SELECTION PRACTICES AND GENETIC TRENDS IN NEBRASKA SPF HERDS

Rodger K. Johnson
University of Nebraska

The rate of long term genetic improvement in the commercial swine industry depends on the rate of improvement in the source of purchased breeding stock. Therefore, it is very important that purebred breeders utilize selection practices that maximize genetic response.

Records from 688,250 pigs farrowed in 165 Nebraska SPF herds during the years 1960 through 1979 were available to study selection practices, genetic trends and phenotypic trends. Traits evaluated were litter size at birth, 140-day weight and backfat at 220 pounds.

Data

The records for each pig may have included sire and dam identification, breed, herd, sex, contemporary group, date of birth, live pigs born in litter and weight adjusted to 140 days of age. Backfat at the first rib, last rib and last lumbar vertebra was measured on all pigs that were certified, i.e. females with 140-day weight in excess of 150 lbs. and males with 140-day weight in excess of 170 lbs. Data were collected by the SPF organization. Of the available records, about 15% were used in this study. An editing procedure was used to eliminate incomplete records and groups of records which would not add to the study.

To utilize a record it had to include parental identification, date of birth, breed, sex, herd, contemporary group and 140-day weight. Also, data were not utilized if fewer than 60% of the records from any breed-herd-year subclass were incomplete. Breed-herds with less than 1900 records prior to the editing procedures were not analyzed and barrow records were excluded from analyses of growth and backfat.

Only herds in which on-farm selection had been practiced were of benefit. And a minimum of 9 males and 76 females which were raised and subsequently produced offspring on the same farm were considered necessary.

After editing, the total number of records was 101,606 from 18 herds representing three breeds during the years 1971 through 1979.

Selection Practices

Most of the selection pressure was on 140-day weight. The average selected female was 13.4 lbs. heavier than her contemporary average while the average selected male was 21.6 lbs. above average. Across herds, the 140-day weight superiority for selected females ranged from 8.1 to 22 lbs. and the range for selected males was 7.3 to 28.6 lbs.

In most herds low backfat was not an important criteria in selecting replacements. In fact it appeared that breeders were picking replacements that were average in backfat. Overall, selected females had .012 in. less backfat than the average of their contemporary group and selected males were .033 in. better than average. The range across herds in backfat superiority of selected females was from .014 in. fatter to .033 in. leaner than average. The average for selected males was from .046 in. fatter than average to .059 in. leaner than average.

The observed selection differentials indicated that very few breeders were paying attention to litter size when making selection decisions. The average selected females and males came from litters that were .1 pigs smaller than herd average.

Herds differed somewhat in the relative emphasis given to each trait in selection decisions. But no herd was realizing all the selection that could have been applied. The average breeder was realizing 11% of the potential selection differential for backfat for female selection and 22% for male selection. The percentage of the maximum possible selection differential being realized for 140-day weight was 40% for females and 50% for males. The best herds were realizing about 30% of the maximum backfat selection differential and 65% of the maximum 140-day weight selection differential for male selection. However, some herds were getting a zero selection differential for backfat but only realizing 30 to 40% or the maximum potential selection differential for weight. Clearly, factors besides backfat, weight and litter size were influencing selection decisions.

Phenotypic and Genetic Trends

The average herd was decreasing in backfat at the rate of -.014 in. per year and decreasing in 140-day weight by .33 lbs. per year. These trends include both genetic and environmental change. Sires were often used for several months and the change in progeny performance over time allows the genetic trend to be estimated.

There was virtually no genetic change occurring in backfat over the time interval of this study. The estimated genetic change was an increase of .004 in. per year. The average genetic change in 140-day weight was an increase of 1.32 lbs. per year.

Both the phenotypic and genetic time trends for backfat were small indicating little change over time for the environmental effect on backfat. However, 140-day weight was improving genetically but declining phenotypically. This suggests changes over the years in environmental factors, and the changes were detrimental to rate of growth. Perhaps these changes are the result of new facilities and/or technology that reduced labor demands but were not beneficial to growth rate. Also, weaning age was declining over this 10 year interval which would likely cause some reduction in 140-day weight.

Boars are introduced into herds to make genetic improvement and to broaden the genetic base of a herd. The assessment of the relative

genetic merit of home grown and introduced males indicated that there was very little average difference in genetic merit for backfat. For two of 18 herds, the average home-raised boar was significantly superior to introduced boars and for two other herds, the reverse was true. The remainder of the herds were introducing sires about equal in genetic merit to what was selected from their own herd.

For 140-day weight, 12 of 18 herds were selecting boars from their own herd that were superior to introduced sires. The difference was significant for only five herds. In only two herds was the 140-day weight genetic merit of introduced sires superior to that of home-raised boars.

In general, introducing outside sires caused very little genetic change. Also, the number of boars that were introduced was considerably higher than what was necessary to maintain a broad genetic base. In order for this to be an important means of genetic improvement, breeders need to be more aware of selection practices in the herds from which sires are obtained. Introduction of fewer sires and more attention to on-farm performance test records seems to be a better alternative.

Using achievable selection differentials and the National Swine Improvement Federation index for backfat and growth rate, the expected annual change in backfat and 140-day weight are -.028 in. and +4.4 lbs., respectively. In comparison, the average Nebraska SPF breeder is changing at the rate of +.004 in. of backfat and +1.32 lbs. in 140-day weight. The mechanism by which the rate of response will be increased is to select more intensely among home-raised boars and gilts and more careful identification of superior animals when introducing new breeding stock.