

PhD THESIS

UNIVERSITY OF KAPOSVÁR

FACULTY OF ECONOMICS

MANAGEMENT AND ORGANIZATIONAL SCIENCES

DOCTORAL SCHOOL

Department of Accountancy and Statistics

Leader of Doctors' School:

DR. GYULA VARGA

Doctor of Hungarian Science Academy

Leader of project:

DR. HABIL. TAMÁS MOLNÁR

Associate Professor

A GÍMSZARVAS-GAZDÁLKODÁS STATISZTIKAI VIZSGÁLATA A DÉL-DUNÁNTÚLI RÉGIÓBAN

Written by:

NAGY MÓNICA ZITA

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1. PRELIMINARIES AND OBJECTIVES OF THE SURVEY

The Hungarian game management went through huge changes during the last decades, which was characterised by several successes but at the same time by at least as many challenges, as well. Among the successes, the world records of red deer, fallow deer and roe deer or the unique game management model of Hungary and the market leading position originating in this model are worth mentioning.

The objective of the dissertation was the *comparative analysis of the game management areas of the South Transdanubian region based on the trophy scores and financial data of the last 16 years (1990-2005)*. It was not the aim of the study to analyse critically the game management practice of the areas; hence it is well-known that the forests of the region supplies red deer with outstanding scores out of which several ones are listed on the world rank order.

Considering the above mentioned, the following **goals** were set:

1. **SWOT analysis** of the game management of the South Transdanubian region, which was conducted on a basis of deep interviews.
2. Development of a categorising indicator which enables **to express the overall quality development of the red deer population**.
3. Comparative analysis of the **financial data** of hunting companies in the South Transdanubian region.
4. Analysis of the number and structure of the **foreign and domestic hunters** and the changes in it.

In order to achieve the above listed goals, the comparative analysis of **the game management areas of Southern Transdanubia and of the three counties of the region** was carried out by various statistical methods. **The observations and conclusions drawn will help the game management practice.**

2. MATERIALS AND METHODS

2.1. Databasis of the analyses

The analyses of the dissertation covered the trophy scores of the three counties of the South Transdanubian region and within it four game management areas in the period between 1990 and 2005. The trophy scores of stag shot by hunters were recorded in trophy record books until the 1990s for each county, and then recording has been based on computer. The electronic databases made it possible to apply deeper and more complex statistical methods in the analyses. Therefore, the period between 1990 and 2005 was chosen to be involved in the study. This period covering 16 years means one and a half generations in the culmination of red deer, which ensures the adequate professionalism of the research. That is, it was possible to consider those stags that were born in 1990, thus they became matured (15 year old) by the end of the period analysed.

The Dbase databasis was delivered by Somogy, Tolna and Baranya County Inspectorates of Game Management and Fisheries.

The analyses covered almost 40 thousand (39 597) records of the game management areas of the Southern Transdanubia, these data were converted from Dbase to Excel and SPSS tables, in order to ensure the basis of statistical analyses. After having grouped the data by areas, **MsExcel** and **SPSS** software were used for data processing and analyses (databasis, tables, diagrams, macros

and statistical analyses), and the text editor **Microsoft Word** was used for composing the dissertation.

2.2. Applied statistical methods

The research is based on both primary and secondary data. The primary information was collected in semi-structured deep interviews. This is a qualitative method providing a face-to-face contact which allows for gaining a more focused and deeper understanding on what the experts think. Personal deep interviews less concentrate on only one question; they cover a wider area of interest, although it is thematically pre-determined by the interviewer (*Lehota, 2001*). The current situation of the game management of the South Transdanubian region was revealed by applying the chosen flexible and structured interview.

For the sustainment and development of game management and in order to reveal the real available opportunities a careful and prospective planning is essential. There are several methods developed that serve this objective. One of the simpler and classical methods is **SWOT analysis** (*Sarudi, 2004*). Having analysed the answers on the deep interviews, the strengths and weaknesses of game management were defined, and opportunities for changes and further developments and the threats were revealed.

The research basically meant a methodological approach of the analysis of the spatial and quality development of different game management areas and the relationship between them. Consequently, the methodological basis of the research consisted of a wide range of **mathematical-statistical tools**, out of which both simpler and more complicated, multivariable tools were used, as well.

In the analysis, the **means of trophy scores weighted** by the size of the red deer population were calculated (*Hunyadi et al, 1996*). In order to express the variability of the scores, **standard deviations** were calculated then the homogeneity of the data was defined with the **coefficient of variation**. **Indices of spatial comparison** were used to compare similar data of different counties or game management areas (*Molnár, 2007*); while for the examination of the structure of emphasised variables, **structural and coordination indices** were used. Finally, **dynamic indices** were used to interpret the dynamic changes of variables (*Köves-Párniczky, 1975*).

During the analysis of economic indicators, ratio-type (intensity) indices were used to calculate the **structural changes** of the revenues and expenses of different years (*Hajdu, 2003*).

As one of the main objectives of the analyses was to reveal spatial and quality differences, the methods applicable for measuring the differences were paid more attention to. Various parameters of the trophies of shot stags in the South Transdanubian region were compared with statistical tools. In the analyses **correlation analysis, time-series analysis and analysis of variances** were used.

Correlation analysis defines both the strength and the direction of the correlation between different factors (such as the correlation between the weight of the antlers and the lower beam length) (*Falus-Ollé, 2000*). The analysis covered the following parameters: trophy weight, beam length, circumference, coronet size, the age of the stag and the international score (*Sajtos-Mitev, 2007*).

One of the key issues of the research was to define trends in the changes of particular variables – for instance the size of the red deer population. The **analysis of time series** is a method to find a pattern in changes which was to my help in projecting the red deer population (*Szűcs, 2004*).

Analysis of variances is used to test more than two sample means by the decomposition of the total variance. By this method, the parameters of red deer populations living in different habitats can be compared, and the significant difference between them can be found. With the help of the method's properties the game management areas can have been defined where significant differences were found between.

The analysis of variances is basically a generalised two sample t-test. Its advantage is that calculating a so-called common significant difference merely simplifies the process of paired comparison (*Hunyadi et al, 1996*). In comparison with variance analysis, in case of using t-tests for the comparison of more sample means an increasing number of samples leads to an increasing number of sample-pairs, thus the calculations would be too complicated (*Rappai, 2001*).

3. RESULTS AND DISCUSSION

3.1. SWOT analysis of the game management of Southern Transdanubia

Hunters (working both in game keeping gardens and free range), woodmen, agricultural producers and managers of Hunting Inspectorates were asked in semi-structured deep interviews in the South Transdanubian region. I wanted to know what the opinions of various experts are on the **quality factors** of the red deer population and the **economic situation** of game management.

Those beneficial features belong to *strengths* that can be positively influenced. One of the determining pillars of strengths is **the outstanding quality of the game population and game management which is based on the high qualification of professionals**. A significant part of the foreign hunters returned to Hungary after having tried the services of competitor companies on foreign hunting markets (Romania, Slovakia), due to the **high quality professional knowledge and services** provided in Hungary. Besides the hunting traditions of several years, the quality of the game herd also attracts the foreign hunters to Hungary.

Table 3.1.1: SWOT analysis of the game management of the South Transdanubian region

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Maintenance of hunting traditions. ▪ Outstanding quality of game population and game management (where it is possible). ▪ High qualification of professionals. ▪ Strong service basis. 	<ul style="list-style-type: none"> ▪ Small game management units. ▪ Lack of legal sanctions. ▪ Low level marketing. ▪ Conflicts with producers and conservationists. ▪ High proportion of game damages and poachers. ▪ Lack of subsidies available for big game.
Opportunities	Threats
<ul style="list-style-type: none"> ▪ Improvement of quality values of the big game population. ▪ Increase in market share (game meat, trophy, hunting). ▪ Improvement of social awareness, change in way of thinking. ▪ Increase of national support. ▪ Improvement of habitats with forestations. ▪ Improvement of eco and hunting tourism, national and international level. ▪ Increase in the role of game management in rural development. 	<ul style="list-style-type: none"> ▪ Worsening traditional hunting ethics. ▪ Considering only economic aspects. ▪ Disappearing, worsening habitats. ▪ Increasing game fences. ▪ Morselling of big game areas.

Source: Own calculation

Negative features of game management belong to *weaknesses*. It often causes problem that the **legal regulations** are difficult; and there is only an inadequate number of legal sanctions that could reduce the number of failure shots. The **low level of marketing** (in hunting and game meat) is one of the significant barriers of market growth and of the – national and international – tourism. The first step to take should be to **widen the marketing approach**. In my opinion, there is a **need for hunting tourism**. It would be possible to improve Hungarian hunting by establishing game keeping gardens, by restructuring hunting houses and by increasing the visits of forest schools. The hunters' image formed in a **non-hunting man's** thinking should be changed also. A low level of marketing can be seen on the game meat market, as well. Although the demand for game meat is growing, it is still not significant. One of the reasons for it is the high market price that is determined by the hygienic and processing terms. **Solutions for it** could be less strict regulations, or establishing more game meat processing plants, or restructuring of beef and pig slaughter houses would be necessary.

Various **national subsidies** are available for crop production, forestation, habitat-development and different land use practices – which however are decreasing year-by-year; although there is a lack of **direct subsidies for game management**.

Even in these days, **conflicts with crop producers and conservationists** are still unsolved problems. Game damages lead to conflict with crop producers. A significant proportion of the expenses of hunting companies are the paid game damages, therefore **non-payback government support** would be necessary. The **reason for the confrontations with conservationists** is game damages in the habitats. Therefore it is of high importance that the density of the game population be harmonised with the interests of silviculture, agriculture and conservation.

Opportunities are such external factors that can not be really influenced. Unfortunately, the total utilisation of benefits provided by the **high quality of big game** herd has not become a feature for Hungary yet, therefore it is considered as opportunity rather than strength in the analysis. By using the **quality level of game management** that is one of the pillars of the strengths, the improvement of habitats, widening forestation and increase of the role of game management in rural development are new objectives to achieve, while considering the previously mentioned recommendations.

Threats are such negative external features that are not controllable either. A significant proportion of the revenues are quest hunting; thus considering economic aspects the hunting companies intend to satisfy the demands of most quests as possible, which could even lead to **worsening hunting ethics**. One of the preconditions of forestation subsidies is building fences, which results in **decreasing number and size of habitats for game**. We need to pay attention to that not only the habitats decrease but along with it the source of food as well. Due to a smaller remaining area, the game damage may increase. **Morselling of big game areas** is the consequence of unsettled proprietary rights, and appears in case of woodlands primarily. To avoid this, cooperation of the companies would be necessary.

3.2. Factors determining the quality of red deer stags yielded in the South Transdanubian region

In the previous, quality level of the herd was mentioned several times, it is necessary to define what excellent, good, average or poor quality mean. The quality of a big game herd is defined by experts according to their experiences of numerous years. One of the main objectives of the dissertation is to develop a categorising index suitable for defining the quality of a red deer population.

The **basis of the investigations** was the scored trophies yielded during 16 years (1990-2005).

Firstly, the statistical relations were analysed between the parameters measured when scoring the trophies. For this reason the correlation-analysis tool of SPSS software was used. *Table 3.2.1* shows the variables where strong correlation ($|R| > 0.7$) was found between; and then the categories of herd quality were based on these variables.

Considering the correlation coefficients, the following parameters were used to form the quality categories: **antler weight, lengths of left and right beams, circumferences of left and right upper beams and the circumferences of the left and right coronets**. *Table 5.4.3* refers on that the **age** of the stags is in strong correlation with the international score; despite it age was not considered in the analyses because of its subjective assessment. The previously mentioned variables were grouped in intervals according to the international scores (CIC). The intervals of different variables were defined according to the interval values in case of bronze, silver or golden medal CIC prizes. For instance, in case of antler weight, the lower value of the interval for golden medal trophies is around 10 kilograms, which is 11.1 kg of the defined interval, that of silver prize is between 8 to 10 kgs (in the defined interval it is 8 to 11) and for bronze medal it is around 6 to 7 kgs (in the defined interval it is 5 to 8 kgs), while those that were not given prize weigh less than around 6 kilograms (and the defined upper value for the interval is 5 kgs) (*Table 3.2.4*). The different intervals were assigned different scores: the lowest interval has got score 10, the next ones 30, 50 and the highest one 70.

Table 3.2.1: Partial correlation coefficients between CIC scores and variables of the analysis

Variables of the analysis	r value according to the CIC scores
<i>Weight</i>	0.88
<i>Circumference of right beam II.</i>	0.81
<i>Circumference of left beam II.</i>	0.81
<i>Length of right beam</i>	0.75
<i>Length of left beam</i>	0.75
<i>Circumference of right coronet</i>	0.74
<i>Circumference of left coronet</i>	0.74
<i>Age</i>	0.72

Source: Own calculation

As the influence of various variables is different (*Table 3.2.1*), scores were weighted by the coefficients of correlation. *Table 3.2.4* shows the calculated scores for each variable. In practice, it means that for example trophies weighing less than 5 kgs were given 8.8 (calculated as 10×0.88), those between 5.1-8.0 kgs 26.4 (30×0.88), between 8.1-11 kgs 44.0 (50×0.88) and antlers weighing more than 11.1 kgs were given 61.6 (70×0.88). The method was similar in case of the other variables.

Table 3.2.2: Final scores

Variables	Intervals	Calculation	Final scores
<i>Weight of trophy, kg</i>	– 5.0	10×0.88	8.8
	5.1 – 8.0	30×0.88	26.4
	8.1 – 11.0	50×0.88	44.0
	11.1 –	70×0.88	61.6
<i>Beam length, cm</i>	– 85.0	10×0.75	7.5
	85.1 – 95.0	30×0.75	22.5
	95.1 – 105.0	50×0.75	37.5
	105.1 –	70×0.75	52.5
<i>Beam circumference II., cm</i>	– 13.0	10×0.81	8.1
	13.1 – 15.0	30×0.81	24.3
	15.1 – 17.0	50×0.81	40.5
	17.1 –	70×0.81	56.7
<i>Coronet circumference, cm</i>	– 21.0	10×0.74	7.4
	21.1 – 24.0	30×0.74	22.2
	24.1 – 27.0	50×0.74	37.0
	27.1 –	70×0.74	51.8

Source: own calculation

Based on the so defined scores – considering each of the trophies (13 000 headcount) –, by summing up the scores of four selected variables the minimum, maximum and quartile values were calculated, which were used to define the intervals for total scores, and were then assigned to four quality categories (poor, average, good, excellent) (*Table 3.2.3*).

Table 3.2.3: Quality categories of red deer population

Intervals	Quality categories
54.8 – 137.6	poor
137.7 – 219.6	average
219.7 – 301.6	good
301.7 – 383.6	excellent

Source: Own calculation

The final scores were defined in a way that the beam length and the circumference of upper beam and of the left and right coronets were separately considered. In case of category “average” for instance, the intervals were calculated in a way that the lower values of the selected variables were summed up separately for the left and the right beams: $8.8+7.5+7.5+8.1+8.1+7.4+7.4=54.8$, and then the quartiles and maximum (383.6) values were calculated. Based on these figures, the intervals were defined for the quality categories (*Table 3.2.3*). Poorer quality antlers are not scored; these are separately shown in *Table 3.2.4*.

The categorising scheme helps to define the quality of red deer population based on the scored trophies in practice. Afterwards, the quality of stags yielded in the three counties of Southern Transdanubia was analysed.

The results of year 2005 are shown in *Table 3.2.6*.

Table 3.2.4: Number and distribution of stags by quality categories (head, %)

Quality categories	Somogy	Tolna	Baranya
<i>Poor</i>	160 (22.07)	106 (28.27)	138 (24.21)
<i>Average</i>	210 (28.96)	117 (31.20)	217 (38.01)
<i>Good</i>	273 (37.66)	123 (32.80)	188 (33.04)
<i>Excellent</i>	82 (11.31)	29 (7.73)	27 (4.74)
<i>Total</i>	725 (71.78)	375 (73.24)	570 (66.59)
<i>Unscored trophies</i>	285 (28.22)	137 (26.76)	286 (33.41)
<i>Scored trophies</i>	1010	512	856

Source: Own calculation

Table 3.2.4 shows that the highest number of excellent quality trophies were scored in county Somogy (11.31%), and the ratio of the poorest quality trophies is the lowest here, as well (22.07%). In county Tolna, 7.73% of the trophies are excellent quality, overtaking county Baranya, however the ratio of the poorest quality trophies is the highest here (28.27%). The ratio of unscored trophies compared to the total number of scored ones is the following: in Somogy 28.22% (285 pcs), in Tolna 26.76% (137 pcs), and in Baranya 33.41% (286 pcs).

The **mean score for each county** was calculated in a way that the trophy scores were summed up and then divided by the number of scored trophies in the county. Thus a rank order of the counties was set up. It was found that the best quality stags are yielded in county Somogy, followed by Tolna and Baranya counties. The **mean scores for the region** was calculated by weighing the mean county scores with the headcount of the red deer population of the county. The analyses of the dissertation did not cover comparisons at regional level. Further efforts will be made in this area of the research in the future.

3.3. Comparison of game management areas

Following the quality analyses, I studied the big game areas of the region. Variance analysis of trophies yielded in years 1990, 1995, 1997, 2000 and 2005 was carried out. The trophy weights were compared in the four game management areas. In the *zero hypothesis*, the trophy weights were assumed to be equal and the differences observed are only due to the sampling. I assumed that an *alternative hypothesis* explains the data and there is a significant difference between the trophy weights.

Table 3.3.1/a. shows the average trophy weights of stags shot during the scoring year **2005** for each area. The highest mean weight was found in the Big Game Area IV/2 in county Somogy (7.67 kg). This means that there is an observed difference between the means; the output *Table (3.3.1/b)* of the variance analyses proved that **the difference was significant**. In the second phase of the analysis those big game areas were identified where the difference was significant between ($SZD_{5\%}=0.3627$). It was found that in year 2005 the differences between the area IV/2 in Somogy and the other three (IV/3 Mecsek, III/3 Tolna and III/1 Southern Baranya) areas are significant. Thus, the results proved that the Somogy area is significantly superior to the other big game areas of Southern Transdanubia. Without showing them, similar results were obtained in further analyses of the years 1990, 1995, 1997 and 2000.

Table 3.3.1/a: Statistics of trophy weights in 2005

ÖSSZESÍTÉS	Headcount	Sum	Mean	Variance
IV/2	254.00	1948.93	7.67	4.17
IV/3	254.00	1466.26	5.77	4.00
III/3	254.00	1781.06	7.01	3.99
III/1	254.00	1495.32	5.89	5.73

Source: own calculations

Table 3.3.1/b: Significance of red deer trophy weights

Factors	SQ	SZF	S	F	p-value	F crit.
<i>Between groups</i>	638.29	3.00	212.76	49.02	0.00	2.62
<i>Within groups</i>	1231.20	253.00	4.87	1.12	0.13	1.18
Error	3294.16	759.00	4.34			
Total	5163.65	1015.00				

Source: own calculations

Multivariable ANOVA test was used to analyse the mean number and specific parameters (average number and age of gold medal trophies, gender ration) of scored trophies between 1990 and 2005 in counties Somogy, Tolna and Baranya. The influence of the areas and the male:female ratio (independent variables) was analysed on the number of scored trophies. *Table 3.3.2* shows the descriptive statistics of 16 years such as the average number of scored trophies is 1181.44 with a standard deviation of 383.21 in county Somogy.

Table 3.3.2: Descriptive statistics

Area	Gender ratio	Mean	St. deviation	N
1 (Somogy)	Total	1180.44	382.21	16
2 (Baranya)		817.75	207.18	16
3 (Tolna)		495.38	125.49	16
Total		831.19	381.22	48

Source: own calculation

The calculations proved that the areas do, while the gender ratios (0.99) do not influence the number of scored trophies ($p > 5\%$). The area and the gender ratio together explain the changes of trophy numbers in 77.1 per cent.

To define the role of golden medal trophies and age played in the variation of the number of scored trophies was part of the objectives of the analyses. As the correlation between these variables was found strong, the multivariable variance analysis would not lead to interpretable results.

3.4. Financial analysis of the game management in the South Transdanubian region

The database of the analysis consists of **receipts from foreign and Hungarian guest shooting and services**, of **market receipts of live and shot game** and of **other revenues**. Expenses of hunting are such as **labour costs, game management costs, agricultural and woodland game damages** and **other costs**.

The analysis of the game management reports showed that in average the balance of game management was negative after year 2000. In the analyses I wanted to find out the reason for it and for the variability within the period, and which financial components fluctuated significantly. The analyses covered the changes of the structure of the financial figures of game management between 1994 and 2005.

The separate analysis of the three counties of the region showed that in county **Baranya** 40 to 50 per cent of the total *revenues* came from foreign guest hunting during the period analysed. If considering the related services also, receipts from foreign guest hunting give up 50 to 60 per cent of the total revenues. Domestic guest hunting (around 10%) and related services (around 5%) together give only 10 to 15 per cent. The average values of the receipts by sources are shown in *Table 3.4.1*.

Table 3.4.1: Average hunting revenues in the South Transdanubian region between 1994 and 2005

County	Average hunting revenues, %						
	Foreign		Domestic		Receipts		
	Guest shooting	Service	Guest shooting	Service	Live game	Shot game	Other
<i>Baranya</i>	41.65	9.47	8.34	3.52	0.46	24.37	12.19
<i>Somogy</i>	47.44	8.29	7.69	2.37	0.61	20.11	13.49
<i>Tolna</i>	46.46	7.65	9.84	3.65	1.16	20.71	10.53

Source: Own calculation

In county Somogy, similarly to Baranya significant proportion of the total revenues comes from foreign hunting (guest shooting: 40-55%, service: 10%). Before 2001 the revenues coming from domestic guest shooting and services represented less than 10 per cent, then these continuously increased reaching 21 per cent in 2005 (revenues from foreign guest shooting was the lowest in this year: 31%). Another significant source of the revenues is the market receipts from shot game, with an around value of 15 to 25% (similarly to Baranya). *Table 3.4.1* shows the figures.

The analysis of **county Tolna** resulted in similar figures to county Somogy. In 1994, 51 per cent of the total revenues came from foreign guest hunting, while in 2005 only 40%. Similarly to the previous the revenues from domestic guest shooting are around 10% (with extreme figures in 1995: 3%, and in 2005: 21%). The market receipts from shot game show similar level to that in Somogy, as well, with around 20%. *Table 3.4.1* shows the figures.

The *expenses* of game management represent the other one of the important financial aspects. Significant proportions of the hunting expenses come from game management costs (40%) and other costs (20%). Labour costs represent some 10 to 15% of the total expenses. The different game damages were more varying in the three counties (although with the highest proportion of agricultural damages). In county Baranya, the level of agricultural damages was

higher than 20 per cent after year 2002, while in county Somogy it exceeded 20 per cent in every year. The game damages are much lower in county Tolna than in the other two counties, representing only 10 percent. The figures of the expenses are shown in *Table 3.4.2*.

Table 3.4.2: Average hunting expenses in the South Transdanubian region between 1994 and 2005

County	Average hunting expenses, %				
	Labour	Game management	Game damages		Other
			Agricultural	Woodland	
<i>Baranya</i>	17.60	38.40	19.82	1.88	22.30
<i>Somogy</i>	14.05	40.64	22.68	2.64	19.89
<i>Tolna</i>	17.35	53.07	6.46	0.55	22.57

Source: Own calculation

After the analysis of the structure of financial components of hunting, the structural changes of the cost and revenue components was analysed considering the last 10 year; when the figures of year 2005 were compared to those of 1994.

Table 3.4.3: Changes in the structure of the revenues and expenses of game management in the South Transdanubian region, comparison of years 2005 and 1994 (%)

Categories		Baranya county	Somogy county	Tolna county
Revenues	<i>Foreign guest shooting</i>	126.45	78.66	128.39
	<i>Foreign services</i>	53.05	95.90	309.79
	<i>Domestic guest shooting</i>	97.94	168.21	55.28
	<i>Domestic services</i>	41.97	660.54	25.73
	<i>Shot game</i>	107.70	98.49	93.95
	<i>Other</i>	127.22	100.17	73.04
	<i>Total revenues</i>	102.51	94.76	109.44
Expenses	<i>Labour</i>	86.33	101.58	113.28
	<i>Game management</i>	118.00	85.57	124.23
	<i>Agricultural damage</i>	127.20	88.26	144.30
	<i>Woodland damage</i>	158.40	91.75	62.31
	<i>Other</i>	65.26	129.60	88.64
	<i>Total costs</i>	97.36	96.24	112.93

Source: Own calculation

Two of the data shown in *Table 3.4.3* can be emphasised: the revenues from domestic service in county Somogy and the revenues from foreign services in county Tolna. The ratios of these variables significantly changed. The ratio of the revenues tripled (309.79%) from foreign services in county Tolna. While, the ratio of domestic services increased to more than six times (660.54%) in county Somogy. In contrast to county Somogy, it decreased to its half in county Baranya and to the fourth in Tolna. From 1994 to 2005, the ratio of foreign guest shooting decreased, while that of domestic guest shooting increased in county Somogy. In case of the other two counties, the changes were opposite. **In my own opinion**, it is a great result that domestic guest shooting and the related services grew with such extent, because it means that the number of active Hungarian hunters increases; while also different services provided are used by them and in my opinion by their family as well.

3.5. Significance of foreign guest hunting in the South Transdanubian region

Concluding from the above mentioned, the main source of the hunting revenues is the foreign guest shooting. The foreign hunters usually arrive for more than one days, and generate other (additional) sources of income beside the shooting fees. They need to pay for shooting out, accommodation, food, guide, and occasionally they also bring their families with them. Besides, hunting is one of the efficient diplomatic tools.

Further analyses covered the structure of stags by the nationality of the hunters. The national data of scored trophies shot out by foreign and Hungarian hunters recorded by the National Game management Database are shown in *Table 3.5.1*.

Table 3.5.1: The proportion of shot stags by foreign and Hungarian guest hunters, Hungary, 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Foreign (head)	4354	3874	3416	4040	4267	5025	4951	5188	5210	4266	5120
Proportion (%)	70.0	71.6	67.6	69.5	63.9	61.9	56.9	53.2	50.8	46.9	52.7
Hungarian (head)	1866	1539	1638	1775	2406	3161	3753	4573	5055	4831	4596
Proportion (%)	30.0	28.4	32.4	30.5	36.1	38.6	43.2	46.99	49.3	53.1	47.3
Total	6220	5413	5054	5815	6673	8186	8704	9761	10265	9097	9716

Source: based on the National Database for Game management – hunting year 2005/2006 own calculation

It is seen that the proportion of red deer trophies shot out by foreign hunters exceeds of that by Hungarian hunters with the exception of year 2004. Considering the last five years, this ratio is around 50-50%, which indicates the strength of the Hungarian hunting while at the same time showing the significance of the foreign hunting. I believe that this advantage should be used in tourism related developments, in which not only hunting but several relating services, “attractions” are meant (organising camps, introduction to nature, animal stroking, etc.). Not mentioning the opportunities for additional incomes at national level. Keeping this in mind, the game management areas were compared in the South Transdanubian region.

Table 3.5.2: Structure of stag trophies yielded by foreign and Hungarian hunters in the region, (db)

Big game areas	Shot by foreign hunters	%	Shot by Hungarian hunters	%
<i>IV/3 Mecsek big game area</i>	4380	57.65	3215	42.35
<i>III/1 South Baranya big game area</i>	2461	43.47	3246	56.53
<i>III/3 Tolna Southern big game area</i>	3065	47.88	3332	52.12
<i>IV/2 Somogy big game area</i>	11666	61.78	7221	38.22

Source: Own calculation

The revenues of big game management more or less cover the expenses, which can be primarily achieved by foreign hunters. This is shown in *Table 3.5.2*, which demonstrates that the proportion of stags shot by foreign hunters is higher in two game management areas (IV/3 Mecsek and IV/2 Somogy) than that by Hungarian hunters. Since Hungary's conditions favour for game population -, which is an unused potential for tourism aims – therefore, game management could be a successful activity in long term with suitable investments, care-taking and marketing.

Besides the hunting revenues we must not forget about the so-called “by-products” that is game meat. Game meat is owned by the game management company that may sell it and thus it produces income above the trophy revenues. This is why the demand for game meat is necessary to increase, primarily with a stronger marketing. This has already been shown by SWOT analysis, also (*chapter 3.1*).

Services related to hunting suit well the **rural and eco-tourism** that has been getting an increasing importance. The importance of these incomes is emphasised by that those local people who utilise these types of income opportunities will not get dependent on various supporting systems, but use them as investment sources. For all these, however, an integrated action-taking of the involved sectors (such as game management, conservation, tourism) is necessary, by considering each others' interests and based on mutual benefits.

4. CONCLUSIONS

The South Transdanubian region is outstanding from the aspect of both the estimated size of the red deer stag population and the number of shot out stags. Therefore, the data of the scored trophies during the last 16 years (1990-2005) were analysed. A comparative analysis of the red deer population (quality, gender ratio, age distribution and yields) and financial data of the game management areas of the Southern Transdanubian region was carried out.

According to a SWOT analysis based on the deep interviews with professional representatives of hunting and game management, the following conclusions are drawn:

One of the strengths is the **outstanding quality of the game management and of the game population which is ensured by the high qualification of professionals**. Due to their skills and experiences, they are able to utilise, take care and protect the game population as natural resource. Therefore, the share of foreign hunters is high in Hungary.

The review of the relevant literature, the experiences gained from the deep interview and from practice demonstrated that there is a gap between hunters and civil “non-hunters” which can be changed by **changing the way of thinking** of these people. The majority of the people think that hunting is only a form of entertainment or even a sport of the New Rich and only a few know its real significance. In order to avoid this misbelief the marketing of hunting should be improved that has been at a low level anyway. Chapter Recommendations reviews the possible tools for this.

Based on the questions arose in SWOT analysis further analyses were done on the population size, quality, gender ratio and age distribution of red deer. The following conclusions are drawn:

The analysis of the estimated size of the red deer hind and stag populations living in Southern Transdanubia gave the following results. Although it is difficult to maintain an optimal gender ratio according to the literature, my experience was that the difference was small between the ideal ratio and that during the analysed period. As estimation based observations are less reliable, the analysis was conducted on the basis of the number of yielded stags. It was found that the gender ratio of the South Transdanubian region is 1:2.

The results of two and multivariable variance analysis of the counties of the region show that the quality of red deer stags yielded in **county Somogy** are superior to those in the other two counties.

The analysis of the **financial data** of hunting companies (1994-2005) led to the conclusion that the role of **domestic guest shooting** increases, which should be maintained together with the increase of the relating services. I presume that the interest of the Hungarians in nature is increasing, which should be encouraged, developed and connected to hunting and relating programmes. This speed of increase is shown only by county Somogy, thus it is necessary to extend it over the counties Tolna and Baranya. Unfortunately, the wage level did not improve during the last 10 years – similarly to other sectors.

Summarising, the Hungarian game management has numerous aspects to improve, although it is not in a crisis; these problems can be solved. For this however, cooperation, government support and change in the way of approach are necessary. However, today not only the increase of the population is an

objective, but the improvement of quality as well as the competition and implementation of conceptions for handling and development are needed, too, while considering the specialities of habitats and of various game populations. The Hungarian hunting society faces hard tasks and lot works to do; but we (non-hunters) also need to make efforts in order to preserve this natural treasure for the future generations.

5. NEW AND PROSPECTIVE SCIENTIFIC RESULTS

In the course of the research, the following new and novel results were obtained by the analyses:

1. Based on the results of **SWOT analysis** of the South Transdanubian region recommendations were given for the **development of game management**. With special regard to hunting tourism, and to the reduction of conflicts with agricultural producers and conservationists, to the improvement of game meat market demand, to the opportunities to change the way of approach towards hunters, to the enhancement of supports aiming big game management and to the utilisation of marketing of game management.
2. I have developed a **categorising score system** for the quality assessment of the red deer population, which is easily applicable in practice, as well. The individual scoring system considered the trophy **weight, lengths of left and right beams, circumferences of left and right upper beams and the circumferences of the left and right coronets**. For these variables intervals were defined, and weighing the scores with the relating correlation coefficients also the intervals for the total scores were defined, which were then assigned to four **quality categories (poor, average, good, excellent)**. The categorising scheme **helps to define the quality of red deer**

population at any level (such as game area, county or regional level), which has been defined according to only experiences so far, in practice.

3. With the help of two-variable variance analysis, reliable conclusions have been drawn on the **spatial structure of red deer stag populations**. The comparative analysis of the big game areas of the South Transdanubian region proved it methodologically too that the role of **county Somogy is significant** in red deer hunting among the counties of the region. Multivariable variance analysis has not proved significantly the role of gold medal trophies and age distribution in the number of trophies scored.
4. The analysis of the Southern Transdanubian game management's financial figures between years 1994 and 2005 led to the consequence drawn that the significance of **domestic hunting and of the relating services** increased in county Somogy, which should be achieved in counties Tolna and Baranya, as well. For that reason, it is necessary to improve hunting tourism (with organising family programs) jointly with the improvement of marketing. The implementation of these actions should be supported by the government. Out of the expenses, **labour costs** should be emphasised of which proportion did not changed during the last ten years in average.
5. The analysis of the share **of foreign and domestic hunters** showed that the **number of the Hungarian hunters increased**, reaching around the same number as that of the foreign hunters. This should be used for the development of tourism, which does not only mean hunting, but other relating services (organising camps, introduction to nature, animal stroking, etc..), as well.

6. RECOMMENDATIONS

Based on the results of **SWOT analysis** of the South Transdanubian region the following recommendations were given for the **development of game management**:

By utilising the quality level of the Hungarian game population, one of the directions of the development could be **hunting tourism** providing quality services and **considering the interest of conservationists**; while further ones can be the improvement of game habitats and enhancement of forestation as well as the increase of the role of game management played in rural development.

According to my opinion, a gap can be found between hunters and non-hunters, which is the result of a different approach. In order to avoid this misbelief people should be **educated on the role and essence of hunting and game management**; and even such school programmes should be provided for kids that bring them closer to nature and introduces them to the significance of hunting.

The low level of marketing (both in case of hunting and game meat sale) is the major obstacle of market growth and tourism. Solutions could be such as to **widen the marketing approach**, to **establish game keeping gardens**, to **restructure hunting houses** and to increase the activities of **forest schools**. The implementation of all these should be also helped by the government, for example through the programmes of the National Institute for Health Development. It should be preferred to establish more game processing plants, for this however, less strict regulations are needed.

Conflicts originating in game damages need to be solved. To avoid it, a simple estimation method is necessary, which may make it more objective to assess the damages and thus the conflicts could be decreased. The national supports should be **completed with direct game supports**, as well.

In order to improve the demand for game meat, different **product tasting promotions** and the **communication of the nutritional benefits** of game meat are of importance. In my opinion, further solution could be the **restructuring of beef and pig slaughterhouses**, or if certain larger processing plants **increased their selection** with processed game meat.

In my opinion, hunters and hunting companies need government support, as **non-payback grants**. In addition, **wild orchards and wild croplands** should be maintained and supported on lands where agricultural production is not profitable. It is also reasonable to enhance forestation, while considering the habitat need of the game population.

In order to answer the questions arose in the course of SWOT analysis, further analyses were conducted on the number and quality of red deer. On the bases of this, the following recommendations can be given:

One of the tasks of game management is to define the size of the game population, which is based on different estimating methods and experiences. To help this work, by considering the **cycle effect** time-series analysis as statistical tool provide **fairly good estimations**.

In order to help the practical work of the game management, a **categorising indicator** has been developed for the quality assessment of the red deer population, thus the quality of a population can be defined on the basis of the

scored trophies. By applying this indicator it is possible **to compare the red deer stag population of various regions or areas.**

7. LIST OF PUBLICATIONS RELATED TO THE PHD RESEARCH

Refereed papers in foreign language published in science journals

M.Z. Nagy: Qualifying red deer population *In: Journal of Central European Agriculture (JCEA)*, 2008. 9.4.

Refereed papers in Hungarian language published in science journals

Barna R.-**Nagy M. Z.:** A vadgazdálkodási jelentések pénzügyi adatainak összehasonlító vizsgálata a Dél-Dunántúli régiókban. *In: Acta Scientiarum Socialium* , XIX./2005, 3-10.

Nagy M. Z.-Pungor T.-Molnár T.-Barna R.: A Somogy megyei gímtrófeák paramétereinek statisztikai elemzése. *In: Acta Agraria Kaposváriensis*, 9. 1. 2005., 59-65.

Nagy Mónika Zita: Vadgazdálkodás és vidékfejlesztés, *In.: I. Terület- és vidékfejlesztési konferencia - Kaposvár*, Proof Stúdió Kft, Pécs 2007.

Nagy M. Z.: A vadgazdálkodás minősítése a Dél-dunántúli régióban, *In: Acta Oeconomica Kaposváriensis Vol 1 No 1, 1-2. 2007.*

Presentations

Nagy M. Z.: Statisztikai összehasonlítások a vadgazdálkodásban, *In.: „Agrárgazdaság, vidék, régiók multifunkcionális feladatok és lehetőségek” XLVIII. Georgikon Napok*, Keszthely, 2006. szeptember 21-22. CD-ROM

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