extension
ALABAMA A&M & AUBURN UNIVERSITIES

Grading Procedures During Rearing in Poultry Production

► This publication is the second in a three-part series on improving body uniformity in poultry rearing. Learn the process, types, frequency, house setup, and important considerations of grading.

The hatchability of broiler breeder eggs is approximately 79 percent as an industry average, which is lower than the hatchability reported by the industry a few years ago. This significantly impacts the number of broiler chicks placed and can ultimately result in empty shackles at the processing plant and loss of revenue. Males with inadequate body condition early in the lay cycle affect fertility and hatchability. In addition, transferring males with uniform body weight (BW) and frame development to the lay house makes them easier to manage for optimal fertility. Poor body condition, improper frame size, regressed testicle size, and flabby hearts have been observed in the field with poorly developed males. Relocating poorly developed males to lay houses has reduced fertility because of the shortage of high-quality males needed for optimal reproductive performance (figure 1).

Grading males has been practiced in many regions across the globe as a tool to improve body condition and uniformity of males during rearing. This publication describes the process of grading and associated management practices after grading. The primary audience is industry personnel involved in rearing broiler breeders of integrated broiler operations.

What Is Grading?

Grading is a technique to separate birds by weight groups within the rearing house. This grading allows service technicians and growers to allocate the amount of feed based on their BW compared with the target BW. Grading can decrease the number of lighter-weight birds in the flock, potentially improving BW uniformity, frame size development, and sexual maturity. This technique will require a commitment to the process to ensure that it is done correctly.

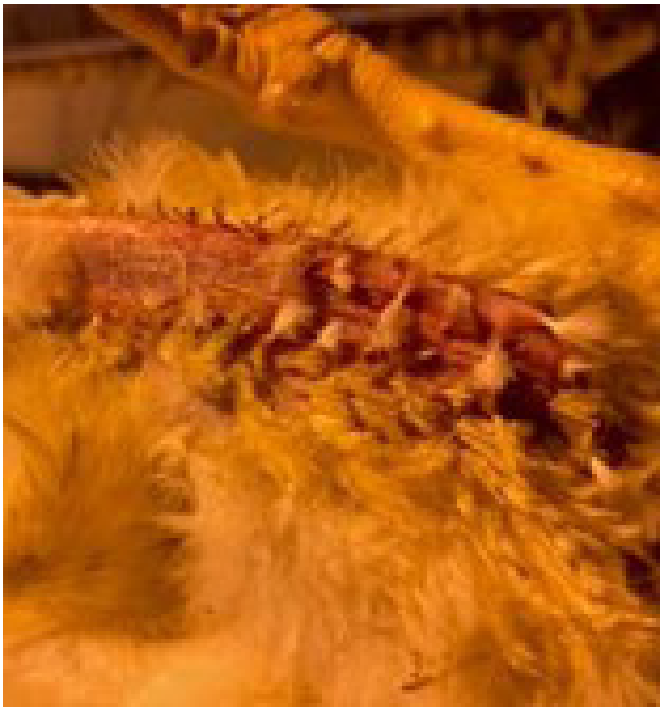

Figure 1. The presence of poorly developed males in lay houses results in decreased fertility and hatchability.

Types of Grading and Frequency

Grading typically consists of a 2- or 3-way grade system using nonadjustable or adjustable penning. A 2-way grade consists of placing a subpopulation in 2 pens, whereas the 3-way grade separates the birds into 3 subpopulations with respect to BW (light, average, and heavy). The subpopulation weight ranges are determined by weighing 10 to 12 percent of the population. A 2-way grade is more appropriate for a coefficient of variation (C.V.) of 10 percent and/or a uniformity (±10 percent of the average BW) from 68 to 79 percent. However, 3-way grading is more appropriate if the flock has a higher C.V. greater than 10 percent or a lower uniformity of 68 percent. Due to time and labor constraints, 2 gradings conducted at 4 and 8 weeks of age (WOA) should be adequate but another grading at

12 WOA would be preferred if labor cost and time are not prohibitive. The second grading may be delayed to coincide with vaccination to minimize the stress of handling the birds. However, the window of optimum frame development can be missed if the second grading is delayed until 11 WOA to coincide with vaccination. Shank length and keel length are indicators of frame development. Approximately 71 percent of the shank length at 25 WOA can be obtained by 8 WOA.

House Setup

Each subpopulation receives accurate feed allocation amounts based on the number of birds in the pen. Desired results will be difficult to achieve by speculating on the amount of feed split between 2 subpopulations. With a 2-way grade, an additional feeding system would be required to feed each subpopulation accurately. This would consist of an additional small-feed bin, scale, fill system, and feed hoppers. A permanent divider that allows air flow can split the house horizontally or split one end of the house vertically to accommodate a pen for the 30 percent (light) birds for a 2-way grade while the remaining space in the house could accommodate the remaining 70 percent (average and heavy) of the population. Hopper size for each feeder line is a critical consideration to accommodate the amount of feed needed for feed restriction programs, which depends on the house size. A 2-way grade of 70 percent and 30 percent offers a significant opportunity to reduce the number of light BW birds in the flock after grading by providing the birds a different feed allocation program.

As an economic option for a 3-way grade, half of the house can be split lengthwise with a winched wire petition or wire kennel panels with T-posts, which could split the end of the house into 2 pens (25 percent each) while allowing adequate floor, feed, and waterer space (figures 2 and 3). The other end could be used to rear the average BW birds using a crosswise petition in the middle of the house. Another option for a 3-way grade would be to place 2 petitions crosswise for 25 percent of the population in the front and back of the house for the light and heavy BW birds, while the middle section can be set up for the average BW birds (figure 4).

An accurate amount of feed should be sent from the feed bin to the hoppers for each subpopulation. Each section or pen needs a small feed bin, scales, fill system, and hoppers in addition to the winch wire petitions or permanent divider so the graded groups of birds can be accurately fed. Calibrate the bin scales to ensure that accurate feed weight is provided to the birds. Scales that are 10 percent over or under the target feed weight could have a significant impact on weekly target BW (figure 5).

Figure 2. The house can be split in the middle with half for 25 percent light birds and the other half for 25 percent heavy birds.

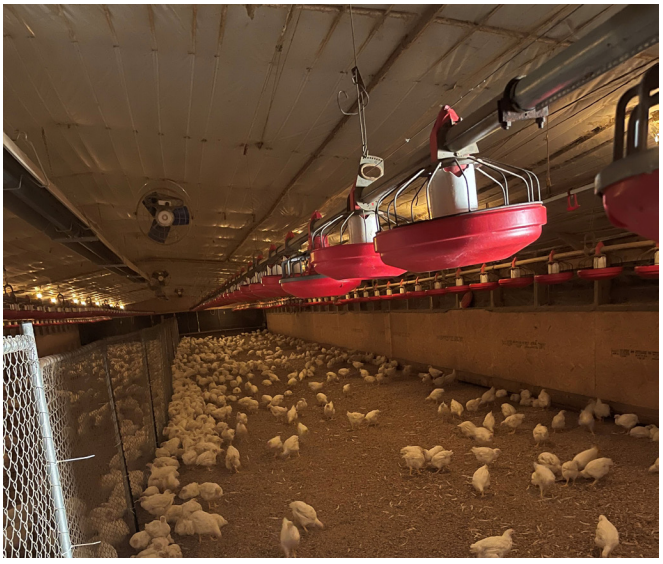

Figure 3. A house can be split lengthwise with 25 percent of the population either heavy birds or light birds.

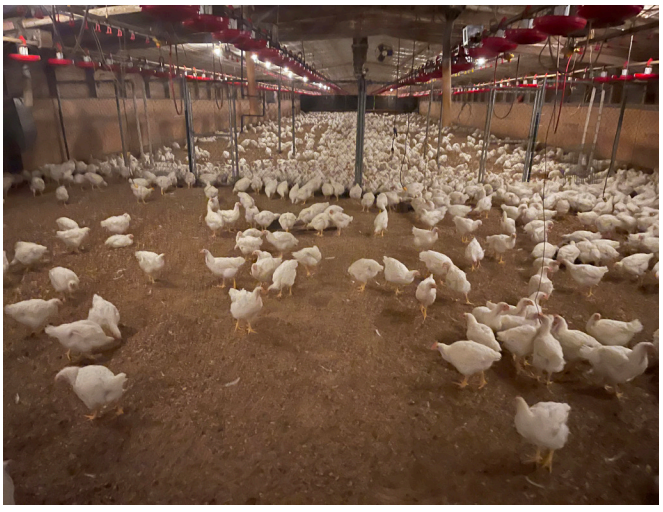

Figure 4. Crosswise petitions in the middle section can be set up for 50 percent average BW birds. The middle partition on either side separates light and heavy birds.

Figure 5. Each section or pen needs a small feed bin, scales, fill system, and hoppers.

What Is the Process of Grading?

Follow these steps in the grading process:

- Determine the profile of the flock as it relates to the average BW, uniformity (±10 percent of the average BW), and C.V. percentage. Do this by weighing 10 percent of the flock. This consists of weighing a representative sample of birds throughout the house. The corners or along the sidewalls can have a higher proportion of lighter birds.
- Establish target BW ranges to pen birds separately.
- Move the flock to one end or half of the house to start the grading process.
- Set up the nets or fences to perform the grading. This arrangement may include a waiting area at the end of the house, grading area, middle of the house areas for average BW birds, temporary fences set up on the sides of the house for light and heavy BW birds, temporary buffer fences, and scale stations (figure 6). Birds can be placed in the buffer fences to help adjust numbers in the light BW or heavy BW groups at the end of grading if needed to accommodate desired percentages.
- Program scales for the weight ranges with signage indicators representing each category to assist with sorting (figure 7). The project manager can adjust the weight ranges when about 65 to 70 percent of the birds have been weighed to avoid using a buffer pen, as more light birds will typically be weighed toward the end of grading. Monitoring data throughout the grading process is important to achieve the desired percentage of light, average, and heavy birds. Arrange the scale stations for easy access so birds can be placed in weight pens (subpopulations).
- Cull birds that are extremely light or have leg abnormalities or other problems before they are graded.
- Consider having a specialized grading crew to expedite the process once it has been refined.
- Remember that an inexperienced grading crew may consist of 8 catchers and 4 weighers and may require about 8 hours or 16 catchers and 8 weighers for 4 hours to complete grading in a house with approximately 6,000 males. Grading will take a certain amount of total labor hours to complete. An experienced crew can grade about 6,000 males in 4 hours with 10 people.
- After grading has been completed, weigh 10 percent of each pen to establish average BW, uniformity (±10 percent of the average BW), and C.V. percentage to monitor the effectiveness of the grading process within the various weight ranges. Data from the entire subpopulations will provide more robust results of the grading process compared with the results of weighing 10 percent of the birds from each pen.

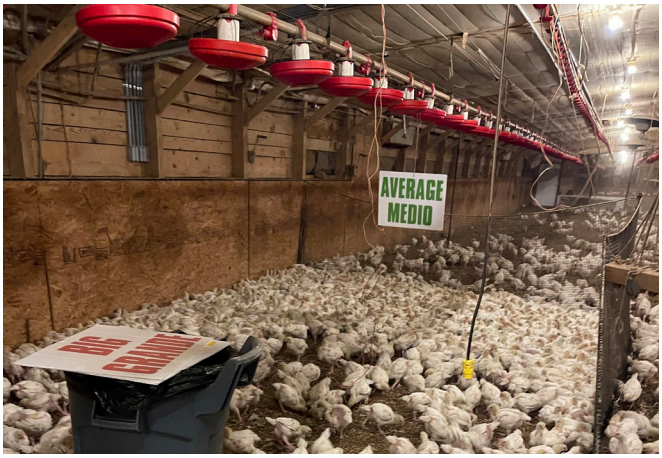

Figure 6. Nets or fences can divide the house for grading areas.

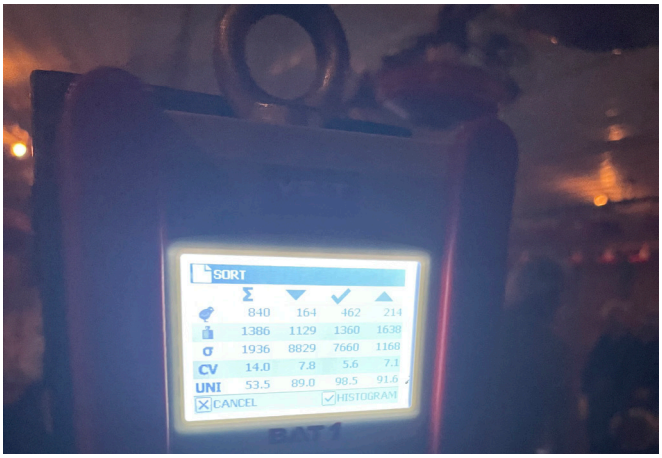

Figure 7. Program scales for weight ranges.

How to Determine the Grading Weight Ranges?

The first step is to weigh 10 to 12 percent of the birds in the house to gather baseline information of the average BW, C.V. percentage, standard deviation, and uniformity (±10 percent of the average BW). Once this is done, BW ranges for grading can be determined for each subpopulation or pen to represent the percentage of birds in each weight category for a 2- or 3-way grade. The heavy, average, and low BW ranges can be determined from the sample BW. For example, if 600 birds were weighed based on a 10 percent weighing of 6,000 birds, the 150 heaviest and 150 lightest birds would represent the heavy and light BW groups to determine the weight ranges for these groups, whereas the average group would represent the BW of the middle 300 birds. The low end of the heavy and average BW can be reduced by 15 to 30 grams to minimize a disproportion of light birds during the weighing process. The adjustment for the weight ranges depends on age, BW, health, and uniformity, and the numerical adjustment will change for each flock that is graded. The manager will need to monitor data during grading to determine if other adjustments with BW ranges are needed. The importance of adjusting BW is to ensure that the desired percentages of the total flock are obtained for the various weight ranges (light, average, and heavy).

Standard deviation measures the variation around the average. One standard deviation will consist of approximately 68 percent of the population around the average, with a normal distribution of BW. A house of males at 4 WOA having an average BW of 1.50 pounds with a standard deviation of 0.09 would result in approximately 68 percent of the birds weighing from 1.41 to 1.59 pounds. The other 32 percent of the flock should be below and above the weight range of 1.41 to 1.59 pounds. The amount of variability around the average BW will continue to increase during rearing as evidenced by more birds being either light or heavy toward the end of rearing.

The population for a 2-way grade can be split into 30 percent of the birds as light BW and 70 percent of the birds being average and heavy BW. A 3-way grade may split the population into either light (25 percent), average (50 percent), or heavy (25 percent) BW birds. Significant BW differences can occur among the groups after grading (figure 8).

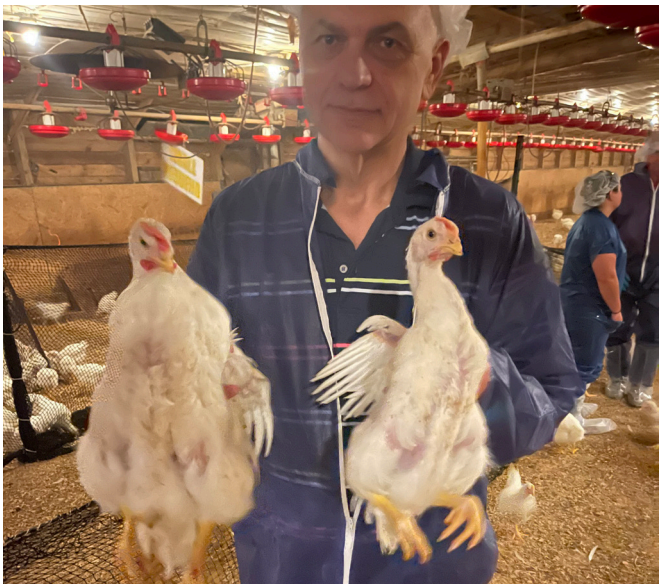

Figure 8. After grading, significant BW differences can occur among groups.

A 3-way grade should allow more control over feed management of the various BW groups to achieve the target BW. It may be easier to manage a 3-way grade to allocate birds into pens by light, average, and heavy BW at 33 percent of each weight range to achieve adequate floor, feeder, and nipple water space allocations if the house has feeding systems to accommodate this setup. This setup allows fewer birds per pen, which should be easier to manage throughout rearing. Pen size should be adequate in floor space, feeder space, and nipple drinker space for the number of birds.

Economic Costs and Benefits

Beyond setting up the house for penning and adding feed system equipment, labor is a significant cost of grading. The labor required to grade may vary as birds age as it could require less time grading at 4 WOA compared with 12 WOA. For example, grading two times may cost approximately $6,800 ($0.50 per bird) and three times as much as $10,200 for a flock with 6,800 birds. For example, a complex has a target broiler BW of 6 pounds, 94 percent livability, meat price at $1.15 per pound, and egg production of 155 eggs per hen and 42,000 hens (10,500 hens per house; 20,000 feet squared). Assume an increase of 1 percent hatchability (79 percent versus 80 percent) for graded males being supplied to four hen houses versus nongraded males placed in four similar hen houses. At 79 percent hatchability, the number of broilers produced from the 42,000 hens would be 4,834,326 at processing resulting in 23,929,914 pounds of meat and $27,519,401 of revenue based on carcass weight and $1.15 per pound as a point of reference. The increase in 1 percent hatchability could result in a

total of revenue of $348,347 without considering live production costs. Grading could potentially yield a 51 or 34:1 revenue over the labor investment depending on whether 2 or 3 gradings are performed in this example.

Grading has the potential of significantly increasing revenue across a complex if all cockerels are graded and properly managed yielding a modest increase in fertility leading to a 1 percent increase in hatchability. Factors other than male fertility, such as egg handling, storage, transport, eggshell quality, embryonic mortality, etc., can impact hatchability. Different scenarios of 2- and 3-way grading on the economic benefits throughout the lay cycle should be evaluated. The industry may consider designing cockerel houses in the future to have a feed system set up to accommodate grading if this tool becomes economically beneficial.

Automatic Grading Machines

Grading machines have been used around the globe during rearing to reduce the amount of labor. The biggest advantage is that the machines can accurately count birds within the specified weight ranges of light, average, and heavy. Grading machines can weigh approximately 850 to 900 birds an hour, so two machines could potentially decrease the amount of labor needed for grading to complete the task. The cost of a portable grading machine ranges from $12,000 to $14,000 per machine.

Important Considerations After Grading

Grading involves several moving parts to ensure a highly efficient process. Consult someone who has previously been involved with this process, as starting the grading process for the first time can be overwhelming for a pullet or broiler breeder manager. It is essential to determine an accurate count of birds within each subpopulation to provide the correct feed allocation. Each subpopulation must have adequate feeder and nipple waterer space allocation, as pen sizes will need to be adjusted accordingly. Not adjusting correctly can result in poor uniformity.

One of the most important management decisions after grading is determining the appropriate feed allocation depending on BW and bird number of each weight category. Feed allocation for the various weight groups can depend on the numerical difference of BW being either below, similar, or above the target BW. Light BW birds may remain on the same feed allocation for the first week after grading as larger dominant birds are no longer in the subpopulation, allowing for more feed consumption. Lighter birds tend to consume feed slower than the dominant birds that were in the population before grading. The other alternatives would be to provide either a similar feed allocation increase as the other BW groups or slightly above the feed allocation increase compared with the average and heavy BW groups. Please be cautious of not providing a large increase in feed allocation to the light BW group during the first week after grading, as BW can increase significantly over the target BW due to the behavior dynamics of feeding coupled with the increase in feed allocation.

After the first grading at 4 WOA, the BW curve may be reassessed so the target weight can be obtained by 8 or 9 WOA with the underweight birds. This is important as 71 percent of the final shank length at 25 WOA is reached by approximately 8 WOA. Shank and keel lengths are highly correlated with BW. It would be beneficial to monitor shank and keel lengths with a small sample of birds after grading to determine that the increased BW is also influencing frame development and not just BW. A longer keel helps distribute fleshing to avoid males not becoming overfleshed during lay.

Feed allocation should be adjusted weekly based on BW and bird numbers. It is important to note that when the males are moved to the lay house, there could be a higher C.V. than 8 or 10 percent as each subpopulation may not have similar BW. A weighted C.V. percentage for the males moved will provide a more accurate reflection of the variation of BW of males placed in the lay house. An alternative strategy would be to move cockerels from each subpopulation to specific houses to minimize variation in BW and frame development.

Summary

- Successful grading requires a team effort with everyone involved embracing the process.
- Grading is a tool to reduce the number of lighter BW birds in the flock and improve uniformity, but proper management is essential to achieve the desired results in rearing.
- Reducing the number of lighter BW males through grading should allow a longer duration of original males in the lay cycle leading to a lower number of spiked males needed throughout the production cycle. This should ultimately result in increased fertility and hatchability.

References

Aviagen Ross Parent Stock Pocket Guide
Rearing, 2019.

Aviagen Ross PS Handbook, 2023.

William Dozier, *Extension Specialist*, Professor, Poultry Science, Auburn University

For more information, contact your county Extension office. Visit www.aces.edu/directory.

New January 2025, ANR-3124