REPRODUCTIVE PARAMETERS OF SOWS IN TWO DIFFERENT TYPES OF HERDS

Pokorná K., Čítek J., Zadinová K., Okrouhlá M., Stupka R.

Department of Animal Science, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences Prague, Czech Republic

Abstract

The profitability of pig breeding is influenced primarily by the reproductive performance of sows and at the same time reproductive performance is the basic indicator of breeding quality. In this study was compared reproductive parameters of sows from two different types of herds. Based on literature is possible to assume that sows from intensive pig breeding have worst lifelong reproductive performance because of overloading. In this study 42 sows from small pig breeding and 464 from intensive pig breeding were evaluated. Both farms breed hybrids Czech Landrace and Czech Improved White. For all sows was found average lifelong performance. Our results show that sows from small pig breeding achieved higher number of lactation for whole life by 2.04 and they were removed from the breeding later ($P< 0.0001$). Number of total live born piglets was higher for sows from small pig breeding by 11.59 %, but the average number of piglets per litter was higher for sows from intensive pig breeding by 23.35 % ($P< 0.0001$). In conclusion, sows from intensive pig breeding have better reproductive performance despite maximum use of reproductive potential of sows and overloading more of them. This result should be great benefit for every pig breeding. Maximum use of reproductive potential of sows can have positive effect for economy of farms and it has no negative effect on reproductive performance of sows.

Key Words: Sow, longevity, reproduction, pig breeding, reproductive performance

The profitability of pig breeding is influenced primarily by the reproductive performance of sows and at the same time reproductive performance is the basic indicator of quality breeding. Reproductive performance is influenced by large number of external and internal factors. For example very early insemination of gilts can caused deterioration of reproductive results (Babicz et al., 2011). First is appropriate to inseminate gilts at the age 210 – 230 days (Čeřovský, 2002), if gilts weigh is 135 – 150 kg (Williamse et al., 2005) and the back fat thickness is 18 – 23 mm (Roongsitthichai and Tummaruk 2014). The age at the first insemination significantly influenced their lifelong performance (Babot et al., 2003). This may be problem especially in intensive pig breeding, where farmers use sows from early age because of profit of farms. The age at the first insemination influence especially number of live born piglets per first litter (Babicz et al., 2011). Highest number of live born piglets have sows, which were inseminated at the age 221 – 240 days. These sows have higher number of total live born piglets per lifelong performance as well. Insemination of sows at lower or higher age have negative effect for their lifelong performance (Szulc et al., 2011). Other effect, which influenced reproductive performance of sows is the order of the litter. Beyg and Rekiel (2010) observed that sows at the second farrowing have higher number of piglets than sows at the first farrowing. In some cases it should be caused by lower number of ovulated eggs because of lower hormonal activity of young gilts. The number of live born piglets increase from first to fourth litter (Wahner, 2009). And the best reproductive performance achieve sows at the third litter and this litter is tagging as a top of reproductive performance of sows (Szulc et al., 2011). Following litters are characterized by lower number of piglets. Sows from the intensive breeding are removed from the breeding at the third litter most often. For following litters are typical lower number of live born piglets (Knecht and Duzinski, 2014). From sixth litter increase unbalanced litters and sows have higher number of still born piglets as well. Milligan et al. (2002) reported that in unbalanced litters is lower survival of piglets. Piglets with lower birth weight most often don´t survive. It is recommended that

sixth and higher litters should create no more 20 – 25 % from totally number of litters. At the second litter have sows least number of still born piglets and at the seventh litter the highest number of still born piglets (Hellbrugge et al., 2008). Simultaneously sows at the second litter give birth piglets with the highest weight, these piglets have higher chances of survival. Nogaj et al. (2006) found that birth weight of piglets is influenced by number of live born piglets. Piglets with the lowest birth weight come from the litters with more than 13 piglets. This is especially problem of intensive pig breeding. The smallest chances to survive have piglets from sows at the sixth and higher litters (Milligan et al., 2002). The longevity of sows is influenced by lot of factors. The age at the first farrowing, size of the first litter, number of still born piglets per first litter, weight of the first litter at the age 21 days, back fat thickness belong to them (Hoge and Base, 2011). Sows from small breeding are removed later because of more individual approach from breeders. Based on literature is possible to assume that sows from intensive pig breeding have worst lifelong reproductive performance because of overloading and they are removed from the breeding earlier than sows from small farms, which have for the whole life individual care from breeders.

Materials and Methods

In this study 42 sows from small pig breeding were evaluated. Farm use open herd turnover breed hybrids Czech Landrace and Czech Improved White. The sows were fed two times a day. The farm used feeding by complete compound feed. Further there were evaluated 464 sows from intensive pig breeding. This farm use closed herd turnover and breed hybrids Czech Landrace and Czech Improved White. For all sows was found average lifetime performance, which means the sum of lactations, all live-born piglets, still-born piglets that were subsequently divided by the order of litter, on which each sow was removed. The assessed sows were selected based on the date of removing from the breed, because data of lifetime performance were known. Sows, which were kept on the small farm, were included in the breed at the average age 187.13 days. They were inseminated at the age 231.16 days for the first time. Sows which were kept on the intensive farm, were included in the breed at the average age 187.77 days. They were inseminated at the age 231.62 days. Sows, which were evaluated, had least one litter. Every reproductive cycle of sows was recorded in the farm system from their entrance into breeding until their removing from the breeding. In the farm system information about every insemination, farrowing, number of live and still-born piglets, number of weaning piglets and total litter weights at weaning was included. Statistical evaluation was performed by statistical software SAS (Statistical Analysis System, version 9.4, 2012, SAS Institute, Cary, NC, USA). To evaluate the influence of individual effects (influence of breeding type on removing from breeding, influence of breeding type on litter size, influence of breeding type on first lactation length, influence of breeding type on number of weaned piglets on individual litters, influence of breeding type first weaning to estrus interval) analysis of variance, GLM procedure was used.

These indicators were calculated and evaluated:

LS Means,

SD – standard deviation,

SEM – standard error of the mean,

P value– statistical significance (significance level, a = 0.05).

Results

Table 1 show the average reproductive performance of sows from two different types of pig breeding from first to fourth litter. In small pig breeding were evaluated 42 sows and in intensive pig breeding were evaluated 464 sows. Sows from intensive pig breeding had higher number of the live born piglets per first litter. It was higher by 29.57 %. These sows weaned more piglets by 16.12 % and these differences were statistically significant. Sows which were kept in small pig breeding had higher number of still born piglets per first litter by 80.23 % and this difference was statistically significant. The first weaning to estrus interval was longer for sows from small pig breeding by 5.15 days and this difference was statistically significant. It is evident that reproductive performance at the second litter was similar. Sows from intensive pig breeding had higher number of live born piglets by 24.54 % and this difference was statistically significant. They weaned more piglets by 9.32 % as well, but this difference was not statistically significant. Number of still born piglets was higher for sows from small pig breeding again. It was higher by 75.26 %. This difference was statistically significant. Second weaning to estrus interval was longer for sows from small pig breeding by 1.55 day and this difference was not statistically significant. At the third litter had sows

from intensive pig breeding higher number of live born piglets by 20.89 % again and they weaned more piglets by 13.58 % and these differences were statistically significant. Number of still born piglets was higher for sows from small pig breeding by 68.7 % and this difference was statistically significant. The third weaning to estrus interval was longer for sows from small pig breeding by 4.54 days and this difference was not statistically significant.

Table 2 contains information about the average lifelong reproductive performance of sows from two different types of pig breeding. It is patent that sows from small pig breeding achieved higher number of lactation for whole life by 2.04 and this difference was statistically significant. Both group of sows were inseminated in similar age. Sows from intensive pig breeding were inseminated only by 2.63 days earlier and this difference was not statistically significant. Number of total live born piglets was higher for sows from small pig breeding by 11.59 % and this difference was not statistically significant. It should be mentioned that sows from small pig breeding achieved this number of piglets in time 6.29 lactation and sows from intensive pig breeding achieved lower number of piglets only by 11.59 % in time 4.25 lactation. The average number of piglets per litter was higher for sows from intensive pig breeding by 23.35 % and this difference was statistically significant.

Discussion

Lifelong performance of sows is very important for economy of pig breeding (Aasmundstadta et al., 2014). Engblom et al. (2009) assessed that sows, which are earlier removed from the breed, have 1.7 – 2.4 times higher litters than sows, which stay in the breed longer. Our results confirm this statement. The higher average number of piglets in individual litters have sows from intensive pig breeding. And these sows were removed from the breed earlier. It can be caused by high reproductive potential of sows, which return costs of sows in less time to herd and the herd can be restored earlier than in small pig breeding. According to Beek et al (2014) good system of removing sows from the breed enable balanced production. Our results show that balanced production in small pig breeding is secured by retention of sows in breeding for longer time than it is in intensive pig breeding. In our results is evident that sows in small pig breeding stay in breeding longer. They Have in average 6.29 lactation per sow. In some cases sows were removed from the breeding at the twelfth lactation. Against this, sows from intensive breeding were removed earlier. According to Čeřovský (2002) sows, which were removed from seventh litter and later, are worst mothers, they have problems with milkiness, they produce unbalanced litters and they more often crush their piglets. It confirms or results. Sows which achieve higher number of litters have higher number of still born piglets, lower number live born piglets and lower number of weaned piglets, it could be caused more frequent crushing of piglets as well. Sows which are at higher lactations should be removed from the breeding. Dourmad et al. (1994) observed that most often are sows removed from the breeding after their fourth lactation. The same information reported Koketsu et al. (1999). Our results confirm these statements only in one case. It is true for intensive pig breeding, where is use maximum reproductive potential of sows already from first litter. In small pig breeding it is later. According the statement Serenius and Stalder (2004), higher number of piglets per litters have positive effect on longevity of sows. In our results is evident that sows from intensive pig breeding have higher number of piglets per litters, but they were removed earlier. Compared to that sows from small pig breeding, which have lower number of piglets per litters and they were remover later, but it could be caused by lower profitability of sows. Every breeder have one important target – decrease unproductive days of sows at minimum (Madej et al., 2016). As unproductive days are meant weaning to estrus interval. If unproductive days of sows increase, size of following litter is decreased by 0.71 piglet (Kravelién at al., 2008). It confirm our results. The number of live born piglets was lower in case of increasing weaning to estrus interval in both types of breeding. Spoolder et al. (2009) found that there are no positive arguments evaluating group housing systems of farrowing houses including influence of group housing systems of farrowing houses to litter size and Kongsted (2004) state that lower number of piglets per litters have sows which are situated in group housing systems of farrowing house. In this study both types of breeding use group housing system of farrowing houses. And in both cases sows have high number of piglets per litters. Our results do not confirmed negative effect of group housing system of farrowing houses to litter size.

Table 1 The average reproductive performance of sows from two different types of pig breeding

	Small pig breeding		Intensive pig breeding		
Item	**Mean**	**SEM**	**Mean**	**SEM**	**P-value**
Number of sows (n)	42		464		
Reproductive performance at the first litter					
Live born piglets (n)	10.24	0.45	14.54	0.13	< 0.0001
Still born piglets (n)	0.86	0.16	0.17	0.02	< 0.0001
Weaned piglets (n)	10.67	0.24	12.72	0.10	< 0.0001
Weaning to estrus interval (days)	11.35	2.82	6.20	0.25	< 0.0001
Reproductive performance at the second litter					
Number of sows	34		378		
Live born piglets (n)	12.18	0.52	16.14	0.17	< 0.0001
Still born piglets (n)	0.97	0.25	0.24	0.05	< 0.0001
Weaned piglets (n)	11.00	0.31	12.13	0.14	0.0209
Weaning to estrus interval (days)	7.25	1.58	5.70	0.44	0.3085
Reproductive performance at the third litter					
Number of sows (n)	33		337		
Live born piglets (n)	13.33	0.63	16.85	0.19	< 0.0001
Still born piglets (n)	1.15	0.18	0.36	0.06	< 0.0001
Weaned piglets (n)	10.82	0.37	12.52	0.09	< 0.0001
Weaning to estrus interval (days)	9.00	2.41	4.46	0.51	0.0105

Abbreviation: SEM: Standard Error of the Mean.

Table 2 The average lifelong reproductive performance of sows from two different types of pig breeding

	Small pig breeding		Intensive pig breeding		
Item	**Mean**	**SEM**	**Mean**	**SEM**	**P-value**
Number of sows (n)	42		464		
Lactation (n)	6.29	0.55	4.25	0.10	< 0.0001
First insemination (days)	233.76	6.44	231.13	0.64	0.3606
Live born piglets total (n)	77.24	7.04	68.29	1.78	0.1543
Live born piglets per litter (n)	11.95	0.34	15.59	0.11	< 0.0001

Abbreviation: SEM: Standard Error of the Mean.

Conclusion

In conclusion, despite our assumption, sows from intensive pig breeding have better reproductive performance despite maximum use of reproductive potential of sows and overloading more of them. The fact that they are removed from the breeding earlier than sows from small pig breeding, can be caused by the fact that sows are able to return costs to herd in less time thanks to high reproductive performance. This conclusion should be great benefit for every pig breeding. Maximum use of reproductive potential of sows can have positive effect for economy of farms without negative effect on reproductive performance of sows and it can increase profitability of them, which is very important nowadays.

References

AASMUNDSTAD, T., OLSEN, D., SEHESTED, E., VANGEN, O. (2014). The genetic relationships between conformation assessment of gilts and sow reproduction and longevity. Livestock science, 167: 33 - 40.

BABICZ, M., REJDUCH, B., KOUBSKA-SOBOCIŃSKA, A., PASTWA, M., KASPRZYK, A., STASIAK, A., SERAFIN-, M. (2011). Analysis of sexual aktivity in gilts in term sof their reproductive value. Annals of Animal Science, 11: 241-250.

BEEK, J., DE JONG, E., VAN SOOM, A., DE KRUIF, A., MAES, D. (2011). Ovarian cysts in sows: a multifactorial disorder with consequences on the reproductive performance. Vlaams Diergeneeskundig Tijdschrift, 80: 215-222.

BABOT, D., CHAVEZ, E.R., NOGUERA, J.L. (2003). The effect of age at the first mating and herd size on the lifetime productivity of sows. Animal Research, 52: 49-64.

BEYGA, K., REKIEL, A. (2010). The effect of the body condition of late pregnant sows on fat reserves at farrowing and weaning and on litter performance. Archiv Fur Tierzucht-Archives of Animal Breeding, 53: 50-64.

ČEŘOVSKÝ, J. (2002). Vyšší produkce selat na prasnici je krok správným směrem. Farmář, 8: 41 - 43.

DOURMAD, J.Y., ETIENNE, M., PRUNIER, A., NOBLET, J. (1994). The effect of energy and protein-intake of sows on their longevity - a review. Livestock production science, 40: 87 - 97.

ENGBLOM, L., LUNDEHEIM, N., SCHNEIDER, M.D., DALIN, A.M., ANDERSSON, K. (2009). Genetics of crossbred sow longevity. Animal, 3: 783 - 790.

HELLBRUGGE, B., TOLLE, K.-H., BENNEWITZ, J., HENZE, C., PRESUHN, U., KRIETER J. (2008). Genetic aspects regarding piglet losses and the maternal behaviour of sows. Part 1. Genetic analysis of piglet mortality and fertility traits in pigs. Animal, 2: 1273-1280.

HOGE, M. D., BATES, R. O. (2011). Developmental factors that influence sow longevity. Journal of Animal Science, 89: 1238-1245.

KARVELIENÉ, B., ŠERNIENÉ, L., RIŠKEVIČIENÉ, V. (2008). Effect of different factors on waning-to-first-service interval in lithuanian pig herds. [Online] available http://vetzoo.lva.lt/data/vols/2008/41/pdf/karveliene.pdf.

KNECHT, D., DUZIŃSKI, K. (2014). The effect of parity and date of servcice on the reproductive performance of Polish large white x Polish landrace (PLW x PL) crossbred sows. Annals of Animal Science, 14: 69-79.

KOKETSU, Y., TAKAHASHI, H., AKACHI, K. (1999). Longevity, lifetime pig production and productivity, and age at first conception in a cohort of gilts observed over six years on commercial farms. Journal of veterinary medical science, 61: 1001-1005.

KONGSTED, A.G. (2004). Stress and fear as possible mediators of reproduction problems in group housed sows: A review. Acta Agriculturae Scandinavice Section A - Animal science, 54: 58 - 66.

MADEJ, A., LANG, A., BRANDT Y., KINDAHL, H., MADSEN, M.T., EINARSSON, S. (2005). Factors regulating ovarian function in pigs. Domestic animal endokrinology, 29: 347 - 361.

MILLIGAN, B. N., FRASER, D., KRAMER, D. L. (2002). Within-litter birth weight variation in the domestic pig and its relation to pre-weaning survival, weight gain, and variation in weaning weights. Livestock Production Science, 76: 181–191.

NOGAJ, J., JARCZYK, A., KOWALEWSKI, D. (2006). The effect of selected factors on litter and piglet weight at the age of 21 days. Animal Science Papers and Reports, 24: 93-101.

ROONGSITTHICHAI, A., TUMMARUK, P. (2014). Importance of backfat thickness to reproductive performance in female pigs. Thai journal of veterinary medicine, 44: 171 - 178.

SERENIUS, T., STALDER, K.J. (2004). Genetics of length of productive life and lifetime prolificacy in the Finnish Landrace and Large White pig populations. Journal of animal science, 82: 3111 - 3117.

SPOOLDER, H.A.M., GEUDEKE, M.J., VAN DER PEET-SCHWERING, C.M.C., SOEDE, N.M. (2009). Group housing of sows in early pregnancy: A review of success and risk factors. Livestock science, 125: 1 - 14.

SZULC, K., SKRZYPCZAK, E., PANEK, A., KNECHT, D., JANKOWSKA, A., SOBEK, Z., STANISLAWSKI, D. (2011). Analysis of reproduction and litter performance of the Zlotnicka Spotted breed and its different crossbreeds. Italian Journal of Animal Science, 10: 184-187.

WAHNER, M., BRUSSOW, K. P. (2009). Biological potential of fecundity of sows. Biotechnology in Animal Husbandry, 25: 523-533.

WILLIAMS, N. H., PATTERSON, J., FOXCROFT, G. (2005). Non-negotiables in gilt development. Advances in Pork Production, 16: 281-289.

Corresponding Address:
Ing. Kamila Pokorná
Czech University of Life Sciences Prague
Department of Animal Science
Faculty of Agrobiology, Food and Natural Resources
Kamýcká 129
165 21 Praha 6 - Suchdol
Czech Republic
E-mail:pokornakamila@af.czu.cz

This study was supported by the Ministry of Education, Youth and Sports of the Czech Republic (Project No. MSM 6046070901).