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FACTORS AFFECTING FEED EFFICIENCY OF LAYING HENS

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Maximum returns to the egg producer depend on many factors, among them, ability to manage his flock to obtain efficient conversion of feed into eggs.

Feed conversion or feed efficiency is most frequently expressed as the pounds of feed required to produce a dozen eggs. Sometimes it may be expressed instead as pounds of feed per pound of eggs or per dozen 24-ounce eggs. These two expressions using egg mass, rather than numbers, are used most frequently in comparing experimental results when a correction for egg size is necessary. Since eggs are priced and sold more on the basis of number than weight, the first expression of feed efficiency, although having some drawbacks, is still the most useful to the producer.

All of these expressions of feed efficiency involve a measure of feed consumption and a measure of production units. This gives a breakdown into two broad categories of factors influencing feed efficiency -- those which affect feed consumption and those affecting numbers of eggs produced.

Two of the best defined factors influencing feed consumption of laying hens are body size and numbers of eggs produced. A certain minimum quantity of feed nutrients is required by the body processes of the bird before any eggs are produced. This quantity, termed the maintenance requirement, varies directly with body size. The production of eggs, then, requires feed nutrients over and above those needed for maintenance and in a similar manner this requirement depends on the number of eggs produced. Approximately 60 percent of the energy and 40 percent of the protein consumed by a high-producing hen is utilized for maintenance. As the number of eggs per hen increases, feed for body maintenance is spread over more total eggs and, while the feed for the production of each additional egg stays approximately the same, total feed efficiency is improved.

This concept of the relation of body size of the bird and number of eggs produced to total feed consumption and feed efficiency is illustrated in the accompanying table. These data are approximated by the following equation which may be useful in estimating total feed required by a group of birds: total feed per year per hen (lb.) = 8.8W + 0.14E + 21.0; where W = body weight in lbs., and E = total eggs produced.

It would appear that the most efficient hen would have the minimum body size compatible with other production

Feed required by chickens of different live weights for maintenance and production of 0, 100, 200, and 300 eggs per year and the corresponding feed conversion ratios 1/

Average live weight	0 eggs per yr. lb.	100 eggs per yr. lb.	F/doz. 2/	200 eggs per yr. lb.	F/doz. 2/	300 eggs per yr. lb.	F/doz. 2/
3.0	47.3	61.6	7.4	74.8	4.5	89.1	3.6
3.5	51.7	67.1	8.1	80.3	4.8	94.6	3.8
4.0	56.1	71.5	8.6	84.7	5.1	99.0	4.0
4.5	60.5	74.8	9.0	89.1	5.3	103.4	4.1
5.0	64.9	79.2	9.5	93.5	5.6	107.8	4.3
5.5	69.3	83.6	10.0	97.9	5.9	112.2	4.5
6.0	73.7	88.0	10.6	102.3	6.1	115.5	4.6
6.5	78.1	92.4	11.1	105.6	6.3	119.9	4.8
7.0	81.4	95.7	11.5	110.0	6.6	124.3	5.0

1/ Adapted from table 6, Nutrient Requirements of Poultry, Publication 1345, National Academy Sciences-National Research Council, 5th Edition, 1966.

2/ F/doz. Feed required in pounds per dozen eggs produced.

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and performance criteria. This is exactly the route being followed by commercial breeders today in their attempt to reduce body size while maintaining such traits as production rate, egg size, livability, and egg quality.

A chicken's feed consumption is quite closely regulated by its requirement for dietary energy. Two additional factors which can have a marked influence on feed efficiency are the energy concentration of the ration and the temperature of the hen's environment. A Leghorn-type hen producing at 80 percent production or greater, at a moderate temperature, 55-70° F., will consume approximately 290-320 kcal (kilocalorie) metabolizable energy per day. The use of well-balanced high energy rations containing 1,300-1,400 kcal/lb. of metabolizable energy will result in improved feed efficiency compared to lower energy rations, since less total feed will need to be consumed to supply this required energy.

Hens in high environmental temperatures will require proportionally fewer total calories per day for maintenance; conversely, in cold weather feed consumption may be markedly increased since more energy is used to maintain the bird's body temperature. It is desirable to avoid temperature extremes from the standpoint of feed and total nutrient consumption and also because production rate may suffer under these stress conditions. Generally, a 10 percent variation in feed consumption between average values for summer and winter will be encountered in a well-constructed laying facility. At the temperature extremes, however, this variation may be considerably greater.

As pullets come into production, feed effiiency approaches a maximum at peak production. It is relatively constant for a period of time, then declines as production rate drops. Although production rate is the major influence during this period, the following factors also contribute to changes observed in the feed conversion ratio: the continued body growth of pullets up to approximately 40 weeks of age, the differences in egg size over this cycle, and a decline in nutrient utilization in older birds.

A well-balanced ration is essential for top egg production and efficient feed utilization. Dietary imbalances, such as total protein to energy and deficiencies of individual amino acids can result in reduced egg production, feed efficiency, and egg size. Although protein and amino acid problems are most frequently encountered, all nutrients need consideration. Where possible, formulation should take into consideration current feed consumption of the flock, rate of production, and age.

The type of housing system, floor vs. cage, would be expected to influence the hen's need for energy and certain other nutrients in conjunction with her reduced activity. Some records of cage-confined hens have shown quite a marked reduction in feed consumption compared to floor-housed birds. In addition, bird density in cage units may affect production rate and the hen's opportunity to consume feed. With properly formulated diets to assure adequate intake of essential nutrients, equal or better feed efficiency should be no problem in a modern cage housing facility. The slightly lower production rate reported in certain tests comparing floor and cage birds is usually more than offset by reduction in labor and overhead obtained using cage systems.

Feed wastage can be a significant contributor to poor feed conversion figures observed in some operations. Feed wastage can result from poor feeder design, poor maintenance and operation of feeding equipment, and over-filling of feed troughs. Ideally, feed troughs should be constructed so they need to be filled only 1/3 to 1/2 full and have a lip to prevent the hens from billing out feed. Proper debeaking will frequently reduce feed wastage. Control of rats, mice, and wild birds is essential for controlling feed wastage.

All producers should recognize that low level disease and parasite infestations can be robbing them of efficient egg production. A count should be kept of dead birds and the cause of death determined. Individual hens should be examined periodically to correct problems immediately, before feed consumption and egg production slumps occur.

Many factors are involved in obtaining efficient conversion of feed into eggs. Perhaps a consideration of these influences on your current flock and a review of past management procedures, feeding practices, and performance records will suggest ways to improve feed efficiency in the future.

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