STAGES Index Changes for 1999

A.P. Schinckel and M.E. Einstein
Department of Animal Sciences

Since the mid 1980's, STAGES has calculated bioeconomic indexes. These weight the expected progeny deviations (EPDs) of traits relative to their economic value and the intended use of the pigs in commercial crossbreeding systems.

In the past, the terminal sire index weighted the EPDs for days to 230 lb, backfat thickness, and feed conversion relative to their economic values. The economic value assigned to backfat thickness was $10.86 per inch, or approximately a 1.05% change in value per .1 inch change in backfat depth. The EPD for feed conversion was estimated based on its genetic relationships to backfat thickness and days to 230 lb. The terminal sire index was developed so that each index point had a value of $.10 per index point per offspring produced.

The maternal line index included EPDs for number born alive, number weaned adjusted for number after transfer (a measure of survival to weaning), 21-day litter weight, and the postweaning traits. The reproductive and postweaning traits are weighted with the realization that a parent gilt in a terminal crossbreeding system expresses her genetic potential for the reproductive traits, and passes half of her genetic potential for the postweaning traits to her offspring.

Since the mid 1980's, the pork industry has undergone constant changes. Pork processors began shifting the ideal weight ranges of their carcass value based payment systems to heavier weights. Currently, the optimal live weight on the majority of pork processor payment systems is close to 250 lb. For this reason, the National Swine Improvement Federation (NSIF) has increased the suggested off-test weights to 250 pounds.

During the late 1980's to mid 1990's, pork processors increased their focus on the production of highly trimmed lean cuts and low fat, value-added products. In the past three years, pork processors have evaluated and are increasingly implementing multiple site ultrasonic backfat and muscle depth measurements.

The use of real-time ultrasound increased dramatically during the 1990's. Independent real-time scanning companies became available across the Midwest. NSIF initiated a certification program for real-time scanners to certify their accuracy in measuring both backfat depth and loin eye area. The combined impact of the implementation of carcass value based purchase programs, increased use of real-time ultrasound, and availability of across-herd STAGES EPDs resulted in intense selection for increased leanness.

Index Changes

To account for the changes in the pork industry and to refine the direction of future genetic selection, the STAGES indexes have undergone evaluation and changes have been implemented. In 1998, it was decided to increase the weight off test from 230 to 250 lb to reflect the current increased average market weights. Growth rate is currently evaluated as days to 250

pounds. Backfat depth is adjusted to 250 lb live weight. The economic value for feed conversion assumes pigs are fed to 250 lb live weight. Additionally, an EPD is calculated for loin muscle area adjusted to 250 lb live weight.

The second change made in 1998 was that an EPD for pounds of fat-free lean adjusted to 250 lb live weight (LBLEAN) would be calculated based upon the backfat depth and loin muscle area EPDs. The equation currently used is LBLEAN EPD = (-14.95 x Backfat EPD) + (2.50 x Loin Muscle Area EPD), where backfat EPD is in inches and loin muscle area EPD is in square inches. This equation has been changed from the 1998 equation, with less emphasis now being placed on loin eye size.

The third change in the STAGES index was the development of a curvilinear economic relationship between carcass value and measurements associated with leanness. In 1997, representatives of four major pork processors were confidentially interviewed as to their current and anticipated future carcass merit buying systems. Currently, one pork processor actually reduces the premium of pigs with less than .67 inch (17 mm) backfat thickness due to an increased incidence of pork quality problems in extremely lean carcasses. One pork processor pays no additional premium for pigs under .60 inch backfat thickness. All four pork processors independently agreed on the following issues:

1. Extremely lean carcasses, greater than 53% fat-free lean, have an increased incidence of numerous pork quality problems, regardless of the stress or napole gene status of the pigs.
2. The more ideal backfat range is .65 to .80 inch backfat.
3. Pigs with 1.1 inch or greater backfat thickness will be discounted to a greater extent in the future, as such pigs produce less lean cut-out value per man-hour of processing labor, are more variable in lean cut weights, and have increased amounts of seam fat.

The current and future anticipated carcass merit systems were scaled to a common value ratio basis, where carcass value = base price x value ratio. A base price of $112.50 was assumed for a pig of 84 lb of fat-free lean adjusted to a 185 lb carcass weight (LBLEAN; 250 lb nonshrunk live weight; 240 lb shrunk live weight). The value ratio was transformed to a value index. The maximum carcass value index (1.00) was attained at 94 lb LBLEAN.

An example was calculated assuming a base price of $112.50 per pig (250 lb live weight). The relationship between carcass value index and LBLEAN is shown in Figure 1. The slope of the dollar value at a specific value for pounds of lean is the marginal value of the next incremental pound of lean. Table 1 shows the incremental value per incremental LBLEAN EPD or per incremental .1 inch change in backfat depth EPD. The marginal value becomes smaller as the pigs become leaner and becomes zero at 94 lb of LBLEAN. It is important to realize that as the pigs become leaner, the EPDs for LBLEAN will increase as the component EPDs for backfat depth and loin muscle area change. As the EPDs for LBLEAN increase, the additional economic (dollar) value of each one pound incremental increase in LBLEAN will become smaller.

The new STAGES indexes utilize this curvilinear relationship between carcass value and the EPDs for pounds of lean. The terminal sire index currently uses a base LBLEAN value of 87 lb, so the economic value for backfat at a 0 EPD for backfat will be $7.68 per inch, about 70% of

the value of $10.86 used previously. A base value of 92 lb for LBLEAN is currently used for the maternal line index, which reduces the economic value of backfat to about 27% ($2.89 per inch) of that of the old maternal line index. In 1998, the base LBLEAN values were 86 lb for the terminal sire index and 91 lb for the maternal line index. Because the maternal line index uses a higher base value (LBLEAN value of 92 versus 87 for the terminal sire index), the very leanest individual boars and gilts will be given a decreased economic value and emphasis in the maternal line index.

The one pound increase in base values are supported by genetic trend estimates. In 1998, Purdue University research found that breed average Durocs (mean EPD of -.04 for backfat) mated to slightly leaner than breed average Yorkshire-Landrace sows produced pigs leaner than expected. The barrows averaged 52.6% fat-free lean and gilts averaged 54.1% fat-free lean. The impact of increasing the base values will result in an overall reduced emphasis on leanness.

Correlation analysis can be used to evaluate the emphasis which an index places on the component traits (Table 3). The new 1999 terminal sire index places less emphasis on LBLEAN and more on growth rate (days to 250 lb) than the 1998 terminal sire index. The 1999 terminal sire index places greater emphasis on growth rate (r = .758 with days) than LBLEAN (r = .650). The 1998 terminal sire index placed greater emphasis on LBLEAN (r = .771) than days to 250 lb (r = -.634).

The 1999 maternal line index places less emphasis on LBLEAN (r = .315 vs. .426), and a slightly greater emphasis on days to 250 lb (r = -.629 vs. -.600) and sow productivity (r = .840 vs. .806) than the 1998 index. The 1999 maternal line index reduces the annual genetic improvement for leanness in the maternal lines by 25% in comparison to the 1998 index. However, greater improvements will be realized for growth rate and sow productivity. The new maternal line index will favor herds which do not overemphasize leanness at the expense of genetic improvement of the growth and reproduction EPDs.

Applications

The new STAGES indexes will remain similar to the old indexes in that they are bioeconomic indexes with a specified dollar value per offspring or per daughter litter. The changes made to the indexes, especially the maternal line index, should result in better weighting between growth rate and leanness so that selection for extreme leanness will be avoided.

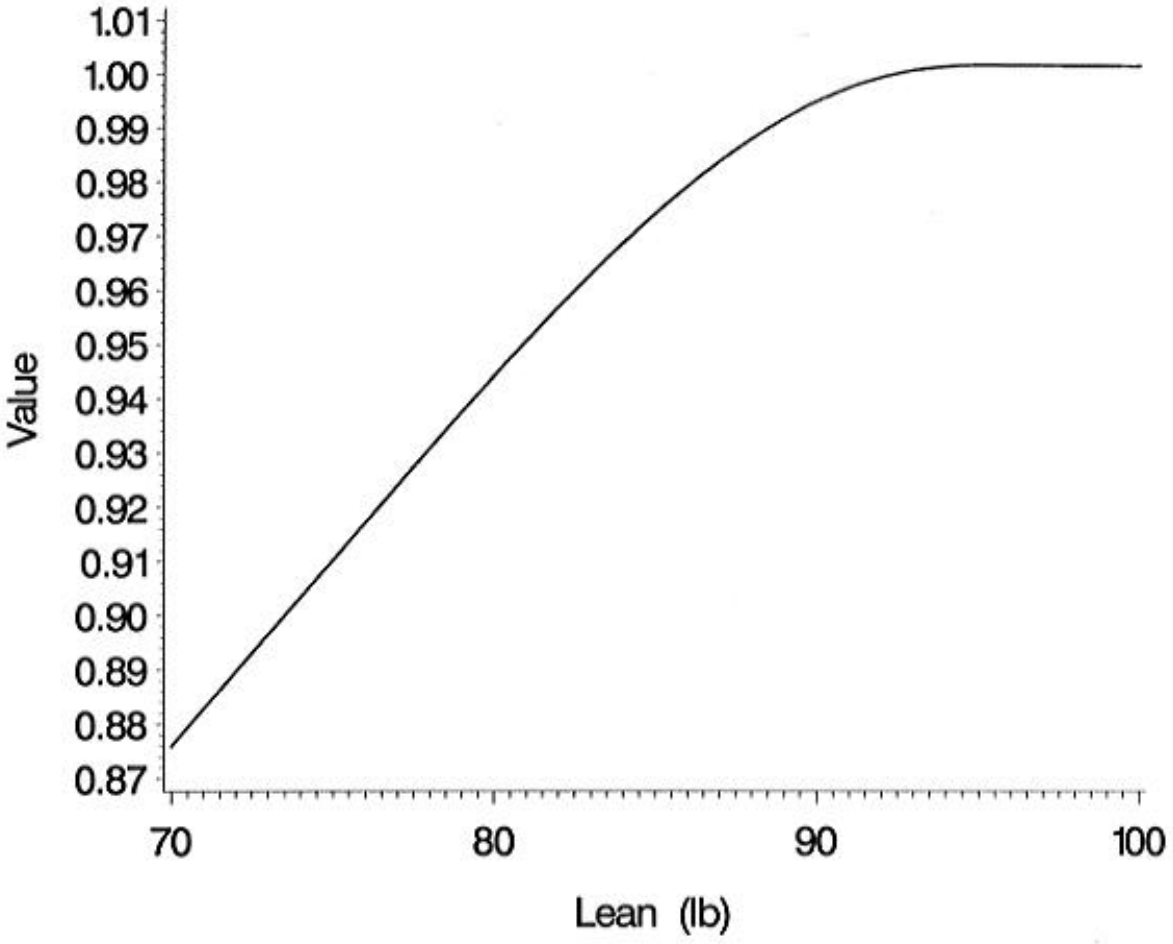

Figure 1. Relationship of carcass value with pounds of fat-free lean adjusted to 250 pounds live weight.

Table 1. Incremental increase in value for each additional pound of fat-free lean EPD or tenth inch backfat EPD at different amounts of fat-free lean.

Pounds of fat-free lean*	$ Change / 1 lb LBLEAN EPD	$ Change / .1 inch Backfat EPD
83	.684	1.02
84	.648	.969
85	.610	.912
86	.563	.841
87	.514	.768
88	.459	.686
89	.400	.598
90	.336	.502
91	.267	.399
92	.193	.239
93	.115	.171
94	.000	.000

*Adjusted to 185 lb carcass weight (250 lb live weight).

Table 2. Correlations of the 1998 and 1999 STAGES indexes with the component traits.

	Terminal Sire Index		Maternal Line Index	
EPD	1998	1999	1998	1999
LBLEAN	.771	.650	.426	.315
Backfat	-.674	-.573	-.462	-.370
Loin Eye Area	.599	.499	.229	.136
Days to 250 lb	-.634	-.758	-.600	-.629
SPI	.175	.193	.806	.840