



The relationship between life performance and productivity in breeding sows

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ABSTRACT

Due to high proportions of early culling few sows reach the age most favourable with respect to reproduction. However, outstanding results for performance in relation to reproduction biology, attained over a long life span, verify that the constitutional stability of older animals surpasses that of younger ones culled at an earlier stage; this can be demonstrated quantitatively in terms of life performance parameters. In this study the authors analysed the individual animals of the Keszthely breeding stock of Hungarian Large White sows. The animals were kept at the farm between 1985 and 1994. Data for 768 sows, their 2660 farrowings and the 26,723 piglets resulting were analysed. The findings of the examinations showed that the parameters for the 1st farrowing remained far behind the performance results for the subsequent farrowings, in which higher levels were maintained for longer periods. Decline in the reproduction performances of sows was observed to commence after the 7th or 8th farrowing. The parameters determined (sow age per piglet and piglet weight increase per sow life-day) provide an accurate reflection of sow life performance, and are suitable for use in quality classification for the purposes of complex assessment of the constitutional stability of sows.

(Keywords: life performance, longevity, Hungarian Large White, farrowing, piglet)

ÖSSZEFOGLALÁS

Tenyészsertések életteljesítménye és a produktivitás kapcsolata

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A nagyarányú korai selejtezés miatt, kevés koca éri el a reprodukció szempontjából ked-vező életkort, pedig a hosszú élettartam alatti kiváló szaporodásbiológiai teljesítmények igazolják, hogy az idősebb állatok szervezeti szilárdsága meghaladja a korán selejtezésre kerültekét. Ez a komplex életteljesítmény mutatóival is számszerűsíthető. Vizsgálatainkban a keszthelyi magyar nagyfehér hússertés törzstenyészet egyedeinek termelését elemeztük. Az állatok 1986 és 1994 között tartózkodtak a törzstelepen. 768 koca 2660 ellése és az ebből született 26723 malac került értékelésre. A vizsgálati eredmények kimutatták, hogy az első ellések mutatói jóval alatta maradnak az ezt követő tartósabb, magasabb szintű teljesítménynek. A kocák reprodukciós teljesítményeiben a hanyatlás a 7., 8. elléstől kezdve indul meg. Az általunk kidolgozott mutatók- az egy malacra jutó kocaéletkor és az egy koca életnapra eső malac súlygyarapodás-, hűlen fejezik ki a kocák reprodukciós életteljesítményét és alkalmasak a minősítésben azok szervezeti szilárdságának komplex értékelésére.

(Kulcsszavak: életteljesítmény, élettartam, magyar nagyfehér hússertés, fialás, malac)

INTRODUCTION

The various parameters for sows (relating to reproduction and life performance) are, in practice, not adequately examined or evaluated in Hungarian pig production. There is no appropriate care applied in the process of replacement. As a consequence of early large scale culling, few sows reach the optimal age with respect to reproduction. Thus, in pig production in Hungary the potential life performance of sows is not utilised to the full. Some production systems attain a high level with respect to solving the issue of sow supply; however, the costs involved in these constitute a considerable burden on the supply of replacement stock. Such systems attach great importance to evaluation of life performance. On consideration of the practices involved in classic pig breeding, within the framework of pure-blood breeding, it can be observed that long-term high levels of sow life performance have always been highly valued. With a view to the fact that among sows certain individuals achieve very high performance throughout their lives, the authors investigated how life performance varies where sows are used for different lengths of time. Excellent values for parameters relating to reproduction biology at the same time verify that older animals have a more robust constitution than those culled at an earlier age; these traits can be converted into numerical values by means of complex life performance parameters. As the majority of the pig population is kept on small-scale farms and not in large agricultural concerns, a particular concern may be that sow supply should not entail expenses occurring too frequently, or of excessively high amounts, in order that more efficient use can be made of the biological potential of sows within the scope of reproduction.

The production of the first litter of a sow usually involves 75% of her genetic capacity. Her maximum level of milk production is generally reached at the 3rd farrowing; this remains relatively constant until the 5th, after which it begins to decrease (Kovács, 1985; Kovács and Rajnai, 1987). However, even at their 8th or 9th farrowing sows can still produce the number of piglets produced in their first litter. Csörnyei (1996) found that the 3rd and 5th farrowings were the most successful with respect to performance. Zschorlich (1989) and later Zschorlich and Langhammer (1989) also confirmed that older sows show better litter rearing ability than younger ones, so with litters of equal size larger increases in body weight are observed in the piglets of older sows during the suckling period. According to Franz (1989), litter size increases up to the 5th farrowing and then begins to decrease. This author demonstrated a correlation between the age of the sow and the time of weaning: piglets produced by younger sows weighed on average 0.47 kg less at weaning than those of older sows.

MATERIALS AND METHODS

In these investigations the authors analysed the production of specimen animals from the breeding stock of the Keszthely variety of the Hungarian Large White. The animals were kept this pig breeding site between 1986 and 1994. The analysis included 2660 litters produced by 768 sows: a total of 26,723 piglets. During the study the animals were grouped according to order of birth, to enable the authors to establish how the litter rearing capacity and prenatal progeny development capacity of sows of different age groups varied. Litter size at birth and at the age of 21 days was examined, as was individual weight and litter weight on the same dates. The authors also analysed how change in the age of the sow influenced the number of stillborn piglets produced and the weight of these; mortality during the suckling period was also studied. Finally, examination of the two new

parameters formulated beforehand in this department was performed; this enabled assessment of both litter and prenatal progeny development capacity to be accomplished on consideration of the age of the sow. One of these parameters was the number of days of life of the sow per piglet, calculated by dividing the age of the sow (the number of days of her life so far) by the number of piglets born alive. Piglet rearing capacity (milking ability) in relation to the age of the sow is the daily weight increase of the piglets per day of life of the sow, determined by dividing the total weight at 21 days of all the piglets reared by one sow by the number of days of the life of the sow so far.

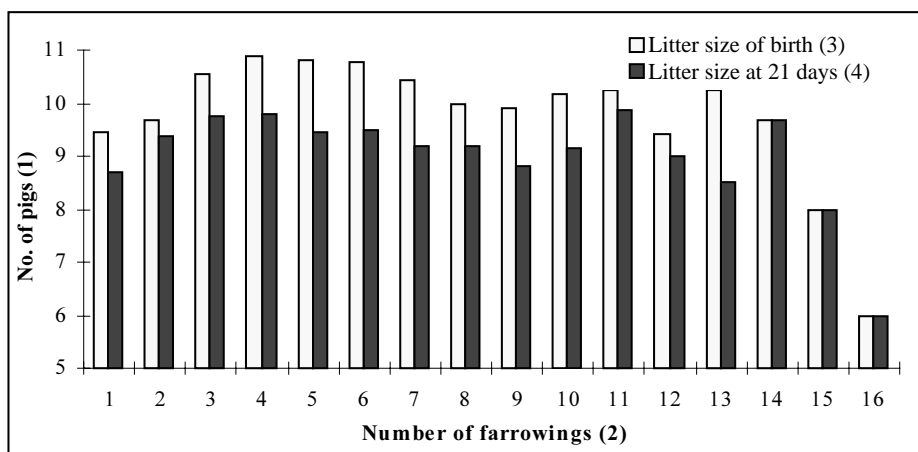
Data processing was performed by means of mathematics and statistics software (MS Excel and Statistica). Variance analysis was used for the purpose of analysing the changes occurring in each litter with respect to the various parameters studied.

RESULTS AND DISCUSSION

On the basis of the parameters outlined above it was ascertained that the performance of the sows reflected the natural biological trend (*Figures 1-4*). These tables show the mean values obtained; distribution and dispersion values are given in *Table 1*. Mean litter size proved one piglet higher at the 4th farrowing than at the first. There was a steady increase in litter size from the 1st farrowing to the 4th. From the 4th to the 9th farrowing, however, in contrast with the earlier increasing tendency, a decrease in litter size was observed. Litter weight at birth, which indicates shows the prenatal progeny development capacity of the sow, showed an identical tendency to the litter size parameter up to the 7th farrowing.

Figure 1

Number of piglets born and reared, according to farrowing order in the Hungarian Large White sows

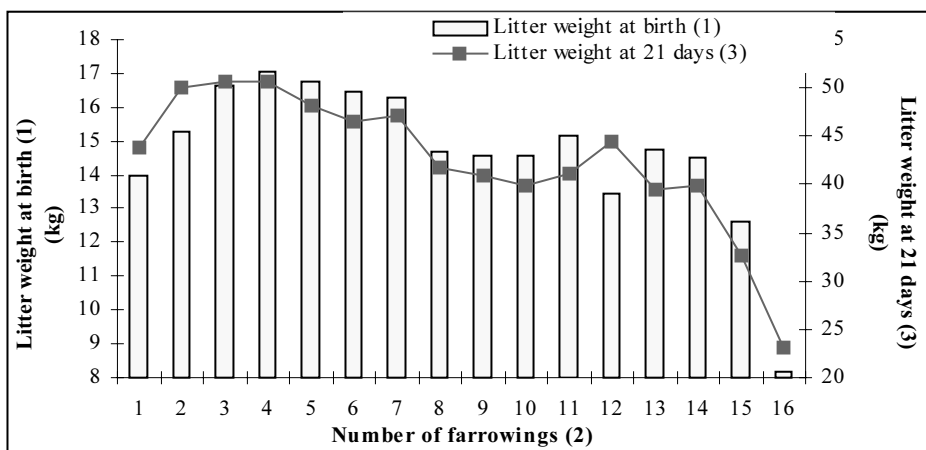


1. ábra: A született és a felnevelt malacok száma a magyar nagyfehér hússertés kocák ellési sorrendje szerint

Malacok száma(1), Fialások száma(2), Születési alomnépesség(3), 21 napos alomnépesség(4)

Figure 2

Average weight of piglets born and reared, according to farrowing order in the Hungarian Large White sows

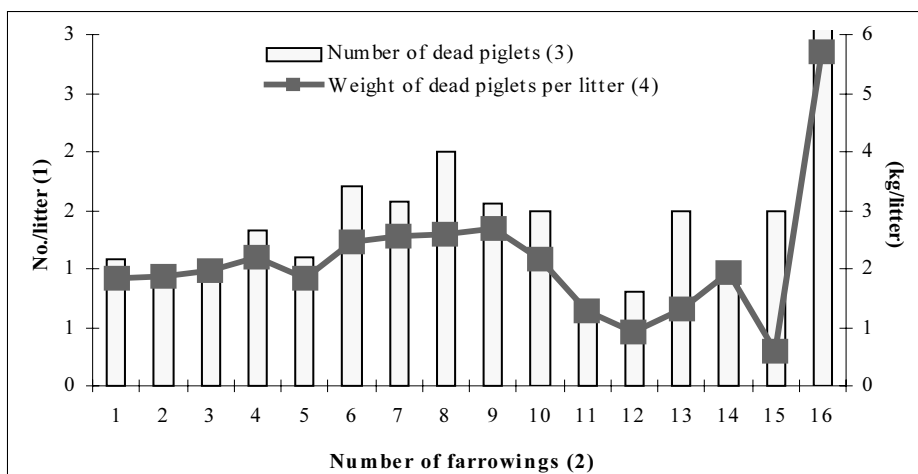


2. ábra: A született és a felnevelt malacok átlagos alomsúlya a magyar nagyfehér hússertés kocák ellési sorrendje szerint

Születési alomsúly(1), Fialások száma(2), 21 napos alomsúly(3)

Figure 3

Number of piglets born dead; their total weight per litter, according to farrowing order in the Hungarian Large White sows

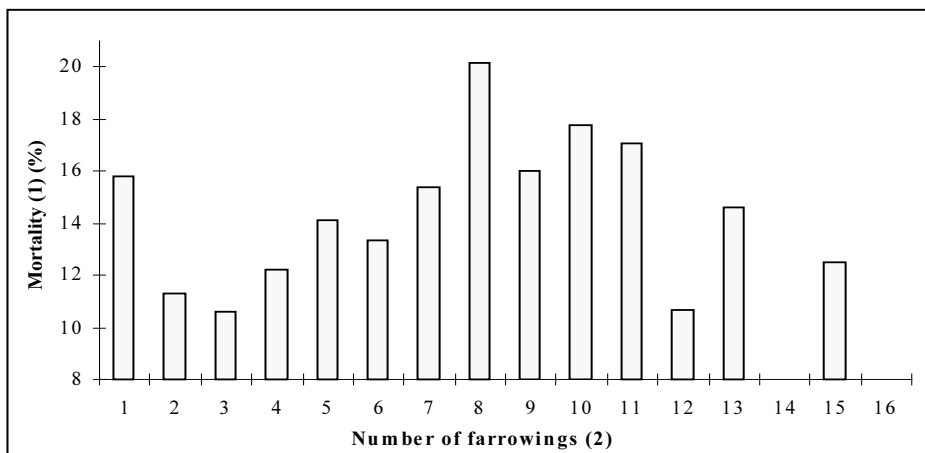


3. ábra: A holtan született malacok száma és azok almonkénti össz súlya a magyar nagyfehér hússertés kocák ellési sorrendje szerint

Db/alom(1), Fialások száma(2), Holt malacok száma(3), Holt malacok almonkénti össz súlya(4)

Figure 4

Piglet mortality in the suckling period, according to farrowing order in the Hungarian Large White sows



4. ábra: A szopósokori elhullások aránya a magyar nagyfehér hússertés kocák ellési sorrendje szerint

Elhullás(1), Fialások száma(2)

Table 1

Maternal development and piglet rearing capacity, and the dispersal values of the new parameters formulated by this research team: number of days of life of sow per piglet and piglet weight increase per day of life of sow, according to the farrowing order of the sows

Farrowing number (1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Litter size at birth (2)	2.6	2.7	2.8	2.6	2.8	2.7	2.8	2.6	2.7	3.4	2.8	1.5	2.5	3.5	2.8
Litter size at 21 days (3)	2.2	1.9	2	1.8	2.1	1.9	1.9	2.1	2.1	2.4	2.7	1.0	0.6	4.2	2.8
Piglet mortality during suckling period (4)	1.8	1.7	1.3	1.05	1.7	1.5	1.4	1.7	1.4	1.7	1.4	0.7	1.0	0.6	1.4
Number of piglets born dead (5)	1.3	1.4	1.4	1.5	1.3	1.9	2.1	1.8	1.9	1.5	0.7	0.8	1.0	1.0	2.1
Total of dead piglets per litter (6)	1.2	1.2	1.5	1.4	1.3	1.9	1.7	1.6	1.9	1.7	0.5	0.3	1.2	1.3	
Weight at birth (7)	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.2	0.9	1.1	0.9	0.8	1.0	1.1	1.0
Weight at 21 days (8)	11.8	10.7	11.3	10.9	11.5	11.9	9.9	11.1	11.2	9.5	14.3	6.5	10.0	10.3	4.0
Days of life of sow per piglet (9)	17.0	13.0	9.6	3.0	2.7	2.3	2.0	1.9	1.9	2.0	1.8	1.1	1.3	1.7	0.0
Piglet weight increase per day of life of sow (10)	68.8	45.7	56.2	36.0	34.5	73.4	34.3	30.2	26.7	21.2	27.7	35.0	34.1	19.1	21.2

1. táblázat: A vizsgált vehem- és malacnevelőképesség mutatók, valamint az általunk kidolgozott egy malacra jutó kocaéletnap és a koca életnapra eső malac súlygyarapodás szórás értékei a kocák ellési sorrendje szerinti megosztásban

Fialások száma(1), Születési alomnépesség(2), 21 napos alomnépesség(3), Szopósokori elhullás(4), Holtan született malacok száma(5), Holt malacok almonkénti összsúlya(6), Születési súly(7), 21 napos súly(8), 1 malacra eső kocaéletnap(9), Koca életnapra eső malac súlygyarapodás(10)

The number of stillborn piglets produced remained practically the same until the 5th farrowing, subsequently showing a rising tendency. A similar tendency was observed with respect to the total weight of stillborn piglets per litter. It is evident from the data that, in genera, in the case of older sows fewer piglets per litter were stillborn; however, the highest number of stillborn piglets per litter was observed at the 16th farrowing.

On examination of the piglet rearing capacity of the sows in relation to their age it can be ascertained that at the first farrowing total piglet loss amounted to 16%; this had decreased to 10.5% in the sows farrowing for the 5th time. At subsequent farrowings there was a steady increase in suckling piglet loss. At the 8th farrowing 20% loss occurred.

With respect to litter weight at the age of 21 days it was established that between the 2nd and the 7th farrowings the milking capacity of the sows was the same as at the first farrowing, but after this there was a significant decrease with advancing age of the sows.

The results of significance analysis are summarised in *Table 2*. This demonstrates which parameters showed significant difference between farrowings.

Table 2

**Significant differences between the farrowings based on the data
for seven parameters relating to prenatal development and piglet raising
in Hungarian Large White sow reproduction**

No. of farrowing (1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	-														
2	4	-													
3	3	1	-												
4	5	3	1	-											
5	3	2			-										
6	5	4	3	1	3	-									
7	5	4	3		2		-								
8	7	5	5	3	5	2	1	-							
9	2	3	3	1	2				-						
10	2	1	2	1	1					-					
11	1	1	1	1		1					-				
12							1					-			
13													-		
14														-	
15				1		1									-

2. táblázat: Az egyes ellések eredményei közötti szignifikáns eltérések száma hét vehem- és malacnevelési mutató alapján magyar nagyfehér hússertés kocák reprodukciójában

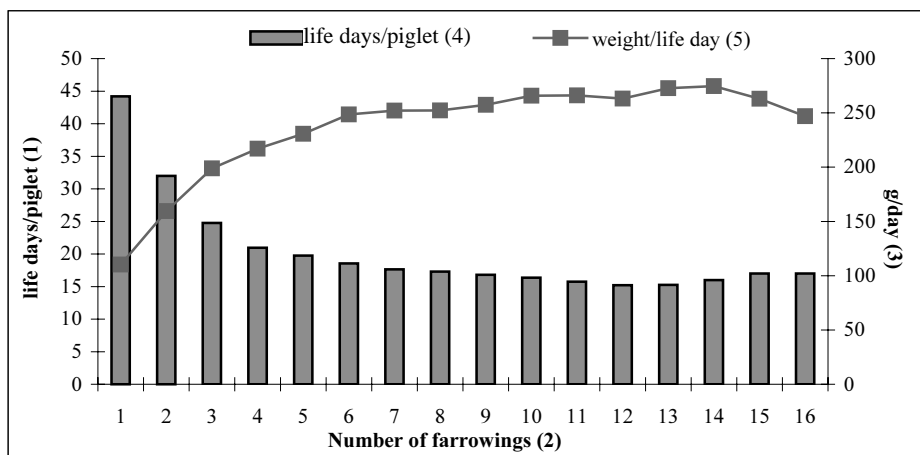
Fialások száma(1)

The data obtained indicate that the parameters for the first farrowing were significantly different from those of later farrowings; this was also true of the 2nd farrowing, while the differences shown by the 3rd-6th farrowings proved less significant; that is, by that time the level of performance attained had become stable. It was observed that by the time of the 7th and 8th farrowings the decline in performance had, as can be seen in the tables,

reached a significant degree, while the results for the subsequent farrowings showed no substantial difference from the others, despite significant fluctuation. It is true, however, that this information should not be relied upon greatly for the purpose of deciding whether to keep in production any sows still yielding good production results: little other relevant information is available, as few farrowings occur in sows of such age.

Figure 5

Number of days of life of sow per piglet and piglet weight increase per day of life of sow in correlation with the number of farrowings of the HLW sows



5. ábra: Az egy malacra jutó kocaéletnapok száma és a koca életnapra eső malac súlygyarapodás MNF kocák ellésszáma szerinti megosztásban

Nap/malac(1), Fialások száma(2), g/nap(3), Életnap/malac(4), Súlygyarapodás/életnap(5)

Figure 5 shows the values obtained for the two new parameters: sow days of life per piglet and piglet weight increase per sow days of life. Both on the level of a whole population and on that of individuals, from the aspect of life performance it is favourable if these parameters stabilise at the given level after the 3rd and 4th farrowings. This indicates that sows should produce litters at regular intervals, and should be capable of rearing the same high number of piglets from their consecutive farrowings. The new table produced to show steady life performance is worthy of note, as it expressly shows the well-balanced nature of life performance results. The parameters recommended for adoption by the authors showed an improving trend up to the 7th farrowing, at which point they reached a certain level at which they stabilised. Sows capable of attaining such excellent performance results possess such biological potential as to verify their outstanding constitution.

With respect to the importance of protecting animals from the stresses to which they are exposed during reproduction, this complex assessment of constitutional stability can provide a good guideline for the evaluation of animals. The use of these parameters in the evaluation of sow life performance could prove much more efficient than the summarised SzFTV indices presently used, and even preferable to modern BLUP methods, which do not devote adequate attention to the farrowing interval.

CONCLUSIONS

With respect to sow reproduction justification for the need for detailed assessment of reproduction parameters is supported by changes in performance results *dependent* upon the order of farrowings.

Besides consideration of the mechanical population average, detailed analysis of accumulative parameters is also important, particularly in improvement; that is, collective analysis of life performance data is an expedient procedure.

Consistent life reproduction performance enables numerical representation of animal constitution to be accomplished.

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