Sow Wastage: Reasons for and Effect on Productivity

R.M. Friendship, M.R. Wilson, G.W. Almond, I. McMillan, R.R. Hacker, R. Pieper and S.S. Swaminathan*

ABSTRACT

The purpose of this study was to examine the reasons for, the rate and the effect of sow culling on productivity. Sow removal or wastage was investigated by means of producer questionnaires and by detailed production data recorded on 30 swine farms for two years. The sow removal rate was high (mean = 44.2%) with a wide herd-to-herd variation (range = 16% to 100%), and correlated negatively with litter size. Reproductive failure was the most common cause of culling cited by producers. It was concluded that sows on many Ontario farms were being culled prior to reaching their reproductive potential.

Key words: Sow culling, wastage, removal, litter size, sow productivity.

RÉSUMÉ

Cette étude visait à examiner les raisons et le taux de réforme des truies, ainsi que la répercussion de cette dernière sur leur productivité. Les auteurs utilisèrent à cette fin les réponses à questionnaire adressé à des éleveurs et les données relatives à la reproduction, colligées dans 30 troupeaux, sur une période de deux ans. Le taux d'élimination des truies afficha une moyenne relativement élevée de 44,2%; il varia toutefois de 16% à 100%, selon les troupeaux, et présenta une corrélation négative avec le nombre de porcelets par portée. L'infertilité se révéla la cause la plus fréquente de réforme, au dire des éleveurs. Il semble par conséquent que, dans plusieurs porcheries de l'Ontario, les truies sont réformées avant d'avoir atteint leur potentiel maximal de reproduction.

Mots clés: réforme des truies, nombre de porcelets par portée, productivité des truies.

INTRODUCTION

The removal of nonproductive sows along with the introduction of replacement gilts is an essential part of maintaining herd productivity at a constant high level. The reasons for culling sows and the rate of removal may be influenced by many factors including housing, genotype, management policies, disease, nutrition and market trends (1,2). Average culling rates of between 30 and 50% with a high degree of variability between farms have been reported (3,4,5,6,7,8). It has been suggested that in many herds the culling rate is too high, resulting in an increased proportion of gilts in the breeding herd, thus causing a lower than optimum mean litter size (9). Surveys have shown that 50 to 67% of culled sows have had three or fewer litters before removal from the herd (2,6,8), indicating that many sows are culled prior to reaching maximum productivity which occurs between the third and sixth parities (10). Conversely, herds with very low culling rates may contain sows which have passed their most productive parities. Such herds may have a lower than optimum mean litter size and a high stillbirth rate.

The measurement of sow culling rates and knowledge of the criteria used in determining why sows are culled, may prove to be useful in herds where low sow productivity is a problem (3).

This study deals with the reasons for, the rate and the effect of sow culling on productivity in a group of randomly selected swine operations in Southwestern Ontario.

MATERIALS AND METHODS

One hundred and twenty swine herds were randomly selected from farms producing more than 1000 pigs a year in the seven largest pork producing counties of Ontario and asked to participate in the study. Thirty farrow-to-finish herds agreed to provide production data and management information for a two year period from June 1, 1981 to June 1, 1983 (11). The weekly information collected from these farms included: the sow and gilt inventory, the number of sow cullings and deaths, and the additions of breeding stock. At the beginning of the study each pork producer and a research technician completed a questionnaire concerning housing and management procedures. As part of this questionnaire farmers were asked to estimate the average age or parity that sows were culled from their herds and to describe the criteria they used for making culling decisions.

Sow housing was not uniform from herd to herd. There were eight operations utilizing individual dry-sow stalls for the entire gestational period compared with 13 herds which grouped sows in pens. The other farms on the study used a combination of stalls and pens.

Three separate culling questionnaires were distributed to the farms to encompass the time periods between December 1, 1981 and February 28, 1982, June 1 to August 31, 1982 and September 27 to December 31, 1982.

The questionnaire listed possible reasons for culling. Farmers were asked to place a mark beside the most appropriate cause when a sow was removed from the herd.

Sow removal rate was calculated by dividing the average number of sows which were culled or died per year by the average sow inventory over the two year study period. Sow removal rates based on data from the three questionnaires were also examined. The possible associations between culling rate and various production parameters were investigated using linear regression analysis (12). A Student t test (12) was used to compare the mean sow removal rates between herds with different housing and management techniques.

RESULTS

Data from the sow culling questionnaires are summarized and presented in Table I. The number or producers willing to fill out the surveys decreased each time they were asked, so that only 13 farmers reported culling in the fall period versus 32 producers in the original winter survey. The average annual sow-removal rate based on questionnaire data was 45.7% (using weighted means) compared to 44.2% recorded in the 30 farrow-to-finish herds for which an entire two years of production data was available (Table III). Pork producers were asked how long they thought a sow stayed in their herds; the average response was seven litters, with a high of nine and a low of only three litters. According to the questionnaire data the culling rate in the fall period was significantly greater than in the winter (t = 13.92, p < 0.05) and the summer periods (t = 9.49, p < 0.05). There was no statistical difference in the summer and winter culling rates (t = 0.139, p > 0.05). Reproductive failure accounted for 43.9, 43.5 and 42.6% of the sows removed from the herds during the winter, summer and fall survey periods, respectively. Old age was a cause of less than half as many cullings as reproduction failure (20.8, 18.4 and 18.3%). Lameness also appeared to be an important cause of sow removal with more than 10% of cullings resulting from feet and leg problems.

There was a wide range in the sow removal rate (from 16% to 100%) among different herds (Table II). However, there was no apparent relationship between the type of sow housing and the sow removal rate. The culling rate was slightly higher in the eight herds that kept sows totally confined in stalls throughout gestation (x̄ = 51.1, S = 24.6) compared with thirteen herds which housed sows in group pens (x̄ = 40.3, S = 17.7), but these differences were not statistically significant (t = 1.44, p > 0.05). One herd in the total-confinement group had a culling rate of 100%; when this herd was eliminated from the calculations the average sow removal rate was 44.1%. The most common reason for culling on this particular farm was small litter size.

The sow culling rate was significantly and negatively correlated with the average number of pigs born alive per litter, and the average number of

pigs weaned per litter and positively correlated with the percent litter scatter (% litters of eight pigs or less) (Table III). There were no significant correlations between the sow culling rate and the percentage of stillbirths, litters per sow per year, pigs weaned per sow per year or herd size.

DISCUSSION

The average annual removal rate of 44% of sows from herds is too high.

Generally, the number of sows replaced in a year is approximately equal to the number of first and second parity sows farrowing per year. In a 100 sow herd with a sow replacement rate of 44% and a production level of two litters per sow per year, one would expect that at least 44 of the approximately 200 farrowings during the year would be attributable to first parity sows. This

TABLE I. Causes for Removal of Sows from Representative Ontario Herds During 1982 and 1983

Reasons for Culling	Winter %	Summer %	Fall %
Reproductive reasons			
Abortion	2.4	1.7	1.7
Failure to conceive	10.6	13.9	13.5
Failure to show estrus	10.2	7.5	9.6
Failure to farrow at expected date (NIP)	[a]	2.7	3.5
Small litter	13.5	11.2	7.8
Small litter weights	3.8	3.7	3.5
Difficult farrowing	2.7	2.7	1.3
Genetic defects in offspring	0.7	0.0	1.7
Total — Reproductive reason	43.9	43.5	42.6
Physical and Health Problems			
Foot and leg problems	10.4	10.2	14.8
Prolapse (rectal)	1.1	2.7	2.2
Too fat	2.4	3.7	3.0
Too thin	1.3	1.0	0.9
Pneumonia	0.4	0.3	0.9
Crushing litters	0.2	0.0	0.0
Mastitis	1.5	2.0	1.3
Poor milker — agalactia	6.6	9.2	6.5
Total	23.9	33.2	29.4
Miscellaneous			
Temperament	1.8	2.0	0.4
Old age	20.8	18.4	18.3
No reason	0.4	0.0	2.6
Other	8.9	2.7	1.7
Died on the farm	[a]	4.1	4.8
Total number of animals culled in 14 weeks	99.7	99.8	100.0
% of sows culled	11.4	11.8	15.8
Total sow population	3964	2501	1459
Number of farms	32	22	13

[a]Not recorded

TABLE II. Sow Removal Rates and Productivity Parameters from Thirty Ontario Swine Farms

Farm Number	Average Born Alive Per Litter	Average Weaned Per Litter	Litter Scatter[a] (%)	Stillbirths (%)	Pigs Weaned Per Sow Per Year	Litters Per Sow Per Year	Herd Size	Removal Rate %
1	10.1	9.6	27	6.2	19.3	1.9	26	69
2	10.3	8.9	20	4.0	19.1	2.2	225	32
3	9.7	8.7	24	5.6	19.1	2.2	131	43
4	12.1	9.9	10	6.0	19.0	2.0	123	29
5	9.7	8.4	26	7.5	18.9	2.3	121	45
6	10.0	7.7	28	7.4	18.9	2.4	109	56
7	10.4	8.1	22	9.0	18.9	2.3	75	35
8	10.2	8.1	23	7.4	18.8	2.4	126	47
9	10.2	9.3	25	7.7	18.7	2.1	37	59
10	10.2	8.1	25	6.9	18.5	2.3	102	48
11	9.9	8.2	29	8.1	18.1	2.3	80	41
12	9.6	8.6	27	5.1	17.9	2.1	378	53
13	10.1	8.5	23	5.9	17.8	2.1	288	66
14	10.2	9.1	16	1.0	17.4	1.9	89	25
15	10.6	7.8	27	7.4	17.3	2.1	27	37
16	9.7	7.9	36	5.5	17.3	2.1	122	35
17	9.3	8.0	33	10.4	17.2	2.2	157	31
18	9.6	7.8	24	5.5	17.1	2.2	90	82
19	9.9	8.6	22	0.4	16.6	2.1	64	31
20	9.9	8.0	25	8.2	16.5	2.1	100	22
21	10.5	8.5	19	5.7	16.4	2.0	187	41
22	10.6	8.6	13	8.3	16.1	1.8	90	33
23	11.1	8.5	17	12.8	16.0	1.9	100	22
24	11.0	9.1	15	6.7	15.3	2.0	178	16
25	10.3	8.6	20	2.6	15.2	1.8	62	16
26	9.2	6.4	42	8.6	14.0	2.4	58	45
27	9.8	7.2	30	5.4	13.7	2.0	86	80
28	9.3	7.2	33	11.5	13.3	1.8	149	27
29	9.0	7.5	31	10.6	13.2	1.8	61	61
30	8.7	5.9	49	11.4	9.1	1.8	52	100
Mean	10.0	8.2	25.4	7.0	16.8	2.1	116	44
standard deviation	0.7	0.8	8.2	2.8	2.3	0.2	76	20

[a]Percentage of litters with eight or fewer pigs born alive

number would be higher if culling was occurring between the first and second parity. An annual culling rate of 44% means that on average a sow will remain in a herd only slightly more than two years or four parities. This is considerably different than the seven litter sow-life-expectancy that the majority of producers estimated they were achieving. If sows were culled after their seventh litter on average the herd replacement rate would be approximately 30%. The sow removal rate was negatively correlated with litter size. The most likely explanation for this relationship is that the proportion of older, more prolific sows was greatest in the herds with the lowest levels of culling. One would anticipate that if culling rates continued at a very low level for several years, the sow herd would become too old, leading to an increase in stillbirths and a decrease in live born piglets. There was no evidence to suggest that herds on this study with the lowest culling rates were keeping their sows too long. Among the five herds with the lowest culling rates (< 30%), the average litter size was 10.5, compared to the overall average of 10.0. Furthermore, the level of stillbirth was no higher in the low culling herds as compared to the other herds on the study.

Culling rate was not found to be associated with litters per sow per year

TABLE III. Correlation Coefficients Between Sow Culling Rates and Various Production Parameters from 30 Farrow-to-Finish Herds

	Mean	Standard Deviation	Correlation Coefficient (r)
Average number of pigs born alive per litter	10.0	0.7	-0.50[a]
Percent of litters with 8 or fewer pigs born alive	25.4	8.2	0.53[a]
Stillbirths (%)	7.0	2.8	0.14
Average number of pigs weaned per litter	8.2	0.8	-0.42[a]
Pigs weaned per sow per year	16.8	2.3	-0.26
Litters per sow per year	2.1	0.2	0.03
Average number of sows in the herd	116	77	-0.08
Percent of sows culled per year	44.2	20.3	—

[a]Significantly different from zero, $p < 0.05$

or pigs weaned per sow per year, which is in contrast to previously reported results (9). The number of litters per sow per year parameter is highly dependent on when, or if, gilts are included in the calculation. In this study, unbred gilts were not included in the calculations for any of the production parameters. A herd with a high culling rate would need a large pool of unbred gilts for replacement breeding stock. Had these gilts been included in the calculations of the production parameters, a relationship may well have been found between the number of litters and pigs produced per sow per year and the culling rate.

A high fall culling rate has been shown to be related to seasonal infertility (13). However, in this study the percentage of sows culled for reproductive reasons compared to other causes, was no greater in the fall than in the winter or summer. Fewer herds completed the questionnaire in the fall, therefore the difference in culling rate that was noted in this study may be a result of sampling different populations and not a seasonal phenomenon.

As well as the overall culling rate, the distribution of parities or a knowledge of the age of culled sows and the reasons for removal are essential factors to consider in investigating problems involving sub-optimal litter size. It has been demonstrated that even among herds with only moderate culling rates (35 to 50%) the majority of sows were removed before their fourth litter (8). Culling frequently occurs after one litter because of a failure to return to estrus or poor first parity performance (small litter size and/or low numbers weaned). According to the reasons given by the producers on the three questionnaires included in this study it would appear that Ontario pig farmers are culling the majority of their sows for causes other than old age. It is likely that many sows are being removed from the herds after one or two parities.

Sow longevity did not appear to be related to type of housing. As in a previous study (14) there was no difference in the culling rate between herds housing sows in individual stalls or grouped in pens during gestation. However, others (2) suggested that there was less culling when sows were housed individually; their comparison was based on a total of only nine farms (three total-confinement) and the herd-to-herd variation in culling rate was very high within both groups.

The results of this study indicate that the longer sows are maintained in the breeding herd, the greater is the herd's potential overall productivity. Older sows may eventually show a reduction in litter size to that of a replacement gilt. At that point, the increased feeding costs for the maintenance of older and larger sows would warrant their removal. However, based on culling rates, there did not appear to be any herds on this study where the average sow age was too high, but, regardless of average age, there will be individual sows which are past the point of optimum production and warrant removal from the herd.

ACKNOWLEDGMENTS

REFERENCES

1. **PATTISON HD.** Patterns of sow culling. Pig News Infor 1980; 3: 215-218.
2. **SVENDSEN J, NIELSEN NC, BILLIE N, RIISING HS.** Causes of culling and death in sows. Nord Vet Med 1975; 27: 604-615.
3. **D'ALLAIRE S, LEMAN AD.** Sow longevity. Swine herd health programming conference, Minnesota, 1984: 82-86.
4. **EINARSSON S, LUNDEHEIM N, MARTINSSON K, PERSSON N, PERSSON I.** Post mortem examination of the genital organs of culling sows from one large herd with relation to fertility data. Proc 7th Int Pig Vet Soc Meeting, Mexico City, 1982: 211.
5. **DUBOIS A, JOSSE J, MARTINAT-BOTTE F, LEDEMMAT M, SAULNIER J, VANIER P, VAUDELET JC.** Sow cullings: results of an inquiry. Proc 6th Int Pig Soc Meeting, Copenhagen, 1980: 45.
6. **DAGORN J, AUMAITRE A.** Sow culling: reasons for and effect on productivity. Ltk Prod Sci 1979; 6: 167-177.
7. **EINARSSON S, SETTERGREN I.** Fertility and culling in some pig breeding herds in Sweden. Nord Vet Med 1974; 26: 576-584.
8. **JONES JET.** An investigation of the causes of mortality and morbidity in sows in a commercial herd. Br Vet J 1967; 123: 327-339.
9. **KROES Y, VANMALE JP.** Reproductive lifetime of sows in relation to economy of production. Ltk Prod Sci 1979; 6: 179-183.
10. **ENGLISH PR, SMITH WJ, MacLEAN A.** The sow — improving her efficiency. Ipswich: Farming Press Ltd, 1978.
11. **WILSON MR, FRIENDSHIP RM, HACKER RR, McMILLAN I, PIEPER R, SWAMINATHAN SS.** A survey of productivity and its component interrelationships in Canadian swine herds. J Anim Sci 1986; 62: 576-582.
12. **SNEDECOR GW, COCHRAN WG.** Statistical methods, 7th ed. Ames: Iowa State Press, 1980.
13. **HURTGEN JP, LEMAN AD.** The seasonal breeding pattern of sows in seven confinement herds. Theriogenology 1981; 16: 505-511.
14. **STONE MW.** Sow culling survey in Alberta. Can Vet J 1981; 22: 363.
15. **LEMAN AD.** Bigger gilt litters mean more pigs later. Pigletter 1984; 4: No. 7, 1-2.
16. **BROOKS P.** Feeding aim — conservation of fat reserves. Pigletter 1984; 4: No. 5, 1-3.