

PHD THESIS

UNIVERSITY OF KAPOSVÁR
FACULTY OF ECONOMIC SCIENCES
Institute of Mathematics and Information Technology
Department of Information Technology

Head of doctoral school:
DR. GYULA SZÉLES
Doctor of the Hungarian Academy of Sciences

Heads of research:

DR. LÁSZLÓ SUGÁR
University professor

DR. BÉLA CSUKÁS
Associate professor

INVESTIGATION OF THE BIG GAME MANAGEMENT IN THE SOUTH TRANSDANUBIAN REGION

Author:
RÓBERT BARNA

KAPOSVÁR
2005.

PHD THESIS

UNIVERSITY OF KAPOSVÁR
FACULTY OF ECONOMIC SCIENCES
Institute of Mathematics and Information Technology
Department of Information Technology

Head of doctoral school:
DR. GYULA SZÉLES
Doctor of the Hungarian Academy of Sciences

Heads of research:

DR. LÁSZLÓ SUGÁR
University professor

DR. BÉLA CSUKÁS
Associate professor

INVESTIGATION OF THE BIG GAME MANAGEMENT IN THE SOUTH TRANSDANUBIAN REGION

Author:
RÓBERT BARNA

KAPOSVÁR
2005.

1. PRELIMINARIES AND OBJECTIVES OF THE STUDY

The aim of the game management can be defined as the quantitative and qualitative regulation, defence and development of game population due to the continuation of planned hunting, just as participation in the biodiversity of the given biotop environmental system.

The game management is an active participant of the multifunctional agriculture. The venison is a healthy product, what is produced in a fully environmentally way and relies upon the ecological potential, the local environmental conditions and the traditions. The game management using biofarming takes part in the conservation of the colorfulness of nature and the habitat. It is conducive to the rural development, rural tourism and guarantees employments.

One of the characteristics of the game management is the amount of big game, which influences the other characteristic, that is the quality and both have an effect on the third, the economic feature.

The South-Transdanubian region is characteristically a big game territory, where the red deer (*Cervus elaphus*), the fallow deer (*Dama dama*), the roe deer (*Capreolus capreolus*), and the wild boar (*Sus scrofa*) finds suitable habitat and has important stock size. The stock of the red deer, the fallow-deer and the wild boar needs to be reduced. The size of moufflon (*Ovis ammon*) population is insignificant.

Among the big game species, the quality of the red deer and the fallow deer occurring in the region is outstanding internationally, which is the joint result of the excellent genetic background and good habitat.

The game management has almost 15 billion Ft income what makes about 2% of the total revenues of the agriculture. In the 2003/2004 hunting

season the country as well as all the three counties of the region has made a big loss on the basis of the game managers financial data.

In my dissertation I examine the relations of the big game stock size and quality, respectively the economic connections of big game management showing a deficit at the moment.

Because of the accessibility of data, my investigations – beside the comparison of the financial situation of the South-Transdanubian region counties – is limited to Somogy County. At the quantitative and qualitative examinations I am occupied in the most important game species in Somogy County, the red deer.

The plans prescribe a sustainable number which is much less than nowadays, characteristic of the seventies. In its interest the stock of big game's powerful reducing was started, the effect of which on the quality, will be experienced later.

We must guard the internationally unique, meaning competitive advantage stock of big game's quality, while we manage successfully with its reduced stock size, what is prescribed.

In the interest of the draft aims the following investigations are necessary:

- To prepare a population dynamic model, what helps to analyse the quantity and the temporal changes of the red deer stock living in Somogy County.
- To evaluate the qualitative characteristics of red deer population and their possible changes happened on the basis of the red deer trophy judgement results available since 1974.
- To examine the financial data's connections of official statements of the counties of the South-Transdanubian region.

- To analyse the connections of the damage done by game, which is mostly harmful to the game management.
- To examine the hunting and venison market through deep interviews, as well as the economic characteristics of big game breeding on fenced area and making the SWOT analysis of them.
- To evaluate the number of hunters' days spent with hunting and the expenses related to it on the basis of questionnaire.

2. MATERIALS AND METHOD

Because of the theme is ramifying, I collected the data needed to the examinations from different places:

- National Trophy Jury;
- National Game Management Data Ware;
- Somogy County Fishery and Hunting Conservancy;
- Special literature;
- Personal communications;
- Questionnaire.

I examined the correlation of the big game stock estimated and the bag from 1969 to 2003. For the red deer quantitative examination I worked out an age-group population-dynamic model. By the model on the basis of the bag data available since 1970 and the known reproductive and mortality characteristics the long distance configuration of the red deer population size living in Somogy County can be estimated. The model is suitable for forecasting too. The size of the red deer bag for the next few years can be estimated and the stock's number belonging to it can be calculated. It can be calculated what hunting strategy the prescribed stock of red deer (6,430 individuals) in Somogy County can be reached by and how can be supported it.

I did the qualitative examinations on the basis of red deer trophy database (n=29,017) using statistical methods. These data are available from 1974 to 2005 February. I examined financial data of the annual game management official statement of the 1994-2003 period related to the counties of the South-Transdanubian region. Because the area, the geographical and climatic conditions, game management's fundamentals of the three counties are different, I examined specific indices, I extrapolated

the data to the dimension of the counties, the forest and agricultural productive area.

I introduced the big game unit (BGU), with which we are able to compare the incomes of the big game species realization is compared to that of the red deer's. In this way we get a standard for each game species, which shows how many individuals of the given game species can assure the same income coming from an average red deer. The revenues from game with trophy as well as the other (female and young) have to be calculated. On the basis of rates, I calculated how many big game units was the annual bag of the three counties in the 2003-2004 hunting year. I examined the financial data proportions extrapolated to the big game units.

I collected the whole area size of the 71 game management units in Somogy County, the dimension of the forest and the other territory, as well as the agriculture and forest damages done by game. I collected the bag data of the big game, such as red deer, fallow deer, roe deer and wild boar from 1997 to 2003. I examined whether there is any correlation between the forests and other data. I investigated what is the correlation between the bag data and the agriculture and forest damages done by game in this seven-year period. Eventually I examined the correlation between the changes of the damage done by game and the changes of the bag on county level.

I examined the data of crop fields for game and supplemental feeding in the counties of the South-Transdanubian region relating the years of 1994-2003.

I made deep interviews with important persons working and having ruling sphere of authority in game management as well as the directors of the venison processing enterprises. I made the SWOT analysis of these management units.

I made a survey by questionnaire related to the personal outlays of the hunters in Somogy County (n=75).

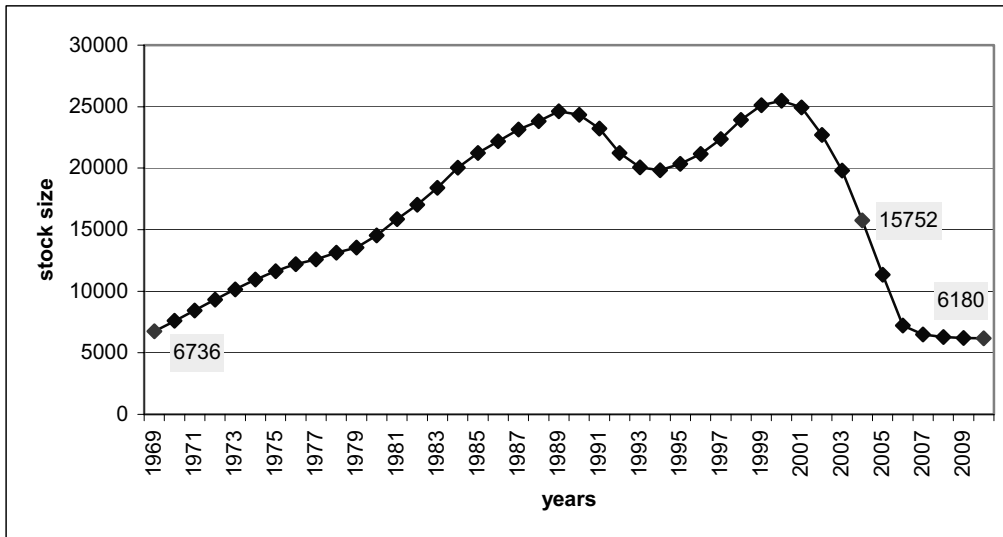
3. RESULTS

3.1. EXAMINATION OF THE RED DEER STOCK SIZE CHANGES IN SOMOGY COUNTY

I examined the correlation between the estimated stock size and the bag. The value is 0.88 in the case of the red deer, 0.96 for fallow deer, 0.5 for roe deer, and 0.97 for wild boar. The connection is close everywhere except of the roe deer, accordingly the opinion is justified, whereas the estimate depends on the intended bag.

The red deer stock size – on the basis of the model calculation – continuously increased up to 1989 beside the hunting determined by bag data starting with 6,736 stock size and 1:1.5 birth sex ratio. In 1989 according to the model 24,629 red deer lived in Somogy County. Then due to the very increased shooting, the stock decreased, and later when the forced hunting was left off, the population recovered and the stock size increased to 25,479 by 2000. Since than – because of the unbearable damage done by game – the hunting authority increased meaningfully again the number of deer to be shot. According to the model the number decreased to 15,752 individual in 2005.

To estimate the stock size in the coming years I used the shot plan accepted for 2005 and planned to 2006 then from 2007 I calculated the bag to set in and to keep the 6,430 individuals as a maximum prescribed by the plan. The hunting must be decreased very much to set in the number prescribed by the plan, because otherwise we will not have enough deer. After the 5,400 bag planned for 2006, 1,000 pieces could be shot, and later to maintain the stock only 200 deer could be harvest. In this case the stock would be stable between 6,100 and 6,300.



The changes of red deer stock size starting with 6,736 stock size and 1:1.5 birth sex ratio

The explanation of the heavily reduced bag is the shift in the sex ratio. According to the bag data of the last few years number of the hinds and calves were double than that of the stags starting with 2001. Since the start of the examination, 1970, first time in 2004 there were more stags than hinds.

3.2 EXAMINATION OF THE QUALITY OF RED DEER POPULATION IN SOMOGY COUNTY

The rate of the medal priced is 39% of the judged trophies, consisting of 19% bronze, 15% silver and 5% gold medal, what shows an excellent stock quality.

On the basis of trophy data the best stags start building bronze medal when they are four-year-old, silver as five-year-old and gold as six-year-old. Most of the bronze medal stags are seven-eight-year-old, while most with silver medal are ten-twelve-year-old. Most of the stags put up the best antlers at the age of 12. It proves the Somogy red deer population's good quality

that is starting from 3 year of age, such as in every age-group there are a lot of medal trophy.

The elderly stags put up ever heavier antler up to the age of 12-13, then they „replace”, that is the weight of the antlers decreases. The bronze medals have on the average 7, the silver medals 9, and the gold medals 11 kg trophy weight.

It praises the game farmers that they have left the really good stags to grow age, because otherwise there will not be above 9 kg average the trophy weight at the age of 12-13.

At the early of the nineties, because of the stock reduction lasting until today, the rate of young in the bag increased heavily, however then the number of the middle-aged and old stags increased too, what cannot be told since 2000. There could be two reasons of it: they spare the older stags, which can not be possible for a long time, or there are not so many old stags. The latter supposal's probability is larger.

To examine the stock of red deer's becoming young I used the χ^2 test, what justified statistically the changes ensued in the rate of the age-groups. Since 2000 the rate of the old age-group has been under 20%, what has never been so low, what allows concluding that the stock became young. Now the stags are missing, which were shot as calf in the nineties.

3.3. COMPARATIVE EXAMINATION OF THE GAME FINANCIAL DATA OF THE MANAGEMENT REPORTS IN THE SOUTH-TRANSDANUBIAN REGION

As for the inflation Somogy couldn't follow it in its revenue, while Baranya and Tolna County could. But the increase of the costs exceeded the inflation in all the three counties.

The big game unit (BGU)

I resembled the incomes of the big game species to the ones of red deer. The calculated rates: 1 BGU value corresponds to 1 red deer, 2.65 fallow deer and 3.29 wild boar value. A big game unit's value in terms of money: 119,400 HUF. I extrapolated every item to big game units and calculated their rates considering the big game unit I got, that the foreigners' and the natives' incomes from paid hunting was much higher in Tolna County and Baranya County, but the added value (supply) was the highest in Baranya County. In the other incomes there is not important difference. According to this Somogy and Tolna County could exploit better their hunting potential with enlarging the service limits.

The wages are the highest in Tolna County, but the difference is not important. The costs of the game management extrapolated to big game units are high in every county. They spend 56% in Somogy and Tolna County, but just 43% in Baranya County. The damage in agriculture done by game is very high in Somogy and Baranya County, nearly 30%, but in Tolna County only 6 %. The measure of forest damage done by game is insignificant 0.6-3,5%. The other costss are the highest in Tolna County, while in the other two counties there are nearly the same.

The total cost shows, that in Somogy County producing every single big game unit costs much more, (with 15% surplus) than in Tolna County, whilst regarding the income, it falls behind. Baranya County's position is the most favourable on cost side, but there the incomes are lower than in the other two counties. It seems from the balances that in Somogy County every big game unit's production generates 20% loss, however in Baranya County only 10% and in Tolna County 2% loss.

3.4. CONNECTIONS OF DAMAGE BY BIG GAME, HABITAT AND GAME BAG IN SOMOGY COUNTY

I examined the correlation of the damage in agriculture and forest done by game with the whole territory of the game management units, with the extent of the forest and with the extent of other lands. The extent of the territory (forest, other and whole territory) shows close correlation with the damage done by game.

The extent of the forest shows closed connection with the damage done by game year by year, whereby it follows that, the game living in a suitable extent forest goes out of it and feeds on arable land, making damage. Fences established in the forests just make stronger this behaviour, because the closed territories decrease the forest carrying capacity.

I examined the correlation between the shot big game – red deer, fallow deer, roe deer and wild boar – and the damage done by game in the different years. It was found that among the connections of the damage in agriculture done by game and the bag regarding the game species, the red deer rises, preceding the wild boar.

In case of the forest damage done by game, the co-efficient of the red deer's one is the largest, the second is that of the wild boar's. In the case of forest damage, deer in general are ranked among the main damage makers. This is justified by the results too in the case of red deer.

In summarizing we can say, that in Somogy County the red deer and the wild boar show the closest correlation taking the total territory into consideration. With the forest area size the bag of the red deer, with the extent of the other territories the bag of the wild boar shows closer connection.

The average increase of the cultivated field and pasture for game as well as the sprouted grazing ground for game was 77% in Somogy, 46% in Baranya, 70% in Tolna County between 1994 and 2003. But the proportion of the cultivated field for game compared to forest is still very low: in Somogy only 0.45%, in Baranya 0.26%, in Tolna County 0.52.

3.5. DEEP INTERVIEW AND SWOT ANALYSIS

Deep interview with hunting companies and clubs

Their economic situation has spoiled, its reasons: decrease in the number of foreign hunters, the HUF/EURO rate spoiling and the changes in the price of venison. On the other side the wage increase is continuous maintenance and the other elements of the management costs ever more, for example the reservation of the hunting lodge, the game feeding and outstandingly the damage done by game and its prevention.

The main incoming source is the hunting, characteristically the big game. The red deer hunting has a decisive magnitude.

The income coming from the venison takes 8-40% and it shows everywhere a decreasing tendency. The income originated from “trophy hunting” is the 40-60% of the total, and has increased lately.

Deep interview with venison processing plants

Their economic situation spoiled, like on the other domains of food industry. The buying-up prices stir constantly, depending on the market buying-up, since the lowest point of the 2003 year, now we can experience a little increase. When we entered the European Union, the economic decline in the former EU-countries caused a general decrease in the venison prices. Beside it the price of the red deer venison is influenced by the great amount of deer

venison imported into Europe by New Zealand, while the price of wild boar meat is determined by the economic situation of Germany.

There are veterinary inspection costs incurring at the game carcass delivery (for example: the obligatory authority veterinary control) which are considerable. The regulations are stricter than in other countries of the European Union. In the last year the rate of the venison unfitted for human consumption was 3 %.

Deep interview with game enclosure managers

The financial position of the game enclosures spoilt except one of them. The 10-15% surplus is over, what could be got for the hunting in fenced areas. Since the joining to EU more “gardens” have showed a deficit because of the high VAT in Hungary.

Among the characteristic costs of operating the most important are the wage and the game feeding. The amortization, the equipments, the building and the repair of the fence costs a lot too. The increase in fuel prices damaged the position heavily.

The veterinary regulations are rigorous and unadvised. The stocks kept in fenced areas must be granted in animal health controls adequately by to the related domestic breeds, and it is not a rule of EU, but Hungarian. The game preserves have formed practices for the preventive and the symptomatic treatment, but these draw high costs.

The game preserves would have better positions on the west-european markets with their venison products, if they were converted to eco-farming. Unfortunately because of the control is impossible, according to the present regulations, the free roaming game stock can not be “eco”. These regulations should be modified. Other state intervention would be necessary too, for example to decrease the VAT’s degree.

The result of the SWOT analysis

Strengths	WEAKNESSES
Uses economical scale of farm	The establishments are used up
The market part of the enterprise is determined	Lack of progress and development
The customers have good opinion	
It has a unique competitive edge	
The enterprise's management is good	
The employees have outstanding expertise	
The enterprise uses well-developed technology	
OPPORTUNITIES	THREATS
Development of complementary products	Strict regulating
Entering to new markets	The market position spoils
Using new technology	The effect of the economic cycle is unforable
Elaboration of new organizational setting up	The consumer claims are unrealizable
	Waning demand

3.6. EXAMINATION OF THE HUNTERS' PERSONAL OUTLAYS IN SOMOGY COUNTY

Today the sport hunters spend less for hunting (176,900 HUF) than in 2002 (191,920 HUF), however it would not seem to be obvious due to the increasing prices.

The obligation fees _except the obligatory insurance – increased meaningfully. The membership fee and the single entry fee increased too in the last period. Its reason is that the sources needed for the functioning of the hunting clubs – mostly because of the increasing damage done by game and the low venison prices – did not cover the incomes originating from the management.

4. CONCLUSIONS

4.1. EXAMINATION OF THE RED DEER STOCK SIZE CHANGES IN SOMOGY COUNTY

The stock of red deer was always underestimated by the game managers/hunters, therefore the age-group population-dynamic model is more suitable for the real estimation of the stock size information.

The composed model can be applied without modification for the population-dynamic calculations of other big game species. After granting the basic data characteristic for the given big game species (sex ratio, initial age-structure, reproduction, mortality, hunting and poaching rate), the changes in the stock size can be calculated in the given period.

According to the model arithmetic the powerful reduction caused in the ratio of female stock, what should be stopped. If it would not happen, there will not be enough progeny, and therefore harvestable red deer, causing decrease in the income.

4.2 EXAMINATION OF THE QUALITY OF RED DEER POPULATION IN SOMOGY COUNTY

The rate of the old stags together with the rate of the medal trophies has decreased in the bag. The red deer stock became younger.

Because of the stock size reduction now those stags are shot too, what were not earlier. Nowadays the hunters had to decide not between the stags of weak and good ability, but between the good and the excellent, what needs very good professional experience.

If we want to keep the quality of red deer stock, the reduction should be done carefully. The future of the “Somogy” red deer will be determined in these years. Now the game managers have a big responsibility for assuring the same quality, with nearly the starting number of 1970. Otherwise we might lose our competitive edge versus the neighbouring countries and the ramification will not be able to keep its revenue producing ability.

4.3. COMPARATIVE EXAMINATION OF THE GAME FINANCIAL DATA OF THE MANAGEMENT REPORTS IN THE SOUTH-TRANSDANUBIAN REGION

The cost-effectiveness of the game management decreased continuously on the nation level. In 2003 all the three counties of South-Transdanubian region as well as on the nationwide ramification closed with negative balance.

In Somogy and Baranya County sources should be assured for the prevention and reduction of the agriculture damage done by game.

At the incomes in Tolna and Somogy County the offered services should be improve as they have reserves in this field compared to Baranya County.

The initiated big game unit is suitable to make a comparison between the counties' big game management.

The effect of the inflation can not be eliminated by the ramification. Its reason is, that the decline in the European Union resulted the decreasing of the solvent demand. In the interest of keeping the guests, the big game prices did not follow the degree of the inflation. The unfavourable change of the HUF/Euro rate exchange had a further negative effect.

Because of our entering the European Union, the trophy taking out from Hungary cannot be considered as export, so the 25% VAT has to be paid for

it, what appeared in the prices and it resulted competitive disadvantage versus the neighbouring countries.

4.4. CONNECTIONS OF DAMAGE BY BIG GAME, HABITAT AND GAME BAG IN SOMOGY COUNTY

In the interest of the improvement of game management's production at a profit the primary object is to decrease the damage done by game. Because the largeness of the damage in agriculture done by game is proportional to the extent of the forest area, so for its decrease the game should be "kept" inside the forest. For this fewer fences should be built and the existing ones should be demolished as soon as possible. Calmness should be assured for the game in the forest and to reduce the disturbance (people collecting antlers, mushroom, snail and cross-motors activity etc.) should be decreased, as well as the cultivated field for game feeding should be enlarged and the understory vegetation level should be developed.

The bag of the wild boar is not sufficient, it should be increased because of its high damage.

4.5. DEEP INTERVIEW AND SWOT ANALYSIS

The state could help the game management section got into sad situation, by decreasing the administration, considering the authority regulations and by pecuniary assistances and decreasing the VAT.

By means of the improvement of the game management position the rural development with highlighted priority by the state, would have favorable situation. Hereby the game managers could concentrate better to the professional work, the reduction of the big game stock could be executed

under better conditions together with the preservation of the world standard quality population.

4.6. EXAMINATION OF THE HUNTERS' PERSONAL OUTLAYS IN SOMOGY COUNTY

In the examined period the hunters' obligatory paid burdens increased, what was compensated by the sum spent on hunting equipments and the reduction of the days spent with hunting. As a consequence of it the damage done by game may increase, the harvest plans are not realised, the professional hunters' authority increases and the poaching could gain ground on the tack.

The hunting clubs supply the sources needed to the game management by the increase of the membership and entrance fees. One may not expect, that private persons finance the economic section with the money set aside on their hobbies.

5. NEW SCIENTIFIC FINDINGS

1. On the basis of the calculations done by the age-group population-dynamic model elaborated by me I justified, that the real number of red deer stock of Somogy County should be more than the double of the estimated number in 1970. I determined by the model calculations that because of the long-term increased reduction of red deer hinds the sex ratio was moved for the good of the stags.
2. By the statistical examination of trophy data I documented that the red deer stock become younger. With full knowledge of this fact, and because of the elimination of „minus point” system the stock size reduction must be done considerately for saving the quality of red deer population.
3. I determined that Somogy County in its incomes could not follow the inflation, and at the same time the outlay's increase surpassed it in all the three counties of the South-Transdanubian region. I introduced and used successfully the big game unit in order to make economically comparable the different habitats and the game management being so much different in the counties.
4. According to my calculations there is a significant correlation between the extent of the forest area and the damage in agriculture done by game, and the damage caused by red deer is more powerful than that of done by wild boar. However it can not be prove in the case of the forest damage done by game. The bag of wild boar is in connection with the extent of the agriculture areas and not the extent of the forest area.
5. I found, that the forms of management of the hunting clubs and fenced game keeping units are the real loser of joining the European Union, because of the 25% VAT settled on the trophy's price. The neighbouring

countries organise huntings cheaper, in addition as the result of reduction of the red deer stock we could loose our advantage due to the qualitative stock.

6. I showed that the hunters because of the increased obligatory burdens decreased the sum spent on hunting equipment and the days spent with hunting.

6. RECOMMENDATIONS

- The big game stock size reduction should be done more carefully, because on the one hand it can remove the sex ratio, and could direct to unfavorable age-group composition, on the other hand it could result deterioration in quality, that can be put right only in twenty years. The economic effects of this are incalculable.
- The age-group population-dynamic model should be used in practice too. Analyzing the results of calculation a lot of connection could be lighted, such as changing its parameters a lot of effects could be examined.
- For the exact financial analysis the balance and the profit accounts should be collected from the game managers. The big game unit should be calculated year by year and with its help to compare the big game management of different habitats.
- The data handling of game management should be put in the Geographic Information System for possible revealing of unfamiliar connections till now.
- To decrease the damage done by game methods should be found, which do not mean new burdens for the game managers. The new results of research should be wide-spread introduced, so that they should be used in practice (for example with improvement of understory vegetation level the damage done by game can be decreased). The farmers should be made to be interested in preventing the damage done by game.

7. PUBLICATIONS IN THE FIELD OF THE DISSERTATION

EDITED VOLUME OF ESSAYS AND STUDIES (1)

Barna R. (szerk. közrem.): A zárttéri vadtartás időszerű kérdései, távlatai. Kaposvári Egyetem - Millenniumi Vadászati Bizottság, Kaposvár, 2001. ISBN 963-9096-75-X. Kaposvár : KE-MVB, 2001.

PUBLICATIONS IN HUNGARIAN (3)

Barna R.: Magyar trófeák a világranglistán. *In: Acta Scientiarum Socialium.* 2000. 3. 7. 51-53. p.

Barna R. – Honfi V.: Somogy megye vadgazdálkodásának elemzése térinformatikai módszerekkel. *In: Acta Agraria Kaposváriensis.* 2002. 6. 3. 163-176. p.

Barna R. – Nagy M.: A vadgazdálkodási jelentések pénzügyi adatainak összehasonlító vizsgálata a Dél-Dunántúli régióban. *In: Acta Scientiarum Socialium.* 2005. 8. 19. (megjelenés alatt)

PUBLICATIONS IN ENGLISH (1)

R. Barna: The connections of damage by big game, the habitat and game bag in Somogy County. *In: Acta Agraria Kaposváriensis.* 2004. 8. 3. 219-226. p.

PRESENTATIONS (3)

Barna R. – Honfi V.: Somogy megye vadgazdálkodásának elemzése térinformatikai módszerekkel. *Térinformatika szerepe az agrárstruktúra átalakításában és a vidékfejlesztésben konferencia.* Kaposvár, 2002. máj. 30.

R. Barna: The connections of damage by big game, the habitat and game bag in Somogy County. *II. Alkalmazott informatika konferencia.* Kaposvár, 2004. máj. 20.

Barna R. – Sugár L. – Csukás B.: A gímszarvas mennyiségének és minőségének vizsgálata Somogy megyében. *A dél-dunántúli gímszarvas kiemelt kezelése: kilátások, teendők, konzultáció.* Rinyatamási, 2005. jún. 29.

EDUCATIONAL COMMUNICATION (1)

Barna R. – Honfi V.: Térinformatika alkalmazása a vadgazdálkodásban. *In: Térinformatika folyóirat.* 15. 3. 95. 2003. 18-19. p.

