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LIFE PRODUCTION BASED ON PROLIFICACY RATES OF SHEEP BELONGING TO DIFFERENT GENOTYPES

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ABSTRACT

The competitiveness of the Hungarian sheep factor requires an increase in reproduction traits and in effective lifespan, therefore the authors aimed to evaluate the effective lifespan of Hungarian Merino, German Mutton Merino and German blackheaded mutton ewes based on reproduction. The study was conducted at a nucleus breeding farm, in Törtel, Pest County, Hungary. Animals taking part in the experiment were born in 2004, 2005, 2006 and 2007. 10-10 ewes were randomly chosen from each year of birth and from each breed, so n=40 Hungarian merinos, n=40 German mutton merinos and n=40 German Blackheaded sheep took part in the study. Ewes were involved in breeding at 15 months of age and only artificial insemination was applied. The keeping system was the same for all three breeds.
According to the results, reproduction measures were favourable in case of an accelerated mating system. Prolificacy rates in German Mutton Merino ewes were increasing in parallel with the number of lambings, while in Hungarian Merino and German Blackheaded mutton prolificacy rates started to decrease after the 5-6th lambing. Based on these results, the authors suggest taking a greater care of reproduction and effective lifespan in the selection of the Hungarian Merino breed, and involve in breeding the ram and ewe lambs born from the dams with best life production.

Keywords: Hungarian Merino, German Mutton Merino, German blackheaded, reproduction

INTRODUCTION

The concordance of breed – environment – market is essential for the competitiveness of the Hungarian sheep sector, however finding the genotype best suiting to our circumstances does not even guarantee the increase in lamb numbers, so it would be important to make accelerated mating more widespread. The profitability of sheep farms can be enhanced by increasing the yields per capita and with combined utilisation. According to the current circumstances, profit is mostly defined by the number of lambs per dams (Abayné and Póti 2013).
Cehla (2011) mentions breed, prolificacy rate and the timing of the sales as the most important factors in profitability. In the Hungarian sheep sector, the genetic base is what needs to be modified, according to Nábrádi et al.(2012), as this determines efficiency the most. Jávor (2000) also stresses the importance of choosing the appropriate breed. Tóth et al. (2015) are preferring using crossbred ewes for creating a maternal line. Keeping and feeding has an important role in reproduction, so to traits related to it, too (Gáspár 1983; Veresset al.1989; Veress 1990; Mucsi and Benk 2002). Keeping technology decisively influences reproduction, abundant or exiguous energy supply has an inhibitory effect as much as the immaturity or lesion due to a permanent illness of digestive organs and insufficient movement during development (Veress et al. 1982). Feeding is an environmental factor which significantly influences the utilization of the genetic potential. It is an ancient experience that dams kept on good pastures, under optimal circumstances have a higher rate for twin lambings, and out of those dams that belong to the same breed, those who have better conditions show better reproduction traits (Downing and Scaramuzzi 1991; Mucsi 1997). Out of the four lambing systems, once a year is common in Hungary which is disadvantageous for the profitability. Advantages of the accelerated lambing system and it being economical were already stressed by various authors (Abayné and Póti 2013; Nagy et al. 2005; Bedő 1989). There are more factors determining whether the stock is suitable for accelerated lambing such as genotype, appropriate feeding and rotational grazing (Póti et al. 2012). According to a great Hungarian animal breeder, genotype pre-disposes, environment realizes (Dohy 1999).
The aim of our study therefore was to analyse the effect

of the accelerated lambing system to the life production of ewes, and also the correlation between the accelerated system and the reproduction traits as well as the ratio of twin lambings.

MATERIAL AND METHODS

Ewes whose life production was studied and the effects of accelerated lambing on it were housed in a nucleus breeding farm in Törtel, Pest county, Hungary. The farm keeps three breeds, Hungarian Merino, German Mutton Merino and German Blackheaded mutton, having approximately 1000 dams. We've chosen individuals taking part in the study randomly from each breed, Hungarian Merino (n=40), German Mutton Merino (n=40) and German Blackheaded (n=40), from each year of birth 10-10 individuals. Animals were born in years 2004, 2005, 2006 and 2007. Ewes were bred at approximately 15 months of age first, applying only artificial insemination. Choosing the ewes in heat probe rams (belonging to Hungarian breeds Ratska, Tsigaja) were used. After the first lambing, dams of all breeds that were studied were lambing in every 8 months in average, oestrus synchronisation was used on the German Blackheaded out of the main breeding season. Feeding of the breeding animals varied from year to year based on the nutrition value of the feed, but was uniform in case of all three breeds. Dams got rye (300 g/day) as supplemental feed for two weeks before insemination.

Data was analysed by the SPSS 23.0 software package.

RESULTS

prolificacy rates did not decrease due to accelerated lambing (in every 8 month in average) in any of the three breeds according to our results, on the contrary, they were exceeding the Hungarian average in nucleus farms (Table 1)

The reason of it next to the genetic potential might be advantageous feeding, keeping and health status in the breeding farm. Based on the publications by the Hungarian Sheep Breeders Association (MJSZ) / Hungarian Sheep and Goat Breeders Association (MJKSZ), the yearly prolificacy rate of Hungarian Merino nucleus population is between1.255-1.328 while it is 1.3-1.4 in German Mutton Merinos in Hungary. However, in German nucleus breeding, the prolificacy rates of the second breed can reach even 160-170% (Veress 1982). Jávor (2012) reported 137.7% for the German Mutton Merino breed under production control in Hungary for the year 2010.

At nucleus breeding farms, yearly average prolificacy rates for Hungarian Merino, German Mutton Merino and German Blackheaded muttons were 1.30, 1.35, and 1.38 respectively. At commercial farms this was significantly less, 1.0-1.1 which is disadvantageous for profitability. At the farm we studied, the German Mutton Merino and German Blackheaded ewes reached a prolificacy rate of 1.50 and 1.59 which is considered to be excellent. According to Pajor et al. (2011), prolificacy rate in German Blackheaded animals can reach even 180-200 %. The prolificacy rate is higher in German Mutton Merino and German Blackheaded breeds than in the Hungarian Merino breed due to the higher number of twin lambings in the first two. Merino breeds are for twin lambings if housed and fed appropriately (Mucsi and Benk 2002).

The prolificacy rate for Hungarian Merino ewes was 1.42 which also can be considered as good. The average prolificacy rate was significantly higher in German genotype compared to the two other breeds.

It is clear based on our results that reproduction traits are advantageous in case accelerated mating system applied beside appropriate feeding and keeping technology. Our results are in concordance to those published by Nagy et al. (2005).

Our results suggest that genotype is having an effect on prolificacy rate, similar to the results of Tóth et al. (2015).

Analysing the life production of Hungarian Merino, German Mutton Merino and German Blackheaded breeds of 10 lambings (Figure 1), we could conclude that prolificacy rate was increasing after the first lambing in all three breeds.

The prolificacy rate of German Blackheaded ewes was the best after the 4th lambing, then it continuously decreased. In Hungarian Merino ewes, prolificacy rates are the highest after the 5th lambing. This is in concordance with the results of Turner and Dolling (1964); Nagy et al. (2005), that prolificacy rate is increasing with the number of lambings, the highest is between the third and fifth lambing, and decreases after the sixth lambing. On the contrary, reproduction traits of German Mutton Merino ewes were improving in parallel with the number of lambings. We were analysing the time ewes spent in production as well. A significant culling was after the 5th lambing in Hungarian Merinos as well as in German Blackheaded and after the 6th lambing in German Mutton Merinos. German Blackheaded ewes were culled the ear-

Table 1: Prolificacy rates due to accelerated mating

	Hungarian Merino	German Mutton Merino	German blackheaded
prolificacy rate (national average in Hungary)	1.30	1.37	1.38
prolificacy rate (farm average)	1.42	1.50	1.59
P	<0.001	<0.001	<0.001

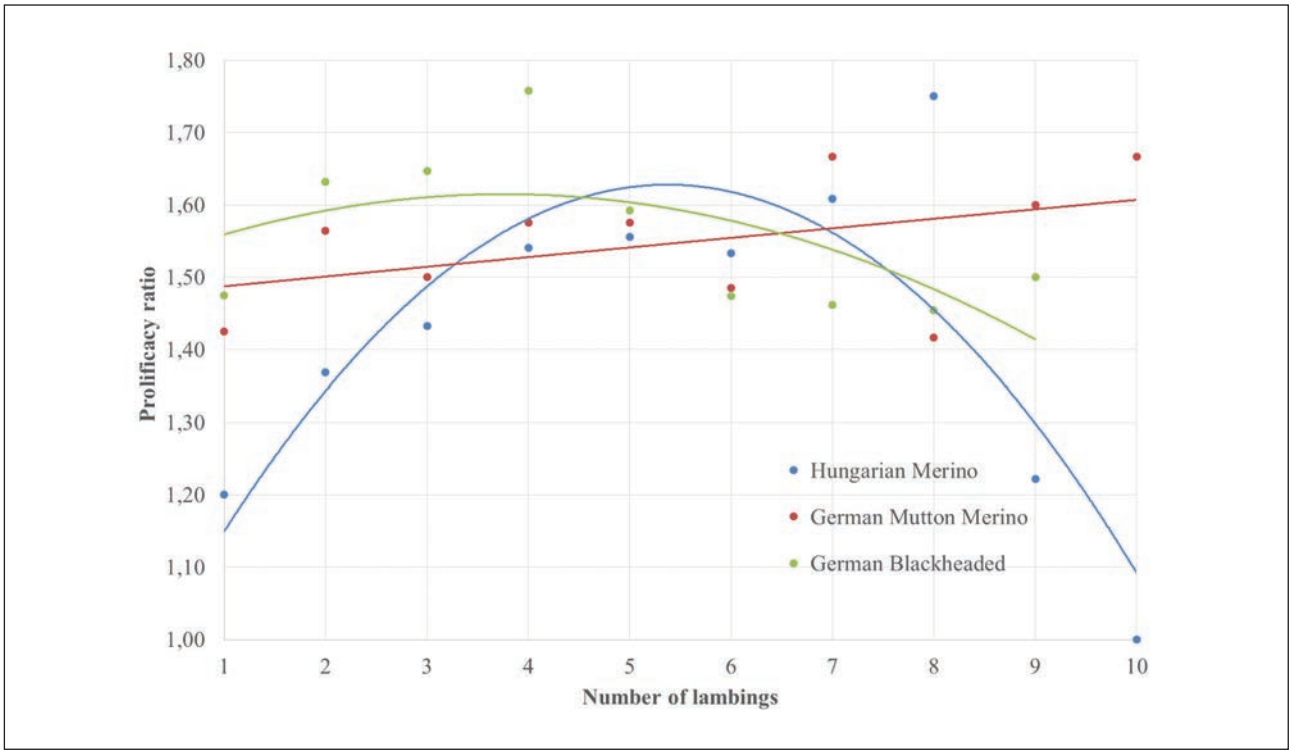

Figure 1: Life production of Hungarian merino, German mutton merino and German black-headed mutton dams

liest in general. Our results suggest that life production is advantageous in case of optimal keeping and feeding.

DISCUSSION

Life production of German Mutton Merino ewes significantly exceeds the one of Hungarian Merino ewes next to appropriate keeping and feeding according to our results. Overall we can conclude that genetic potential of merino sheep is not utilized fully which can partially explain the state of the sheep factor nowadays.

We suggest to consider prolificacy and life production more seriously in the selection of breeding ewes, and involve in breeding the progeny of ewes with the best life production, ram and ewe lambs born from them, especially those born after the 8th lambing in the German Mutton Merino breed.

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ECOLOGICAL RABBIT HUSBANDRY AND ECOLOGICAL RABBIT MEAT PRODUCTION

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ABSTRACT

Striving for healthy lifestyle, nutrition and environmental awareness today provide grounds for ecological farming and husbandry. Due to strict supervision and quality control, ecological products can be the basic elements of modern, high-quality nutrition. My paper is about the dual topic of rabbits and ecological husbandry because both fields may have a great future. The growing consciousness of consumers and the diet and lifestyle that is changing worldwide can be beneficial for both ecological farming and rabbit husbandry. Rabbit meat is very healthy, a source of protein with excellent contents, low cholesterol and high mineral content, and rabbits are very prolific animals with a very outstanding production. Rabbits utilise food that is not for human consumption therefore it is not competing with humans in the food chain. One way of protecting the sole indigenous rabbit breed of Hungary, the Hungarian giant is its using in ecological husbandry. I mapped the potential of free range, ecological rabbit husbandry, examining the rules and practical opportunities.

keywords: ecological husbandry, rabbit-breeding

INTRODUCTION

„Animal husbandry provides our food, ecological animal husbandry secures our good health and keeping our environment wholesome. This slogan is accepted, understood and done by every ecological farmer." (Radics & Seregi 2005). Ecological farming requires a novel approach in agricultural production. By changing the approach, this mentality requires a new quality of lifestyle. Animal husbandry plays a very important role in such farming with a new perspective since there is an important demand regarding the quality of life, products of animals in ecological husbandry, and on the other hand, it provides a big part of the basis for ecological farming (pastures, habitat maintenance, soil support, etc.) (Radics 2001).

The figure shows the trend of Hungarian ecological livestock (Figure 1). In contrast with the high demands of modern breeds, indigenous, extensive breeds used in ecological husbandry have lower demands for their environment, they have better adaptability and resistance. The use of traditional breeds is important for environmental sustainability and the protection of breeds, too. Unfortunately, many traditional breeds are becoming extinct in animal husbandry because they cannot compete in intensive industrialised husbandry, they cannot produce as much as modern intensive breeds that have been formed by almost too much breeding. Therefore ecological animal husbandry has a great role in preserving traditional, indigenous breeds, our traditional livestock, protecting the national values of "Hungaricums". Recently, interest in animals kept with ecological husbandry have been placed in the focus of interest. We can only hope that interest in healthy nutrition and lifestyle is not a "fashion trend" of the era because it opens up new opportunities to grow the Hungarian livestock. Besides, it must be stressed that along the national, agricultural benefit of increasing the amount of livestock and promoting Hungarian animal products, it also has a great role in preserving the current identity of grass plains of the Hungarian Great Plain and other Hungarian landscapes (Szabó 2006, Radics 2001).

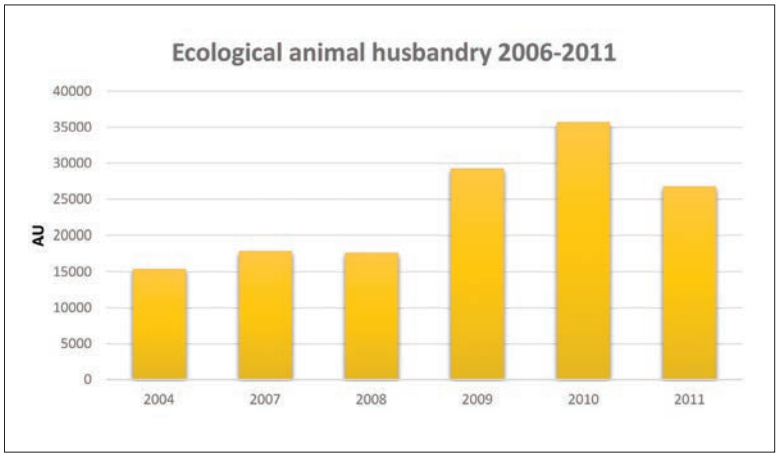

Figure 1: The trend of ecological livestock expressed in animal unit (National Action Plan for the Development of Ecological Farming, 2014)

Figure 2: A Hungarian giant with its offspring (agouti colour) from János Nagy (Csertő)

Our only indigenous rabbit breed is the Hungarian giant (Figure 2). According to its abilities, this "Hungaricum" could be worthy of the primary breed of choice for ecological rabbit husbandry. The Hungarian giant bears extensive husbandry well but it can bear state-of-the-art raising methods less well. It develops foot ulcer in disproportionately high numbers on a grid footing that decreases its economic value. The breed is not favoured in bigger establishments of 50-400 dams (female rabbits with offspring) due to problems with keeping it, therefore it can only be encountered in small-scale husbandry. However, if circumstances allow it, Hungarian giants can be kept profitably. (Table 1) As it is our only breed bearing the name "Hungarian" – and recognised abroad –, its maintenance is justified as accumulating genetic reserve, too (Holdas 2000).

Although intensive rabbit husbandry will keep the main role in production, consumer demand is growing for meat products from alternative sources, too. In recent years, many studies examined group husbandry that is used in alternative husbandry and recommended for animal welfare. An expectation that is spreading worldwide is that production should conform animal welfare and environmental aspects, too. Timely research topics are the effect of husbandry in bigger groups, the type of floor and the environment on the animals (Kustos et al. 2003a, 2003b, Metzger et al. 2005, Verga et al. 2004, Maertens et al. 2004, Trocino et al. 2004, Princz et al. 2005a, 2005b). According to some studies examining deep-litter group sizes, it can be stated that raising rabbits in big groups on deep litter (64 animals/pens) can be effective with a healthy livestock and appropriate hygiene but it achieved considerably better results than intensively kept rabbits fed by fodder with medicals compared to natural raising and fodder. Taking the longer growth period and higher loss rate into regard, alternative raising and feeding methods cost more even with good conditions (Kustos et al. 2003a). The trend of meat quality with different raising methods has also been examined. According to the result of the study, deep litter method is not advisable for practice because the worst results were observed when meat quality was examined in the case of deep litter (Jekkel et al. 2008). These studies provided useful data to implement alternative rabbit husbandry and raise the issue of further examinations. Further studies may aim to explore animal health risks and the possibilities of reducing loss during nurturing.

During studies of raising dams in groups, it was observed that in many cases, dams are giving birth in the same box which may cause mortality among newborn rabbits (Mirabito et al. 2005). Many studies and observations are directed at that among European rabbits, those who are behind in the ranking have to constantly endure stress and this considerably reduces their prolificacy and nurturing performance compared to dominant specimens. Many examined the behaviour of young rabbits kept in a group (Dal Bosco et al. 2002, Lambertini et al. 2001, Princz et al. 2008). In bigger groups, rabbits rest less, move more, social interaction and aggressive behaviour is more frequent. It was stated from production and slaughtering results as well as observing the behaviour that 16 rabbits/m^2 can be regarded as ideal. If animal density is increased, performance in production is decreased and behaviour changes. (Szendrő 2009a). According to Szendrő (2009), based on the results, raising dams in groups is unambiguously detrimental and disadvantageous and even in the case of young rabits, only a litter is worth keeping together. Deep litter has many disadvantages for both dams and young rabbits. During later studies, keeping in groups was examined many times because animal welfare movements call for and the requirements of ecological rabbit husbandry prescribe this mode of husbandry (Szendrő et al. 2010, Szendrő et al. 2011, Szendrő et al. 2012, Szendrő et al. 2013).

Table 1: Growth of Hungarian giant rabbit according to breed standard (MÓE 2010)

Age (month)	1	2	3	4	5	6	7	8	9
Weight (kg)	0.7	1.6	2.5	3.4	4.2	5.0	5.5	6.0	6.5

MATERIAL AND METHODS

During my own study, I examined the attitude of Hungarian rabbit breeders to ecological rabbit husbandry and map Hungarian ecological husbandry technologies. I examined the productivity and profitability of a rabbit stock of 50 animals raised and bred ecologically. I have done my study by questionnaire among those who raise rabbits.

RESULT

Summary of questionnaire results

The questionnaire was filled in by 84 rabbit breeders. I have sent the questionnaire to the breeders online.

Breeders have the following breeds: Vienna White, Vienna Blue, Flemish Giant, New Zealand White, New Zealand Red, Californian, French Lop, Hungarian Giant, Pannonian White, dwarf rabbits (Netherland, Lionhead, Lop, etc.) and mixed domestic rabbits.

The surveys show well that many raise rabbits as part of the household mainly for self-sufficiency and genetic conservation. Approximately half of smaller breeders are members of a club of a breed or breeder organisation. Most of rabbit breeders have a livestock of 5-10 breeding animals, approximately half of their amount keep around 20 breeding animals, 5 respondents have a rabbit stock with 20-50 dams and one has 250 dams.

Most keep rabbits in a cage but some of them place the animals on a run during the day. A smaller part of the breeders uses some kind of alternative method, free-range or deep-littered in a barn. 80% of those who were asked use individual cages, 17.8% keep rabbits in small (2-10) groups and 2.2% in bigger groups (above 10 rabbits). In most cases when they described their method of keeping the rabbits and when individual cages are used, cages are in a fully closed building or closed from 3 sides. Some breeders place their cages according to the weather: outdoors in the summer at a shaded but draft-free place and in a closed building in the winter. The small number of breeders using deep-litter keep their stock almost exclusively in a closed barn.

Breeders indicated the following goals: hobby (24%), meat production for own needs (11%), meat production for selling (18%), genetic conservation (10%), producing breeding animals (19%). Rabbits for selling are not always bought by slaughterhouses, therefore many sell rabbit meat themselves. Rabbits for slaughterhouses are sold by live weight. Producers mostly offer rabbit meat sold by themselves as kitchen-ready.

Regarding fodder, rabbit-breeders often feed animals with seed and grain feed (barley, grain, oat, peas, sunflower, corn) but in the case of rabbits for fattening, industrial fodder together with seed and grain feed is preferred. In ecological husbandry, feeding with grain and seed as well as hay is deemed to be good but in case of rabbits for fattening, fodder is regarded to be more useful in many cases, according to their experiences, rabbits fatten faster if they are fed with fodder or seeds and grains, they can reach slaughtering weight faster.

Most of those who were asked have heard about ecological husbandry. Many regard it to be imaginable that they will use this method. A free range – runway system is deemed to be beneficial for rabbits by everyone. Deep-litter is much more divisive for breeders but they agree that with proper hygiene and regular cleaning, deep-litter is a good placement method. However, many regard deep-litter to require more work than cages because animals have to be cleaned more often.

None of the breeders agree with keeping breeding rabbits in groups. Most mention the problem of the population growth being untraceable, therefore the performance of a dam is not revealed and the breeding group makes the breeding of registered animals impossible. The majority deems it to be inappropriate for the sire to always be with the dams because that would result in more than 6 births per year and the sire would harass the dams. Many even deem 6 births per year to be too many. Most of the breeders regard 3-4 births per year to be appropriate. They deem keeping rabbits for fattening to be good if the young rabbits are divided according to sex because if they remain together then it does not have a positive impact on the group. They would keep the group of rabbits for fattening at a maximum of 15 animals, 60 rabbits in a group are deemed to be too much by all breeders. Many mention that in case of keeping the stock in a too dense group, diseases occur more easily.

They think that the conditions of ecological husbandry could easily be fulfilled if care is taken of the placement of rabbits but the acquisition of fodder is deemed to be problematic. They regard this kind of rabbit husbandry to be much more costly. Due to extra costs (e.g. building a runway) they reckon that it cannot be used in industrial-scale husbandry, ecological husbandry is not profitable. Some thought that if already existing outbuildings, garden, pasture could be used then it can even be cost-effective. In a smaller establishment if there is demand for ecologically raised rabbit than they deem provisions to be fulfillable. Many find the period to be ready (14 weeks) to be long and this is one of the reasons why they do not regard high-scale production to be profitable.

According to the conclusions that can be drawn from the questionnaire, it can be stated that breeders in smaller household establishments try to realise husbandry similar to ecological methods. They reckon that the provisions of ecological rabbit husbandry can be fulfilled but higher-scale production of this kind is not necessarily profitable. Generally, it can be said that ecological production is regarded to be beneficial from an animal welfare perspective but from an economical and labour intensive point of view, they prefer cages.

Introducing the ecological rabbit farm of Ökorex-Bio Kft.

The owner of the farm is president of Central Hungarian Bioculture Association ("Közép-magyarországi Biokultúra Egyesület") and agricultural engineer László Obreczán who started ecological farming 16 years ago.

He started to establish the ecological farm in 1999. Since 1999, Ökorex-Bio Ltd. Producing and Marketing Ecological Agricultural Products ("Ökorex-Bio Mezőgazdasági Biotermékeket Termelő és Forgalmazó Korlátolt Felelősségű Társaság") has been producing ecologically on 200 hectares in Fiad, Somogy county, on the premises of Kéri Manor ("Kéri Major"). They produce pesticide-free products exclusively with strict official control at their farm.

Their husbandry section is based on swine, more specifically mangalica swine. Beside that, they also rear poultry, sheep and rabbits. They use the rabbit-breeding prescriptions of Biokontroll Hungária Kht. for rabbit husbandry with a slight modification. Animals are fed with self-produced seed and grain feed as well as alfalfa hay. The livestock consists of 50 dams and 10 sires as well as the new generation. Dams are kept in groups, 5 dams, a sire and the newly born rabbits – until they are separated – consists of a production group. There is a maximum of 6 litters in a year. Average litter size is 4-12/dam but due to keeping the rabbits in groups, there are approximately 4-5 kits for a dam. There is no measurable data for loss around giving birth, approximately 5% is the loss from giving birth to separation. There are dams who are individually placed in parts with a set floor area. (Figure 3) Here, average litter number is kits/dam. This way, the performance of each dam can be monitored better, it can be filtered if one of them eat the kits. Kits are – according to prescriptions – with their mother until they are 5 weeks old, then they are placed to the young rabbits. They are also kept in groups n the fattening period. (Figure 4) Before puberty, the stock is separated to avoid aggression. Fattening groups can consist of a maximum of 60 specimens according to the prescriptions. Here, there are generally much less rabbits in a group.

The purchaser transports the animals when they reach the weight for slaughtering (around 2.7-3 kg). Rabbits for fattening reach this weight at the farm in approximately 4-6 months. They are slower to be ready in the summer

Figure 3: Individual placements of a dam at the premises of Ökörex-Bio

Figure 4: Group keeping at the premises of Ökorex-Bio

because their feed consumption, therefore their weight gain is reduced in case of great heat. They consume more feed in the winter period, therefore their specific feed consumption is better, they reach the weight for slaughtering more quickly. Olivia Ltd. takes them from the producer to its own slaughterhouse. They pay 828 HUF+VAT/kg for the rabbits (2014 data). The slaughterhouse has such a high demand for ecologically produced rabbit meat that it almost exclusively sold abroad. For disease prevention, the dams are vaccinated against myxomatosis once a year. After separation, young rabbits get Trisulmix to prevent coccidiosis. Loss is around 10-20 % which occurs in great heat because rabbits have low tolerance for heat, they cannot adequately perspire, they get a heat stroke and die. There are various herbal products available for other diseases. Based on practical experience, the farm initiated to modify the condition system of Biokontroll for rabbits regarding castration, the placement of dams, the size and composition of the group for fattening and the number of boxes for giving birth.

The farm is currently producing with 50 dams and with approximately 5 young rabbits per litter, resulting in 150 rabbits for fattening in a cycle. Calculating with a fattening period of 5 months, they bring a profit of 185 000 HUF for the farm. (Table 2) Calculating with 6 times of giving birth per year, the sum is 900 rabbits for fatten-

Table 2: Profit calculation of ecological rabbit husbandry		
Income:	**Expense:**	
Purchase price 828 HUF/kg + VAT	Fodder	50 000 HUF (flat cost)
Weight when purchased 2.7-3kg	Hay	5 000 HUF (flat cost)
Sold in total 150 pcs	Straw	2 000 HUF (flat cost)
	Salt, other	1 000 HUF
	Medicaments	4 000 HUF
	Labour costs	100 000 HUF for 5 months
Total income: 347000 HUF (net)	Total expenditure: 162 000 HUF	

ing per year, yielding a profit of 1 110 000 HUF per year calculated with current costs and purchase prices. This means 92 500 HUF of income per month.
For comparison: during the planning of an intensive rabbit farm of 50 dams, 72 213 HUF clean profit is calculated per month. It is apparent from the comparison of data that a breeder of ecological husbandry can produce economically, with profit as well.

CONCLUSION

It is not recommended to keep dams in groups based on research data mainly due to negative behaviour and because it increases loss around births due to dams giving birth in boxes. According to practical experiences, the individual placement of dams is more beneficial. In the case of groups of younglings, the conclusion can be drawn that healthy livestock in not too big groups, with proper hygiene and separated according to sexes can produce effectively but the production level cannot get near to results achieved with intensive husbandry and modern methods (artificial insemination, hormone treatment, fodder with antibiotics). However, it must not be forgotten that the goal of ecological husbandry is not to reach the production levels of intensive industry.

SUMMARY

Striving for healthy lifestyle, the need for the traceability of products and sustainable farming as the ever-increasing demands of the modern era give grounds for ecological farming, husbandry. Products of ecological husbandry can worthily be the basics of modern healthy nutrition thanks to strict monitoring and quality control schemes. The uptick of ecological rabbit husbandry would have a significant role in reviving household farms, rural development and supplementing income. It would result not only in the welfare of our animals but also the living standards of people taking care of them. Ecological husbandry has a great role in forming the face of the countryside and conserving our indigenous species. Ecological rabbit husbandry provides a chance to save our only indigenous Hungarian rabbit species, the Hungarian giant, to conserve it as a "hungaricum". Although studies of rabbit-breeding and the experiences of breeders should alert us that the requirements of ecological rabbit husbandry need to be revised but everyone agrees that there are opportunities for keeping rabbits with near-natural conditions especially on the scale of small farms. Slaughterhouses have a high demand for ecological rabbit meat, proving that there is already a market for such products abroad, therefore it is worth dealing with it by all means.

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THE EFFECT OF DIFFERENT HOUSING SYSTEMS ON TRAITS OF EXPERIMENTAL CROSSBRED LEGHORN AND BROWN TYPE LAYERS UNTIL 96 WEEKS OF AGE

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INTRODUCTION

TETRA layer hens are well known internationally. Intensive egg production started in Bábolna State Farm in 1963. Lohmann Leghorn type hybrid hens produced 262 eggs on average, a high performance at that time (Schlett 2004). The Tetra layer hybrid hens bred by Bábolna reached this performance in 1970. The basic system of selection was reciprocal recurrent selection – and its modified versions – until the present time. By improving persistency and other main traits the performance of layers increased continuously. In 1990 Tetra SL layers reached 300 eggs/hen, in 2010 357 eggs/hen and in 2016 412 eggs/hen production levels due to higher laying potential and longer production cycles (Budai 2012, 2014, Forgács 2016). The total improvement in 50 years was 150 eggs/hen. As a comparison egg production of layer type hens during the XX century increased from 170-175 eggs to 290 eggs due to selection, hybridization and continuous performance testing (Ensminger 1980, Albers 1998, Anderson 2015).

Leading primary layer type hen breeding companies try to improve efficiency off egg production by selecting hens with better persistency, thus keeping hens longer in production. As an example ISA hens are able to produce 400 eggs until 85 weeks of age, and 500 eggs until 110 weeks of age (Hunton 2012.) Budai (2012) reported that in TETRA large scale individual performance tests 72 % of the hens produced more than 400 eggs until the age of 90 weeks. The University of Kaposvár and Bábolna TETRA Kft. (and their legal predecessors) cooperated closely since 1972 testing commercial and experimental layer lines and cross combinations under different managament systems simultaneously.

MATERIALS AND METHODS USED

The layer hens

In the present test 3 white Leghorn cross combinations (designated by Tetra LW_1, LW_2 and LW_3) and 3 brown egg layer crosses (designated by Tetra $Brown_1$, $Brown_2$ and $Brown_3$) were compared.

The housing systems

All six cross combinations were kept during a long 19 month laying period in 3 different housing systems. Those were: (1) EU compatible furnished cages providing 756 cm^2 floor space/hen, 10 hens were placed to cage (Figure 1); (2) traditional cage system providing 630 cm^2/hen floor space 6 hens were placed to cage; (3) pens with slatted floor and litter, providing 1042 cm^2 floor space/hen, 53 hens were placed to pen (Figure 2). Total number of EU compatible cages were 144, total number of traditional cages 72, and number of floor pens 12. In total number 2508 hens participated.

Figure 1: Leghorn layers in furnished cage

Figure 2: Brown egg-type layers in the floor housing system

Figure 3: The experimental layer house of Kaposvár University where the test was conducted

The traditional cage system was banned in Hungary in 2012. With special permission considering the experimental goals, and the fact that Tetra hens are widely kept in several countries in the World using the typical traditional cage systems, we could test the hens in the traditional system too. All experimental groups were kept in the same environmentally controlled house. The cage systems, (rows) were located on the two sides of the house, in the middle section the floor pen row was installed (Figure 3).

Within all cages and pens the number of hens were kept constant all the time, to stabilize group sizes and density level. All dead hens were replaced on the same day by reserve hens kept in the same house, and housing system. Additional 20 % reserve hens started the test.

The replacement procedure does not influence the performance of the hens as several previous experimental data showed. The official license number of the test is 232.1/0042/0016/2011 and SOI/312766-7/2016 (KA-2044).

Management

All chicks were reared on litter in the same rearing unit. All procedures practiced were the same as described in the Bábolna TETRA-SL Commercial Layer Management Guide (2012). Rearing ended on the 19th week, where the pullets were transferred to the laying house. They were kept in the laying house until 96 weeks of age. The layers were debeaked. Commercial feeds were fed throughout rearing and the laying period.

Traits measured and main methodical specifications

All traits were measured according to the guidelines described in the Hen and Turkey Performance Testing Code IV (Mezőszentgyörgyi et. al 2007)

Eggs were collected daily for each cage or pen. Traits measured or recorded the following parameters: % egg production, peak production, duration in days over 90 % production, eggs produced per hen housed, and per standard number of hens, egg mass produced/hen, mortality, feed conversion, body weight of hens at 365 days and at the end of production. Nine egg quality traits were measured each 4th week by Egg Quality Microprocessor Range system (Technical Services and Supplies Ltd., York, England). Broken and cracked eggs were recorded daily. Also floor eggs were collected daily. Statistical analysis was performed on cage and pen data, using ANOVA.

RESULTS

Because of strict limits regarding the length of the paper, we will present data only on total egg numbers produced, laying house mortality, egg mass production, percent of floor eggs produced in the alternative system, and percentage of broken and cracked shelled eggs produced in the various keeping systems. In Table 1 the total number of eggs produced by the hens until 96 weeks of age as influenced by genotype and housing system are presented. On Table 2 the laying house mortality data are summarized, considering the same influencing factors. In Table 3 the total egg mass production of the hens are shown. In Table 4 the percentage of the floor eggs are shown in the alternative system, considering the great economic significance of this phenomenon or trait as latter is influenced also to considerable extent by genetic factors in interaction with the housing system. In Table 5 the percentage of macroscopically cracked, and those cracked shelled eggs observable only by candling are shown, related to total eggs laid as affected by genotype and housing system.

MAIN CONCLUSIONS

• Based on the performance test results it can be stated that among, the TETRA layer hen cross combinations

Table 1: Total number of eggs produced per hen till 96 week of age as influenced by genotype and management

Genotypes	Egg production/ hen Management system		
Leghorn types:	Furnished cage* (756 cm²/hen)	Traditional cage* (630 cm²/hen)	Alternative** (1042 cm²/hen)
LW_1	$420,7_a$	$379,3_a$	$426,5_a$
LW_2	$399,2_c$	$354,0_c$	$371,2_b$
LW_3	$394,7_c$	$359,5_{bc}$	$351,8_b$
Mean:	*404,9*	*364,1*	*383,2*
Relative difference:	**100%**	**90%**	**95%**
Brown egg types			
$Brown_1$	$407,9_b$	$352,9_c$	$431,2_a$
$Brown_2$	$420,3_a$	$371,0_{ab}$	$425,9_a$
$Brown_3$	$414,3_{ab}$	$361,6_{bc}$	$410,9_a$
Mean:	*414,1*	*361,8*	*422,7*
Relative difference:	**100%**	**87%**	**102%**

*: eggs/hen/standardized number **: eggs/hen/mean number of hens
Data designated by the same letter are not statistically significant within columns.
P < 0,01

Table 2: Laying house mortality of the hens till 96 weeks of age as affected be genotype and housing system

Genotypes	Mortality % Housing system		
Leghorn types	Furnished cage (756 cm²/hen)	Traditional cage (630 cm²/hen)	Alternative (1042 cm²/hen)
LW_1	$10,0_{ab}$	$12,5_a$	$24,5_a$
LW_2	$5,0_a$	$7,0_a$	$8,5_b$
LW_3	$20,0_b$	$8,3_a$	$20,8_a$
Mean:	*11,7*	*9,3*	*17,9*
Brown egg types			
$Brown_1$	$17,5_{ab}$	$4,2_a$	$20,8_a$
$Brown_2$	$8,3_{ab}$	$11,1_a$	$21,7_a$
$Brown_3$	$6,7_a$	$1,4_a$	$19,8_a$
Mean:	*10,8*	*5,6*	*20,8*

Table 3: Total egg mass produced by the hens/housed during a 19 month laying period as influenced by genotype and housing system

Genotypes	Egg mass (kg/hen) Management system		
Leghorn types	Furnished cage (756 cm²/hen)	Traditional cage (630 cm²/hen)	Alternative (1042 cm²/hen)
LW_1	24,688	21,504	24,670
LW_2	23,372	20,631	22,125
LW_3	21,703	20,879	20,689
Mean:	*23,250*	*21,002*	*22,496*
Relative difference:	**100%**	**90%**	**97%**
Brown egg types			
$Brown_1$	23,452	21,159	24,722
$Brown_2$	23,742	20,638	23,830
$Brown_3$	23,392	20,681	22,819
Mean:	*23,555*	*20,834*	*23,786*
Relative difference:	**100%**	**88%**	**101%**

several are capable to produce 400 and more eggs/hen in cage systems matching EU standards, with laying house mortality rates not exceeding 0.5 % per month, considering a 19 month laying period.

• In furnished cages layers produced 10-13 % (41-53) more eggs compared to the traditional cages banned in the EU since 1 of January, 2012. In the alternative system (slatted floor + litter) Leghorn crosses produced 5 % less eggs compared to furnished cages, whereas brown egg type (Rhode Island) hens did not show a reduced performance. It must be stated however that between the cross combinations within Leghorn and brown egg types significant differences existed, indicating a great genetic variability present and opening new possibilities for further genetic improvements.

Table 4: The percentage of floor eggs laid during a 19 month laying period in the alternative system

Genotypes	Floor eggs (%)
Leghorn types	
LW_1	$33,3_a$
LW_2	$7,6_c$
LW_3	$30,3_{ab}$
Mean:	**23,8**
Brown egg types	
$Brown_1$	$27,5_b$
$Brown_2$	$8,4_c$
$Brown_3$	$9,7_c$
Mean:	**15,2**

Data designated by the same letter are not statistically different.
^{xxx} $P < 0,001$

• It must be emphasized that the high laying house mortality in the alternative system is of great economic significance, and is far exceeding mortality rates compared to both cage systems tested.

• In the alternative system the type of the layers (Leghorns vs. brown egg type groups) did not influence the % of floor eggs, if the group means are considered. But within both type of groups certain cross combinations showed exceptionally high disposition to lay floor eggs. Nesting behavior should be considered seriously in the future as an important behavioral trait in selection, because this way floor housing systems will be more widely applied in table egg production in the future.

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Table 5: Percentage of macroscopically cracked and cracked shelled egg by candling observation in % to total number of eggs layed as affected by genotype and housing system

Genotypes	(%) of total cracked eggs Management system		
Leghorn types	Furnished cage (756 cm²/hen)	Traditional cage (630 cm²/hen)	Alternative (1042 cm²/hen)
LW_1	$3,2_{abc}$	$4,2_{abc}$	$2,8_a$
LW_2	$4,8_{abc}$	$5,8_a$	$2,7_a$
LW_3	$5,7_a$	$3,2_{bc}$	$6,1_b$
Mean:	4,6	4,4	3,9
Relative difference:	**100%**	**96%**	**85%**
Brown egg types			
$Brown_1$	$2,8_c$	$3,0_c$	$2,8_a$
$Brown_2$	$2,3_c$	$3,5_{abc}$	$1,6_a$
$Brown_3$	$2,9_{bc}$	$3,5_{abc}$	$1,9_a$
Mean:	2,7	3,3	2,1

Data designated by the same letter do not differ significantly within columns.
^{x} $P < 0,05$ ^{xxx} $P < 0,001$

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DEVELOPMENT OPPORTUNITIES AND PROFITABILITY OF PRIVATE UTILITY PIGEON BREEDING IN HUNGARY

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INTRODUCTION

In Hungary, squab production was supported in the 1960s with the aim of increasing exports. As a result, producer groups and buying-up networks were established and processing plants were updated to suit the quality requirements of foreign markets. Hungary became the second-third largest squab producer in the world. The State Purchasing and Marketing Cooperative was also involved in the project. It was at this time that the major Hungarian bases for pigeon breeding came into being: dovecotes of Autosex Texan pigeons at the State Farm of Enying, of Pannonian Texan pigeons at the Agricultural College of Kaposvár and of King pigeons at the Cooperative of Ócsa. These centres had the task of raising breeding pigeons and selling them to producers.

Chilled squab that has a uniform size and a high useful meat ratio (70%) is sought after and profitable export commodity even today today. Therefore it is important to supply breeders with information on new pigeon breeds (hybrids) that will better satisfy utility demands and need intensive husbandry practices. Organised purchasing and industrialized processing of the squabs offspring must be encouraged, emphasising the economic benefits of squab production.

OVERVIEW OF LITERATURE

The number of Hungarian businesses keeping squabs is minimal today (249 thousand utility pigeons in 2014) and the purchasing network ceased to exist while 1000 tons per year (2 million) pigeons were slaughtered and exported in the 1970s and 1980s to Switzerland, Germany and Italy. Parallel to a drastic decrease in livestock numbers, pigeon-slaughtering plants also ceased to exist in Hungary. Poultry meat production for consumption increased from 412.2 thousand tons in 2002 to 507.94 thousand tons in 2016 but the proportion of pigeons slaughtered was so low that it is not included in the database of the Hungarian Central Statistical Office.

According to Dr István Meleg, since the dissolution of the Poultry Trust in the 1990s no precise statistics have been available on the number of squabs sold in Hungary and on external markets. The State Purchasing and Marketing Cooperative ceased to exist in this period, resulting in the end of organised purchase of rabbits and pigeons. It is a small wonder that Hungarian pigeon farms keeping thousands of pairs 30 years ago have disappeared (Fehér 2010) Antal Uhrner, president of the National Association of Hungarian Pigeon and Small Livestock Breeders says that setting up joint enterprises for breeders to sell their pigeons for slaughtering would improve the situation. If enough interest was generated, utility pigeon breeding could be re-launched in most of the Hungarian settlements based on the current membership. István Bárdos, president of the Hungarian Racing Pigeon Sports Federation says that the members of racing pigeon associations (4200 people) cannot be left out of squab production in Hungary either. Former Secretary of State for Employment Sándor Czomba says that substantial support should be allocated to people seeking employment (Czomba 2014). Agriculture could play a key role in promoting employment in agriculture: Hundreds of thousands of jobs could be created if there was labour supply and advisory services.
For the sake of the population retention capacity of the countryside it is important to make it possible for people to engage in household agricultural activities such as squab production, which could provide them with extra income. Squab production could be such an activity, if a production, purchasing and marketing chain were available. Both theoretical knowledge and practical skills are indispensable for boosting meat pigeon husbandry. One important link in the system of after-school training programmes is adult education because those who take part in this can apply their newly acquired knowledge immediately – in this case, in producing squabs. However, in the starting period this may prove to be an unbearable burden for them, so they should be supported (even financially) from several sources. Currently, the following sources are available:

- the law on adult education (2013/LXXVII. Part 1. 1. § 2.) provides support for training and adult education programmes offered by educational institutions,
- training support for jobseekers is available from Regional Employment Bureaus,
- priority support is available,to promote the employment of disabled people
- the Ministry for National Economy offers support to facilitate employment,
- the Hungarian Development Bank offers loans at a reduced interest rate for livestock farming current assets,
- funding can be sought under VP-4.1.1.1-16 to improve livestock farms, which is also available for utility pigeon husbandry,
- the Mininstry of Agriculture could be instrumental in promoting the establishment of a squab supply chain, exploring export markets for deep-frozen Hungarian squabs and working out the authorisation process of marketing,
- support by application for funding for "young farmers" under 40 years by the Ministry of Agriculture,
- support from the Hungarian National Rural Network, www.mnvh.eu (2014-2020 period) can be applied for,
- common refinancing support is available from Eximbank and Agricultural Business Loan Guarantee Fund for integrators after 2016 to reduce the financial burden of animal-keepers,
- help can be sought from local governments to secure the production site, production and selling permits and the promotion of direct selling of squabs for consumption.

Announcing such a supported program is feasible only if every stakeholder knows the full chain of squab-selling in advance, a legal framework for cooperation have been laid down, and the interests of the various parties have been clarified. (Jilly 2014)

Technological standards:
Nursing, feeding, watering, observation, the separation of successive generations, selective qualification of the breeding stock, air exchange, illumination, regular cleaning, disinfection, maintenance of the building and the renewal of built-in technological equipment has to be taken care of. Even the simplest type of housing requires three separable parts, one where breeding and production of squabs is done, one for the 35-180-day-old breeding pigeons and a third one for housing meat pigeons – separated after 28-35 days – for a few days. (Jilly 2011)
Several research studies show that the oxygen demand of a pigeon with one kg liveweight body at an optimal temperature of 18C° is 1.25litres/h. This is 30litres/day for one kilogram of liveweight, contained in 4.4m^3 of fresh air. A calm pigeon takes 40-50 breaths per minute. This number may be lower at lower temperatures and significantly higher at higher temperatures. The amount of CO_2 emitted by a pigeon is 22 litres/day/kg of liveweight. Pigeons continuously brood (10-14 younglings/year) in a building of optimal temperature (14-22C°), their offspring grow at a fast rate (450-650 grams/bird at 28 days old with a 65-70% yield), so production is profitable (Lahayes – Cordiez 1969; Stam 1987).
Pigeons demand a lot of room, therefore a minimum of 0,5-0,8m^3 of air should be allocated to them per kilogram of liveweight. Their floor area demand is 0.25-0.5kg liveweight/m^2 depending on breed and temperament. The floor area of dovecotes should be determined on the basis of groups of 15-30 breeding pairs. In the case of smallholders, the useful floor area of a building section is approximately 5-6m^2 – 9-10m,^{2} where up to 60 pigeons can be housed. In large-scale husbandry stalls are divided into sections of 9-12m^2 with a handling corridor in front of them (Meleg 2000 and Horn (ed.) 2009).
From the perspective of the efficiency of pigeon-breeding, the following groups can be distinguished:
- small size – 20-50 pairs (hobby size)
- mid-size – 51-200 pairs (size providing extra income)
- big size – more than 200 breeding pairs (smallholder size)
- industrial size – 1000 pairs requiring permanent workforce (business)

Topic introduction

Technological equipment for pigeon-breeding: nesting places, feeders, water dispensers, mineral dispensers, bathing pots, seats for younglings. A group of pigeons corresponding to the number of nesting places (1:1 sex ratio) are placed in a section at the same time. After occupying the nests and choosing mates (10-15 days), the birds start nesting, egg-laying and a 18-19-day-long incubation period. Nesting cells with a width of 80 cm vertically divided into two parts (40 cm deep, 35-40 cm high) have proved suitable for breeding. In some designs cube shaped nesting cells are used (60 cm wide, 60 cm high and 50-60 cm deep), divided into two parts.

Feed supply of utility pigeons: In a 5-year experiment in Germany (1998-2002), with closed keeping and 14 hours of illumination, Hubbel pigeons at a large farm were allowed to eat ad libitum from Cafateria self-feeders. The experiment found that pea consumption (up to 44%) at the expense of corn (up to 36%) was the highest during the period of shedding and rearing (July-October) while a 20-22% wheat consumption was stable throughout the year Pigeons also received finishing rations, vitamins and clam powder (Damme 2004).
Supplying pigeons with feed corresponding to the birds' physiological requirements is more important than the ratio of seed types (protein: 56-60% digestibility, carbohydrates: 67-70% digestibility, fat: 70% digestibility, fiber, vitamins, amino acids). Feed consumption can be four times

higher when the chicks are reared compared to a calm period. 3.0-3.5 kilograms of optimal seed mix is needed to produce a kilogram of young pigeon meat while the feed consumption of the parents is 40-50 grams/day/bird depending on size. Granulated feed has some advantages, includng a better feed conversion ratio.

Utility pigeons bred in Hungary: Breeds that are prolific and produce offspring with a utilizable meat ratio of 65-70% are preferred. The most popular *breeds* are the homing pigeon, the American giant homer, the King, the Autosex Texan, the Pannon Texan, the Carneua, the Mondain, the Hungarian giant, etc. Hybrid pigeons, such as the Euro-Pigeon, Mimas, Mirtys, Titan and Hubbel, have better prolificacy and better meat ratio (70%) than the traditional breeds.

Meat pigeon sales: The purchase price of broilers at processing plants is 246 HUF/kg (approx. 0.78 EUR/kg), 459.3 HUF/kg (1.47 EUR/kg) after processing. (Vadkerti-Tóth 2017) In contrast, since 2015 Hungarian slaughterhouse have been purchasing 4-5-weeks-old, category I. squab at an average price of 2200ft/kg liveweight. The average weight of an oven-ready, shrink-wrapped and deep-frozen pigeon is 0.45kg (the deep-frozen size threshold is 0.4-0.5kg), with a retail price of 3540 forints/kg + 27% VAT (since 2017, only 5%). Oven-ready pigeon is in high demand and can be exported to many countries in Europe and the

Figure 1: King

Figure 2: Hungarian giant

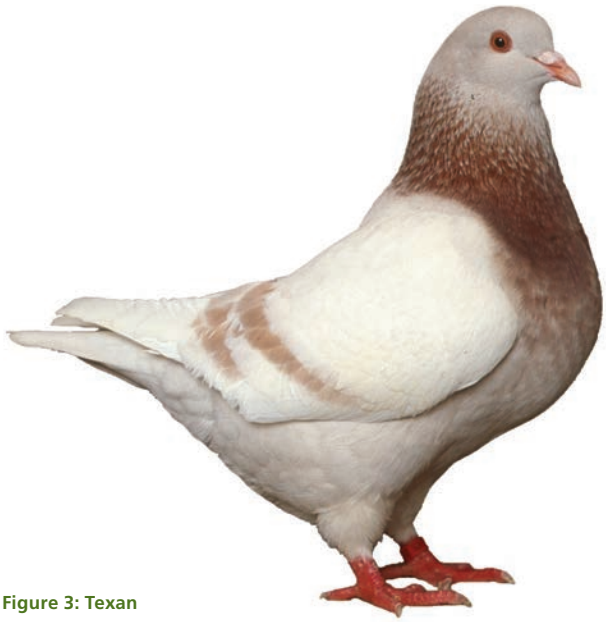

Figure 3: Texan

Figure 4: Carneua

Figure 5: Mondain

Figure 6: Pigeons prepared for fresh consumption or deep-freeze

Figure 7: Shrink-wrapped, deep-frozen oven-ready pigeons

Arab world, too. In spite of this, there is no significant squab production in Hungary (Kertész 2018)
Table 1 shows yearly tendencies of breeding stock qualification and income calculations per breeding pair is in. (The purchasing price of squab at a processing plant is 2200 HUF/kg live weight, the daily feed demand of a breeding pigeon is 40g/day, feed demand for nurturing is 3.5 kg/kg live weight, the average price of feed is 100 HUF/kg, average market weight is 0.54 kg/bird).
Occasionally, breeding stock can be replaced from own population growth but some of them can also be sold as breeding stock. A higher (fourfold) income per bird in this case offsets the decrease in the number of marketable squabs, which results from the need to replace breeding stock from own population growth.

RESULTS

Based on one variant of model calculation, with a flock replacement period of seven years, the six-year population growth from 20 pairs of utility pigeons will yield a contribution margin of 680 thousand forints, and from 1000 pairs 33.724 thousand forints (Table 2).
According to the other variant of the model calculation, if breeding stock is replenished from own population growth, six years with 20 pairs result in a contribution margin of 515 thousand forints, and from 1000 pairs 25.770 thousand forints (Table 3).
7-10% of the breeding stock per year is required to replenish the number of breeding pigeons, since a young meat pigeon is mature for breeding at the age of 6-7 months. If lost breeding pigeons are replaced from own growth, income per pair (based on the model calculation) will decrease by 950 HUF, while feed cost per pair will increase by 540 forints due to the feed demands of the breeding youngling (5.4kg/bird), reducing contribution margin by a total of 1.490 forints per pigeon pair. If the whole breeding stock is sold at the 7th year and the building is filled with new (6-7-month-old) pigeons, the above-calculated income per pair can be expected. The biggest cost item is feed, while the costs of water, electricity, minerals, vitamins, disinfectants and fixed assets are easy to calculate. Data from the literature put the cost of feed within the total costs of meat pigeon production (in large farms) at 40-50%. No detailed, reliable data are currently available on meat pigeon husbandry and the relevant data for farms in other countries are incomparable with Hungarian data for the past of the pigeon industry.

CONCLUSIONS

Since squab produced by utility pigeon breeding does not compete with other poultry species on the product market, demand for it is even (and increasing), and its market price compares well with that of the most expensive meat

Table 1: Offspring, income and cost changes and culling times of pigeon pairs

Breeding years	1.	2.	3.	4.	5.	6.	7.
Laid eggs (no./pair)	14.6	17.8	17.8	17.8	17.8	12.1	10.2
Chicks hatched (no./pair)	11.5	14	14	14	14	9.5	8
Chicks lost (no./pair)	0.7	0.5	0.5	0.7	1.1	2.3	3.2
Matured chick (no./pair)	10.8	13.5	13.5	13.3	12.9	7.2	4.8
Separated pigeons (kg/pair)	5.832	7.290	7.290	7.182	6.966	3.888	2.592
Income (HUF/pair)	**12830**	**16038**	**16038**	**15800**	**15325**	**8553**	**5702**
Feed demand (kg/pair)	50	55	55	54	54	43	38
Feed price (HUF/pair)	5000	5500	5500	5400	5400	4300	3800
Other variable costs (HUF/pair)	3000	3300	3300	3240	3240	2580	2280
All variable costs (HUF/pair)	**8000**	**8800**	**8800**	**8640**	**8640**	**6880**	**6080**
Contribution margin *(HUF/pair)*	**4830**	**7238**	**7238**	**7160**	**5585**	**1673**	**-378**

Table 2: Model calculation I. for the profitability of pigeon production with a 7-years flock replacement period

Unit: 1000Ft

Breeding year	1.	2.	3.	4.	5.	6.	7.
20 pairs	96.6	147.6	147.6	143.2	111.7	33.5	-7.6
40 pairs	193.2	295.2	295.2	286.4	223.4	67.0	-15.2
50 pairs	241.5	361.9	361.9	350.0	279.2	83.6	-18.9
200 pairs	966.0	1476.0	1476.0	1432.0	1117.0	334.6	-75.6
1000 pairs	4830.0	7238.0	7238.0	7160.0	5585.0	1673.0	-378.0

Table 3: Model calculation II for the profitability of squab production in the case of yearly stock replacement

Unit: 1000Ft

Breeding year	1.	2.	3.	4.	5.	6.	7.
20 pairs	66.6	115.0	115.0	113.4	81.7	23.5	-37.4
40 pairs	133.2	230.0	230.0	226.8	163.4	47.1	-75.8
50 pairs	167.0	287.4	287.4	283.5	204.2	56.9	-93.4
200 pairs	668.0	1149.6	1149.6	1134.0	817.0	235.4	-373.6
1000 pairs	3340.0	5748.0	5748.0	5670.0	4085.0	1127.7	-1868.0

types. The amount of squabs produced in Hungary is far below the previous period despite the fact that buyers in the export markets are willing to pay a very high price for it (4700 HUF/kg). Its production is relatively risk-free and over the long term good income-generating potential justify the opinion that an increase in production and exports is desirable. By creating the conditions necessary for such an increase, the current squab output in Hungary could be multiplied within a short period, thereby ensuring a significant increase in squab producers' extra or main income. Squab production, carried on as a business enterprise, would also open an income source for the state.

SUGGESTIONS

It appears necessary to

- Formulate, as soon as possible, the contractual cooperation opportunities of stakeholders.
- Promote utility pigeon mostly in subregions with low employment rates by stressing local opportunities and advantages.
- Disseminate knowledge on utility pigeon husbandry and squab production via supported training to those who are interested.
- Explore the possibilities of providing financial support for producers, provide help in writing successful applications and tenders and in implementing projects.
- Facilitating the national level integration of current and future squab-keepers.
- Provide knowledge and know-how, with advisory services tailored to the conditions of a production site and a given producer.
- State-supported employment opportunities for registered jobseekers in the form of social cooperativess.

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Ajánló

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s igyekezzünk különbek lenni annál, amik vagyunk."
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