture would be like if the goal was to produce more food more efficiently, save the environment and realize more equitable income distribution.

The results of this research support the idea that the distribution of CAP subsidies should be defined individually tailored to the country's capability, taking into account the principles of solidarity, equal access, justice and equity. My analysis on the amounts of CAP subsidies shows that its distribution is neither efficient nor equitable thus violates economic rationality, social and community solidarity and it is not conducive to the preservation of environmental values.

Compromise can be made on efficiency, i.e., as Harvey said, it is possible to reduce coherence in favor of legitimacy or vice versa, but so far the system has not served either of them, moreover, the third aspect, sustainability has not been encouraged as well.

It might be worth taking into account the country's capabilities when awarding the grants. The reason for this is that the EU funds will not grow, but will decrease, while funding is provided to an increasing number of acceding countries. For example, if a less developed (poor) EU country has a lot of high quality agricultural areas, many people are employed in agriculture for low wages, the major export items are agricultural products, and the per capita income in purchasing power parity is only third as much as in developed countries, then subsidies should be given taking into account the capabilities of the developing country – e.g. vegetable and fruit cultivation, training of the workforce in rural areas.

The first pillar of the CAP emphasizes the economic aspect of sustainability, so this pillar should be called the pillar of food market. The 2nd (rural development) pillar points out the social aspects of sustainability, therefore, as Jám bor and Harvey (2010) suggest, there is a need for developing a third pillar of CAP, whose role would be to emphasise the environmental aspects of sustainable agriculture. The institutional factors of the future 2 +1 pillar Common Agricultural Policy would be the EU budget, the WTO, the Lisbon Treaty and the legal system of the EU.

B. This study set out with the assumption that the development of agriculture can be understood along two dimensions and performance is inseparable from sustainability.

The issue of the U curve is an intriguing one which could be usefully explored in further research. Future research should therefore concentrate on the investigation of values representing performance and sustainability and approximately 150 countries would be positioned in the corresponding coordinate system to examine the relevance of the hypothesis.

PUBLISHED LITERATURE RELATED TO PHD TOPIC

I. Articles in scientific journals:

A) In English:

1. J. BEKE LISÁNYI (2010): Integration of environmental components in measuring the performance of the agricultural sector in selected countries. In: *EU Working Papers*. XIV. évf. 1. szám, p. 77-88.
2. BEKE J. – FORGÁCS A. (2011): Measuring the performance of agriculture. Proceedings of Budapest Business School. II. évf., p. 120-128.
3. J. BEKE LISÁNYI (2011): Statistical and “green” evaluation of agricultural efficiency in Denmark and Hungary. In: *Regional and Business Studies*. Vol. 3. No. 1, 12-15, Kaposvár University, Faculty of Economic Sciences, Kaposvár.

B) In Hungarian:

1. LISÁNYI ENDRÉNÉ BEKE J. (2008): Dánia agrárgazdasági eredményei. In: *Heller Farkas Főiskola Tudományos Közlemények*. 5. szám, p. 200-208.
2. LISÁNYI ENDRÉNÉ BEKE J. (2009): A dán agrárfejlődés történeti sajátosságai. In: *Európai Tükör*, XIV. évf. 10. szám, Magyar Köztársaság Külügyminisztériuma Budapest, p. 25-37.
3. LISÁNYI ENDRÉNÉ BEKE J. (2009): Agrárpolitikai tapasztalatok: Dánia és Magyarország agrárgazdasági eredményeinek összehasonlítása. In: *EU Working Papers*. XIII. évf. 2. szám. p. 64-76.
4. LISÁNYI ENDRÉNÉ BEKE JUDIT (2009): Magyarország és Dánia mezőgazdasági fejlődésének tanulságai. In: *A falu*. Agroinform kiadó, 2010 tavasz, XXV. évf. 1. szám, p. 49-60.
5. FORGÁCS A. – BEKE J. (2009): Dánia és Magyarország mezőgazdasági szektorának történeti és hatékonysági összevetése. In: *Heller Farkas Füzetek. Közgazdaság- és Társadalomtudományi Folyóirat*. VIII. évfolyam, Gazdaság- és eszmetörténeti tanulmányok”. Szerk.: Botos Katalin – Schlett András, p. 76.-88.
6. BEKE J. – FORGÁCS A. (2010): A modern mezőgazdaság teljesítményének mérhetőségéről – komparatív szektorelemzés. In: *EU Working Papers*. XIV. évf. 1. szám, p. 89-101.
7. BEKE J. – FORGÁCS A. – TARJÁN T. (2011): Európai Unió országcsoportok mezőgazdasági teljesítményének összehasonlító vizsgálata. In: *Gazdálkodás*. 2010. I. szám, p. 39-51.

II. Scientific conference full papers in Hungarian published in proceedings:

1. LISÁNYI ENDRÉNÉ BEKE J. (2009): Dánia agrárgazdasági eredményei. In: *Tudományos Közlemények*. 5. szám, Budapest, p. 198-210.
2. FORGÁCS A. – BEKE J. (2009): Dánia és Magyarország mezőgazdasági szektorának történeti és hatékonysági összevetése. In: *Magyarország tényleg más? „Egy műhely vonzaskörzetében”*. Pázmány Péter Katolikus Egyetem, Budapest, p. 138- 140.

III. Scientific conference full papers in English published in proceedings:

1. LISÁNYI ENDRÉNÉ BEKE J.: The place of agriculture in the green national accounts. In: *Proceedings of the 7th International Conference on Computational Cybernetics*. 26-29. November 2009, Tyrp Bellver, Palma de Mallorca, Spain, p. 75-80. ISBN 978-1-4244-5311-5, IEEE Catalog number: CFP09575-CDR. Library of Congress: 2009936140.

IV. Scientific conference lecture abstracts in Hungarian:

1. LISÁNYI ENDRÉNÉ BEKE J. (2008): Dánia és Magyarország mezőgazdaságának és vidékfejlesztésének összehasonlító vizsgálata. Konferencia a Magyar Tudomány Napja tiszteletére. Kultúraközi párbeszéd az üzleti világban. 2008. november 6-7. BGF Programfüzet, p.150.
2. BEKE J.– FORGÁCS A. (2009): A modern mezőgazdaság teljesítményének mérhetőségéről – komparatív szektorelemzés. Konferencia a Magyar Tudomány Napja tiszteletére. Válság és Megújulás 2009. nov. 5-16. BGF Programfüzet, p.103.
3. FORGÁCS A. – BEKE J. (2009): Dánia és Magyarország mezőgazdasági szektorának történeti és hatékonysági összevetése. Magyarország tényleg más? Tudományos konferencia a PPKE Gazdaságtörténeti Doktori programjának 10 éves évfordulója alkalmából 2009. nov. 26. p. 138-140.
4. BEKE J.– FORGÁCS A. (2010): Többet érdemel-e Magyarország? A KAP támogatások elosztási elveinek vizsgálata. "Merre tovább? - Gazdaság és társadalom, realitás és esély". Konferencia a Magyar Tudomány Ünnepe tiszteletére, 2010. November 3-4. BGF Programfüzet, CD.

V. Others

1. FEHÉR I. – BEKE J. (2008): A mezőgazdaság gazdaságfejlődésbeni szerepe. In: *Gazdálkodás*. 52. évf., 3. szám. p. 249-250.
2. FEHÉR I. – BEKE J. (2008): The Role of Agriculture in Economics. The Lessons of History by Soren Kjeldsen-Kragh. Könyvismertetés. In: *Gazdálkodás*. 52. évf, 3. szám, p. 294.