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PERFORMANCE ANALYSIS OF ILE DE FRANCE, SUFFOLK AND BABOLNA TETRA SHEEP BREEDS

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I. OBJECTIVES

Two notable tendencies exist in world's animal husbandry: one is to increase yields, while biological capacity is maximally exploited among intense circumstances, the other works among extensive circumstances, where costs are low to level or even increase the profit.

Examination of increasement mainly means the analysis of Hungarian breeds, evaluation of their availability and importance. That is why three different genotypes are evaluated in my work; each of them is able to play an important role in the specialization and intensification of Hungarian sheep sector.

My objectives are the followings:

- How the productive parameters of our Babolna TETRA stock have developed? What kind of correlations exists between the traits and what is their inheritableness?
- How the geno-and phenotypic production of Ile de France breed has formed through out the examined period? What kind of correlations and inheritableness are typical to the examined traits?
- What kind of procedure featured the change of phenotypic- and genotypic structure of Suffolk breed?
- According to the results, what role the examined breeds could play in the national sheep sector, what level their usage could be, and what is their expected future?

II. ANTECENDENTS

Breed assortment of Hungarian sheep sector is not favourable. One breed dominates over the sector, which has moderate and low production abilities (KUKOVICS and JÁVOR, 2001). Beside market-popularity there is not any technical reason standing beside the notable narrowness of the breed assortment. Compared to Merino, import breeds are capable to produce at higher level. But acclimatization has to be considered, because import breeds can only be well utilised, if the environmental conditions are satisfied on the highest level (JÁVOR, 1995).

Efficiency development of sheep breeding is only reachable by the increasement of the yields (JÁVOR, 1995). There are two alternatives to increase the meat production: one improves the meat-form and size of the animals, while the other increases the prolificacy and lamb-nursery ability. On this field, desired results can be satisfied by pure-bred breeding, or by the faster crossings. Earlier, crossing programs were used in Hungary to increase the quantity and quality of lamb-meat. The two most notable programs were the J-ÁKI hybrids and Babolna Lamb Meat Production System (VERESS, 1991).

Babolna Lamb Meat Production System was a classical three-breed livestock crossing construction. A maternal line was established by crossing the later developed breed – Babolna TETRA – and the good-combination meat-type breed - Ile de France. To terminate the crossings Ile de France (lower marketable weight) or USA Suffolk (higher marketable weight) rams were used, according to the demand of the market.

After finishing the Babolna Sheep Breeding Program at 1986, the three above mentioned breeding stocks have been maintained through many difficulties at Szendrő. By 1995 the breed announcement for registration have been realised and at 1999 all of the three breeds had got governmental appreciation.

<u>Ile de France</u>

Ile de France is one of the modern breeds that is very similar to merino breed. There are many reasons beside Ile de France breed like early mating, ready-to-slaughter at any stages, because of low fat-ratio, very good conformation, great weight gain, good aseasonability, good milk-, and wool production, as a crossing partner, the offspring is suitable for further breeding. It is also important that the breed accepts most of the climatic conditions, because of its good acclimatization. Using any kind of keeping system they always produce high yields. Ile de France is the second most important breed of Hungary –

although it is only a fragment compared to merino – in number of ewes. The breed is very capable for pure-breeding and also for crossings, increasement of efficiency can be resulted by its use in breeding and production stocks *(*KUKOVICS, 2000*).*

Suffolk

Suffolk is one of the best meat-type breeds of the world, especially its American variety *(*HARCSA and JÁVOR, 1999*).* Suffolk is the most respected paternal line, which was developed in England from 1700, crossing northfolk horn ewes with southdown rams. Hungarian appearance of the breed was not easy, because the first imported animals from England acclimatized very badly. Knowing both the acclimatization problems of the English variety and the modernization of some traits in the American variety; the first imports came from the United States of America at 1973, from Illinois and Iowa states in a very low number.

Babolna TETRA

The aim of development of Babolna TETRA sheep was to increase the very low prolification rate at Hungary. The breeding program started at 1970, with the test of 12 different breeds. Three breeds were selected from them, national Merino, Romanov and Finnish Landrace. Different Romanov and Finnish Landrace background lines were established, using almost 67,000-ewes population with different genetic background (F1, F2, R1, R2), based upon the pheno- and genotypes. They took part of the new breed developing crossings.

The aim of the Babolna TETRA-breeder was to develop a breed that lambs through out the year, and able to produce an average of 1,7 lambs/lambing. It can be raised profitable between pure-bred conditions and also as crossing-partner. The aim of using Babolna TETRA as a crossing partner was to develop the prolificacy and maternal traits of the ewes. The breed can be successfully used for purebred-breeding and crossings.

III. MATERIAL AND METHODS

Three breeds of the Hungarian assortment - Suffolk, Ile de France, Babolna TETRA - have been evaluated, according to the collected data of a decade.

After the import of breeding animals they were kept on different farms until the end of the 80's, when they were gathered to the Stock Farm at Szendrő. From this time production datas are collected and recorded uniformly. Datas are collected by the breeding stock; OMMI and MJSZ stores them; and OMMI gives the certifications.

Because the datas are certified and reliable the estimation of breeding value has become possible, so decisions -which based on these results - can be done. Breeding lines can be selected, desired parameters can be determined, genetic correlations between different traits can be found and utilized.

Keeping and feeding technology of the three breeds suit to the average national level. The developed modern keeping system, individual lambings, small-group keeping guarantees the controll of on-farm work and correction of the occured mistakes.

To help making the above mentioned breeding decisions, production and breeding parameters were collected between 1989-2003 of the Babolna TETRA, Ile de France and Suffolk stocks. The reliable and correct datas were used for further decisions. To exclude the extreme items accepted statistic methods were used. The following data were collected, which are shown in *1. table.*

Evaluated production parameters

1.table

Collected parameters	Counted parameters	
Both sexes pedigree data (reg.number of father, mother) date of birth weaning weight date of weaning daily weight gain until weaning yearling live weight matured live weight ÜSTV	daily weight gain until weaning	live weight at weaning/age in days at weaning
	ÜSTV	ÜSTV difference between in- and out weighing/number of days passed between
	age at first lambing	age at first lambing - date of birth
Female date of mating reg.number of mating ram date of lambing number and sex of lambs	lambing frequency	days passed between two consecutive lambing
	life-time performance	total number of lambs after the ewes that born before 1995.01.01. Because they seemed to have all the required datas.
	repartition of lambings	monthly number of lambings in proportion to total lambings

I left the complete analyzation of wool traits out of the consideration, because since 1998 01. 01. collection of wool data is not required in the stock-book, for meat-type and prolific sheep breeds. At the other hand these traits play no important role in my evaluation process.

I also left out of the consideration the valuation of index-numbers, because exist of counting-errors, which information came form the maker of the index-valuation program. So comparison of parameters of different years would have not given correct results for the appreciation of index adaptability.

Collected data were assorted and evaluated by different aspects. Based upon these I analysed the performances at different years in connection to the above mentioned data. I separately analysed the performance of the animals that were born at different periods (month, season). I also analysed the performance of lambs depending on the number of lambing of their mother, and also the performance of ewes depending on the number of their lambing. I analysed the lambing performance at different months, and the effect of the pedigree data (stock-book classification, line, family) on the maternal and growing ability. I made the comparison between lambs and ewes in connection to the type of lambing, and also searched for differences between sexes on the growth traits.

The selected methods were the analysis of variance, regression, correlation, inheritability, and analysis of homogeneity (χ^2 trial). I made the analysis of variance in relation to the above mentioned classifications. Phenotypic regression and pheno-, and genotypic correlation were used to evaluate the lines among and within the breeds. I used the paternal half-brother method for counting inheritability; those populations make the exception where number of animals was too low. In these cases mother-daughter regression was the possible way to determine the level of inheritability. I used χ^2 trials as a homogeneity trial to determine the division-frequency of lambings. Collected data were managed and evaluated by Microsoft Office 2000 Excel and Mixed Model Least-Squares and Maximum Likelihood Computer Program (© Walter R. Harvey, 1990) PC.

IV. MAIN CONCLUSIONS OF THE THESIS

Maternal and growth parameters of the three breeds are shown in *2. table.*

Evaluation of the Ile de France breed

Ile de France breed is suitable to increase the effectiveness of Hungarian sheep breeding. Its appearance is not differ from Merino – most of the import breeds could not widely spread out in the Hungarian assortment, because of the formalism and traditions of Hungarian shepherds, who not tried to use them, or even worked against them. Its prolificacy-, and meat-productive parameters are surpass the average of national Merinos stocks, at the other hand the breed has no economically negative effect on wool production traits.

Lambing frequency – based upon the data of more than 6000 lambings – was approximately 387 days, average prolificacy rate was 1,26 lamb per lambing. Of course the effect of previously mentioned factors has occurred in connection with these traits. Based upon the month of birth, lambing frequency can be decreased by two months and prolificacy rate can be increased by 0,05 lambs per lambing. Choosing the right time for mating lambing frequency can be shortened to less than a year, and average prolificacy rate can be increased by 0,09 lambs per lambing.

There is a strict genotypic correlation (r_g=0,74) between average prolificacy rate and the age at first lambing, but phenotypic correlation (r_p=0,03) was not meaningful. Both genotypic-, and phenotypic correlation (r_g=92, r_p=0,59) showed strict relation between prolificacy rate at first lambing and average prolificacy rate. Based upon the prolificacy of first lambing the average prolificacy rate can be estimated for the following lambings.

Ile de France ewes – based upon the data of national stock-book, and upon my own researches of previous years – lambs first at the age of 725 days, so the first mating is realised around their 1,5 years of age. The expected prolificacy rate at first lambing is 1,19 lambs per lambing. But this parameter is well influenced by environmental effects, the birth date of ewes and the date of mating. Depending on the month of birth the first mating of the stock can become 4 months earlier or even 1 month later, as extreme end values. As an effect of these factors litter size at first lambing can be increased by 0,30 lambs or decreased by 0,03 lambs. Depending on the date of first mating the age at first lambing can be shortened by 80 days, or even lengthened by a month. In relation with prolificacy there is 0,03 lamb difference between the two extreme end values.

There is moderate genotypic correlation between the age at first lambing and the prolificacy rate of following lambing; technically there is no reliable phenotypic correlation between the same traits.

Age at first lambing has a numerous influence on the age at second lambing showing a strict genetic-, and a moderate phenotypic correlation. I could not find any correlation between the prolificacy rates of first lambing to the age at second lambing. Prolificacy rate of first-, and second lambing show a very strict genetic correlation, at the other hand phenotypic correlation shows no significance.

The expected life-time performance is 5 lambings and 7 lambs, but the best ewes lamb 8-10 times and have more than 10 lambs during their lifetime.

Depending on my research birth type has no numerous influences on the life-time performance, because ewes coming from twin litter does not-, or only a little bit surpass the result of single-litter ewes. Environmental effects – effect of the year -, date of birth and mating could have large influence on the life-time performance, and difference between the two extreme end-values could even reach 4 lambings and 5 lambs. Life-time performance – according to my research, in the Ile de France breed – mainly depends on the length of productive life-period (total number of lambing), rather than on the average-, and first-time prolificacy rate. Both genotypic-, and phenotypic correlations show very strict relation.

Inheritability of maternal traits in Ile de France stock is very low (h^2=0,02-0,2), at the same time it is moderate in case of life-time performance (h^2=0,3-0,4).

During evaluation of maternal traits I analysed the results of animals coming from different lines. The least favourable results came from the ewes of line No. 8. (the longest time until the first lambing and low prolificacy rate), the most favourable results came from the ewes of line No. 4. (shortest period between two consecutive lambings, best life-time performance). I have to underline the results of the ewes coming from line No. 9. who spent the longest time between two consecutive lambings and at the same time their prolificacy rate was higher than the average of the breed.

Daily weight gain is expected to be 287 g/day in relation of the whole breed, in case of ram-lambs 293 g/day, and 283 g/day for ewe-lambs. Sex had no numerous effects on the differences. Another important influence-factor is the effect of the year, season of birth and the number of lambing of the mother.

Weaning weight was 18,0 kg, there was no significant difference between sexes (young-ram 18,2; young-ewe 17,9 kg). Among the previously mentioned factors – except of the effect of the year – not any resulted more than 1 kg difference between different categories.

Average of ÜSTV is 288 g/day, expressive difference exists between different sexes, in case of young-rams 319 g/day, in case of young ewes 273 g/day. Results are affected by both the year of birth and the date of birth.

The expected live-weight at one year of age is 49 kg, but meaningful difference exist between the sexes: young-rams 65,4 kg, young-ewes 47 kg. External environment has large influence on the trait – effect of the year and the date of birth – season of birth. The difference between rams of autumn and spring was 14 kg, in case of young-ewes the difference was 4,6 kg, in live-weight.

Mature weight – at the average of 10 years – was 53 kg, dimorphism between sexes was large (ram: 79,5; ewe: 51,4 kg). Influence factors were the year, season of birth and type of birth.

Considering different lines; line No. 9. has to be underlined on the positive side (high daily weight gain, weaning-, and yearling weight), and line No. 4. on the negative side.

I found different level of correlations between the growing traits. Very strict genotypic-, and phenotypic correlation was between ÜSTV to yearling weight and mature weight (r_g=0,96 and 0,78; r_p=0,43), between yearling-, and live-weight at two years of age (r_g=0,77, r_p=0,83). Moderate correlation was between the weaning weight and the daily weight gain (r_g=0,59, r_p=0,68), and between the daily weight gain to yearling-, and matured live-weight (r_g=0,59, r_p=0,68). Loose correlation has appeared between other traits.

Results of correlation researches between maternal-, and growing traits show loose or not existing phenotypic relations. At the other hand genotypic correlation shows a very strict and negative relation in case of Ile de France breed between the yearling live weight and life-time performance (r_g=-0,94), allowing the conclusion that fat, overweight ewes lamb less.

Moderate strict and negative correlation exists between daily weight gain, ÜSTV and age at first lambing (r_g=-0,40) in case of Ile de France; at the same direction, but lower phenotypic correlation can be found.

Inheritability of growing traits is mostly moderate, but between different sexes large differences can be found. Weaning weight transforms best to the offspring in the Ile de France stock (h^2=0,41), at the same time, weight gaining transforms the worst (h^2=0,17).

Evaluation of the Suffolk breed

Suffolk breed is suitable to increase the effectiveness of Hungarian sheep sector according to its parameters and indicators. The breed is recognised as one of the best meat-type breeds of the world, its American variety that acclimatized more-or-less surpasses the Hungarian Merino stocks according to its higher prolificacy-, and meat production results. The breed has no economically negative effect on wool production traits.

Lambing frequency – based upon the results of at least 1000 lambings – the average was around 394 days, and the average prolificacy appeared to be 1,45 lamb/lambing. Of course the effect of previously mentioned factors has occurred in connection with these traits. Based upon the month of birth, lambing frequency can be decreased by two months and prolificacy rate can be increased by 0,22 lambs per lambing. Choosing the right time for mating lambing frequency can be shortened to less than a year, and average prolificacy rate can be increased by 0,12 lambs per lambing.

There was no correlation between average prolificacy and the age at first lambing. At the other hand strict phenotypic correlation has occurred between the prolificacy of first lambing and average prolificacy (r_p=0,67). Based upon the prolificacy of first lambing the average prolificacy rate can be estimated for the following lambings. According to the regression equation it is concluded that one lamb growth on the size of the first litter, the average prolificacy increases by 0,51 lamb.

Suffolk ewes – based upon the datas of national stock-book and upon my own researches of previous years – lambs first at the age of 697 days, so the first mating is realised around this time. The expected prolificacy rate at first lambing is 1,34 lambs per lambing. But this parameter is well influenced by environmental effects, the birth date of ewes and the date of mating. Depending on the month of birth the first mating of the stock can become 100 days earlier or even 46 days later, as extreme end values. As an effect of these factors litter size at first lambing can be increased by 0,54 lambs or decreased by 0,16 lambs. Depending on the date of first mating the age at first lambing can be shortened by 4 months, or even lengthened by two month. In relation with prolificacy there is 0,48 lamb difference between the two extreme end values.

There was no valuable genotypic correlation between the age at first lambing and the prolificacy rate of following lambing. Technically there is no reliable phenotypic correlation between the same traits. Age at first lambing has an influence on the age at second lambing showing a moderate strict phenotypic correlation (r_p=0,57). I could not find any correlation between the prolificacy rate of first lambing to the age-, and prolificacy at second lambing.

The expected life-time performance is 3 lambings and 5 lambs, but the best ewes lamb 8-10 times and have more than 10 lambs during their lifetime.

Depending on my research birth type has influences on the life-time performance. Because ewes coming from twin litter surpass the results of single-litter ewes, the difference is significant: 1,27 lambs. Environmental effects – effect of the year -, date of birth and mating could have large influence on the life-time performance, and difference between the two extreme end-values could even reach 4 lambings and 5 lambs. Life-time performance – according to my research, in the Suffolk breed – mainly depends on the length of productive life-period (total number of lambing, r_p=0,95), rather than on the average-, and first-time prolificacy rate. Phenotypic correlation shows very strict relation, because of low number of rams the genotypic correlation was not valuable.

Inheritability of maternal traits in Suffolk stock is low, the best result came from the relation to life-time performance (h^2=0,21), and to the age at first lambing (h^2=0,22).

During evaluation of maternal traits I analysed the results of animals coming from different lines. The least favourable results came from the ewes of line No. 1. (longest time between consecutive lambings and low life-time performance), the most favourable results came from the ewes of lines No. 3. and No. 9. (early mating, large prolificacy and life-time performance).

Daily weight gain is expected to be 336 g/day in relation of the whole breed, in case of ram-lambs 343 g/day, and 328 g/day for ewe-lambs. Sex had no large effects on the differences, but it was significant. Another important influence-factor is the effect of the year, season of birth and the number of lambing of the mother. Differences between extreme and-values could reach 100 gr. at young-rams and 80 gr. at young-ewes.

Average weaning weight was 19,4 kg, there was no significant difference between sexes (young-ram 19,9; young-ewe 19,0 kg). Among the previously mentioned factors, the effect of the year, date of birth and litter size have resulted more than 1 kg difference between different categories, both sexes.

Average of ÜSTV is 346 g/day, expressive difference exists between different sexes, in case of young-rams 360 g/day, in case of young-ewes 330 g/day. Results are affected by both the year of birth and the date of birth.

Between different years – while the items have fluctuated – averages of ÜSTV slowly lowered, which could not stopped by consecutive imports. This relation needs further attention, to reverse the tendency.

The expected live-weight at one year of age is 62 kg, but meaningful difference exist between the sexes: young-rams 76,6 kg, young-ewes 56,3 kg. External environment has large influence on the trait – effect of the year -, and the date of birth (season of birth). Based upon the ten-year research of the breed the results enormously fluctuate by years, but a lowing tendency occurs (b=-0,5 kg).

Mature weight – at the average of 10 years – was 71,9 kg, dimorphism between sexes was large (rams: 95,6; ewes: 65,0 kg). Influence factors were the year, type of birth and number of lambing. Difference between years is large with a growing tendency (b=3 kg).

Considering different lines; line No. 13. has to be underlined as the most negative one, and line No. 17. on the positive side, whose growing results have become the best.

I found different level of correlations between the growing traits. Very strict genotypic correlation was between ÜSTV to yearling weight (r_g=0,91) and between yearling-, and second year live-weight (r_g=0,86). The phenotypic correlation was also strict in case of the second relation (r_p=0,80), while correlation with ÜSTV results show a moderate connection (r_p=0,38).

Moderate correlation was between the ÜSTV parameters and the matured live-weight (r_g=0,43, r_p=0,43), and between the weaning weight and the daily weight gain, while the genotypic correlation is negative and the phenotypic is positive (r_g=-0,47, r_p=0,48).

Further moderate strict genotypic correlation has been found between daily weight-gain and yearling-, and mature live-weight (r_g=0,64 és 0,61), at the same time the phenotypic correlation showed only loose relations (r_p=0,15 és 0,28). Moderate strict genotypic correlation appears between weaning-, and yearling live-weight (r_g=0,43), but the phenotypic correlation is loose (r_p=0,28). Lower than moderate connection can be found between weaning-, and mature live-weight, while the genotypic is negative and the phenotypic is positive. Daily weight gain correlates loosely to the ÜSTV parameters, with a non appearing phenotypic correlation. The same lack of correlation has appeared between weaning weight and ÜSTV parameters.

Results of correlation researches between maternal-, and growing traits show loose or not existing phenotypic relations. At the other hand genotypic correlation shows moderate strict and negative relation in case of Suffolk breed between the mature live weight and life-time performance (r_g=-0,56), allowing the conclusion that fat, overweight ewes lamb less, but phenotypic values show only show loose correlation.

Moderate strict correlation was found between age at first lambing and mature live-weight, it was positive (r_g=0,56), which means that larger ewes lambs later than those whose live-weight is lower at their two years of age.

Inheritability of growing traits is not uniform at the Suffolk stock. There are production parameters where uniquely large results appear (mature weight h^2=0,73), at the same time, there are few where inheritability is quite low (weaning weight h^2=0,09).

Evaluation of the Babolna TETRA breed

Babolna TETRA breed is suitable to increase the effectiveness of Hungarian sheep sector according to its parameters and indicators. The breed is recognised after its unique prolificacy and good lamb-nursing ability. It is successfully usable to increase the maternal traits of national Merino flocks, making a basic population for further, multi-breed crossings.

Lambing frequency – based upon the results of more than 3000 lambings – the average was around 378 days, and the average prolificacy appeared to be 1,68 lamb/lambing. Of course the effect of previously mentioned factors has occurred in connection with these traits. Based upon the month of birth, lambing frequency can be decreased by one month and prolificacy rate can be increased by 0,06 lambs per lambing. Choosing the right time for mating lambing frequency can be shortened to less than a year, and average prolificacy rate can be increased by 0,09 lambs per lambing.

There was no correlation between average prolificacy and the age at first lambing. At the other hand moderate genotypic-, and phenotypic correlation has occurred between the prolificacy of first lambing and average prolificacy (r_g=58, r_p=0,60). Based upon the prolificacy of first lambing the average prolificacy rate can be estimated for the following lambings. According to the regression equation it is concluded that one lamb growth on the size of the first litter, the average prolificacy increases by 0,48 lamb.

Babolna TETRA ewes – based upon the data of national stock-book of the last decades and upon my own researches of previous years – lambs first at the age of 665 days, so the first mating is realised around 1,5 years of age. The expected prolificacy rate at first lambing is 1,55 lambs per lambing. But this parameter is well influenced by environmental effects, the birth date of ewes and the date of mating. Depending on the month of birth the first mating of the stock can become 2 months earlier or even 2 months later, as extreme end values. As an effect of these factors litter size at first lambing can be increased, or decreased by 0,18. Depending on the date of first mating the age at first lambing can

be shortened by 60 days, or even lengthened by 16 days. In relation with prolificacy there is 0,37 lamb difference between the two extreme end values.

There was no valuable genotypic correlation between the age at first lambing and the prolificacy rate of following lambing. Age at first lambing has a small influence on the age at second lambing showing a low phenotypic correlation (r_p=0,32). I found a moderate strict and negative genotypic correlation between the prolificacy rate of first lambing and the age at second lambing (r_g=-0,48). But phenotypic correlation was not meaningful in relation to the above mentioned traits. Neither genotypic-, nor phenotypic correlation has occurred between prolificacy rate of first lambing and prolificacy rate of second lambing.

Numerous differences can be found between birth types and lambing frequency, ewes coming from twin litter have the better parameters even with a month. At the other hand litter size has no effect on the prolificacy rate, this means that it is not the right tool of effective selection, no fast improvement can be realised. The expected life-time performance is 5 lambings and 7 lambs, but the best ewes lamb 10 times and have 20 lambs during their lifetime.

Depending on my research birth type has no meaningful influence on the life-time performance. Because ewes coming from twin litter does not or only a little bit surpass the results of single-litter ewes. Environmental effects – effect of the year -, date of birth and mating could have large influence on the life-time performance, and difference between the two extreme end-values could even reach 4 lambings and 6 lambs. Life-time performance– according to my researches at the Babolna TETRA breed also mainly depend on the effective life-time performance (total number of lambings), rather than the prolificacy rate of average-, or first lambing. Both phenotypic-, and genotypic correlation shows very strict relation (r_g=99, r_p=0,95).

The maternal-trait results of the ewes of line No. 2. were always lower than the other lines.
Inheritability of maternal traits in Babolna TETRA stock is high in case of the parameters of life-time performance (h^2=0,7), according to the age at first lambing it is low (h^2=0,02-0,18).

Daily weight gain is expected to be 239 g/day in relation of the whole breed, in case of ram-lambs 240 g/day, and 238 g/day for ewe-lambs. Sex had no large effects on the differences, but it was significant. Another important influence-factor is the effect of the year, season of birth and the birth type.

Numerous differences can be found between different years, the tendency is consecutively lowing (b=-5,4 g/day). According to the month of birth the difference between the best-, and the worst results can reach 10 %. Result of lambs coming from single litter – in both sexes – enormously surpass the twin lambs. But there is no large difference between twin-, and triplet lambs. Number of lambing is also important; lambs coming from first and second lambings always surpass the results of later coming lambs, in both sexes.

Average weaning weight was 14,8 kg, there was no significant difference between sexes (young-ram 14,9; young-ewe 14,6 kg). Among the previously mentioned factors, the effect of the year – environmental parameters - has resulted meaningful and lowering differences that can even reach 0,5 kg/year. Also large differences exist according to the season of birth; summer-, and winter lambs can differ from each other by 3 kg.

Average of ÜSTV is 239 g/day, expressive difference exists between different sexes, in case of young-rams 270 g/day, in case of young-ewes 223 g/day. Results are affected by both the year of birth and the date of birth. Between different years averages of ÜSTV slowly increased, which could mean b=19 g/day every year.

The expected live-weight at one year of age is 42,6 kg, but meaningful difference exist between the sexes: young-rams 60,6 kg, young-ewes 41,5 kg. External environment has large influence on the trait – effect of the year. Season of birth is also an important factor11,8 kg difference exist between summer- and spring rams and 3,4 kg is the difference between autumn- and spring ewes.

Mature weight – at the average of 10 years – was 55,1 kg, dimorphism between sexes was large (rams: 80,4; ewes: 54,5 kg). Influence factors were the year and the season of birth.

Considering different lines; line No. 14. has to be underlined as the most negative one, and line No. 10. on the positive side, according to their growing.

I found different level of correlations between the growing traits. Strict genotypic-, and moderate strict phenotypic correlation was between daily weight gain and weaning weight (r_g=0,70; r_p=0,58). Moderate and negative genotypic correlation was found between adaily weight gain to the weaning weight and mature weight (r_g=-0,64 és –0,54), but phenotypic correlation showed no connection. Loose genotypic- and phenotypic correlation was between daily weight gain and weaning weight to the ÜSTV (r_g=-0,24). while correlation with ÜSTV results show a moderate connection (r_p=0,38). . Loose, negative genotypic- and not appearing phenotypic correlation was found between daily weight gain and yearling weight (r_g=-0,39), while loose phenotypic correlation existed between weaning- and yearling weight (r_p=0,12). Loose connections were found between other production parameters.

Results of correlation researches between maternal-, and growing traits show loose or not existing phenotypic relations. At the other hand genotypic correlation shows strict and negative relation in case of Babolna TETRA breed between the weaning weight and age at first lambing (r_g=-0,98), allowing the conclusion that fast growing young-ewes can be mated earlier which is also based upon the phenotypic correlation results (r_p=-0,28).

Moderate strict and negative correlation was found between the yearling weight and age at first lambing (r_g=-0,51), which means that good condition ewes can be mated earlier.

Inheritability of growing traits is low at the Babolna TETRA stock (yearling weight h^2=0,19), or moderate (weaning weight h^2=0,54).

V. NEW SCIENTIFIC RESULTS

- I established that effect of different years, date of birth- and lambing influence the prolificacy and the age at first lambing.

- I counted the inheritability parameters of total number of lambs during the ewes' life-time, in all three breeds.

- I confirmed by correlation-examinations that life-time performance if mainly effected by the length of the period of breeding, the prolificacy only plays secondary row.

- According to my results the month of birth influences the date of first mating of Babolna TETRA. The best values came from those who were born in August, the least favourable result were produced by ewes that born in January. Reachable life-time performance is better by 5 lambings of the January-born ewes compared to the worst, November-born ones.

- Prolificacy of first lambing has influence on the life-time performance of Ile de France and Babolna TETRA ewes. Based upon the first lambing the life-time performance can be estimated in both breeds, while it is not true at the Suffolk breed. Prolificacy rate of first lambing influences the prolificacy, but has no effect on the total number of lambings.

- In relation to Ile de France breed strict and negative genotypic correlation was found between yearling weight and life-time performance. This means that heavier young-ewes have lower life-time performance.

- In relation to Suffolk breed moderate strict genotypic- and loose phenotipic correlation exist between mature weight and age at first lambing. This means that heavier young-ewes lambs at first later, compared to those, whose live-weight was lower at their 2 years of age.

V. TECHNICAL USEFULNESS OF THE RESULTS

- According to my results, it is concluded that right breeding needs decades of work, good preparedness, strong technical consistency and large amount of funds. Evaluation of breeds, that cover more than 20 years, shows that during the development and acclimatization of a new breed many problems have to be faced of. From my evaluation it became clear that performance of breeds largely fluctuates according to the aptitudes of different years.
- My researches made it possible to determine the differences between the three genotypes, and the previously breeded Merino. I have found out that Ile de France, Suffolk and Babolna TETRA breeds largely differ from each other and from Merino breed. The three genotypes represent different values on the Hungarian breed-assortment that is largely conducive to the development of effectiveness and efficiency of the national sheep-sector.
- I also analysed the affect of sexes on the production parameters in all of the three breeds. The largest differences have occurred in relation to Suffolk breed, but the difference was numerous at the Ile de France and Babolna TETRA breeds too, according to the ÜSTV results of two sexes (46 g/day). Difference between yearling- and mature live weight almost reaches 20 kg, in all of the examined breeds. It is interesting that in case of daily weight gain, the Babolna TETRA breed showed no difference between ram- and ewe lambs.
- The best results of lambing frequency, based upon the data of 3464 lambings, came from Babolna TETRA ewes - 378 days -, Ile de France differed not much from this, on the basis of 6071 lambings, with 387 days. While the worst result came from Suffolk ewes – on the basis of 884 lambings, with 392 days.
- Age at first lambing of Ile de France, on the basis of 2027 ewes, was 725 days average; at Suffolk, in case of 386 ewes, it was 697 days, average. Babolna TETRA ewes, with 1739 animals, lambed first at their age of 665 days.
- Large differences were found on the distribution of lambings, between all of the three breeds *(1. diagram).* Analysis of aseazonality was assured by the fact that continuous mating was applied. Most lambings of Suffolk have realised at March, the less at September (33,8 and 0,29 %). In case of Ile de France breed, most of the ewes lambed at March (17%), but January, February, November and December also showed good results (12-15%). September also had worse results (2%). In case of Babolna TETRA breed most of the lambing have realised at February, other months have appeared levelled, but 2 % of August needs further attention to increase the aseazonality of the breed.
- The seasonality researches confirm that numerous differences exist on the prolificacy, according to the month of mating- and lambing: Ile de France produced the highest prolificacy with those ewes who lambed in March, surpassing the average with 0,11 lambs. The lowest prolificacy was produced by ewes who lambed in November, 0,05 lambs under the average. In case of Suffolk breed the best prolificacy comes from ewes that lambed in February, with 0,12 lambs surpass to the average. The least favourable ewes were who lambed in December, with 0,21 lamb negative difference from the average. Ewes of Babolna TETRA breed produced the most lamb in April, surpassing the average by 0,09 lamb, the least lambs came from December-lambings, lagged behind the average by 0,14 lambs. (*2. diagram*)
- Average prolificacy of the examined breeds much differed from each other. The best prolificacy rate came from Babolna TETRA ewes (n=5203 1,68 lamb/lambing), performance of Suffolk ewes (n=1358 1,45 lamb/lambing) surpasses the parameters of Ile de France ewes (n=8095 1,16 lamb/lambing).

  Prolificacy is also effected by the different years, months, number of lambing and sometimes the different lines.
- According to the life-time performance examinations it is concluded that 7,62 lambs of Babolna TETRA ewes, 7,26 lambs of Ile de France ewes, and 5,13 lambs of Suffolk ewes are expected. Differences between Suffolk and the other two breeds became significant.
- Maternal traits of best sub-populations of the three breeds well dominate over the average of different breeds, which individuals are capable to introduce a nucleus breeding-system. Life-time performance is duplex of the average of individual breeds.

- In case of meat-production parameters, daily weight gain until the weaning was 283 g/day at Ile de France breed, 335 g/day at Suffolk breed, and 239 g/day at Babolna TETRA breed. Weaning weight was 18,0 kg of Ile de France, 19,4 kg of Suffolk and 14,8 kg of Babolna TETRA lambs. These results confirms that daily weight gain until the weaning mainly depend on the maternal ability of the ewe, while only a little of effect has the genetic parameters. This conclusion is mainly depending on the comparison of the two sexes.
- At ÜSTV trials, which are done between standardized circumstances, larger differences are existing between different genotypes, rather than between sexes. The best results came from Suffolk lambs – 346 g/day-, Ile de France produced 58 g/day-; and Babolna TETRA had 107 g/day lower parameters. The order between sexes is the same, while Suffolk lambs had the best results: – ram-lambs 360, ewe-lambs 330 g/day; Ile de France rams reached 41-, Babolna TETRA rams 90 g/day, Ile de France young-ewes 57, and Babolna TETRA young-ewes 107 g/day lower parameters.
- Breeding animal selection and directed mating have to be improved to fasten the desired development. I concluded this on the basis of the results that came from the examination of lines and families.
- Among the correlation researches I have to underline that only Ile de France breed showed genotypic correlation between first- and second lambings; and between prolificacy of first- and second lambings. Based upon the results of first lambing the prolificacy of second one is not estimate able.
- Inheritability of maternal traits is not large in any of the breeds, Excepting the parameters of life-time performance, which inheritable low at Suffolk (h^2=0,21), and high at Babolna TETRA (h^2=0,7) breed.
- Inheritability of growing traits is not uniform according to the examined breeds. There are parameters where inheritability is uniquely high (mature weight h^2=0,73), and there are some where it is low (weaning weight h^2=0,09). Between these two extreme end-values most of the traits inheritable moderately in the examined populations.

According to my widely spread researches I concluded that three of the examined genotypes are able to play important role in the Hungarian sheep sector, they could be additive to the national breed-assortment. Based upon the results it is also concluded that the previously collected production and breeding data assures an effective and correct breeding work. At the other hand inadequate production- and breeding data evaluation resulted the default of many improvement possibilities. Currently done and presented data-evaluation makes the efficiency-improvement of breeding work possible.

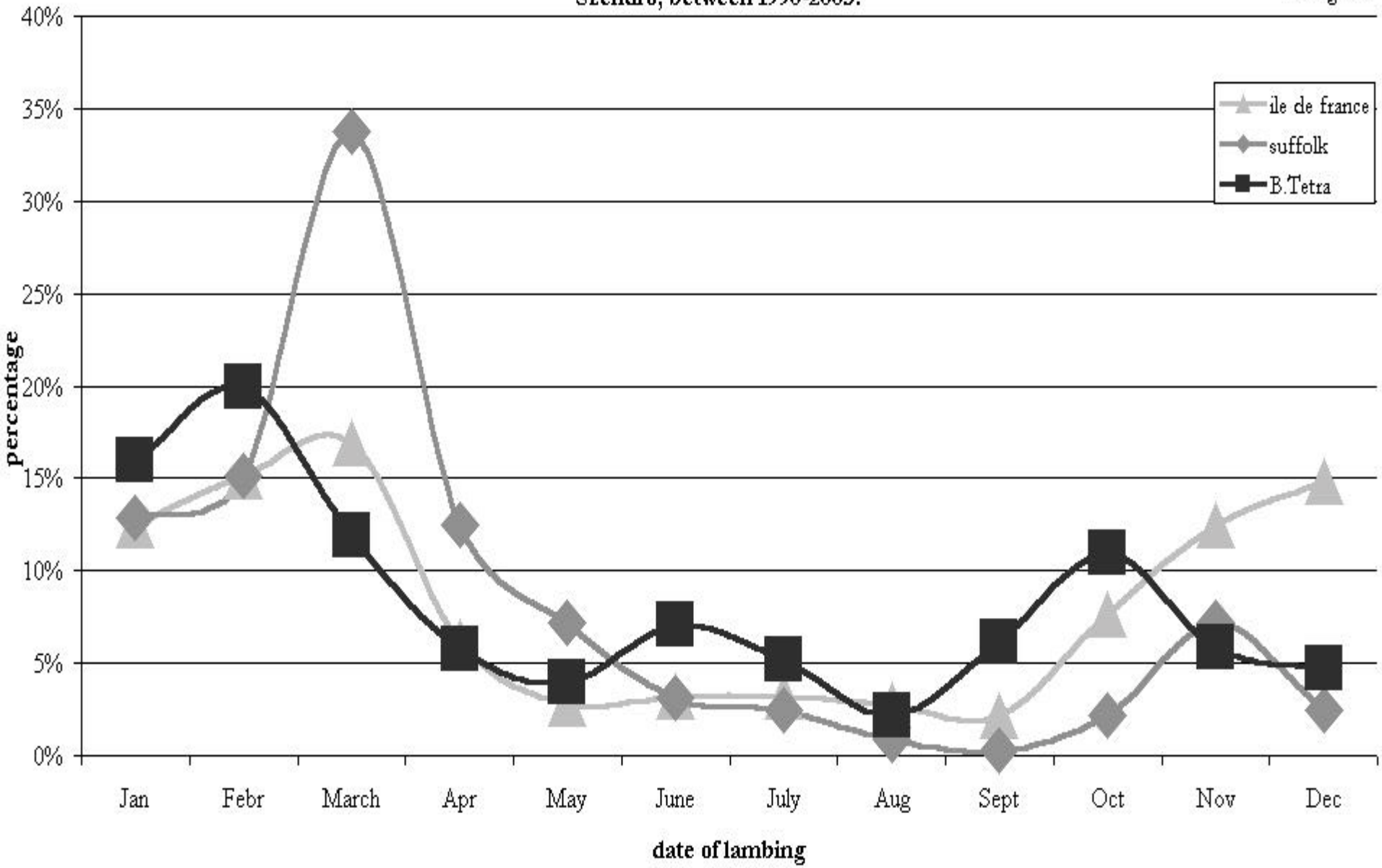
Results-, and inheritability of maternal-, and growth traits of Bábolna Co., Szendrő, breeding stock, between 1990-2003.

2. table

trait	n	mean	CV	n	h^2	breed
lambing frequency	6066	387	0,46	5065	$0,02^{+}/_{-}0,08$	ile de france
(day)	879	394	0,48	458	$0,09^{+}/_{-}0,08$	suffolk
	3464	378	0,53	716	0,18	B.TETRA
litter size	8098	1	0,35	6744	$0,03^{+}/_{-}0,01$	ile de france
(number of lambs born per ewe lambing)	1358	1	0,38	208	0,1	suffolk
	5203	2	0,31	1258	$0,02^{+}/_{-}0,03$	B.TETRA
age at first lambing	2027	725	0,13	1679	$0,26^{+}/_{-}0,08$	ile de france
	386	697	0,15	50	0,22	suffolk
	1739	665	0,13	1451	$0,15^{+}/_{-}0,06$	B.TETRA
litter size at first lambing	2027	1	0,33	1679	$0,14^{+}/_{-}0,05$	ile de france
	386	1	0,37	50	0,14	suffolk
	1739	2	0,34	1451	$0,10^{+}/_{-}0,05$	B.TETRA
lifetime performance	805	7	0,52	593	$0,37^{+}/_{-}0,17$	ile de france
(total number of lambs born)	136	5	0,63	105	$0,21^{+}/_{-}0,30$	suffolk
	313	8	0,64	75	$0,75^{+}/_{-}0,65$	B.TETRA
total number of lambings	805	6	0,50	593	$0,44^{+}/_{-}0,2$	ile de france
(lambing)	136	4	0,58	66	$0,04^{+}/_{-}0,25$	suffolk
	313	5	0,61	75	$0,77^{+}/_{-}0,65$	B.TETRA
daily weigt gain until weaning	5759	287	0,25	5425	$0,36^{+}/_{-}0,07$	ile de france
(g/day)	870	335	0,24	668	$0,10^{+}/_{-}0,07$	suffolk
	3280	239	0,25	3167	$0,28^{+}/_{-}0,07$	B.TETRA
weaning weight	5759	18	0,19	3065	$0,41^{+}/_{-}0,10$	ile de france
(kg)	870	19	0,20	579	$0,09^{+}/_{-}0,08$	suffolk
	3217	15	0,21	3167	$0,54^{+}/_{-}0,15$	B.TETRA
daily weigt gain post weaning	2644	288	0,16	2526	$0,17^{+}/_{-}0,05$	ile de france
(g/day)	466	346	0,17	372	$0,46^{+}/_{-}0,22$	suffolk
	423	239	0,19	255	$0,31^{+}/_{-}0,20$	B.TETRA
yearling live weight	2259	49	0,18	2127	$0,30^{+}/_{-}0,07$	ile de france
(kg)	353	62	0,18	278	$0,22^{+}/_{-}0,17$	suffolk
	1027	43	0,17	987	$0,19^{+}/_{-}0,08$	B.TETRA
matured live weight	930	53	0,16	596	$0,32^{+}/_{-}0,13$	ile de france
(kg)	105	72	0,23	79	$0,73^{+}/_{-}0,49$	suffolk
	411	55	0,13	397	$0,40^{+}/_{-}0,19$	B.TETRA

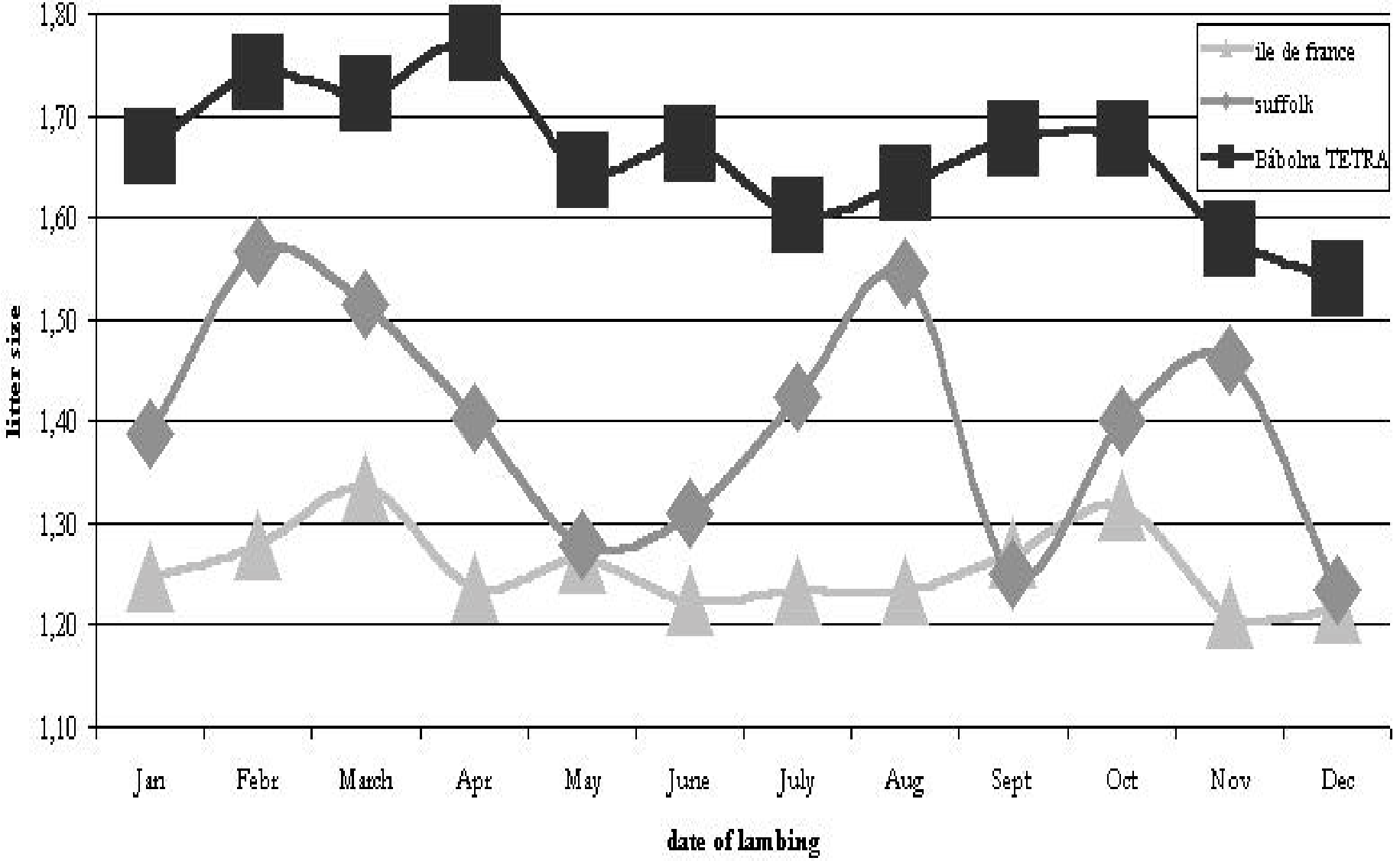
Lambing distribution during the year of Ile de France, Suffolk and Babolna TETRA breeds of Bábolna Co. Szendrő, between 1990-2003.

1. diagram



Litter size of Ile de France, Suffolk and Babolna TETRA breeds of Bábolna Co. Szendrő, between 199-2003. Based upon the lambing data, according to the date of lambing.

2. diagram



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