

INITIAL RESPONSES TO SELECTION FOR LITTER SIZE IN PIGS

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SUMMARY

Several large Western Australian intensive piggeries have been screened for breeding stock originating from litters with sixteen or more live-born pigs to form foundation stock in a selection study for increased litter size. Parental stock originated from litters of 16.47 pigs (14.80 after correction to first parity). First generation sows produced 9.08 ± 0.32 and 9.82 ± 0.56 live pigs in first and second litters. Second generation sows produced 9.61 ± 0.49 and 10.35 ± 0.34 live pigs in respective litters vs. 8.48 ± 0.26 and 9.21 ± 0.34 in unselected controls.

INTRODUCTION

Low reproductive rate has been long recognised as one of the major factors limiting efficiency of the Australian pig industry (Penny *et al.* 1971, Dunkin 1972). The average number of pigs produced per sow per year is far below results recorded in some European countries. Lindsay (1974) stated that differences in litter size, often approaching two pigs per litter, appear to be the main reason for this unsatisfactory performance.

In recent years the Australian pig breeders followed the overseas trends and have neglected selection for reproductive performance while concentrating on growth and carcass traits. Preferences for growth and carcass quality were soundly based on the prevailing conditions (Smith 1964; Moav and Hill 1966). Hill and Webb (1981) in their review concluded that even with present economic values and low heritabilities for litter productivity, only small benefits can be achieved from inclusion of reproduction in selection indices for the European Large White and Landrace breeds (with relatively high litter sizes). However, the selection for reproduction may be justified in countries with lower litter size and feed cost/carcass differentials (Clarke and Smith 1979). Furthermore, as there are already some indications that the fat cover on entire male carcasses is reaching the optimum limit for some processing requirements (Hill and Webb 1981) the importance of reproduction in breeding programmes is likely to increase to the point where selection would be economically justified. Current developments of commercially viable artificial rearing systems will also further enhance the merits of selection for increased litter size.

Only a limited amount of experimental work has been done on selection for litter size in pigs in Europe and U.S.A. and no information is available from Australian sources.

Rutledge (1980) recorded small improvements in the first two generations of selected lines. Ollivier and Bolet (1981) reported significant improvements after the first five generations but not at generation 10. Inconclusive results have been also reported by Cunningham *et al.* (1979) who obtained a substantial response from selection for ovulation rate, but only a marginal improvement in litter size due to a large increase in embryonic mortality. However, it should be noted that selection for litter size in relatively small populations, such as those used in the previously mentioned studies, usually leads to increased inbreeding and corresponding decline in reproductive performance (King 1967).

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Screening of large populations for prolific sows has been tried with some success in France (Legault and Gruand 1976; Legault *et al.* 1981) and in Norway (Skjervold 1979). It is of interest to note that the Norwegian work involves the standardisation of litters to avoid possible negative maternal correlation between successive generations (Skjervold, personal communication).

Hill and Webb (1981) suggested that the use of techniques such as the standardisation of litter size at birth and (or) direct measurement of ovulation rate, could raise the effective heritability to the point where selection would be warranted even at present economic values.

MATERIALS AND METHODS

Several large Western Australian intensive piggeries provided breeding stock to form a *Prolific Nucleus Herd* at Muresk Agricultural College. The pilot study commenced in 1977 and the project is currently being expanded.

Large White and Landrace weaners (2 boars and 4 gilts per litter group) born in litters containing 16 or more live-born pigs have been reared at the Muresk piggery and used as a parental generation in the selection study.

Data on the number of piglets born per litter (litters were not standardised) and other reproductive parameters have been so far recorded for the 32 first generation sows and the 18 second generation animals. First and second litter results in the selected line are compared with controls (Muresk herd with a 10 year history of selection for growth rate and carcass quality).

RESULTS AND DISCUSSION

Data for live litter size show a continuous trend towards higher productivity in the selected line (Table 1).

TABLE 1
Live litter size (mean and SE) in
selected and unselected pigs

	Parity			
	1		2	
	Mean	SE	Mean	SE
First Generation (n)	9.08 (32)	0.32	9.82 (24)	0.56
Second Generation (n)	9.61 (18)	0.49	10.35 (13)	0.78
Control Groups (n)	8.48 (56)	0.26	9.21 (41)	0.34

There is also some indication of a higher conception rate and a shorter weaning to mating interval in the selected line. However, the more reliable information on these and other reproductive characteristics, such as the length of productive life and the ease of mating, will become available after several more years of breeding work in an 80 sow nucleus herd,

A negative environmental correlation between the litter size of the dam and her progeny has been originally reported in mice by Falconer (1960) and later also found in pigs by Revelle and Robinson (1973) and more recently by Vangen (1980). This relationship may explain changes in litter size between generations, granddam 16.47 (14.8 corrected for parity, dam 9.08, daughter 9.61) recorded in this study.

Selection for reproductive performance, particularly in breeding stock providing dams for slaughter generations may offer a relatively inexpensive method of improving the reproductive potential of breeding herds. It could also be pertinent in situations where selection for growth rate and carcass quality resulted in reduced litter size (Tomes and Nielsen 1979) caused by corresponding small negative selection pressure for litter size as identified by Guy and Steane (1978) and Skjervold (1979).

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