SUMMARY

Data are presented to demonstrate the realistic genetic response expected per generation at both the broiler and parent stock level for the most economic important traits. The greatest economic gains are made at the broiler level as opposed to the parent level. It is also demonstrated that a positive response for egg numbers will negatively influence the more economic important broiler level traits, such as growth rate and a high degree of fleshing. Data presented show that a subjective score of body conformation (fleshing) can accurately be utilized for increasing the percentage dressed carcass weight (yield) of live broiler weight.

INTRODUCTION

In today's highly sophisticated broiler chicken industry, every effort is made to accurately determine where production costs are incurred. Since there are many options for the selection intensity that can be applied to the various traits of economic importance, the animal breeder needs very accurate guidance. Operating within a total integrated broiler company makes the decision more easily obtainable from a purely scientific viewpoint. On the other hand, a primary breeder serving a more diverse market may not make his selection procedures based purely on economic bottom line performance. This is because they are in the business of selling day old breeding stock and not totally dependent on the bottom line performance of the end product. For example, the non-integrated international market might demand more emphasis on high egg numbers than pure economics would dictate. Thus, the primary breeders serving these markets must emphasize egg numbers in lieu of some other more important economic trait. This presentation will basically deal with the genetic progress realistically obtainable and what the economic worth of the progress is to the integrated broiler producer.

ECONOMIC VALUE OF TRAITS

In a total integrated broiler operation, it is possible to accurately determine the economic value of each trait based on some common denominator. It has been my procedure to relate the economic value of each trait to an economic base of cents (U.S. $) per pound of salable meat through the processing plant. By this method the parent and broiler performance can be evaluated along with the yield through the processing plant.

Table 1 demonstrates some values for the most important broiler performance traits that it takes to equal 0.5¢ per salable pound of

228
meat. Each of the factors in Table 1 are equal to each other in economic value and each is equal to 0.5¢ per pound of salable meat. For example, if one breed combination gave 0.40 lbs. more weight gain to market age and all the other 4 traits were equal, that breed combination would have a 0.5¢ advantage per salable pound of meat.

Table 2 contains some of the more important influences of cost at the parent stock level. Each of these factors are equal to each other and each is equal to 0.5¢ per salable pound of meat. Each of these factors for the parent stock traits are also equal to the broiler traits presented in Table 1. For example, 29 hatching eggs at the female parent stock level is equal to 0.40 lbs. of weight gain at the broiler level as far as bottom line economics is concerned.

EXPECTED GENETIC RESPONSE

In order to determine what genetic response can be realistically expected, consider the data presented in Table 3. Two parent stock and two broiler level traits are presented for the maximum genetic response expected in one generation if maximum selection intensity was practiced for only one particular trait. Body weight gain and feed conversion are two of the three most important traits to be considered at the broiler level. Yield is the third and less definable as far as selection procedures are concerned and it will be discussed later. The two primary parent stock traits are egg numbers and hatchability.

ECONOMIC VALUE OF GENETIC RESPONSE

Table 4 compares four traits for the economic value of their response in one generation. As can be seen, the two broiler level traits would yield at least 7 times more economic gain than the parent stock traits per generation. In reality, egg production would be at a greater disadvantage because of extending the generation interval in order to measure egg numbers in the pedigree candidates. A minimum of 52 weeks generation interval is necessary when selecting for egg numbers (part year records). Without considering parent stock traits, a generation interval of 40 weeks is realistic. Therefore, in 10 years a loss of 3 generations is realized in the broiler level traits when selecting for egg numbers and maintaining a 52 week generation interval.

One is further discouraged from selecting for egg numbers because of the negative genetic correlations between egg numbers and body weight gain, and egg numbers and increased carcass fleshing (conformation). Genetic regressions of body weight and body conformation on egg numbers are presented in Table 5 for one female line. It can be seen that if a realized gain of 2.5 eggs is obtained a decrease of -0.30 lbs. in broiler weight and a reduction of -0.27 in body conformation score (fleshing) can be expected. The values in Table 5 assume a linear relationship for the genetic correlation.

No attempt will be made here to demonstrate a selection index to apply to these traits. This subject was looked at in detail by Hogsett and Nordskog (1958).
SALABLE MEAT YIELD

As stated earlier, yield in terms of percentage of salable carcass of live weight is a complex issue compared to selecting for body weight gain. However, one can make progress in selecting for increased salable meat yield. In our breeding program, we measure body conformation in terms of a subjective scoring system. In this system a score of 1 is the best body conformation and 5 is the worst. The conformation score is made up of the width of the breast at the anterior point of the keel bone and to what extent the meat is laid along the entire length of the keel bone. An objective measurement (breast angle) is highly correlated with conformation score but does not adequately measure the degree of meat (fleshing) for the entire length of the keel. The change in breast angle and yield by year, as measured in the final dressed product, is presented in Table 6. As can be seen, salable yield and breast angle increased by years.

Regression of yield on breast angle was highly significant (Figure 1) and the regression of yield on time (years) was also highly significant (Figure 2).

CONCLUSIONS

With the level of egg numbers that are still in broiler parent stock today, it appears conclusively that selection intensity should be utilized at the broiler level. The economic value of making positive gains in growth rate, feed efficiency and yield is too attractive not to put total emphasis on these traits for a total integrated broiler operation. Although not demonstrated in this paper, all 3 of these traits are desirably genetically correlated. As we continue to select for these highly economically favorable broiler traits, we will see a continuous depression in egg numbers because of the negative genetic relationship between these characters. As egg numbers continue to decrease the cost per egg will increase. As the egg cost increases our economic value formula will change and at some point we might be forced to emphasize selecting for egg numbers.

Meat yield, although difficult to quantify into one objective measurement, can be selected for and genetic gains realized. A subjective scoring system for measuring the degree of fleshing (conformation) can be utilized to genetically improve the percentage of dressed carcass weight (yield) of live body weight.

REFERENCES

### TABLE 1 Integrated Broiler Production Equivalent Cost Factors

(Each Equals about 0.5¢/lb. of Salable Meat)

**Broiler Level (6 wks. of Age)**

1. 0.40 lbs. of live body wt.
2. 0.05 lbs. of feed per lb. of live meat.
3. 1% processing plant yield.
4. 1.2% condemnations.
5. 2.2% broiler livability.

### TABLE 2 Integrated Broiler Production Equivalent Cost Factors

(Each Equals about 0.5¢/lb. of Salable Meat)

**Parent Stock Level (280 Days of Lay)**

1. 29 hatching eggs per hen housed.
2. 16% hatchability of eggs set.
3. 2.6 lbs. of feed per dozen eggs.
4. 16¢ cost per dozen hatching eggs.
5. 29 lbs. less breeder feed per hen housed.

### TABLE 3 Comparative Genetic Progress Per Generation of Two Broiler and Two Breeder Traits

<table>
<thead>
<tr>
<th>Trait</th>
<th>Heritability</th>
<th>Selection Differential</th>
<th>Response *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight Gain (lbs.)</td>
<td>0.40</td>
<td>0.60</td>
<td>0.240</td>
</tr>
<tr>
<td>Feed Conversion (lbs.)</td>
<td>0.30</td>
<td>0.12</td>
<td>0.036</td>
</tr>
<tr>
<td>Egg Numbers (120 day record)</td>
<td>0.20</td>
<td>12.00</td>
<td>2.400</td>
</tr>
<tr>
<td>Hatchability (%)</td>
<td>0.10</td>
<td>4.00</td>
<td>0.400</td>
</tr>
</tbody>
</table>

* Selecting for only one trait without influence of genetic correlations.
Figure 1. Change in salable meat yield as breast gauge increased.
Figure 2. Change in salable meat yield by years