



SZENT ISTVÁN UNIVERSITY, GÖDÖLLŐ
Management and Business Administration PhD School

THESIS OF DOCTORAL (PhD) DISSERTATION

ECONOMIC ASSESSMENT OF CERTAIN PROPERTY
RIGHTS CONCERNING AGRICULTURAL LANDS
*(Identification of factors influencing leasing fees of hunting
rights)*

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1. Background and objectives

The topic of this PhD is the economic analysis of property rights concerning agricultural lands. Author's focus is on lease of right to hunt. Author wishes to know if there's a method applicable to the calculation of leasing fees for domestic hunting areas, if the international literature has any methods usable for the calculations in question. In case there are, author also wishes to know how the methodological background be applied to Hungarian conditions.

Author believes the analysis of leasing domestic hunting rights related to agricultural land is an important research question because current Hungarian practice only has regulations in effect that offer largely vague background. There are no generally accepted standards in use. This results in land owners having conflicts, and the authorities having problems with applied regulations. There are a multitude of reasons for a new leaseholder to be given rights to hunt. Such are the violation of significant contract terms, or the hunting association, or economic stakeholder discontinuing activities. Author believes it important to have an exact method to calculate leasing fees and authorities' acceptance. Exact in this context means that a new lease contract is made between the two sides.

Author determined goals within the framework of leasing fee calculation methodology.

G1: Author's first goal is to analyse if there's a need to create a method applied for calculating leasing fees for hunting rights.

G2: Author wishes to analyse how the structure and quality of wildlife of the area in question affects the amount of leasing fees. Author analyses if, and how the presence and ratio of big and small game affect the area's leasing fee of hunting rights.

G3: Author's third goal is to analyse if, and how the habitat's attribute and the ratio of forested area within it affect the leasing fee of hunting rights.

G4: Author's fourth goal is to analyse the relation between the approachability of the hunting areas, their distance from the capitol, and the leasing fee of hunting rights. As part of this, author also wishes to know how the travel distance between the capitol and the hunting area affects the leasing fees of hunting rights.

G5: Author's fifth goal is to analyse how much the leasing fees of hunting rights differ according to the relationship of local agricultural producers and hunters.

G6: Author's sixth and final goal is to create a method for calculating

leasing fees of hunting rights in case the previously mentioned goals have adequate results. Author wishes said method to offer relevant aid for the national economy's perspective as well.

In relation to author's goals, the following hypotheses were defined:

H1: There is currently no adequate method to determine leasing fees of hunting rights, however, there is a need for one.

H2: The leasing fee of hunting rights is affected by the type and quality of large and small game population within the habitat.

H3: The leasing fee of hunting rights is affected by the attributes, forested area size and ratios of arable land, meadows, pastures and reeds.

H4: The leasing fee of hunting rights is affected by the hunting area's approachability and distance from the capitol.

H5: The leasing fee of hunting rights is affected by the relationship between agricultural producers and hunters.

H6: The leasing fee of hunting rights can be calculated from the factors mentioned above, by which the authorities can accept lease contracts for hunting rights within an exact framework.

As part of the research process, author attempts to validate or discard these hypotheses for the Hungarian context. As there are no adequate statistical data for author to use, author procured the following data: leasing fee data for the hunting areas of two counties, game and agricultural data of two counties, geographical distance data, and data collected from individuals using questionnaire and interview. Validation was done by analysis of the obtained data, and the questionnaire and interview results.

2. Review of Literature

The task of hunting economy is to raise and efficiently use the wildlife, and to identify further activities' economic relations, finally creating models and methods related to them. (Kóhalmy - Márkus, 1996 In: Stark et al, 2010) The hunting economy has two internationally relevant research areas, which are determining the size of the game population, and cost- and benefit analyses related to this, or the results necessary to design policies. (Gren et al, 2018)

Wildlife management is connected to the two most notable land development activities – agriculture and silviculture – as a secondary development form. The most relevant areas of this relation are wildlife damage and habitat conservation. (Stark et al, 2010)

Local spread of big game fundamentally determines the economic limits of wildlife management. This is due to how income from hunting is usually most affected by large game.

(Stark et al, 2010) However, big game management's efficiency is heterogeneous, the chances of increasing income are limited. (Bíró et al, 2010)

Wildlife management may have a non-differentiated role in creating economic stability for disadvantaged areas, depending on local attributes. (Magda et al, 1999) Recreational hunting activity is important for rural areas. (Lund - Jensen, 2011) When creating policies, the fact that the estimations regarding size, values and costs of the wildlife are largely assumed should be taken into consideration. However, few theoretic studies cared to do this. (Gren et al, 2018)

In Hungary, hunting rights are inseparable components of land development rights, given to the owner of the land designated as a hunting area. It's important to note that lease of rights to hunt does not constitute rights for land usage. Lease of rights to hunt is a partial right related to joint rights of ownership, where the land owners of the hunting area exercise rights according to joint ownership regulations in an analogue manner. (Bezdán, 2012)

Factor costs' leasing fees always depend on the respective negotiation positions of respective sides forging a market agreement, based on the ability of the area in question to produce income. (Szűcs, 1998) International literature uses the method of evaluating renewable resources to evaluate the hunting areas. The most notable usage for hedonic pricing is to determine the price range of properties, but international literature also uses it to determine the value of hunting areas.

Lundhede and colleagues (Lundhede et al, 2015) used the hedonic pricing method to determine leasing fees of hunting rights for Danish hunting areas. They assessed the following factors: the size and position of the hunting area, its distance from larger cities, the costs of travel from home, and alternative costs of time and other problems (L). The quality and biodiversity of the area, the ratio of forested and agricultural areas, the notable spots of the area, like lakes, historical buildings, etc. (A). The attributes of the area related to hunting, the diversity of game, the nature of the hunting bag and the value of wildlife meat (H). The social vector of hunting activity, the relations of hunters with agricultural producers, and each other (S). Other factors, such as type of contract, and contract's term validity (C).

They made the following regression model for leasing fees of hunting rights (P) based on abovementioned factors:

$$\ln(P_i) = \alpha_0 + \sum_{l=1}^L \lambda_l L_{il} + \sum_{a=1}^A \alpha_a A_{ia} + \sum_{h=1}^H \varphi_h H_{ih} + \sum_{s=1}^S \rho_s S_{is} + \sum_{c=1}^C \kappa_c C_{ic} + \varepsilon_i$$

Tei Mensah and Elofsson hypothesised the negative correlation between leasing fees and the distance to the closest city in their study. As the distance also comes with larger travel expenses, which decreases demand for the lease of rights to hunt, people wishing to hunt will pay less for a more distant hunting area. The hedonic pricing model group is often influenced by effects from location. As an example, tendencies of a region's market for lease have an effect on the markets of the neighbouring regions, and vice versa. This is due to determining the base price of an area in accordance with prices for neighbouring hunting areas' prices, when offering said area on the market for lease. (Tei Mensah - Elofsson, 2017) Scandinavian land owners have significantly more freedom with their rights to hunt than their Hungarian colleagues. Areas of difference are the length of the contracts, the selection of the lease owner, and the notable terms and form of contract. Author wishes to analyse if the evaluation methods introduced above can be applied to Hungarian conditions in spite of this.

3. Material and methods

3.1. Secondary data serving as research basis, and its evaluation

In order to conduct the asset valuation calculations that serve as the basis of determining leasing fees of hunting rights, author wished to work with the data from several counties' hunting associations.

Author collected the hunting area size and leasing fee data for Bács-Kiskun County from the hunting lease contracts during February, 2018. Also in 2018, the same data was sent from Nógrád County, together with complementary information about some specifics of lease owners, stating if the land owners are hunting on their land, and information about which lands are state-owned.

In order to analyse leasing fees of rights, author researched the following: travel distance of hunting areas from Budapest, the last public land prices released by the HCSO (2016) by location, county land lease fees, the ratios of different sectors in land usage compared to all unincorporated areas from

the Land Office website, and the last public hunting bag rates (2014) for the most notable wildlife on the hunting area (red deer, fallow deer, roe deer, boar, mouflon, European hare and pheasant) from the regional wildlife plan, and medal rates of trophies. Though hunting lease contracts must list the game population mandatorily, after author analysed these, he drew the conclusion that using the hunting bag as a starting point is more beneficial. This constituted considering wildlife that was actually successfully hunted in the area. Estimations of the game farmers regarding game population don't offer adequate data. The hunting bag should be considered objective instead. (Barna, 2005) Considering the estimations for wildlife quantity the base population, the hunting bag becomes layered sampling by species, age and gender. (Márkus - Mészáros, 1997) Usage of hunting bag density data to define wildlife size has duality in opinions, however, is a method used for defining trends and regional differences (Bleier, 2014) There are practical examples of using the hunting bag data of preceding years to calculate leasing fees. One such example is Croatia. As contracts were mostly made during 2016-17, author believes that lacking newer data is not a significant problem.

Said data was summarised in a chart in order to apply linear regression. The goal of the analysis was to determine if these data have an effect on the leasing fees of hunting rights, in other words, if and how leasing fees change in light of them.

Author's secondary goal was to structure natural factors into a system where their complex evaluation becomes possible by designing an exact methodology.

Normality analysis was applied to data of leasing fees of hunting rights. In case of the linear models, normality analysis of residues is necessary. Lundhede and Tei Mensah's analyses were referenced, and author conducted logarithmic transformation of the leasing fees. This made the resulting variables applicable for further analysis.

Processing of data and statistical analyses were conducted using the IBM SPSS Statistics 22.0 for Windows.

3.2. Primary data serving as research basis, and its evaluation

This thesis contains data used from author's own questionnaire sample. Due to the nature of the topic, the questionnaire was conducted among: hunters, forensic experts of agriculture, agricultural producers, university staff and students, and other relevant personnel from social media. Data

was collected between 9. April and 20. April, 2018. Prior to the questionnaire, a test was conducted in accordance with Earl Babbie, and the questionnaire was finalised according to its results. (Babbie, 2001) The questionnaire was made using Google Forms. It was shared using social media platforms (Facebook and LinkedIn), and in e-mail via mailing lists for the staff and students of the University of Veterinary Medicine and the Szent István University. The questionnaire was also sent to several hunting, agricultural and forensic expert associations. Author's work was supported by the Hungarian Hunting Magazine and the Shooting Press online by publishing the questionnaire on 10. April, 2018. By being represented on different channels, author wished to follow the principle of Earl Babbie: by reaching as many groups as possible, the diversity of groups is represented. (Babbie, 2001) The questionnaire had questions for three different topics: general attitude towards hunting, relation of hunting and nature conservation, and effects of hunting on tourism and economy. The questionnaire was concluded with demographic questions.

The 18 questions related to attitude towards hunting were measured using 1-5 Likert scales.

Due to the nature of data, and the size of the sample, nonparametric tests Mann-Whitney, Kruskal-Wallis and Dunn-Bonferroni post hoc tests were conducted. Processing and statistical analysis of data was conducted using the statistical programme pack IBM SPSS Statistics 22.0 for Windows.

Naturally, the sample isn't representative for the total population based on the demographic data of the participants, as it doesn't represent the entirety of the population. This couldn't be a goal to begin with in this case, as the ratio of hunters and forensic experts in the population is so small that statistical analyses couldn't yield acceptable results if they were representative for the population within the sample. However, the sample is representative for the analysed part of the population, by showing differences in opinion between hunter and non-hunter participants.

The questionnaire was conducted with 625 participants. Demographic questions related to the participant's gender, age, highest education, location, and if the participant hunts, conducts forensic expert tasks, or agricultural tasks.

In order to analyse hunting area data, and further evaluate the data results of the questionnaire, author also conducted interviews. Interviews were conducted in two steps: on the one hand, for the preparation of the leasing fees' analysis, and for determining the questions in the questionnaire; on

the other hand, to evaluate the results obtained from the statistical analysis of leasing data and questionnaire. During the interviews, author kept notes, but didn't feel it necessary to make a voice recording, as some of the interviewees would've been disturbed. In accordance with this, data processing wasn't as large in volume as it would've been for a recording.

As such, validating hypotheses according to the abovementioned methods was done as follows (Chart 1):

1. Chart: Methodology to validate hypotheses

Data	Goals	Research tools		Results		
		Hypotheses	Methods			
secondary and primary data	G1	Literature review	H1	analysis of legal acts, interviews	▶ E1	Conclusions H6 - E6 (modelling)
secondary and primary data	G2		H2	correlation, regression analysis, interviews	▶ E2	
secondary and primary data	G3		H3	correlation, regression analysis, interviews	▶ E3	
secondary and primary data	G4		H4	correlation, regression analysis, interviews	▶ E4	
primary data	G5		H5	questionnaire interview Mann-Whitney test Kruskal-Wallis test	▶ E5	

4. Results

4.1. Identification of factors influencing leasing fees of hunting rights using correlation and regression analyses

Obtained and collected data both reflected the significant difference between leasing fees of hunting rights between the two counties, Bács-Kiskun and Nógrád.

In order to analyse the leasing fees of hunting rights, author applied multi-variable linear regression analysis methodology. During the analysis,

author wished to understand how, and how much independent variables (X) effect the leasing fee as the dependent variable (Y).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_i X_i + \varepsilon$$

Author transformed data using the logarithmic transformation of the dependent variable.

Due to the high number of originally evaluated descriptive variables, author began by analysing their correlation with the dependent variable, and with each other. For those that had no significant correlation to the leasing fees of hunting rights, the decision of exclusion from analysis was necessary. Further excluded independent variables were the ones where though correlation was significant with the dependent variable, however, the strength of the correlation could be considered weak at 0,4 or lower.

Following this, author analysed the correlation of descriptive variables to each other in order to exclude multi-collinearity resulting from extreme correlation. Such cases were the correlation between red elk and boar at 0,7+, as such, only one of them was included.

Finally, author left four descriptive variables in the analysis: percentage ratio of forested areas in all unincorporated areas, the hunting bag for red elk (number by sq. km), the hunting bag for European hare (number by sq. km), and the travel distance of hunting area from Budapest (km).

Based on the above, at $R^2=0,672$:

$$\ln(\text{leasing fee}) = 5,312 - 0,008 * \text{travel distance from Budapest (km)} + 0,11 * \text{percentage ratio of forested areas in all unincorporated areas (\%)} - 0,290 * \text{hunting bag for European hare (specimen/km}^2\text{)} + 0,602 * \text{hunting bag for red elk (specimen/km}^2\text{)}$$

In other words, this means that the forested areas' ratio, the saturation of big game, and close proximity with the capitol have a positive effect on the leasing fees of the hunting area, whereas the saturation of small game and larger distance from Budapest decreased the leasing fees for the hunting areas. Independent variables described 67,2% of the dependent variable's total variance, estimated deviation of ε was 0,425.

4.2. Statistical analyses and results for the questionnaire

While processing the questionnaire data, author had to keep in mind that close to a third of participants said they hunt. The analysis was conducted for the entirety of the participants as a trial (n=625), results here only

identified difference between hunters and non-hunters, and even this data wasn't detailed enough.

As part of evaluating the questionnaire results, in order to analyse the answers given by hunters and non-hunters, author conducted a Mann-Whitney trial, as said results' ratio scales deviated from norm.

Furthermore, as close to a third of the participants hunt, about a third conduct some form of agricultural activity, and the two groups had significant overlaps with each other as well, author chose the Kruskal-Wallis nonparametric test.

By statistically evaluating the questionnaire results, author identified several significant matches and differences in opinion related to attitude towards hunting. A part of these were related to generic attitude towards hunting, whereas another related to questions on hunting and nature conservation, and hunting, tourism and economy.

For the statement of **Game would overbreed without proper regulation, causing significant damages in agriculture and an increase in health risks**, hunters and non-hunters have a significant difference in opinion. There's no relevance with the participant having an agricultural activity or not for this question. A significantly larger portion of hunter participants believe that without regulating game, they would overbreed, causing damages to agriculture and health risks. It's important to note that the questionnaire was conducted in spring, 2018. This was only a few months before the African swine fever appearing in Hungary. Recent years' epidemic defence interventions, which also put strain on swine farms, participants would most likely have a different opinion today.

Hunters believe that the wider public opinion can't relate to the goals of wildlife management, because they don't know, as seen in their answers for **Wildlife management's goals are unknown for the wider public, making them less involved**. Non-hunters don't believe that this is the case, however, we might find rationale in this statement regardless, as author found a similarly significant difference in opinions of hunters and non-hunters for the statement **Hunting is an unreasonable and unnecessary destruction of wildlife**. The latter had a more positive attitude towards this statement.

Among non-hunter men and women, women were more of the mind that management of wildlife as a career requires a very high level of professional knowledge and responsibility. Women also had more positive attitude towards the statement on the goals of wildlife management and public opinion mentioned above.

The statement of **Hunters have a negative image in society** provoked the most acknowledgement from hunters that don't conduct any agricultural activities, and the least from those that conduct neither hunting nor agriculture.

The post hoc trial for hunter and non-hunter groups for the statement **Hunting is an unreasonable and unnecessary destruction of wildlife** showed significant difference. Agricultural activity similarly had no effect here. Hunters were less prone to acknowledge this statement.

There were differences between hunters and non-hunters in regards to opinion on the statement **Hunting is also an applied nature conservation method**. Hunters tended to agree more to this. Women among the non-hunter group were more accepting of the statement that members of hunting associations do work, such as feeding and taking care of the wildlife, which also contributes to the conservation of wildlife.

Yet another significant difference in opinions showed between hunters and non-hunters about the statement that **Damages in wildlife are mainly the fault of hunters**. Hunters tended to disagree here.

For the statement that **Damages in wildlife can mainly be attributed to intensive agriculture, and related usage of chemicals**, a significant difference in opinions showed between hunters and non-hunters once again. Hunters tended to agree more to this statement, whereas among non-hunters, women tended to agree more.

Unlike for previous cases, the post hoc test managed to differentiate between three groups of opinions for the statement that **Hunter society should be forced to compensate for agri- and silvicultural damages caused by protected wildlife**. The hunters that have no agricultural activity have a separate opinion to those that have, and those that don't hunt have another separate opinion, regardless of conducting agricultural activity or not. Among the last of the three, non-hunter men tended to agree more.

Non-hunters also agreed more to the statement that hunters are the source of wildlife damage as well.

Hunter participants agreed more to the statement that **Hunting tourism is an important element in rural development**. This was irrelevant of agricultural activities. Non-hunter participants' gender-based Mann-Whitney test resulted in the men agreeing more to this statement.

The least acknowledgement for the statement that **Non-arable lands could offer income in the fields of hunting and tourism** came from non-hunter participants, and hunters conducting no agricultural activities. Whether they conduct agricultural activities or not, hunters tended to agree more to this statement. However, no significant difference in opinion can be

validated for the case of non-hunters doing agricultural activities, when referenced to the above two. Once again, non-hunter men tended to agree more to this statement.

The statement that **For those that have hunting rights, compensating for agri- and sylvicultural damages is a significant load** provoked the least agreement from those conducting agricultural activities, but no hunting, and the most agreement from hunters conducting no agricultural activities. The opinions of hunters conducting agricultural activities have no significant difference to either group's opinion, and non-hunter non-agricultural producer participants' opinions aren't significantly different to that of other participants conducting agricultural activities. The statement was more accepted by women.

In relation to the **Hunters and agricultural producers tend to cooperate** statement, the most positive opinion came from participants both hunting and doing agriculture, while the least positive from those not hunting, but doing agriculture. The opinion of the wider public showed no significant difference to non-hunting agricultural producers, and the group averages of hunters had no significant difference to that of hunter and agricultural producer participants. In summary, hunters tend to think they cooperate with the agricultural producers, while non-hunters, and most notably non-hunter agricultural producers tend to think otherwise.

During the statistical analysis of the abovementioned statements, several significant differences in opinions of participant groups were identified by author. However, as opposed to author's early expectations, significant difference in opinions of agricultural producers and society at large were not present, unlike the Scandinavian authors saw in Denmark and Sweden. The concept of a utilitarian agricultural producer as the owner of hunting rights didn't exist within the results of the statistical analyses.

Among non-hunter participants, those conducting agricultural activities, and those not doing so showed no significant differences in opinion related to the act of hunting during the conducted tests.

In order to understand the results better, author conducted interviews.

4.3. Analysis of deep interviews

As the results of the interviews conducted, author drew the conclusion that participants think the largest social, geopolitical or ecological changes of the last twenty to thirty years came to pass for hunting. This result came from linking hunting rights to the land, and the system of agricultural subsidy that appeared after Hungary became a part of the European Union.

After this happened, subsidies that twisted the market appeared for plant production, and these caused a reduction in the value of hunting and wildlife management, specifically for the people who own the hunting rights. This tendency also causes less advantageous habitats, as to exploit land-based subsidy, all possible arable land is taken into agricultural use, and a general deforestation and reduction of meadows is done. This mainly causes a problem for small game management.

In society, the thought pattern that those who hunt have the financial leeway to do so is gaining more and more ground. Meanwhile, hunting slowly becomes a mass product. The hunter society underwent significant change. The hunters became a “mandatory grouping”, membership differs both socially, and existentially. Therefore, there always was, and always will be human factor in membership that can't be solved. The number of rich people tends to increase. After the Regime Change, market relations were introduced, and money became more and more important. The costs of wildlife management experienced a significant increase, which associations often tried to finance from new entrants' membership fees. This caused the membership structure to change. Remaining hunters that aren't rich were pushed into a disadvantageous situation, and were forced into the background. During contracted hunting, rich domestic hunters and foreign hunters are considered, and opportunities for membership are pushed into the back again. However, people that may own weapons, but will never become hunters, even if they consider themselves to be also began to hunt also appeared. Such people enjoy posing as hunters, but have no credibility, which has a very strong negative impact on hunting and hunters. The same rules apply for hunting as other parts of the economy. If something is a luxury good, it keeps its value – today, this only refers to the highest category of trophy hunting. Contracted hunters of prime trophies used to be the German hunters, but today, Hungarian hunters can, and want to pay for these as well. However, this only gives a fragment of all hunting income. Average trophies are no longer luxury goods. The reason for hunting becoming more relevant is the increase in big game quantity, which has an effect on the 'commodity supply'. The increase in game quantity is of such pace that it causes a problem in current wildlife management structure. However, an increase in price can be seen for the European hare, according to data at hand.

The basis for land owners determining the leasing fees for hunting rights and the percentage of its practical application is that in the land owners' meeting, only hunting land owners and representatives take part that cover more than half of the votes, determine a minimal price. Therefore, land owners aren't the ones determining the leasing fees, which is instead under

the management of the land owners' meeting. This is a significant difference because the meeting has rights to joint decree, but needs more than 50% of the votes. Usually, stakeholders collect rights to represent before the meeting, which offers them a chance at protecting their interests, which covers both selection of lease owner and determining the leasing fee. Therefore, the amount of leasing fee for hunting rights is determined by the participants of the meeting in a way that protects their own hunting interests. There was an opportunity for exercising hunting rights as a land owner, but now, only the leasing form remains. There's no basis for calling this a decision made upon business interests, as it's such a minor thing that it's barely ever requested. Those with large areas don't care, and those with small areas get a mere pittance, even fuel to reach the meeting costs more than what the owner could collect as leasing fees. Owners usually expect wildlife damages instead. In places where an annual price of 80-100 HUF by hectare is the norm, even collecting the price for a 10ha area isn't worth it. The volume of agricultural production, and the income by ha is so significant that the leasing fees for hunting rights, or even the wildlife management in its entirety is a mere fraction.

When determining the hunting bag system of agri- and sylvicultural wildlife damages, it's important to note that the national economy gains way more advantages from agriculture than from hunting, meaning agricultural producers will always have the edge. Law only places the responsibility to compensate on the one leased to hunt for seven species which could otherwise produce a gain in wildlife management. Therefore, for these species, profit-oriented economic activity is also an option. However, in this case, responsibility for conflicts resulting from increased presence should similarly follow. If hunters are also land owners, and have a good relationship with each other, and if they luckily think that wildlife needs to eat too, the question of wildlife damage can be handled flexibly. However, if there's a hostile environment, professional opinion, and almost guaranteed legal action causes the hunting lease owner to calculate with higher expenditures. Currently, the most notable problem of wildlife damage compensation is that agricultural producers immediately run to the notary to request a forensic expert for the increasing number of cases. However, there's no procedural law that states both parties need to be present when recording the wildlife damage case. And the most notable source of disagreements comes from the wildlife damage case's recording, which can be tracked back to the lack of methodology, as protocols for estimating wildlife damages don't exist. And on the field of biological processes' expert activities, the modelling process that contains a wider

breadth of errors with much higher difficulty compared to other professional fields is a problem in and of itself.

In relation to the connection between the leasing fees of hunting areas and the compensation for wildlife damages, we can conclude that they have no effect on each other, and don't affect the relationship of hunters and agricultural producers either. The leasing fees are deposited to the account of the land owners' association in one transfer by the hunter's association, from where the agricultural producers may request them. However, the leasing fees are usually so low that there's no actual effect on the settlement of wildlife damage. It would be much more important to settle wildlife damage cases by creating a "guideline" that shows the correct references in laws for the rights and responsibilities of land user and hunting lease owner for the prevention of wildlife damage. Maybe non-requested leasing fees should be invested into wildlife damage compensation.

There are a few sensitive areas, locations and species in the relation between hunting lease owners, nature conservation authorities and nature conservation activists which breed arguments, but basically, the relationships are properly managed in most areas of Hungary. In Northeast-Hungary, the presence of large predators, while in the Great Plains, that of white-tailed eagles and Eastern imperial eagles may prove to be a source of conflict. However, areas are well-separated, and truly sensitive areas are usually under national park management. In these cases, conditions are precisely set. This reduces conflicts to a great degree as well. Among professional nature conservation activists, there are those loyal to hunting, because they realise we work in an ecological context. Something bad for one is also bad for another. However, many of the ultra-greens lack basic ecological knowledge. These people are often "activists for show", blindly charging and uneducated, which causes these people to be immune to rational discussion. They have no grasp on local conditions, even though there'd be more than enough domestic endangered wildlife to protect as well. The same can be said about hunters too, though – as an example, the "thrashers are the cause of lack of small game" attitude is also highly prevalent, while the efficient crowd thinning isn't done for either foxes or avian pests that can be controlled legally.

Another problem regarding the troubles in activities, and opportunities of hunting lease owners is that the amount of annual wildlife damage is very hard to plan for. Further troubles arise from expensive vehicles crashing into wildlife, and the fact that professional staff is underpaid, which will soon necessitate intervention. On the input side, planning for sales of trophy game and game meat are hard, most notably due to ASP. Hunting association membership fees are still too low in many areas. The

opportunities are few and far between: there are barely any tenders, the hunting association can't procure land, or the land owners hold preferential rights when the land lease agreement runs out. The finances of the Wildlife Management Fund are minimal, and have no significant effect. In the case of small associations, having a mandatory gamekeeper is an unnecessary problem. Wildlife can be preserved, and wildlife damage prevented without a gamekeeper as well, as it's in everyone's interest to have a profitable economic activity. As such, people will do necessary tasks, feed, protect wildlife, prevent wildlife damage, contract for hunting, etc. even without a gamekeeper, for which excess expenditures needn't be stacked on top of small associations.

4.4. Hypothesis validation, new scientific results

Hypothesis summary

Results	Hypotheses	
E1	H1	valid
E2	H2:	valid
E3	H3:	partially valid
E4	H4	valid
E5	H5	invalid
E6	H6	valid

H1: There is currently no adequate method to determine leasing fees of hunting rights, however, there is a need for one.

Based on the literature review, author validated that the leasing fees for hunting rights have no currently adaptable method for calculation, and there's no sense that it would be determined based on business opportunity. It's so insignificant that most land owners don't even collect it. However, there's a need to make up some form of methodology for calculation, as the Hunting Act rules that the hunting authority can't legalise the hunting lease agreement contract if the leasing fees aren't determined while taking the structure of the hunting area's wildlife and the method of land usage into consideration. Based on all this, author believes that there's a need for a method that assists the authorities' application of law in an exact manner.

H2: The leasing fee of hunting rights is affected by the type and quality of large and small game population within the habitat.

The hypothesis was validated by the results of the regression calculation. According to this, the fact that the area in question has mostly big game appears as a factor increasing lease fees on the analysed hunting areas, and if the area has mostly small game, the leasing fees are decreased as a result.

H3: The leasing fee of hunting rights is affected by the attributes, forested area size and ratios of arable land, meadows, pastures and reeds.

The hypothesis was partially validated by the results of the regression calculations. Of the attributes of the habitat in question, such as: ratio of arable land, ratio of pastures, ratio of reeds, etc. only the ratio of forested areas showed a significant relation to leasing fees, appearing as a factor increasing the price. There was no proof that the amount of arable land, pasture or reed have any significant effect on the hunting area's leasing fees, author got no results that justified the validation of the hypothesis.

H4: The leasing fee of hunting rights is affected by the hunting area's approachability and distance from the capitol.

The hypothesis was validated by the results of the regression calculation. There was a significant relation between the travel distance of the hunting areas and Budapest and the leasing fees. The closeness of the capitol increased, and the larger distance decreased said fee.

H5: The leasing fee of hunting rights is affected by the relationship between agricultural producers and hunters.

The hypothesis couldn't be validated by the Mann-Withney and the Kruskal-Wallis tests' results. From the results of the questionnaire, we can conclude that agricultural producers don't have much of a good opinion of hunters, but this has no effect on leasing fees of hunting rights. This result was also supported by the data from interviews.

H6: The leasing fee of hunting rights can be calculated from the factors mentioned above, by which the authorities can accept lease contracts for hunting rights within an exact framework.

$\ln(\text{leasing fee}) = 5,312 - 0,008 * \text{travel distance from Budapest (km)} + 0,11 * \text{percentage ratio of forested areas in all unincorporated areas (\%)} - 0,290 * \text{hunting bag for European hare (specimen/km}^2\text{)} + 0,602 * \text{hunting bag for red elk (specimen/km}^2\text{)}$. Independent variables described 67,2% of the dependent variable's total variance, estimated deviation of ϵ was 0,425.

New scientific results:

1. Based on the mathematical-statistical analysis of the information basis, and the processing of international literature after synthesis; with the aid of interviews conducted with domestic and foreign practical experts, author concluded that there is currently no method applicable to calculating the leasing fees of hunting in Hungary. Considering that international literature has methods that take note of local specialities, creating a method usable for domestic leasing fee calculation usable in practice is necessary and timely.

2. As the basis of calculating leasing fees of hunting rights, author analysed the data of two – naturally and economically different – counties' hunting association data. Using multi-variable statistical methods to analyse scientific results, author identified the factors influencing the leasing fees of hunting rights and their effects. Using the mathematical-statistical analysis, author validated the connection between the leasing fees of hunting rights for hunting areas in Bács-Kiskun and Nógrád counties, and the type of game population, the quality of habitat and travel distance from the capitol.

3. Author concluded that to determine the leasing fees for hunting rights, there's a necessity to create a secure and reliable calculation method, and to interpret the influencing factors and their effects. Using mathematical analysis methods, author analysed how domestic conditions allow for the application of foreign practical evaluation opportunities and factors. Professional material of county wildlife management also have detailed statistical and financial data for the 1998-2014 period. These were used as the basis for the introduced, indicative-minimal license fee calculation. The license fees for hunting areas were proven scientifically for the data of the hunting areas located in the two counties, and used identified relations to draw up the following:

$$\ln H = \beta_0 - \beta_1 T + \beta_2 E - \beta_3 A + \beta_4 N + \varepsilon; \quad H = 202,755 \cdot 0,992^T \cdot 1,011^E \cdot 0,748^A \cdot 1,826^N$$

where H= Annual license fee of hunting area (HUF/ha/year), T=Travel distance from Budapest (km), E= Ratio of forested areas in all unincorporated areas (%), A= European hare hunting bag (specimen/km²), N= Red deer hunting bag (specimen/km²).

Independent variables described 67,2% of the dependent variable's total variance, estimated deviation of ε was 0,425.

4. Based on the deep interviews conducted with domestic and foreign experts, author validated that determining the leasing fees is based on a complex relationship system, where economic content and fee level are

pushed to the background, the fees are usually low. Land owners' obligation to offer hunting associations leasing already makes the financial talks one-sided, and minimal calculated value doesn't exist for administrative fees. One side in the leasing of rights to hunt are land owners, the other is usually the hunting association. The license fee between the two usually doesn't get determined based on business interests. It's often so negligible that the agricultural producers don't even collect it, however, the resource, income and costs of wildlife damage are all significant.

5. The modern mathematical-statistical analysis of the questionnaire data showed significant differences between values and interests of parties – hunter-agricultural producers, non-hunters (and agricultural producers) – in terms of attitude towards hunting, hunting and nature conservation, hunting's tourism- and rural economy-related effects, and wildlife damages and compensation. . The concept of a utilitarian agricultural producer as the owner of hunting rights didn't exist within the results of the statistical analyses, as opposed to other countries. The deep interviews showed that there's a need to modify legal regulations in order to make these groups understand, and support the goals of national economy related to hunting.

5. Conclusions and recommendations

Author evaluated the question of leasing fees for hunting rights within this thesis, and the factors influencing the calculation of leasing fees. Author concluded that there's no currently applicable method to determine the leasing fee for hunting rights, and there's a need to form some kind of method.

Author analysed the license fees of hunting rights for two counties, Bács-Kiskun and Nógrád. Perspective of analysis was the structure and quality of the wildlife in the given area, specifically the appearance and ratio of big and small game species allowed to hunt. The goal of analysis was this factor's effect on the license fees. Author also analysed how much the habitat attributes and ratio of forested areas affect license fees. Based on the literature data, author also checked the effect of travel distance from the capital, using public roads, has on the license fees.

In order to identify the effect the above mentioned have, author analysed the fee data of hunting areas in light of them. Taking international literature into consideration, author used multi-variable regression analysis for the task.

In order to identify the deeper correlations of leasing of hunting rights, and to analyse how much the hunting areas' leasing rights is influenced by the relationship between local agricultural producers and hunters, author checked several sources. These include: the domestic and foreign literature background of hunting economy, legal structure, and relevant historical information on wildlife management. In order to analyse attitudes of society towards hunting, author conducted questionnaire data collection (n=625), and applied statistical analyses to resulting data.

In order to gain a deeper understanding of the results, author conducted several deep interviews with domestic and foreign, theoretic and practical experts. Their answers assisted author in understanding the social, legal and economic contexts of the leasing of rights to hunt, and to properly interpret the data resulting from statistical analyses.

Based on the analysis of the above mentioned, author constructed a multi-variable regression equation to determine leasing fees, which is applicable to analyse the leasing data of the two counties' hunting areas. Later, this data supplemented by the data of other counties can serve as support on the level of national economy.

In relation to the leasing of rights to hunt, land owners that have land in hunting areas are obliged to offer the hunting rights for lease by law – together, and for long-term leasing. These conditions have a significant effect on the economic conditions of the leasing agreement. The land owner community can only decide on the price offers for the leasing of hunting rights for their land together, along legal regulations. This makes the proper calculation of leasing land usage rights aimed at hunting and optimal usage efficiency much harder.

The special state regarding leasing of rights to hunt is that the lease owner is granted the right to hunt by the land owner, while the wildlife that's the target of the usage agreement is not in their ownership. The reason is that legal regulations state that the wildlife is in the property of the state, however, in case there's wildlife damage, the responsibility isn't on the owner, but on the lease owner of the hunting area. The lease owner has to be responsible for the damages the wildlife causes, though the damages are obviously done prior to the hunting or catching of the game, and prior to taking ownership, before the lease owner could apply for rights of ownership.

The structure of current Hungarian hunting areas is based on the conditions created during the Socialist times. The land owners' meeting that determines the leasing fees of hunting rights don't consider the quality of the hunting area. A significant portion of the lease owners are non-profit hunting associations, where even the current leasing fee is a significant

expenditure. Meanwhile, said fee is miniscule compared to the leasing fee of agricultural areas, meaning most land owners don't even collect it.

The leasing fees paid to land owners for hunting rights are significantly lower than the leasing fees after arable lands. The leasing fees for agricultural production facilities are insignificant for hunting rights, compared to the subsidies and the leasing fees for agricultural and arable land. The situation, however, is different for agri- and silvicultural wildlife damages, which can cause a significant drop in the lease holders' finances. Based on the analysis of the lease of rights to hunt related to arable land, the economic rationality of leasing arable land is limited, as it's affected by other factors. These include the regulations, the jointly selected lease owner, and the practice of wildlife damages. This makes the leasing fee of hunting rights not reach optimal level, and makes it impossible to assure macro-economic and social-level development. The lease owner isn't forced to conduct his/her wildlife management activity optimally, and the operational structure and other obligations of the hunting associations make it impossible for them in the first place. A significant portion of hunting right owners operate as a NGO, while their economic activity and employer rights management give them the standard SME problems and challenges. Lease of rights to hunt is a distorted market, where community, human relations and forced cooperation are all in effect. Hunting and wildlife management can't be seen exclusively as a sector of agriculture, thus, we can't determine its sustainability exclusively from the economic perspective either. Beyond it being our national heritage, it has a fundamental importance in preserving bio-diversity.

In spite of all these, statistical methods proved that leasing fees have rational parts already identified by the authors listed in the literature review, who researched them for the West-European and American hunting areas made for completely different economic and socio-cultural bases.

In light of the above mentioned, author believes that the hedonic pricing method is a method applicable to calculating the costs of domestic lease of rights to hunt. This can be used to determine if the fee within the leasing contract for the hunting area in question is representative of the area's attributes. The conclusions author drew from the data of the two counties subject to analysis are applicable as the basis for further research. However, a nationally usable equation can only be made once the national data is processed, which, according to author, are necessary to collect.

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