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Ph.D. thesis

**ANALYSIS OF CERTAIN ECONOMIC FACTORS OF THE
HUNGARIAN SHEEP SECTOR**

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1. SCOPE AND GOAL OF THIS RESEARCH

The sheep branch, by means of its products, is considered to be a special branch, as it produces good quality consumer products on the poorest areas, while still earning above-average profits. The price of mutton and lamb meat is relatively expensive, compared with other meat types. The wool, because of its naturalness and high processing cost, is also an expensive product; while special dairy products made from ewe milk (such as curd and ewe-cheese) are also valuable and popular goods. As a result of the crisis in the branch experienced in the last decade, there was a significant decline in the production and trade of sheep products, and this affected various sheep products distinctly according to geographical areas of production and with respect to their economic relevance.

The consequence of this crisis led to the decrease in the world's sheep stocks during the last decade. During the period between 1991 and 2003, sheep stocks decreased by 180 million animals worldwide, dropping to the level in 1973. The reasons behind this stock decrease may be found in economic problems, such as profitability reduction and decline of subsidies. These phenomena appeared even in the world's leading sheep keeping countries. A significant decline was also experienced in world trade. New Zealand, the leading exporter of deep-frozen lamb meat, obtained results by improving its breeding and production indicators in consequent and successful ways, and now controls 60% of total exports. New Zealand's producers are attempting to spread into the United States, Northern and Western Europe, and to gain new markets for its ready-to-cook products, all on the basis of excellent marketing work. Australia exports mainly live sheep stocks to the Middle East. Half of the exports in world production go to North Africa, the Middle East and the European Union.

In the last decades, the sheep sector was the most contradictory field in Hungarian agriculture; its production standard has been decreasing for decades (NÁBRÁDI – JÁVOR, 2002). Both the rise and the dramatic drop in production are typical for the sector. Livestock numbers are smaller, the average yield and the gross production stagnating, and the quality of the products is weak.

The reasons for the existence of the sheep sector is unambiguously justified by Hungary's ecological conditions, large grazing land and pasture, the utilization of arable land which has weak fertility, the relatively lower capital need of the sector, the use of the already existing

assets (such as buildings, machines, equipment), expertise and market demand (VERESS, 1996). The number of ewes in Hungary continuously decreased in the 1990s, and as a result, about 900 thousand ewes were registered at the end of the 1990s. At the same time, the ewe stock grew by 23% from 1999 to 2000 (from 727 thousand to 897 thousand ewes) (BORSOS et al., 2003). The reason for this increase in ewe stock was the fact that the sheep stock of private farms increased in 2000; 83% of Hungary's sheep stock could be found in private farms in this year. This kind of development did not occur in 2001, when private farmers owned 80% of the total stock. The role of the sheep branch in animal husbandry, as well as in the national economy, is not negligible, in spite of the fact that its share decreased from the gross production value of agriculture, as most of the ventures in the sector operate in areas under unfavorable economic and natural conditions, that is in areas of multiple disadvantageous conditions (such as Hajdú-Bihar county) (LAPIS – SZŰCS, 2002; SZÖLLŐSI, 2006). The share of the branch is 1% of the gross production value of agriculture (KUKOVICS et al, 2008). Approximately 36% of Hungary's sheep stock were found in the North Great Plain region (16,5% in Szabolcs-Szatmár-Bereg county, 14,7% in Hajdú-Bihar county) in 2001. These territories are characterized by high unemployment rates, and the quality of the significant part of these agricultural areas does not make competitive field plant cultivation and animal husbandry based on this possible. Therefore, keeping sheep stock satisfies not only the production purpose, but it may have significant roles in retaining the population of the previously mentioned areas, creating jobs, maintaining subsistence opportunities, utilizing territories, regional development, using areas of weak conditions, as well as in agricultural environment of certain regions. Developing the sector and sheep-farming mean much more than developing the sheep stock. The development and reanimation of the processing industry, milk industry and meat industry built on the sector should have a great significance. This would serve the development of the employment and keeping the labor force in place, as it ensures the existence of more than 7000 families, as well as for those working in the processing industry, transportation or feed production industries related to the sheep branch.

The problems mentioned above greatly influenced my selection of the subject of my dissertation. As I live in the village of Hortobágy, which is located in one of the disadvantageous regions in Hungary, the mentioned problems also have effects on me and the members of my family. Hortobágy has a population of 1400, and the dissolution of the Hortobágy State Farm meant that the job opportunities the village had on offer have decreased

over time. This is also true for the sheep farms and the export sheep slaughter-house of the former Hortobágy State Farms. The last one went through continuous ownership changes in the 1990s and became an Italian property in 1998. The Italian owner has several slaughter-houses in Europe, and operates the slaughter-house in Hortobágy as an auxiliary firm. The Italian owners only start operations if the conditions on the world market would make this profitable. As a result, the capacity utilization has continuously decreased in the slaughter-house. In this way, this workplace, which ensured subsistence for more than one hundred people in Hortobágy and in the neighboring communities, is utilized below capacity, having dropped already below 5%, thus limiting the opportunities for Hungarian producers and traders. At present, the number of employees is only 3.

The Hungarian consumers cannot buy any domestic product of good quality from the sheep sector as these products are extremely expensive, so a Hungarian consumer can only buy refused products and products sold by necessity.

Due to my being personally affected and my vocation to the sheep branch, my objective is to search for breaking points in the branch reasonably declared to be unsuccessful, by which Hungarian sheep breeding may improve its marketing position and raise its revenue.

One can only be successful on today's global market if one is able to continue to offer customers competitive prices for demanded quantity. If costs are high - and even the prime costs of the domestic sheep branch are high - then other opportunities have to be sought for marketing purposes. To utilize the breaking points mentioned above, the research objectives of my dissertation are the following:

- Evaluating the present situation and position of Hungarian sheep breeding.
- Investigating lamb prices thoroughly, illustrating seasonal tendencies on the potential markets of the European Union.
- Comparing the applicability of different prognosis methods for forecasting lamb prices.
- My investigations should contribute to strengthening decision making activities of farmers, in order for them to produce products which will be in harmony with market demands, to decrease marketing uncertainty and to improve the profitability of sheep keeping.

2. PRELIMINARIES OF THE RESEARCH AND THE UTILIZED METHODS

2.1. Preliminaries of the Research

The selection of my research subject dates back to 2002, when I wrote my Master's thesis at the Université de Lyon Jean Moulin 3 DESS CAAE and in the postgraduate MBA program at the University of Debrecen. In determining my final PhD and research subject, I strove to harmonize it with the doctoral program of the Doctoral School of Interdisciplinary Social and Agricultural Sciences and the scientific research carried out at the Department of Economic Analysis and Statistics.

2.2. Methods Used During the Research

In order to evaluate the present position of the Hungarian sheep branch, I utilized the commercial data of the Sheep Product Council. In addition to using descriptive statistics for this analysis, I used the methods of analyzing time series and variance analysis. In order to evaluate the present profitable situation of lamb fattening, I constructed a valuating system, in which I strove to take the modifying factors into consideration in a holistic way. To reflect the tendencies of lamb prices in the European Union and the seasonal fluctuations, I used the data of the Market Price Information Service of the Research Institute of Agricultural Economics and the Directorate-General for Agriculture and Rural Development of the European Commission (DG AGRI). I used descriptive statistics, correlation calculation and time series analysis for my examinations.

On the basis of my investigations, there is a significant seasonal fluctuation in European lamb prices; the rate and timing of these changes differs by country. Price is an important component of profitability; assessing its expectable tendency is relevant information for farmers. In the case of Italian lamb prices and their meaning for our main market, I compared the applicability of different prognostic methods by using the data of the Directorate-General for Agriculture and Rural Development of the European Commission (DG AGRI). I analyzed these data with the help of Microsoft Excel 2003, SPSS 13.0 and X-12 REGARIMA statistical programs.

3. MAJOR FINDINGS OF THE DISSERTATION

I investigated the selling data, such as selling price, average weight, sold quantity and the profit conditions of lamb fattening. Furthermore, I carried out the analysis of Hungarian and international lamb prices and, as a final point, I compared the applicability of different prognostication methods for lamb price.

3.1. The Profit Conditions of Lamb Fattening in Hungary

The aim of my analysis was to examine the reachable surplus profit during lamb fattening. When defining the method of the evaluation, I strove to take the modifying factors into consideration in an all-rounded way.

The results as a whole proved the farmers dealing with keeping domestic sheep, that is the significant part (79%) of the lambs, are sold in three weight categories. Weaned lambs between 20 to 24 kilograms belong to the first weight category, ewes and rams between 24 to 27 kilograms constitute the second weight category, and rams between 27 to 30 kilograms are sold in the third weight category. I analyzed the profit of fattening in every weight category, but in this case I introduce the results of only the category between 24 to 27 kilograms in a detailed way. My calculations show (Figure 1) that the profit is 65 HUF per lamb in case of ewes between 24 to 27 kilograms, while it is 293 HUF per lamb in case of rams between 24 to 27 kilograms, and it is 396 HUF per lamb in the category between 27 to 30 kilograms. In other cases, fattening or keeping the animals for longer periods resulted in losses.

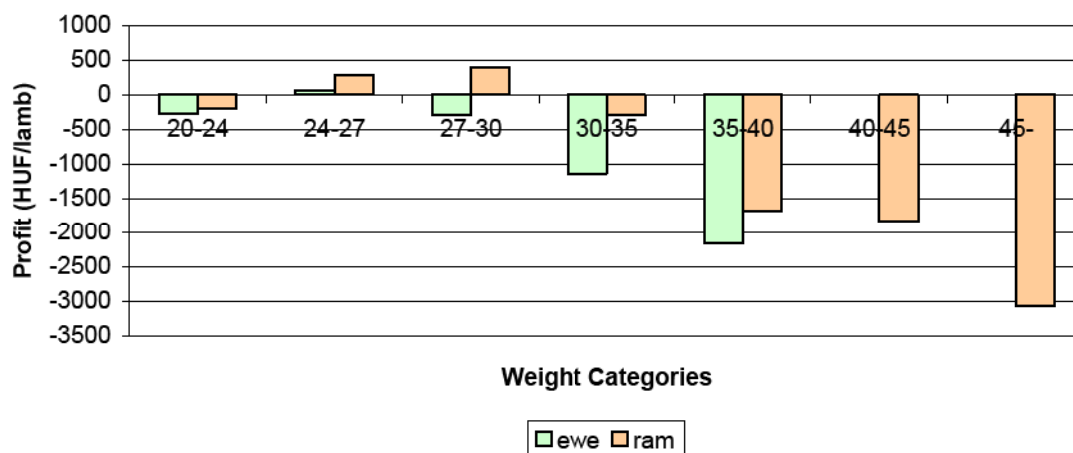


Figure 1.: Per Lamb Average Profit in Weight Categories between 1998 and 2006

Source: Own calculation on the basis of data from the Sheep Product Council

Lambs over 35 kilograms cause a 2152 HUF loss in the case of ewes, and rams over 45 kilograms produce a 3062 HUF deficit. These profit data relate to the average of the examined nine years. Deviations may be experienced between specific years and fattening periods in the detailed analysis.

In practice, most lambs are sold in the weight category between 20 and 24 kilograms, which constitutes 37% of the whole population. According to my calculations, fattening lambs in this weight category results in losses for sheep farmer. The deviation comes from the fact that, in the model, lambs of 16 to 20 kilograms being fattened are weaned and this is followed by an intensive fattening period. Contrary to this, farmers often reach the selling weight of 20 to 24 kilograms by extended suckling.

Examining the weight category of 24 to 27 kilograms, which constituted 27% of the sold quantity within the period of 1998 and 2006, I concluded that, considering the data of the four fattening periods, the biggest profit per lamb could be reached in the summer fattening period in the average of the eight years. This was followed by the spring and fall periods, and lamb fattening during the winter period seemed to be the less profitable (Table 1)

Table 1

Per lamb Average Profit from Fattening in the Period between 1998 and 2006

Denomination	Spring	Summer	Fall	Winter
Profit (HUF/lamb)	174	206	179	157

Source: Own calculation on the basis of data from the Sheep Product Council

Under domestic conditions, insemination is typical in autumn. In this case, lamb fattening occurs at the end of the winter period and in spring, depending on the time of fertilization. For this period, the biggest demand depends on the precise date of Easter, in March and April, and this is the period in which the fluctuation of prices is the greatest. It would be worth using up the opportunities of the summer period in August as, though it is true that selling prices were the lowest in this period during the examined eight years, the profit from lamb fattening is the highest at this time. The timing of lamb fattening should be adjusted to market demand and sufficient quantity should be in the market in periods when the demand is low.

Regarding both sexes, the profit from fattening was outstanding in 2001 among the nine years in every period. This was the year when the average selling price of the weight category of 24

to 27 kilograms was the highest in real value, in comparison with the year 1998. Thus, this outstanding profit was attributable to the selling price typical to the given year. This fact shows that the tendency of lamb prices can barely be forecasted in most of the times. Focusing on the data of ewes belonging to the category of 24 to 27 kilograms, fattening was profitable in every second year. Selling fattened lambs in the category of 24 to 27 kilograms resulted in significant losses for farmers in the years 1998, 2000, 2002 and 2004 (Figure 2). During the summer fattening period, only minimal profit (59 HUF/lamb) was gained in 1998. Producing fattened lambs in this category was profitable in every period in 1999, for which the summer period was also outstanding (200 HUF/lambs). The different profit fluctuations of certain years are modified by several factors, such as the tendency of selling price, which is considered to be unpredictable. This is greatly determined by the quantity and quality of products offered by the competitive partners in the market in the given period.

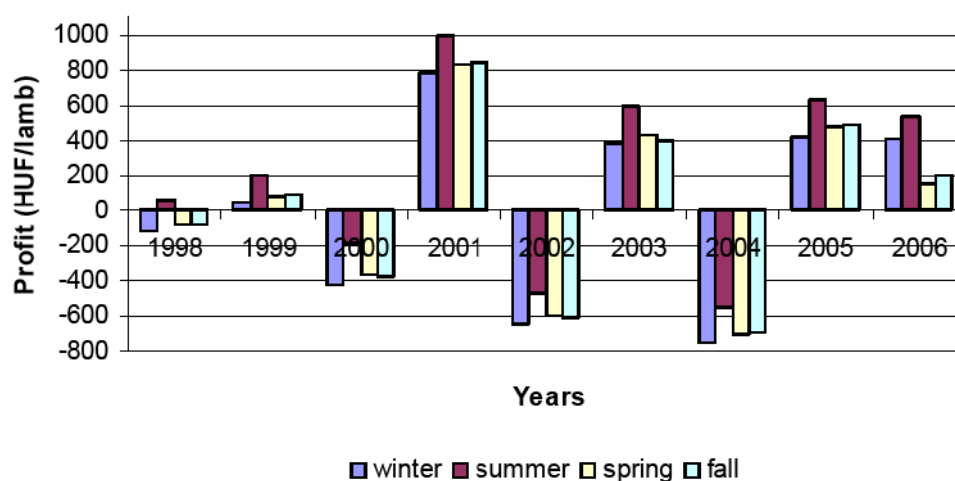


Figure 2: Profit of Fattening ewes of 24-27 kilograms between 1998 and 2006

Source: Own calculation on the basis of data from the Sheep Product Council

The profit from fattening of ram lambs is more favorable than in case of ewes (Figure 3). Two periods have to be highlighted, 1999 and 2004, where fattening led to losses. Even the summer period of 1998 posted a loss of 83 HUF per lamb.

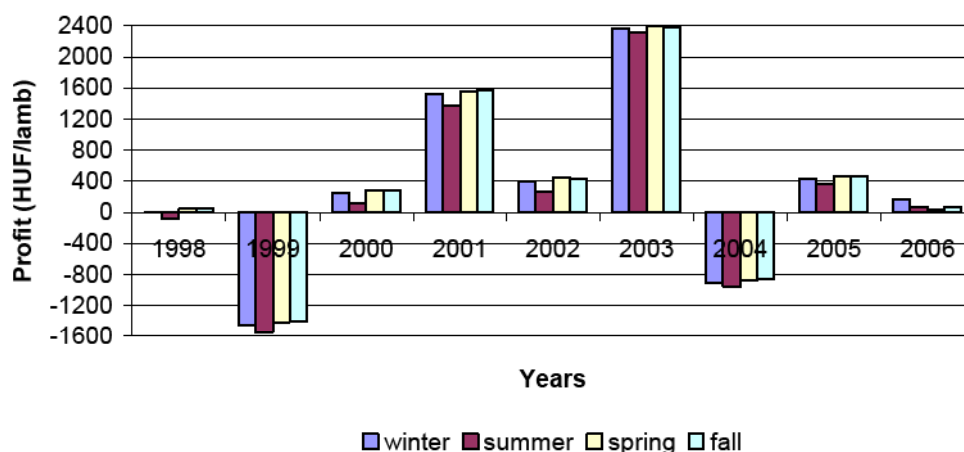


Figure 3: Profit of Ram Lambs of 24-27 kilograms between 1998 and 2006

Source: Own calculation on the basis of data from the Sheep Product Council

Farmers who sold their products in this category in other years and periods made good decisions. The year 2003 is outstanding, as per fattened lamb profits exceeded 2300 HUF in every period.

3.2. Analyzing Data of Domestic Live Lambs Between 1998 and 2006

On the basis of an analysis of export data for Hungarian live lambs, it turned out that the period following EU accession hardly caused any changes in the Hungarian sheep branch. Even the market conditions did not change, as almost the entirety of the national hogget goods was exported to Italy before and even after the accession. Examining the output trend for the nine years between 1998 and 2006, the export quantity decreased by 3681 animals. In 2006, 829 thousand hogget were exported, which equals that for Italian export, and is similar to that for the previous years.

The export of hogget is characterized by three main seasons: Easter, Ferragusto and Christmas. On the basis of available data, I investigated the selling data of different seasons, such as quantity, price and average weight; and examined how the data of the different periods run in comparison with the basic trend.

On the basis of my focusing on the number of exported animals, I concluded that the demand peaks in March-April, as well as the one in December, strongly influence the exported

quantity, but the effects were dissimilar in the examined years. The most intensive transport related to Easter in every year.

The seasonal deviation on the basis of data from the period between 1998 and 2006 reflects (Figure 4) that compared to the basic trend, the second quarter is outstanding, as in these periods of the year, an average 14.5% higher sales were realized. In the third quarter, the sold quantity somewhat exceeded the trend value, while in the first and fourth quarters fewer animals were sold. Three months have to be highlighted among the nine years: March in 1999 (207 thousand), April in 2001 (2013 thousand) and December in 2001 (178 thousand).

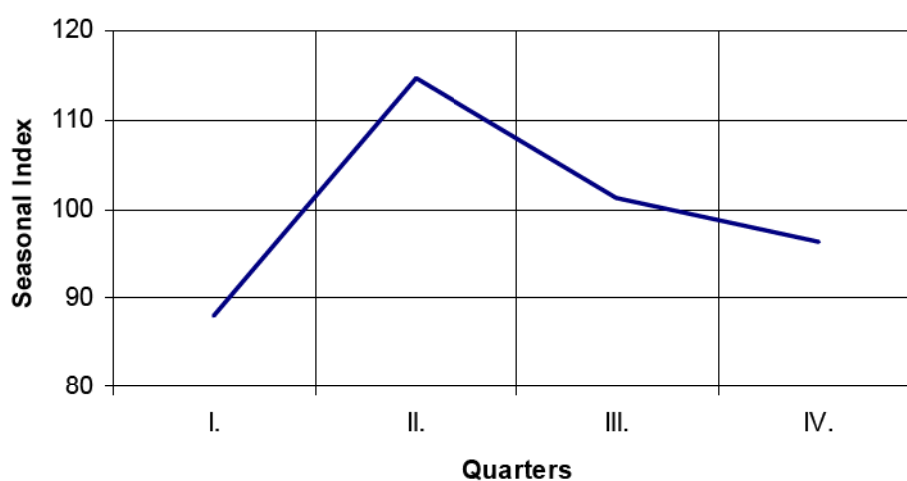


Figure 3: The Seasonal Deviation of the Sold Animals on the basis of Data of 1998 to 2006

Source: Own calculation on the basis of data of the Sheep Product Council

In summary, the cyclical changes within a year run similarly in every year. The most significant export occurs at Easter, when approximately 30% of the total export is sold. The second most important period is Christmas, when 20% of the total exported animals are sold.

3.3. Lamb Prices in the European Union between 2004 and 2007

I had an opportunity to study the lamb prices of the European Union on the basis of the database and meat market report published biweekly by the European Committee and the Market-Price Information Service of Agricultural Economics Research Institute. Regarding the sheep carcass market in the European Union, prices relate to lambs over 13.1 kilograms as well as lambs below 13 kilograms, depending on which one is typically sold in a particular member state (STRUMMER, 2005). On this basis, seasonal fluctuations of prices for lambs

over 13 kilograms and for lambs below 13 kilograms in the European Union are investigated and analyzed separately. The average live weight of Hungarian lambs being exported is about 19 to 21 kilograms, thus the need to introduce the topic of domestic prices related to lambs below 13 kilograms to be introduced in the thesis.

Comparing prices is only limitedly possible because these evolved in another trading condition system. With smaller mistakes, the prices of live lamb and hogget may still be compared, as both of them reflect the real value gained for the animal. Hungarian prices are determined on the basis of this understanding. The rules of reception differ by country; the place of price calculation, the transportation distance and waning are also different.

The limits of comparative evaluation of Hungarian and European data are:

- the price fluctuation is distorted even by any change in the HUF exchange rate;
- settlement prices are used in Hungary, which are lower because of the need to taking over the cutting fee and transport costs.

Lamb prices in Hungary had largely mirrored the tendencies for the average price in the European Union until the middle of 2005, and then they fell behind (Figure 5).

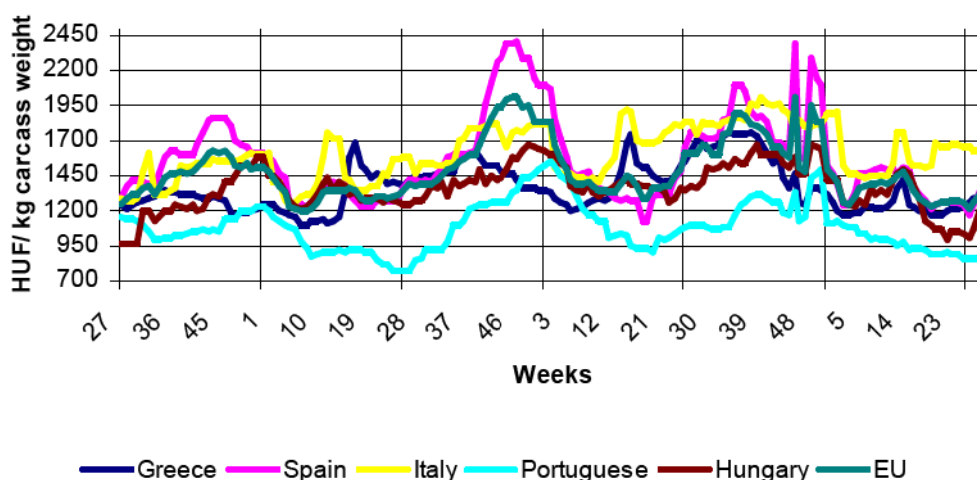


Figure 4: The Tendency of Average Price of Lambs below 13 kilograms between 2004 and 2007

Source: Own construction on the basis of data of Agricultural Economics Research Institute and DG AGRI

Prices decreased after the Christmas export both in the member states of the EU and Hungary. Seasonal effects realized in the changes. Lamb prices in 2006 exceeded those of the previous year by 5 to 10%. The prices of the first eleven weeks of 2007 approached the prices of 2005.

Greek authorities proposed a regulation forbidding the import of live lamb for the safety of their own farmers, which heavily influenced the Easter prices and the exported quantity in 2007. Accordingly, Hungarian live lamb could not appear on the Greek market either.

Registered and large-scaled fluctuations became typical for the prices of the analyzed countries within a short period. The instability of prices differs by country. The fluctuation of prices was the greatest in Spain, while it was the lowest in Greece. Because of the price changes, farmers often suffered great losses. Thus, timely market adaptation of production has to be improved. It would be useful to develop a balancing – self-supporting fund for farmers in order to balance the prices.

The Hungarian sheep sector is strongly export-orientated, in this way prices in foreign markets as well as the quantity to be sold determine the results of the sector to a great extent (Figure 6). The Italian prices determining exports exceeded Hungarian lamb prices by an average of 17%. The Italian prices were six times lower than the Hungarian lamb prices at the end of 2005 and 2006. The Greek prices were lower than the Hungarian prices from the 42nd to 44th week, and this tendency lasted from the 12th to 15th week of the following year.

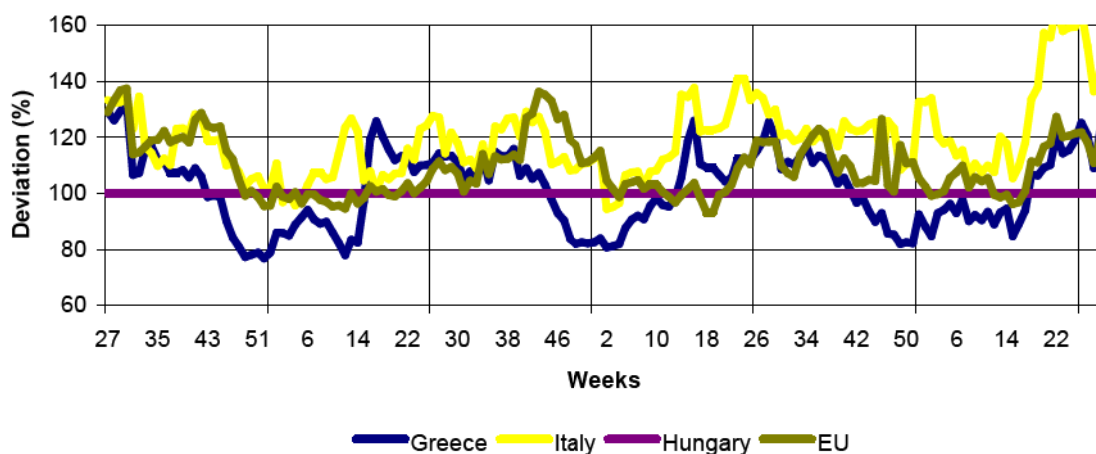


Figure 5: Greek and Italian Prices in Comparison with the Hungarian Prices between 2004 and 2007

Source: Own construction on the basis of data of Agricultural Economics Research Institute and DG AGRI

More than 95% of the sold lambs are exported as live lambs from Hungary, and Italy and Greece constitute the biggest markets. The competition becomes stronger in the sheep market of the European Union, primarily Romania is considered as a significant competitor to Hungarian farmers. The price changes in the export markets influence the tendency of Hungarian prices. Thus, I investigated what correlation exists between the Hungarian and the

Greek and Italian prices, as these represent our two main markets. I carried out two-variable-correlation calculation in order to measure the intensity and the tendency of the correlation. The stronger the correlation between the two variables is, the nearest the value of the coefficient is to 1. Table 2 contains the values of the correlation coefficient calculated on the basis of prices of the period between the 27th week of 2004 to the 29th week of 2007.

Table 2

The Correlations of Italian and Greek Lamb Prices with Hungarian Lamb Prices

Denomination	EU-Hungarian	Italian –Hungarian	Greek -Hungarian
Correlation coefficient	0,74	0,71	0,34

Source: Own calculation on the basis of data of DG AGRI

The examination verified the findings published in the literature relating to the subject, i.e. the prices in the meat market of the European Union influence the tendency of the Hungarian lamb prices to a great extent. The coefficient of 0.74 between the average prices of the European Union and Hungary reflects a strong correlation. Especially in case of Italian prices, as significant parts of the Hungarian lambs are sold on the Italian market, and the correlation coefficient of 0.71 shows a strong correlation between the tendency of the two prices. There is a weak correlation between Greek and Hungarian prices on the basis of this calculation. After Italy, Greece is the second biggest market for Hungarian lambs, but the transported quantity lags rather behind the quantity sold to Italy. The ratio of animals exported to Greece is 0 to 12% during the past 10 years. This value was 12% in 1999 and 2000, and 1% in 2002. The remaining part almost as a whole was transported to Italy.

3.4. Seasonal Investigations of Lamb Prices on the Basis of Long-term Time Series

In addition to the Hungarian prices, I had the opportunity to analyze the long-term time series of prices in case of Italian and Greek lambs below 13 kilograms and those for English and French lambs over 13 kilograms according to the database of the European Commission. On the basis of the available data, I carried out the examination of seasonal fluctuation, from which I focus on the seasonal indexes of prices for lambs below 13 kilograms.

Fluctuation in the average prices of twelve years may provide useful information for farmers. Deviation from the trend may help in breeding organizations and in conformation to markets,

even if price tendencies of certain years differ from the 12-year-average. As there is a strong correlation between the Italian and Hungarian prices, the data illustrated in the figures may be utilized by Hungarian farmers, as well. According to the curve with two peaks, the highest prices are experienced at Easter and Christmas. Data reflects that February, July and August (surprisingly) seem to be the lowest periods in the Italian market (Figure 7)

It is also relevant to evaluate Greek prices (Figure 7), as the Greek market is a supplementary market for Hungary. This phenomenon is strengthened by the Greek data, as in the price fluctuation, the periods of peak and low prices occur in different months than they do in Italy. In Hungary, there are three determining periods in hogget marketing due to the seasonal demand in the export markets. These are Easter, Ferragusto and Christmas. Because of the seasonal effect, lamb prices in Hungary decrease from the beginning of the year (Figure 7). The price increase starts several weeks before Easter, together with the increasing number of exported animals.

In accordance with Hungarian breeding customs, lamb supply is the greatest in the Easter period. In spite of the great demand, this period in Europe is generally characterized by over-supply, which results in lower prices. In order to increase the revenues from lamb marketing, it would be necessary to increase export more evenly throughout the year. In the second part of the year, the supply is more moderate and the prices are more favorable. The one-market-type typical for lamb marketing increases the defenselessness of the branch; thus, besides the Italian market, it would be desirable to increase transports to countries where lambs of greater weight are preferred.

France or Germany could be such markets for us. In addition to selling lambs below 13 kilograms, it would be important to endeavor to market lambs over 13 kilograms by improving the quality and profitability of fattening.

The tendency of Hungarian prices generally follows the prices of the most relevant markets (Figure 7). Similar to Italian prices, the increase of lamb prices begins as early as September. At the end of the year, the demand of South European countries grows by the coming holidays.

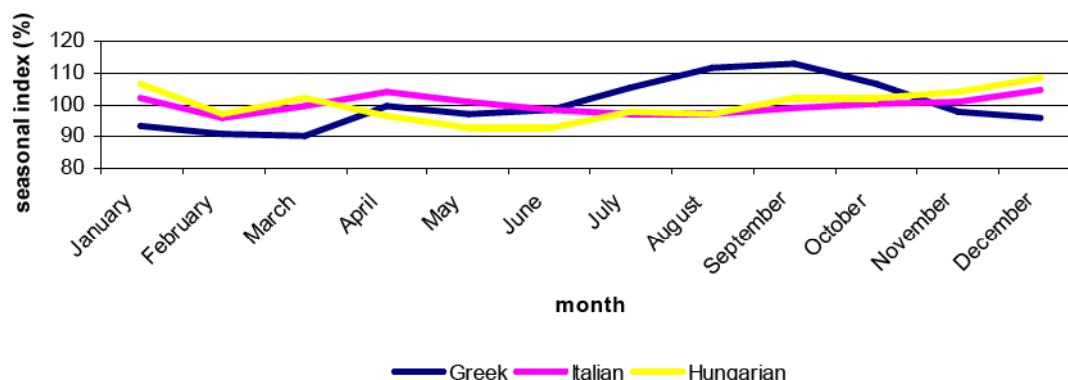


Figure 6: Seasonal Fluctuations of Prices on the Basis of Data of Period between 1996 and 2007

Source: Own calculation on the basis of database of DG AGRI

The high Easter prices are followed by a great price decline in Hungary, similar to what occurs with Italian prices, but its ratio is even higher. Greek prices follow the product supply in a better way due to the seasonal lamb production of dairy sheep farms.

3.5. Applicability of Different Prognosticating Methods in Forecasting Lamb Prices

There is a significant seasonal fluctuation in European lamb prices; the rate and timing of the changes differs by country. Results gained through studying the literature and analyzing the lamb trade urged me to analyze to what extent the lamb prices may be prognosticated. Using data of the European Commission, I carried out the prognostication of the selling prices of Hungarian and Italian lambs on the basis of monthly data from the period between 1998 and 2004.

I compared the applicability of five methods. I constructed 13 competing models for Hungarian data and 14 competing models for Italian data, in order to forecast the lamb prices.

The prognostication of data was examined in forecasts for both the short-run and the long-run. To evaluate the short-run prognosticating ability of the models, I assessed the following month, such as January of 2005 on the basis of the data in the period between January of 1998 and December of 2004. Then, I evaluated February of 2005 on the basis of the period between January of 1998 and January of 2005, and so on, until December of 2006.

It is difficult to decide which method seems to be the most appropriate for prognosticating lamb prices. Therefore, first every model was illustrated in figures giving a deviation zone of $\pm 5\%$ in the figures besides the original and the forecasted data. The prognostication by seasonal decomposition seemed to be the best method in the case of the Hungarian database; the prognosticated values are mostly within the 5% zone.

To answer the question, I took the following aspect into consideration: the prognostication is the best when the data fit closer to the original data.

- I calculated the differences between the original and the prognosticating data.
- I ranked the methods on the basis of the absolute value of the differences calculated by periods.
- I aggregated the gradations and calculated the average scores of the methods.

In the cases of both time series, those methods ranked in the top three places which handle the seasonality issue (Figure 8). In prognosticating Hungarian data, the seasonal decomposition, ARIMA (111)(100) and ARIMA (010)(100) models were the most applicable methods.

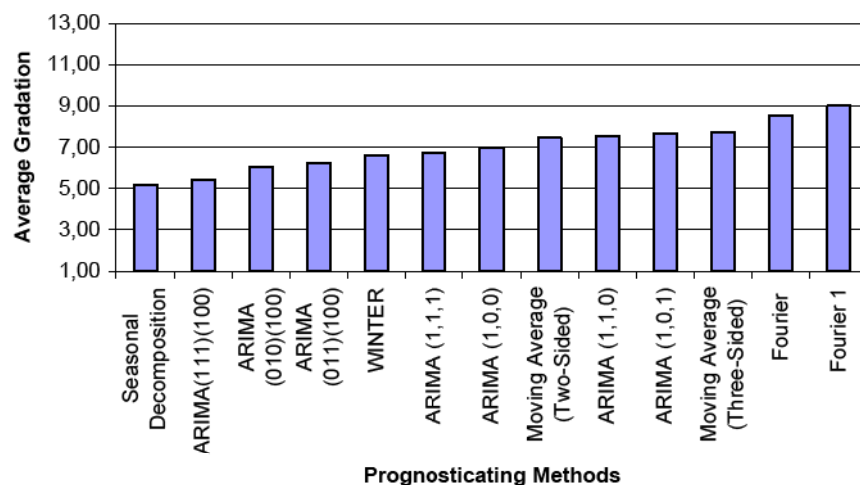


Figure 7: Average Gradation of the Prognosticating Methods Applied for Hungarian Lamb Prices

Source: Own calculation on the basis of database of DG AGRI

On the basis of the results and gradations, I created classes among the methods with the help of cluster analysis, the elements of which attach to each other by the closest way and differ relatively from the elements of the other clusters. The created classes are shown in Figure 9.

Among the methods handling seasonality, seasonal decomposition and SARMIA models got into the same class.

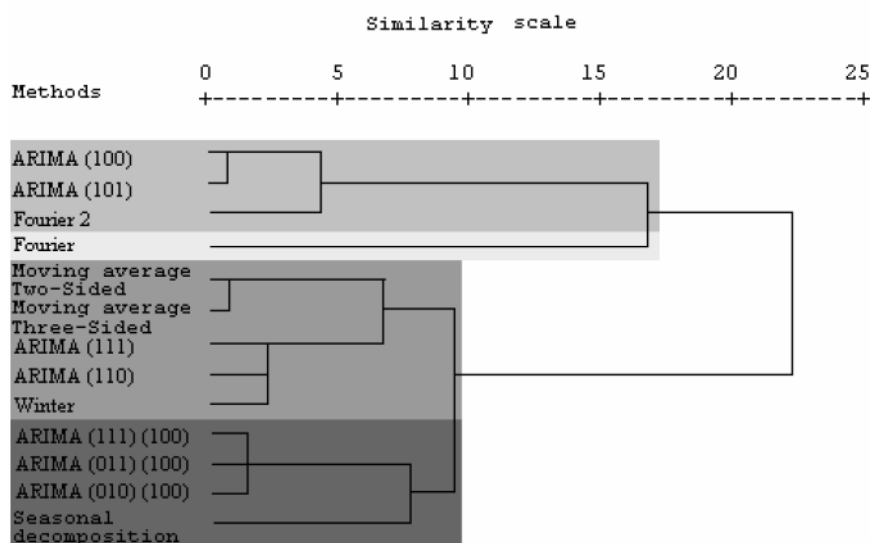


Figure 8: Methodological Clusters Created by Cluster Analysis

Source: Own calculation on the basis of database of DG AGRI

When ranking the prognosticating methods of Italian data similarly to the Hungarian data series, ARIMA (100)(110), seasonal decomposition and ARIMA (010)(100) models proved to be the most applicable methods (Figure 10).

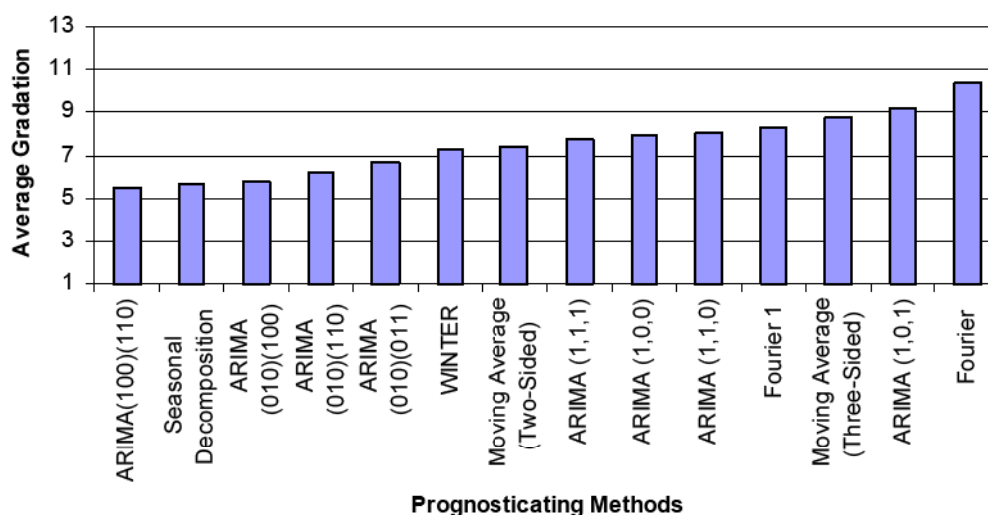


Figure 9: Average Gradation of Prognosticating Methods applied to Italian Lamb Prices

Source: Own calculation on the basis of database of DG AGRI

Figure 10 illustrated the clusters created during cluster analysis. Similarly to the classification of methods applied in Hungarian prices, among the methods handling seasonality seasonal decomposition and SARIMA models got into the same cluster

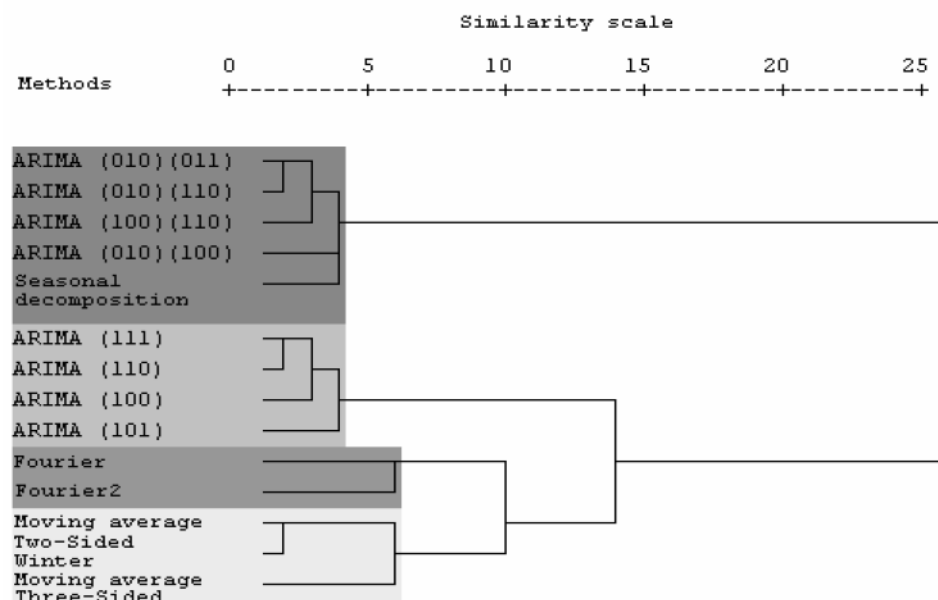


Figure 10: Methodological Clusters Created by Cluster Analysis

Source: Own calculation on the basis of database of DG AGRI

All in all, in order to prognosticate lamb prices for a short-run, methods handling seasonality such as seasonal decomposition and ARIMA models are worth using for forecasting lamb prices from the examined methods.

4. NEW AND NOVEL SCIENTIFIC FINDINGS

1. Regarding the selling price of the period between 1998 and 2006, I concluded that fluctuations of distinct rate are typical to the prices of the certain weight categories. The prices of lambs over 35 kilograms and ram lambs of 40 to 45 kilograms showed the highest instability. According to this, the risk of fattening to greater weight is higher. The domestic prices run together with Italian prices. I concluded that there is a significant seasonal fluctuation in the European lamb prices; the rate and timing of the changes is diverse by countries. On the basis of analyzing European prices, Spanish and Greek markets for lambs below 13 kilograms with seasonal demand and French, German, English and probably Austrian markets for lambs over 13 kilograms may serve to provide a seasonal demand for Hungarian farmers.
2. I concluded that lamb fattening in Hungary showed a deficit during the past eight years. In the examined period, it was worth selling in only two weight categories, between 24 and 27 kilograms and between 27 and 30 kilograms, as in these weight categories some profit of distinct rate was realized in the majority of the years.
3. I carried out prognostications for the Hungarian and Italian lamb prices with the help of different prognosticating methods. I concluded that the seasonal decomposition and SARIMA models reflected the most precise prognostications in case of forecasting both Hungarian and Italian prices.

5. THE PRACTICAL USE OF THE RESULTS

With my thesis, my aim was to help, strengthen and support decisions of farmers in order to fertilize their ewes and produce in harmony with the market demands, to being consistent with the demands, to decreasing marketing uncertainty and to improving profitability of sheep keeping for getting to know the past and present of family farms in a scientific way and for the favorable tendency of their future:

- I concluded that in the examined period, it was worth selling in only two weight categories, between 24 and 27 kilograms and between 27 and 30 kilograms, as in these weight categories some profit of distinct rate was realized in the majority of the years. The profit of fattening ram lamb is higher and more secure than that of ewes. Based on the results, ewes are recommended for sale at lower weights, while rams should be sold fattened in higher weight categories to the market.
- As well as the fluctuation of prices, it is reasonable to investigate the differences between costs in seasonality examinations.
- In my opinion, based on my results, the evaluation and consideration of Italian and Greek prices give correct information and help to Hungarian farmers for timing their production.
- In addition to the Italian market having a single permanent demand for Hungarian lambs, it would be worth using other European opportunities, which meet the transport requirements and are solvent.
- When comparing the different prognostic methods for analyzing the forecast of Hungarian and Italian lamb prices, the opportunities given by the one-, three- and eight-month-forecasts may be used in practice, so that farmers may get into a better market position in comparison with their present opportunities.

6. PUBLICATIONS IN THE SUBJECT OF THE RESEARCH

Books, book chapters:

1. **Fenyves V.** – Ertsey I. (2003) A gazdasági elemzés során alkalmazott alapvető elemzési módszerek In: Gazdasági adminisztráció, szerződések Szerk.: Bács Z. – Orbán I. ISBN 963 86424 3 2 Campus Kiadó Debrecen 97-111. p.
2. **Fenyves V.** (2003) A vállalkozások vagyoni, pénzügyi és jövedelmi helyzetének vizsgálata In: Gazdasági adminisztráció, szerződések Szerk.: Bács Z. – Orbán I. ISBN 963 86424 3 2 Campus Kiadó Debrecen 111-117. p.
3. **Fenyves V.** (2004): Mérlegelemzés, Jövedelmezőség elemzése In: Gyakorlati alkalmazások – Az üzleti tervezés gyakorlata - Szerk.: Nagy L. – Szűcs I. ISBN 963 86424 6 7 Campus Kiadó, Debrecen 114-129. p.
4. Bács Z. – **Fenyves V.** – Katonáné Kovács J. – Nagy A. – Nábrádi A. – Popovics P. (2005): Vállalkozások működése az Eu-ban Szerk: Nábrádi A. – Nagy A. Szaktudás Kiadó Ház Budapest,
5. **Fenyves V.** – Ertsey I. (2005): Vállalkozások gazdasági elemzése In: Vállalkozások elszámolása és számvitele Szerk: Bács Z. – Fenyves V. Szaktudás Kiadó Ház Budapest ISBN 963 9553 646 187-214. p.
6. **Fenyves V.** – Jávör Sz. – Jávör A. (2007): Szezonális tendenciák a hazai és nemzetközi bányarág alakulásban In: A juhágazat helyzete, kilátásai és fejlesztési lehetőségei Szerk: Nábrádi A.- Jávör A. – Madai H. ISSN: 1588-8665 Debrecen, 2007 112-123. p.
7. **Fenyves V.** (2007): A vállalkozások gazdasági elemzésének módszerei In: Számviteli, pénzügyi, adózási ismeretek Szerk: Bács Z. – Dékán Tamásné Dr. Orbán I. Szaktudás Kiadó Ház Budapest ISBN 9789639736351 81-89. p.

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8. Ertsey I. – Balogh P. – **Fenyves V.** (2003) Gazdaságstatisztika Gyakorlati jegyzet a III. évfolyam számára (Gazdasági agrármérnök képzés) Szerk.: Ertsey I. Debrecen, 1-84. p.

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9. **Fenyves V.** – Barabás K. – Ertsey I. – Jávör A. (2007): Market reserves in relation to seasonality Licrari Științifice Zootehnie și Biotehnologi Vol. 40 (2) 254-260. p.

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10. **Fenyves V.** – Ersey I. (2006): A bányahizlalás jövedelmi helyzete hazánkban Gazdálkodás 50. évfolyam 2006. 6. szám 51-60. p.
11. **Fenyves V.** – Ertsey I. (2007): A magyarországi juhtartás jövedelmezősége Gazdálkodás 51. évfolyam 2007. 1. szám 47-54. p.
12. **Fenyves V.** – Ertsey I. (2007): Az élóbány kivitel a magyarországi juhágazat teljesítményében Gazdálkodás 51. évfolyam 2007. 2. szám 48-60. p.

13. **Fenyves V.** (2007): A bárányhizlalás jövedelmét meghatározó tényezők értékelése. Agrártudományi Közlemények Acta Agraria Debreceniensis 2007/26. szám 171-177. p.
14. **Fenyves V.** (2008) Hogyan határozzuk meg a várható bárányárakat? - A magyar és az olasz báránypiaci árak elemzése Agrártudományi Közlemények Acta Agraria Debreceniensis megjelenés alatt

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15. **Fenyves V.** – Barabás K. – Ertsey I. (2007): Profitability of lamb fattening in Hungary MACE 2007. január 18, Berlin www.mace-events.org/greenweek2007/4286-MACE.html
16. **Fenyves V.** – Ertsey I. – Kovács S. (2007): Comparison of the statistical methods used for analysing the Hungarian lamb prices, Agrarian Perspectives XVI. „European Trends in the Development of Agriculture and Rural Areas” International Scientific Conference Volume II, Prague, Czech Republic, 2007/. /1087-1095 p. ISBN 978-80-213-1675-1 / (2007. szeptember 17-19.)/
17. **Fenyves V.** - Ertsey I. - Kovács S. (2007): Methods for analysing time series in forecasting lamb prices. „Rural Development 2007” The Third International Scientific Conference, Proceedings Volume 3, Book 1 Akademia, Kaunas region, Lithuania, 2007., 287-293. p. / (2007. november 8-10.)/
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21. **Fenyves V.** – Jávora A. (2008): Seasonality questions of lamb trade. 43rd Croatian & 3rd International Symposium on Agriculture 1 Proceedings Opatija, Croatia 2008. 195-198. p. / (előadás, 2008. február 18-21.)/

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23. **Fenyves V.** – Ertsey I. – Jávora A. (2007): Szezonális vizsgálat az élőállat kivitelben AVA 3 konferencia 2007. március 20-21.
24. Drimba P. – Ertsey I. – **Fenyves V.** (2007): Francia és magyar régiók állatállományainak összehasonlító elemzése Erdei Ferenc Konferencia Kecskemét megjelenés alatt

Non-revised/popular-science articles:

25. Lapis M. – **Fenyves V.** (2004) Az EU juhhúspiacának árelemzése Magyar Juhászat 13. évfolyam 2004/2 2-3 p.
26. Jávor A. – Lapis M. – **Fenyves V.** (2004): A juhhús piaci helyzete az Európai Unióban Az Európai Unió agrárgazdasága, ISSN 1416-6194 2004 (9. évf.) 5-6 sz. 37-39 p.
27. Lapis M. – **Fenyves V.** (2005): A juhhúspiac árelemzése Östermelő 2005/1. február-március 85-86 p.
28. **Fenyves V.** – Ertsey I. – Barabás K. – Jávor A. (2006): szövetkező francia juhászok Magyar Juhászat 15. évfolyam 2006/8 2-5. p.
29. **Fenyves V.** – Jávor Sz. (2008): A piaci változások szezonális kérdései Magyar Juhászat 17. évfolyam 2008/1 2-4. p.

<u>Scores of the Publications Relating to the Dissertation (Minimum Score: 1,0):</u>					
1. 0,25	6. 0,5	11. 0,1	16. 0,1	21. 0,025	26. 0,01
2. 0,5	7. 0,166	12. 0,2	17. 0,1	22. 0,033	27. 0,005
3. 0,083	8. 0,4	13. 0,2	18. 0,075	23. 0,025	28. 0,01
4. 0,25	9. 0,1	14. 0,1	19. 0,1	24. 0,01	<u>Total: 3,866</u>
5. 0,166	10. 0,1	15. 0,1	20. 0,15	25. 0,008	