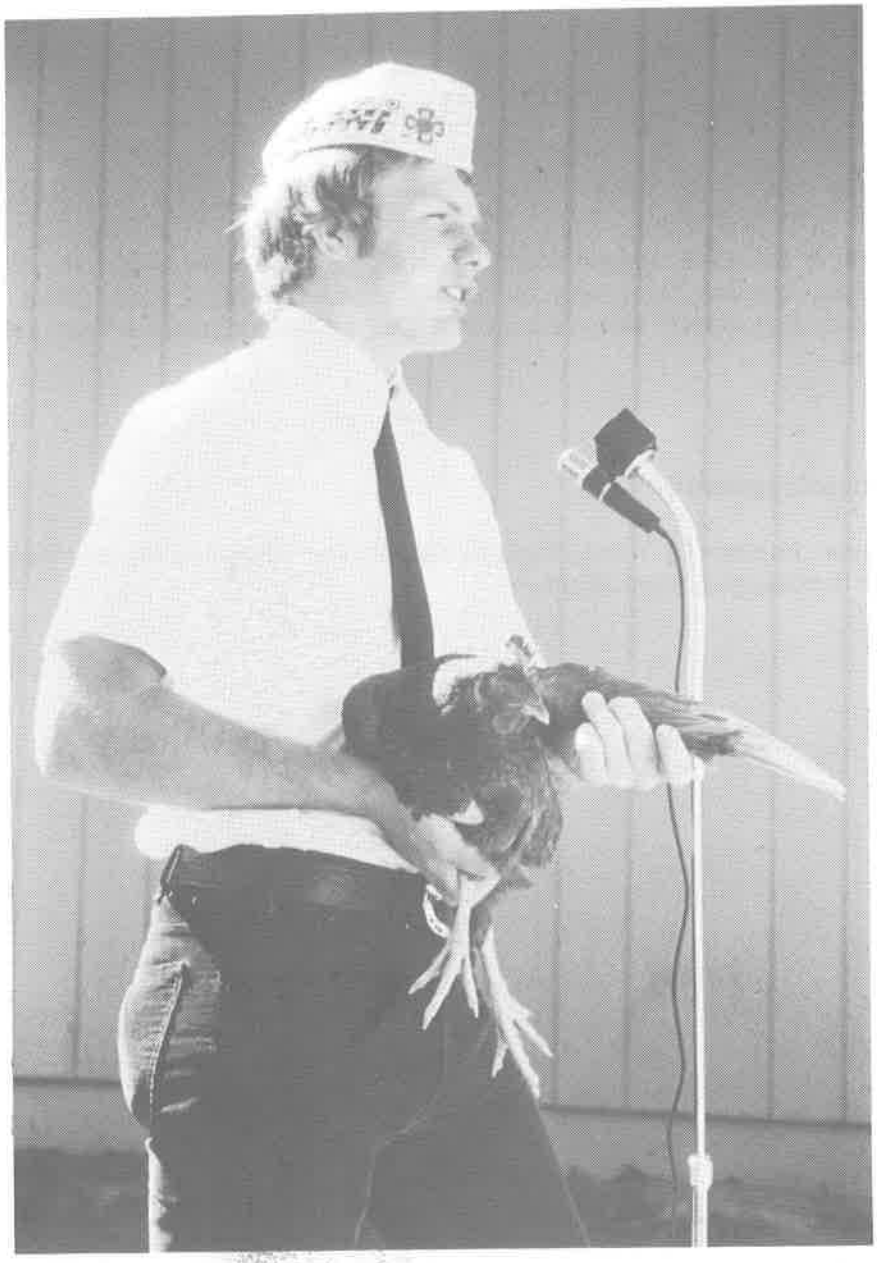
4-H POULTRY SHOWMANSHIP



Division of Agricultural Sciences
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4-H POULTRY SHOWMANSHIP

The poultry showmanship activity provides 4-H members an opportunity to competitively demonstrate their knowledge and skill in raising, conditioning, evaluating, and handling poultry. Participants gain experience in following oral instructions, speaking before an audience, and reacting to problem situations.

Selecting Your Bird for Competition

Selecting the birds you are going to use should begin several weeks before the competition. Work with your best birds a few minutes every day so that they are used to being handled and become trained to the different showmanship procedures. During the final two to three weeks concentrate your efforts on a small number of birds so that they will be ready when the competition begins.

Select birds with the following traits:

- A pleasing appearance (bright red combs and wattles, bright eyes, good fleshing, alertness)
- Good plumage with shiny, well-developed feathers and no stains or discolorations
- Breed and varietal characteristics
- Freedom from parasites and diseases
- Freedom from traits that would make them hard to train for the activity (cowardliness, flightiness, and so on)

The better you select and train your bird, the greater your chances of excelling at the competition.

Training Your Bird

A well-trained bird is calm and responsive during competition. Feeding grains, greens, and raw meat by hand may assist you in preparing your bird. Birds to be shown should be handled on a show table and taught to pose so that they both display their strengths and minimize their weaknesses. To train your bird:

1. Keep its head up by lifting the beak lightly with your index finger.
2. Tuck up its wings each time the bird lets them droop.
3. Except for birds with gamey tails (*e.g.*, Modern Game or Cornish), encourage the bird to spread its tail feathers by stroking the base of the tail under the main tail feathers. On birds with game-type tails, close your hand loosely over the tail and stroke lightly to the rear to encourage the bird to tighten its tail feathers.
4. As soon as feathers become ruffled, straighten them.

Move slowly as you handle the bird least you startle it — a bird with relaxed feathers is more characteristic of its type than when it is excited. You can observe this quite easily, for when it is excited, its tail feathers will be drawn up tightly and as the bird relaxes, the tail slowly spreads to its fullest. The bird should, however, be kept alert and active.

In your training program, try to duplicate showroom conditions and handle your bird exactly as it is to be handled during the competition. Play a radio near them once in a while to accustom them to loud noise like that which they will hear at a poultry show.

Fitting Your Bird for Competition

Your fitting procedures will depend on your bird's breed, condition, and color pattern. Try to talk to someone who has exhibited your type of bird before you start to groom it.

1. If you decide to wash your bird, use only warm soapy water. Avoid harsh detergents and, in cold weather, provide a warm area for the bird to dry.
2. Keep the bird's head and nostrils dry.
3. Toothpicks or cotton swabs are useful in removing dirt from areas that are difficult to clean.
4. A **small** amount of petroleum jelly worked into the shanks, feet, comb, wattles, and beak will give them a brighter appearance. Use a soft cloth to remove excess jelly so that the plumage will not be stained.
5. Use fingernail clippers and an emery board to trim and shape toe nails and beak if necessary.
6. For colored varieties, wipe the plumage just before competition with a soft cloth to which a few drops of lanolin have been added. Do not apply anything to the plumage of white varieties.

The plumage of most varieties will be in better condition for exhibit if birds are on clean litter or a wire floor, and in a shaded area for several weeks before the show.

Suggestions for leaders. Leaders can provide valuable assistance to participants in the showmanship activity by explaining the appropriate procedures for the contest. Practice contests can be staged for training purposes with members functioning as judges. This would be an excellent opportunity for Jr. Leaders to help in training less experienced members.

THE COMPETITION

Judging divisions. Contestants are divided by classes based on age, experience in poultry showmanship, or a combination of these factors. Greater learning will take place if participants compete against others of equal skill.

Awards. Ribbons are awarded based on the Danish system (blue, red, white). Special awards may be given to the outstanding showman in each class.

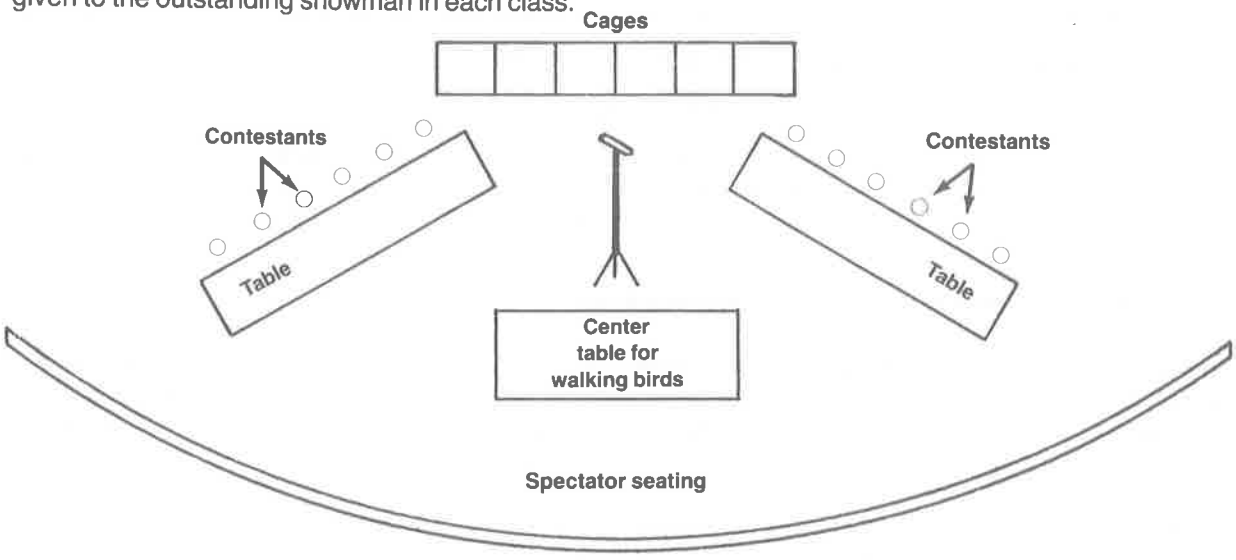

Fig. 1. Suggested arrangement for arena.

The showmanship arena. An arena-like area is recommended for staging the show. Its arrangement will vary according to the physical characteristics of each location. However, the arena should be spacious enough to allow all contestants in a class to enter the arena at one time. The area should have tables covered with burlap, a unit of exhibition cages, a central table on which birds can be walked, and sufficient space for the judges and spectators. Seated spectators enjoy watching the participants in action. A public address system which allows the spectators to hear both the judges' directions and the contestants' replies is suggested, if available.

Procedures

Stage I.

Participants in the class carry their birds to the position designated for them in the judging arena. They should remain at this position holding their bird until they receive instructions. The judge will ask each member to make a complete examination of his/her bird. During this phase of the competition, members will be scored on personal appearance and the techniques displayed while holding, carrying, and examining their bird.

Carrying a bird

To carry a bird, keep the bird's body balanced upright on the palm of the same hand with which the bird was removed from the cage. The head and neck of the bird may extend between the arm and the body of the person carrying it or, with a small bird, against the carrier's body and above the arm on which it is carried. The other hand should rest on the bird's back. (Figs. 2 and 3.)

Holding a bird

Birds should be held upright to give the judge a side view of the body. The bird should rest comfortably on the palm of the holder's hand. The strengths of the bird should be emphasized: tails fluffed, head and beak raised, feathers smoothed, and wings tucked in a normal position. (Fig. 4.)

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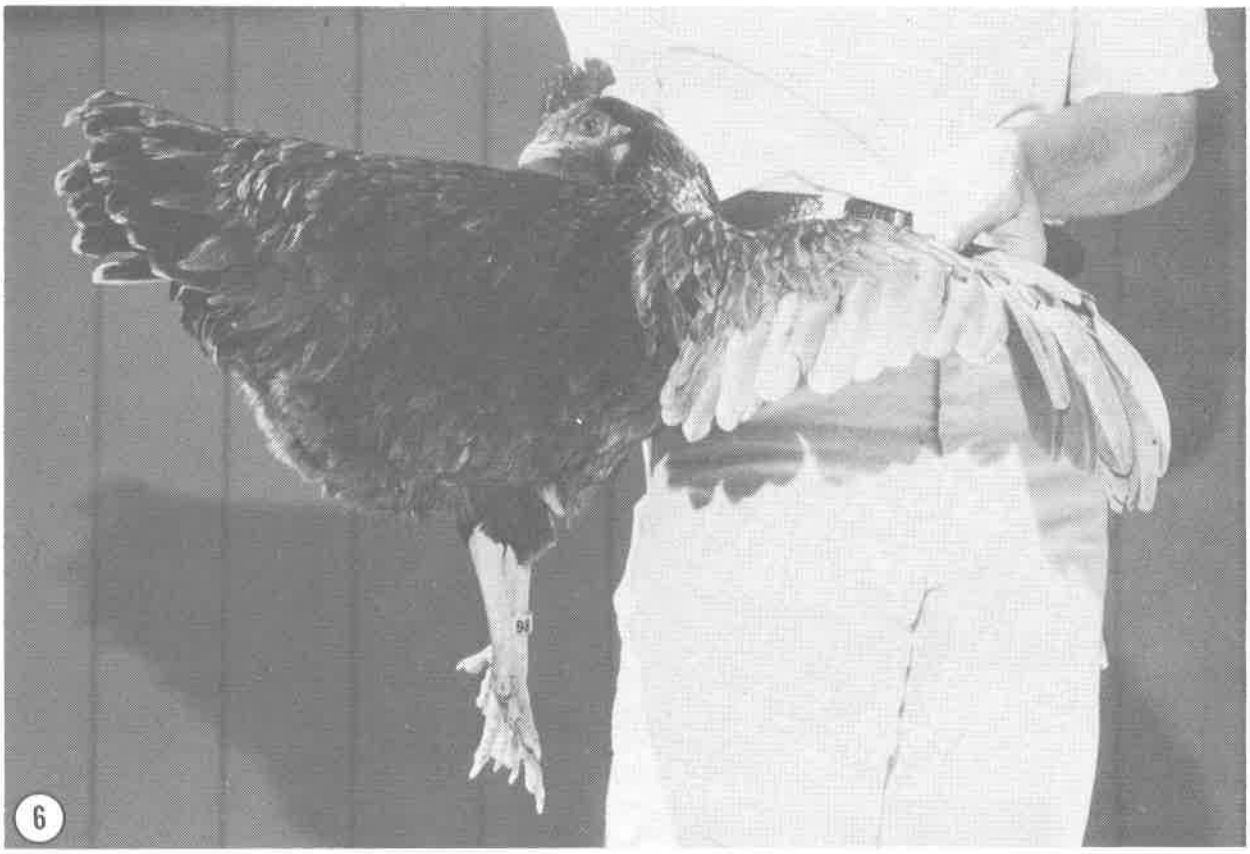
Evaluating a bird

Contestants will demonstrate the procedures used in examining a bird. They will use these same procedures — or at least the portion that is applicable — when evaluating their own bird or other birds during stages IV and V. All body measurements and examination should be completed while the bird is in the basic hand-posed position.

1. Head. Raise bird to shoulder height. Turn bird so that head and face can be examined. The hand supporting the bird should remain in place, while the free hand moves the head (fig. 5). Complete the examination by turning the bird to examine the other side of the head and face.



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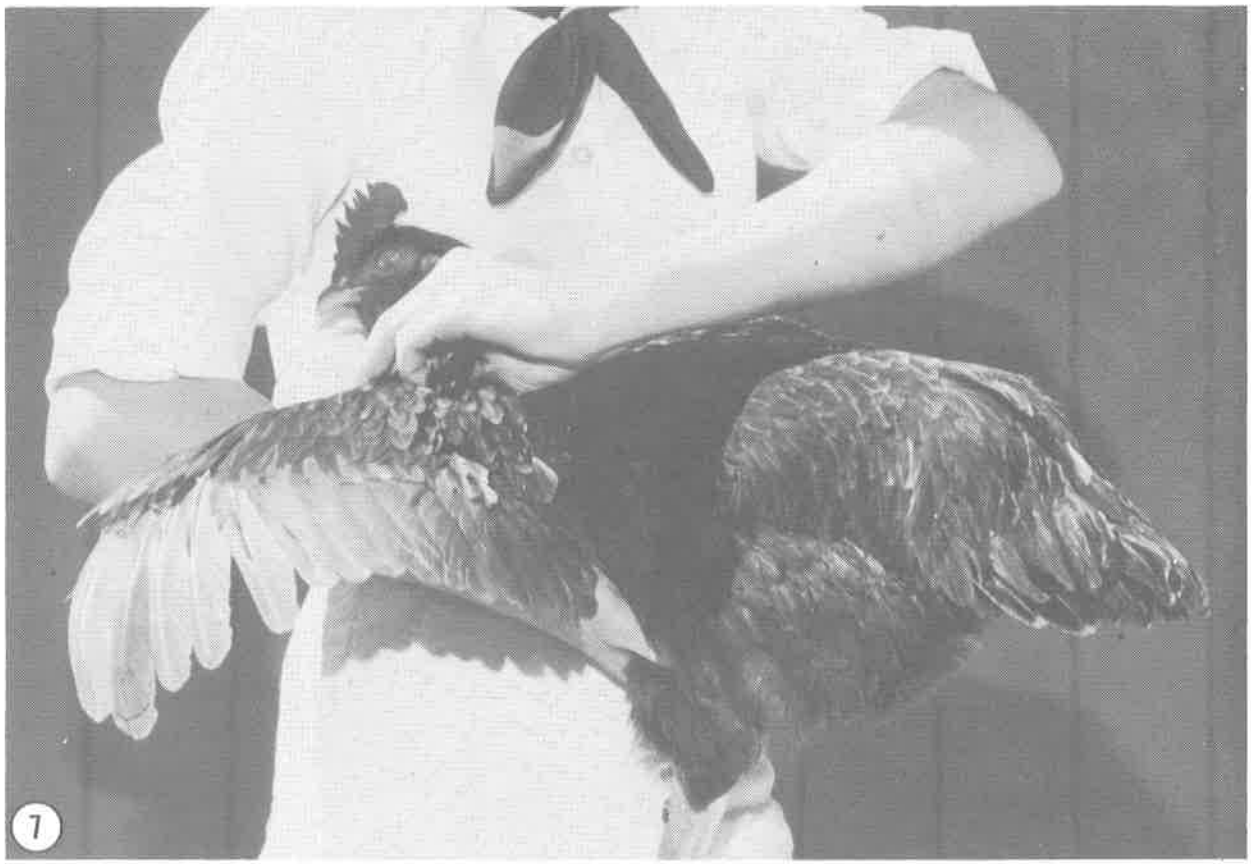

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2. Wings. Spread wings to examine condition and pattern of feathers. To extend the first wing grasp wing tip with free hand and pull (fig. 6). To examine second wing place free hand across body of bird and apply pressure to last wing joint with thumb and fingers of free hand to extend the wing (fig. 7).

3. Undercolor. The undercolor of both the back and body of the bird should be examined. Using finger tips gently pull tops of feathers "against the grain." This action exposes portions of feathers normally hidden from view. (Fig. 8.)

4. Width of body. Width of body is determined by placing the thumb and index finger of the free hand across the bird's body directly behind the base of the wings. Gently push the measuring arch thus formed downward to the tail to determine the width and shape of the body. (Fig. 9.)

5. Breast. Without changing the grip, examine the breast by holding the bird so that its head is downward and its back is directly against the body of the showman. The showman's free hand should be used to measure the breastbone and examine the keel for staightness, knots, indentations, or other defects (fig. 10). In this position the depth of the body or the distance between the keel and back may also be determined.

6. Vent. To examine the vent area, tilt the bird forward so that the abdomen can be observed easily. Using the thumb and fingers of the free hand, expose the vent and note its color, moistness and pliability (fig. 11).

7. Depth of abdomen. After examining the vent, measure the depth of the abdomen by placing as many fingers of the free hand as possible between the tip of the keel and the pubic bones (fig. 12).

8. Pubic bones. The width between the pubic bones is determined by placing as many fingers of the free hand as possible between the tips of these bones (fig. 13).

9. Feet and legs. To examine the feet and legs, the bird is held against the showman's body. The free hand should be used to manipulate feet and legs so that all parts can be examined. Swivel the bird to examine the front of the feet and legs (figs. 14 and 15.)

Stage I	**Points**
Personal appearance of member	5
Carrying bird	5
Examining bird	15
	25


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Stage II.

Participants will be directed to pose their birds on the table in front of them, show the birds to the judge, and take the birds in and out of a designated cage. The judge(s) will evaluate not only the members' techniques, but also the appearance and condition of the birds.

Posing a bird

Gently place the bird on the table so that the judge can observe the side of the bird. Straighten the feathers and place the head and tail in a natural position. Strive to show the bird's strongest characteristics. Maintain control of the bird at all times. (Fig. 16.)

Removing bird from exhibition cage

To remove bird from cage, reach across bird's back; grasp far wing and turn bird so that it faces cage door (fig. 17). Slide second hand beneath bird's body, placing one or more fingers between bird's legs and grasping them so that the bird, when lifted, can be balanced on the palm of that hand. Place first hand on bird's back. Remove bird from cage, head first, closing door of cage once the bird has been removed (fig. 18).


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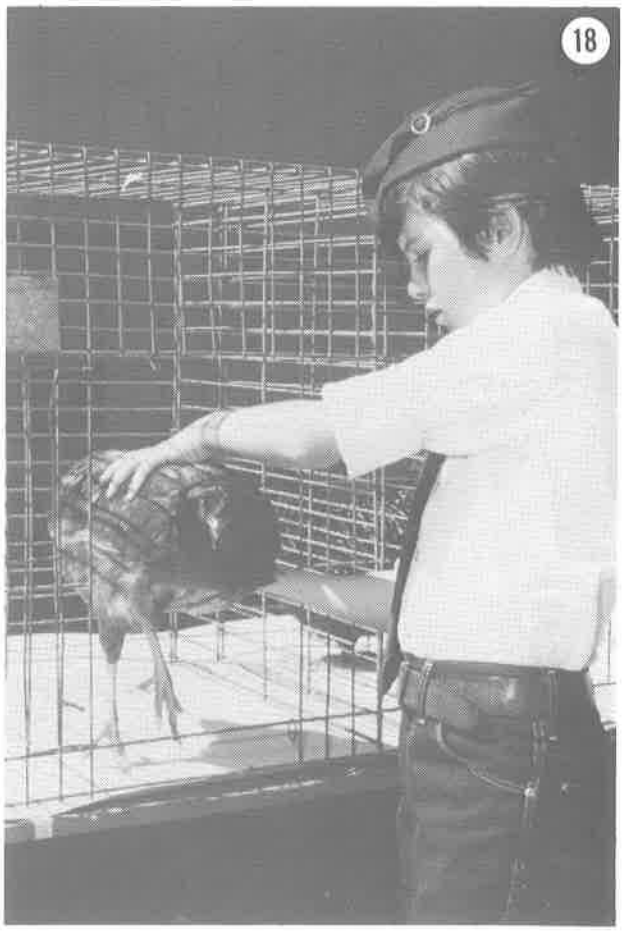
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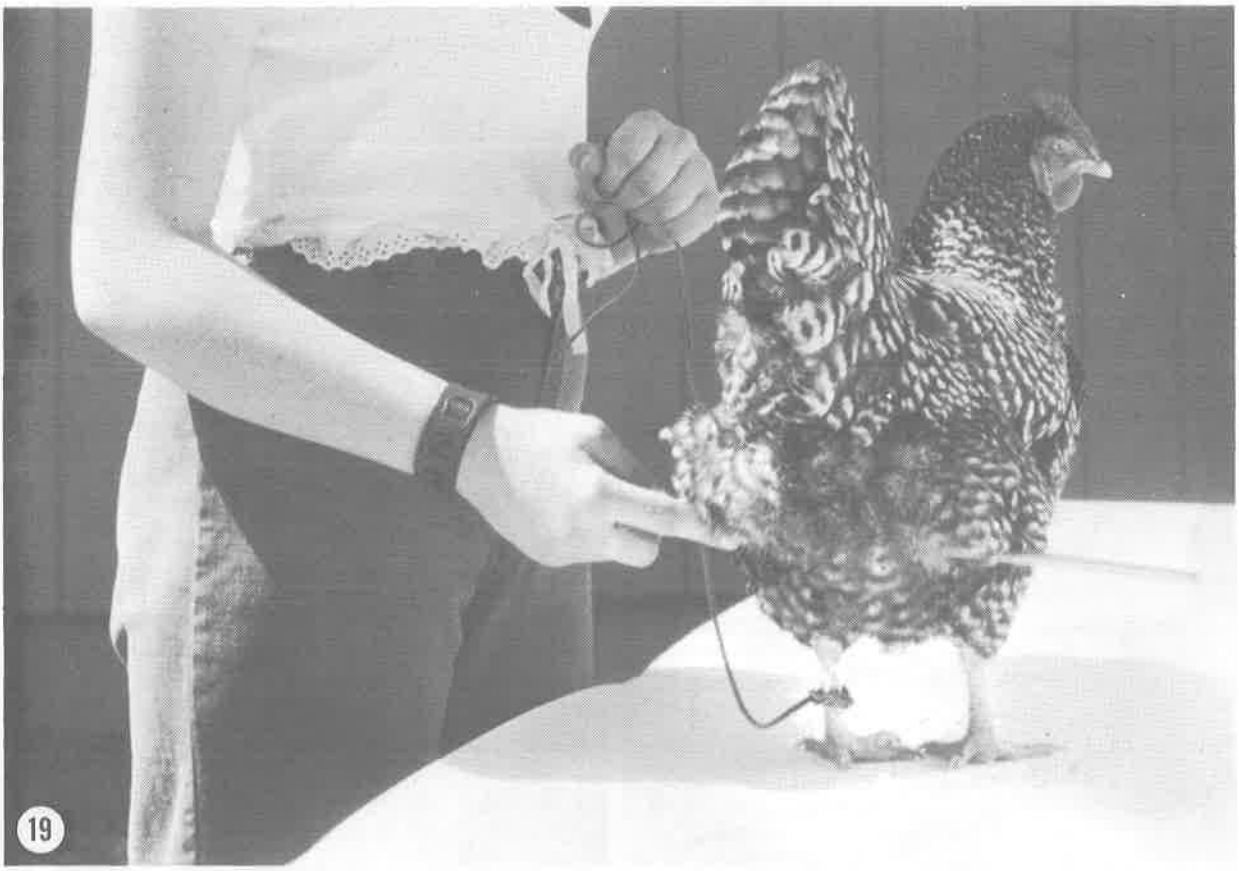
Returning a bird to cage Carry the bird to the cage, open the cage door, turn the bird and put it into the cage head first, place it gently on the cage floor, and close the cage.

Stage II	Points
Posing bird on table	10
Quality and conditions of bird	10
Handling bird in and out of cage	5
	25

Stage III.

Each contestant will carry his/her bird to the center table, pose it, and walk it along a predetermined course (usually from the center to the end of the table and back), and then pose the bird again. A show stick should be used in directing the bird. A tether may be used during this exercise. The showman must not pick up his bird until the prescribed course has been completed. (Fig. 19.)

Stage III	Points
Posing bird	10
Walking bird	15
	25



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Stage IV.

At a microphone or from the center of the judging arena contestants evaluate their birds, both showing and commenting on good points and faults.

Oral evaluation of bird

Carry the bird to the microphone or designated area. Present a clear, concise evaluation of both the strong and weak points of the bird, showing them as well as discussing them.

When asked to evaluate a bird other than your own, turn your bird over to someone to hold or place it in a cage. Quickly catch and examine the other bird and evaluate it.

1. Standard bird. Evaluate a standard bird by comparing it to the standard for that breed and variety. Note any disqualifications or defects. Remember to emphasize comb, color pattern, feather condition and any other physical characteristics typical for that breed.

2. Production. Evaluate and comment on the potential of the hen to produce eggs. Remember, the characteristics of a good layer are:

a. a bright comb
b. a soft, pliable abdomen
c. a large, oval, moist vent
d. two- to four-finger spread (depending on breed) between pubic bones and between pubic bones and tip of keel
e. no molting or growing of new feathers
f. bleaching of pigmented areas (in yellow-skinned breeds)

3. Meat. Evaluate on the basis of the type of carcass that would be obtained if the bird were picked and eviscerated. Emphasize conformation, fleshing, finish (fat in skin), feathering and freedom from bruises. Place heavy emphasis on the condition of the breast.

Stage IV	**Points**
Poise	5
Speaking ability	5
Bird evaluation	15
	25
	Total: 100

Stage V.

If the judges are unable to select the top showman at the end of stage IV, they may wish to proceed to stage V and use one or both of the following procedures:

a. Have each contestant examine and evaluate a bird that is not his own.
b. Ask each contestant to answer questions on poultry or avian science.

Transferring a bird

To transfer a bird to another person, swivel the bird placing your free hand under the breast and hold the bird facing the person to whom it is to be given. That person should then slide one hand between the legs of the bird, place the second hand on the bird's back and lift it to the proper position for a bird being held. When birds are posed on a table, the bird's owner should pick the bird up before its transfer. Once the other person has a comfortable hold on the bird, he may return it to the table if so instructed.

JUDGING

The contest procedure is designed so that the judge(s) can eliminate contestants after each stage (when large numbers participate). When the number of participants is small, the judge may allow all contestants to participate in the entire contest. However, if a contestant's bird is not adequately trained, the contestant should be eliminated after stage I or II. Participants are judged on their ability to follow instructions as well as on how effectively they complete a particular part of the contest.

The judge has complete authority over the operation of the contest and the evaluation of contestants. The judge can delegate part of this responsibility if he/she wishes.

Whenever feasible, experienced 4-H members should be involved in judging the contest. This will provide these members with new and valuable experiences. If possible, three or more member-judges should be used to avoid bias. Their scores may be used by the judge with over-all responsibility if he/she wishes, but member-judges should always be allowed to compare their scores with the final results to make this a meaningful, educational experience.

4-H Poultry and Egg Judging Manual

Agricultural Extension University of California

4-H--Ag45

JUDGING TECHNIQUES

If you learn to be a good poultry judge, it will help you to select good birds for your flocks or for exhibiting. You learn to pick out the best live chickens, the best dressed birds, and the best quality eggs. As part of your poultry project, you should know how poultry and eggs are graded for market. Judging contests can be fun, too.

When you are judging a class of hens for production, first examine the birds while they are still in the cages. Stand back about 5 feet and compare one bird with another—comb and wattles, pigmentation, vigor with respect to molt, etc. It might be well to carry a small stick—to raise any bird that is sitting down.

Your next step is to handle each bird. To remove a bird from the cage, grasp the left wing with the right hand and gently pull her toward the door. Then, place your left hand beneath the body, with two fingers between the legs, and lift the bird out of the cage. You may want to hold the bird in the right hand if it is more convenient.

In handling the bird, be systematic, check everything – physical condition, pigmentation, molt, etc. After handling each bird, write on your score card the number of points in each category that you feel the bird deserves. Try to draw a "mental picture" of the characteristics of each bird you handle, so you can compare her with all the other birds in the class.

Return the bird, head first, into the same cage from which you took her. When several members of a team are handling the same class of birds, it is a good idea to stand directly in front of the cage in which the bird belongs. This will keep the class in the order that the official judge placed them.

Handle the birds gently. Be especially careful when measuring the distance between pubic bones; these bones will break under heavy pressure.

The author of the section on Judging Chickens for Egg Production is Mathew B. Lonsdale, former farm advisor, San Bernardino County. Virgil Stratton, farm advisor, Sonoma County, is the author of the sections on Judging Live Meat Birds, Judging Dressed and Ready-to-Cook Poultry, and Judging and Grading Eggs.

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JUDGING CHICKENS FOR EGG PRODUCTION

We judge a hen for egg production to determine if she is laying well and should be kept in the flock; if she is not she should be sold. You can tell a high producing hen from a poor one, and it is also possible to estimate how many eggs the hen has laid from the time she began laying. Judging is not completely accurate, but it is better than guessing; improvement comes with practice and experience.

The most accurate way to determine which chickens in a flock are laying and how many eggs they produce is to keep birds in individual cages, or use trapnests. The cost of keeping daily individual records of production on individual birds is too high, except for poultrymen who have a breeding program. Most poultrymen either put two or more chickens in a wire cage, or have several hundred to a pen on the floor.

One way to tell if the hen is producing eggs is by her appearance. For example, most breeds of chickens have yellow pigment (color) in the skin. The amount of this color that is present helps us judge a hen's present and past egg production.

There are many reasons for poor egg production. The ability of the stock to produce eggs is inherited, but egg production can be influenced by disease, not enough feed and water, internal and external parasites, the weather, etc. For example, the chicken you may judge to be a poor producer may have a disease, or perhaps she has not been managed properly. With better management, she might lay well in a short time and be profitable. In your own flock, it is important to consider everything before deciding that a hen is a poor producer. However, in a 4-H judging contest, you must assume that a class of chickens has had the same chance, and judge them accordingly.

ANATOMY

A chicken has many more parts than are shown in figure 1. In judging for production, however, we will use only the parts shown and their common terms.

It is important that you know these parts so that you can compare the birds being judged. It is also important that you know them so you can intelligently present your reasons for placing a class of birds to the official judge of the contest.

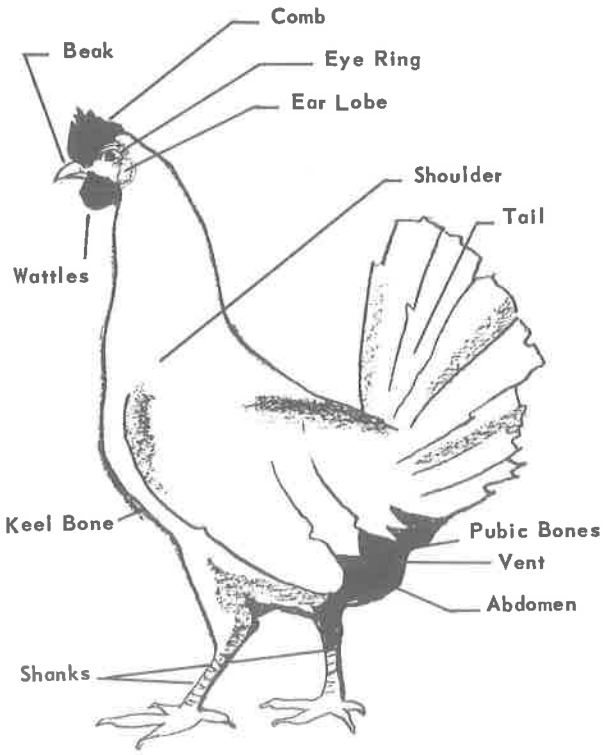


Figure 1. Parts of a chicken, giving common names used in judging for production.

PHYSICAL CONDITION

Comb and Wattles. These features are dependable guides to a bird's health, sexual maturity, and production. The comb and wattles begin to enlarge before a bird comes into production. They become bright red, and warm and waxy to the touch, and remain this way while she is laying. The comb and wattles of a nonlayer become small, pinkish instead of red, and look coarse.

The size of the comb alone is not important in judging all breeds and strains of chickens. Some poultry breeders have selected birds for certain size and shape of combs. Therefore, size can be considered as an index of production only when judging birds of the same breed and strain.

Pubic Bones and Abdomen. These bones are located on either side of the vent. The "spread" between these two bones, as measured by the fingers (figure 2), is one indication of whether or not a bird is laying. A spread of one finger or less indicates that the bird is not laying. A spread of two or more fingers indicates a bird is in production. The hen in high production also will have thin, straight pubic bones. The poor producer has thickened pubic bones; she has not been laying and has accumulated fat around the pubic bones.

The distance between the pubic bones and the rear of the keel (the abdomen) will measure three or more fingers across (figure 3) in the good producer and less in the nonproducer. The abdomen in the good producer is full, soft, and pliable to the fingers. In the nonlayer the abdomen is small, shrunken, and hard.

Vent. One of the quickest ways to tell the laying condition of a chicken is to examine the vent. A good producer will usually have large, moist, bluish-white vent. The poor producer will have a small, yellowish dry vent.

Plumage. Usually, the hen with the loose-feathered rough-looking plumage is the best producer. She has worn the same plumage for some time without resting or molting. Poor producing hens often have taken time out to molt, and their plumage looks clean, smooth, and close feathered.

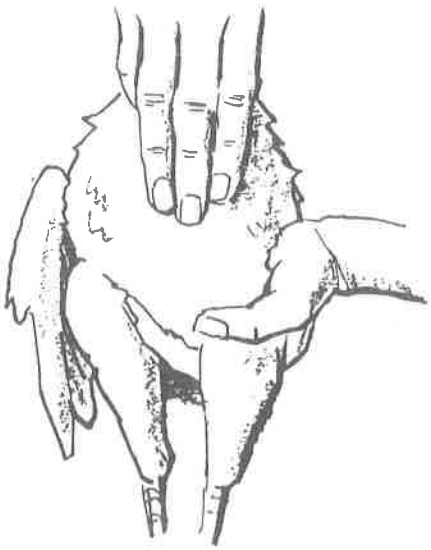


Figure 2. Method of measuring distance between pubic bones.

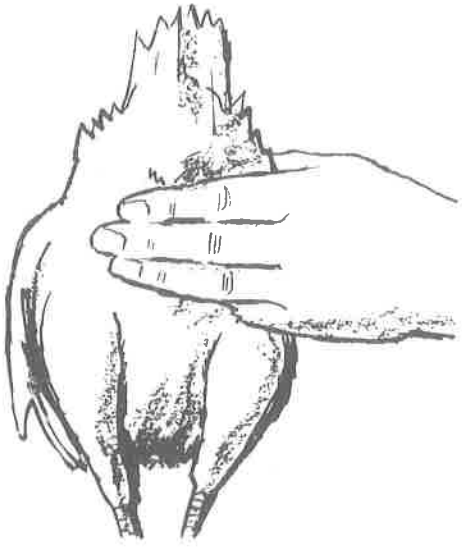


Figure 3 Method of measuring distance from pubic bones to tip of keel bone.

Skin. The condition of the skin (thickness, looseness, elasticity, and pliability) all are indications of laying condition. The good producer has a pliable, soft, smooth skin. The poor producer has thick, tight skin.

Eyes. A bird in good production has large, round, bright, prominent eyes. The poor producer has small, oval, dull, sunken eyes. Birds with grey eyes may have leucosis. (Leucosis is a disease that affects many parts of the body and sometimes causes the iris or pupil of one or both eyes to become irregular in shape and discolored.)

PIGMENTATION

Yellow-skinned breeds include the Leghorn, Rhode Island Red, Plymouth Rock, etc. Breeds such as the Minorca, Australorp, Orpington, etc., have white skin and do not show changes in pigmentation. Ignore pigmentation when judging white-skinned breeds of chickens.

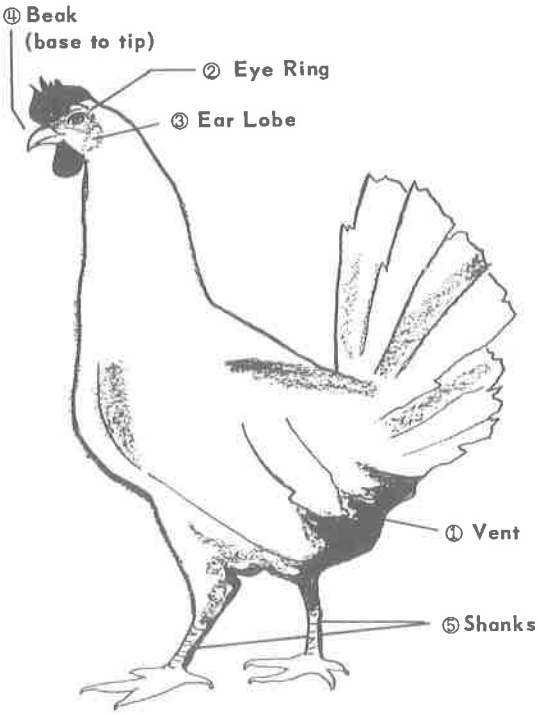


Figure 4. Parts of body numbered in the order in which pigment bleaches.

The yellow color found in the skin of the vent, eye ring, ear lobe, beak, and shanks of immature healthy pullets of many breeds is produced by a pigment called xanthophyll. This yellow pigment is one of the natural compounds found in chicken feeds. Alfalfa meal and green grass are rich sources of xanthophyll.

When a pullet starts producing eggs, the yellow pigment in the feed is deposited in the yolks of the eggs as they are formed, and the yellow in the various parts of the hen starts to "bleach out." It disappears from the body in a very definite order. In all yellow-skinned breeds it disappears in the following order: First, from the vent, closely followed by the eye ring and ear lobe; next, the beak, starting at the base and gradually extending to the tip of the beak; and, lastly from the shanks.

After production starts, it takes 4 to 6 days for the vent to bleach out, 2 weeks for the eye rings, 3 weeks for the ear lobes, 4 to 6 weeks for the beak, 4 to 6 months for the shanks. Figure 4 shows the order in which the pigment bleaches out from the parts of a hen's body.

When a hen stops laying, the pigment begins to return to her body. It returns in the same order that it disappeared, but at a much faster rate. One section is not entirely repigmented before pigment becomes visible in other parts of the body.

A study of the amount of pigment in the parts of the body will give you a fair idea of how long a bird has been in production. If the shanks of a bird are bleached out, this would indicate that she has been in production longer than one that still has pigment in the beak.

MOLT

A hen usually retains her old feathers while she is laying regularly. She is molting when she begins to drop her old feathers and starts to grow new plumage.

The feathers usually are molted first from the neck, then from the back, wings, and body. Neck molting is rather common at any season of the year, even in good layers, but if the molt progresses to the body, the primary feathers of the wing generally molt also.

The primaries are the ten feathers farthest from the bird's body and the secondaries are the feathers (usually 14) closest to the bird's body when the wing is spread. A hen usually first drops the inner primary feather next the axial feather. If she remains out of production for 2 or more weeks, the second primary feather will be dropped, and so on until the entire wing has molted.

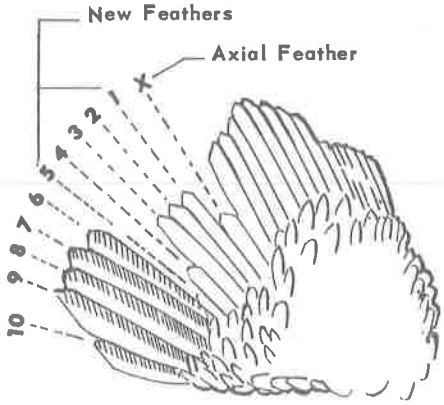


Figure 5. Wing feathers – rapid molter

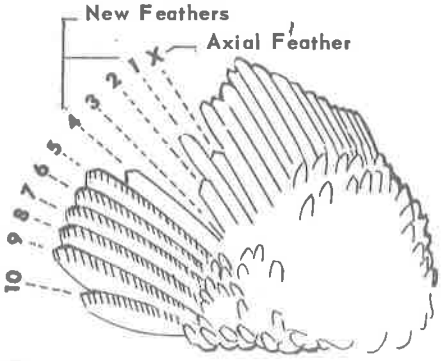


Figure 6. Wing feathers – slow molter

The poor producer usually drops one primary feather at a time and takes a long time to complete the molt. A good producer may drop a few, then replace them and start laying again, keeping some of the old primary feathers another season. In some cases she may drop as many as four primaries at one time. It requires approximately 6 weeks to grow a new primary feather.

With good management, the best hens should lay for 12 months or longer without molting. After a long period of laying the best layers usually will have brittle, rough, broken, and soiled plumage. The plumage of poor layers is often new, clean, and attractive.

BODY TYPES

The size of the breed does not affect a hen's ability to lay eggs. A Bantam chicken is approximately one-fourth the size of a Leghorn, but she may lay as well as or better than the Black Jersey Giant, which weighs more than twice as much as the Leghorn.

Chickens of the same breed and strain must have adequate body size or capacity to compete with pen mates and produce large eggs. We expect a vigorous healthy bird to be average or above average in body size for its breeding. Often a high-producing hen is surprisingly heavy for her size.

To measure the length and width of a bird's body, rest the palm of the hand on the back just behind the shoulder (figure 7), with the thumb and fingers along the sides of the bird, and slide the hand toward the tail.

To measure the depth of the body place the thumb on the small of the back and the fingertips on the keel (figure 8), and slide the thumb along the back and the fingers along the keel.

Figure 7. Method of measuring length and width of body.

Figure 8. Method of measuring depth of body.

WHEN YOU GIVE ORAL REASONS

In a 4-H poultry judging contest, you are usually asked to give oral reasons for the way you placed a class of birds. Since you are judged on how you give your reasons you must sound as if you know what you are talking about. You must know the parts of the chicken, when telling the judge what you observed about each bird.

The notes on your judging card will be helpful when you tell the judge why you placed the class as you did. Did you check all these points?

JUDGING FOR EGG PRODUCTION

PARTS OF BODY	GOOD PRODUCERS	POOR PRODUCERS
Comb and wattles	Large, red, waxy	Small, pale, coarse texture
Pubic bones	Thin, pliable, spread apart two or more fingers	Thickened, spread less than two fingers
Abdomen	Full, soft, pliable	Shrunken and hard
Vent	Large and moist	Small and dry
Pigmentation	Evidence of bleaching	Yellow pigment
Molt	Old plumage which appears soiled and broken	Smooth, clear feathers in plumage indicating molt
Body size general condition	Average size for breed, surprisingly heavy for size, vigorous appearance	May be small, lacking in depth of body and lacking in vigor

Begin your oral reasons by stating the breed, sex, and class of your placing. A sample set of oral reasons might be as follows: I placed C over B because she has more distance between the pubic bones and a more pliable abdomen.

I placed B over A because B has comb and wattles with more color and finer texture and a wider moister vent. B shows no sign of molt, while A does.

I placed A over D because D is obviously out of production. She has yellow in her vent, eye ring, and ear lobes. The pubic bones are close together, the vent is small, and the abdomen is shrunken and hard. A is somewhat smaller than we would like but is in laying condition. Both A and D are beginning their molt.

For these reasons, I placed this class of production White Leghorn Hens C-B-A-D.

SAMPLE SCORE CARD

Class: W.L. Hens, judged for present production

Score Card for Hens and Pullets

		A	B	C	D
1. Comb and wattles	20	15	18	18	5
2. Pubic bones and abdomen	25	18	18	25	5
3. Vent	15	10	15	15	5
4. Pigmentation	15	15	15	15	0
5. Molt	15	10	15	15	10
6. Body size, general condition	10	6	10	10	7
Total	X	74	91	98	38
Team No. 3 Club: Chino Busy Farmers					
Name Johnny Doe					
Placing		C	B	A	D

DISEASE CONTROL

If you have chickens of your own you can help prevent the spread of poultry disease by wearing clean clothes and shoes when you visit another farm for instruction in poultry judging. When you return home, do not go near your chickens until you have changed your clothes and shoes.

Have the "dirty" clothes washed before using again, and clean the bottom of your shoes with detergent and water. Also, wash your hands after handling chickens.

If a group of birds is selected from your farm for a 4-H judging contest or other poultry shows, it is not a good idea to take them home after the show. Your poultry may "pick up" a disease or parasite from other poultry. If you have a small flock and want to run the risk of bringing them home, do be careful. Keep them separated from the other birds for 3 weeks. This will give you a chance to observe them for diseases and parasites.

If your family has a commercial poultry farm, or even a flock of 100 birds, do not bring any birds home! You cannot afford the risk!

After a 4-H poultry judging contest, you might give the birds to a 4-H member who does not have chickens at home. This would give another boy or girl a chance to have a small flock, and you wouldn't have to worry about bringing disease back to the home flock.

JUDGING LIVE MEAT BIRDS

When judging live meat birds, you think how the live bird will look when dressed. You may be asked to judge different kinds of poultry—chickens, turkeys, ducks, geese, guineas, or pigeons. Each kind of poultry is divided into classes. The class depends on age, sex, and the usual method of cooking the poultry.

CLASSES OF MARKET CHICKENS

Young Birds

Broilers are young chickens, about 8 to 12 weeks old, of either sex. They must not weigh more than 2½ pounds, and the flesh is soft enough to be cooked tender by broiling.

Fryers are young chickens, about 9 to 20 weeks old, of either sex. They must weigh between 2½ and 3½ pounds, and the flesh is soft enough to be cooked tender by frying.

Roasters are young chickens, about 4 to 9 months old, of either sex. They must weigh more than 3½ pounds, and the flesh is soft enough to be cooked tender by roasting.

Stags are male birds of any weight. The flesh is slightly dark and tough. The comb and spurs are developed more than on roasting chickens, but less than on cocks.

Capons are unsexed male birds, usually 7 to 10 months old. They must weigh more than 4 pounds, and the flesh is soft and tender.

Old Birds

Fowls are mature female birds of any age and weight.

Cocks are mature male birds of any weight. The flesh is darkened and toughened.

POINTS TO CONSIDER

Look for these points when you are judging live meat birds:

Health and vigor	Fleshing
Feathering	Fat covering
Conformation	Number and kind of defects

Health and vigor. A healthy vigorous bird is alert, with full, round, bright eyes. The comb is bright and of good texture. The plumage is usually glossy and clean due to the bird's natural desire to preen itself. The oil gland is full of oil. The feathers around the vent are clean and dry. The feathers on the body fit closely. Birds lacking in vigor may be listless. The comb may be dark or pale. The feathers may be loose and ruffled, and there may be soiling around the vent.

Feathering. Well-feathered birds are those that can be easily processed into ready-to-cook poultry. Your main concern with the feathering of a bird is the presence of pin feathers, particularly those just coming through the skin. A good quality bird is thoroughly covered with feathers, with only a slight scattering of pin feathers. A poor quality bird has a large number of pin feathers on all parts of its body. It also could have no feathers on its back, and patches of sunburned or discolored skin containing broken quills.

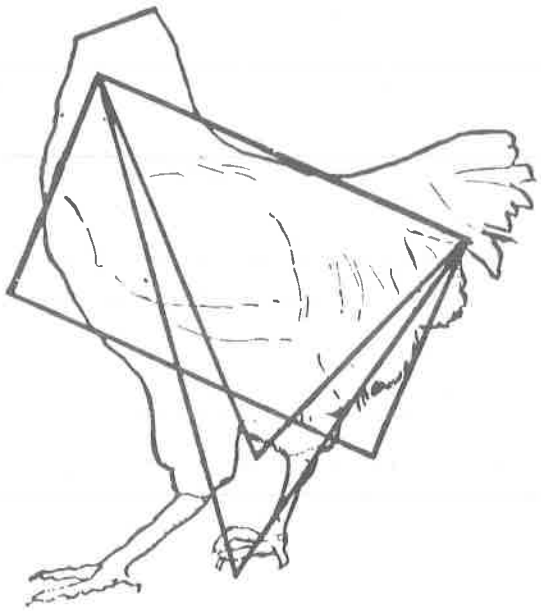


Figure 9. A meat-type bird of good quality is somewhat rectangular in shape.

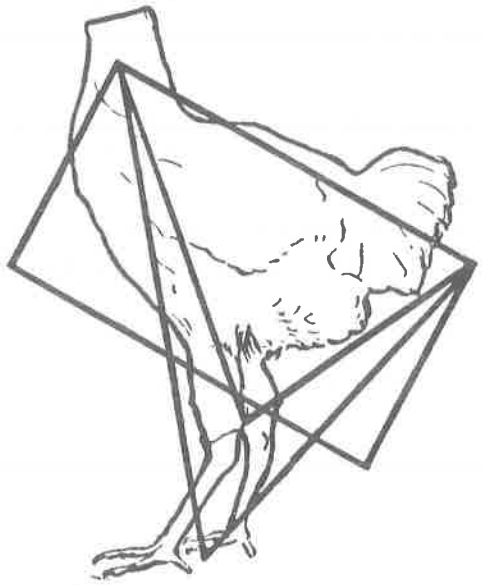


Figure 10. The body of a poor quality meat-type bird is shaped more like a triangle.

Conformation. The ideal shape of a meat bird is roughly that of a rectangle. A poor quality bird may be wedge shaped. A good quality bird may have a slight dent in the breastbone, but breasts that are crooked, knobby, V-shaped, or slab sided are found on birds of poor quality. Their backs may be narrow, crooked, or hunched, and their legs and wings may be deformed or swollen.

Fleshing. The flesh is well distributed on a good quality bird. Examine the drumsticks, thighs, and breast to see that these parts carry the bulk of the flesh. The breast should be full and rounded and carry the width well back to the end of the keel. The legs and drumsticks are well covered with flesh and the back is moderately fleshed along the vertebrae and around the hip bones.

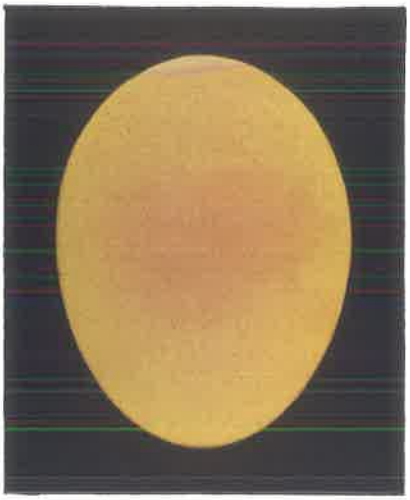
A poor quality bird may have a poorly developed, narrow breast, that is V-shaped or concave, rather than full and rounded. The legs and drumsticks are thin, and there is only a thin covering of flesh over the entire body.

Fat. One of the first things marketmen look for is the amount of fat in the skin. A good quality bird is well covered with fat on the breast, back, hips, and pin bones, except that a fryer may have only a moderate amount of fat covering these parts. A hen, stewing chicken, or fowl should not have excessive fat on the abdomen. Examine the skin between the heavy feather tracts, in the collar of the wishbone, where thigh joins the breast, and on the web of the wing. A good way to determine the amount of fat is to pinch the skin of the abdomen between your thumb and fingers. A poor quality bird may have only a small amount of fat in the feather tracts, and no fat on the back and thighs. You may be able to see the flesh through the skin.

Summary chart of—

UNITED STATES STANDARDS FOR QU

Illustrations of candled appearance of white-shelled eggs showing maxi



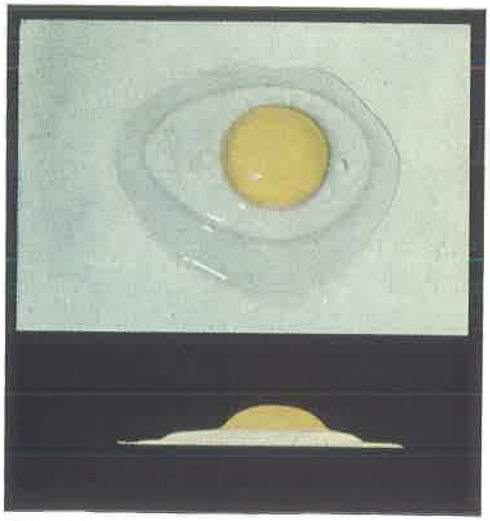
AA Quality

1. Shell—clean; unbroken; practically normal.
2. Air cell—1/8 inch or less in depth; practically regular.
3. White—clear; firm.
4. Yolk—well centered; outline slightly defined; free from defects.

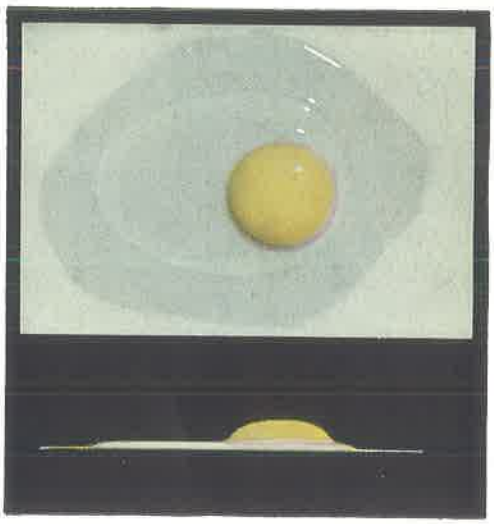
A Quality

1. Shell—clean; unbroken; practically normal.
2. Air cell—2/8 inch or less in depth; practically regular.
3. White—clear; may be reasonably firm.
4. Yolk—may be fairly well centered; ou
fairly well defined; practically free from defects.

Illustrations of broken-out appearance (top an



AA Egg covers small area; much thick white surrounds yolk; has small amount of thin white; yolk round and upstanding.



A Egg covers moderate area; has considerable thick white; medium amount of thin white; yolk round and upstanding.

Graders should check their work by breaking out an egg occasionally and comparing it with th

ALITY OF INDIVIDUAL SHELL EGGS

num depth of air cell and outline and position of yolk in each quality

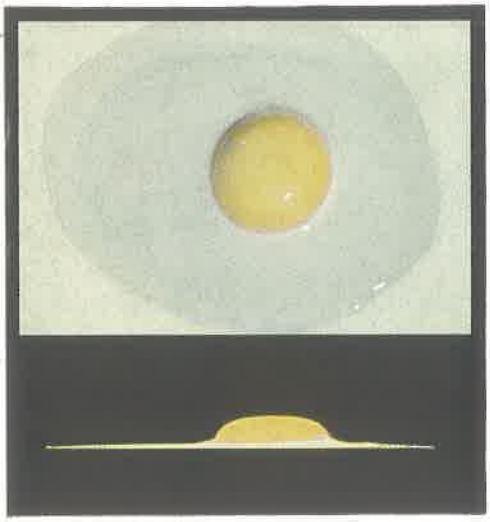
B Quality

1. Shell—clean; to slightly stained; unbroken; may be slightly abnormal.
2. Air cell—3/8 inch or less in depth; may be free ' ·t not bubbly.
3. hite—clear; may be slightly weak.
4. Yolk—may be off center; outline well defined; may be slightly enlarged and flattened; may show definite but not serious defects.

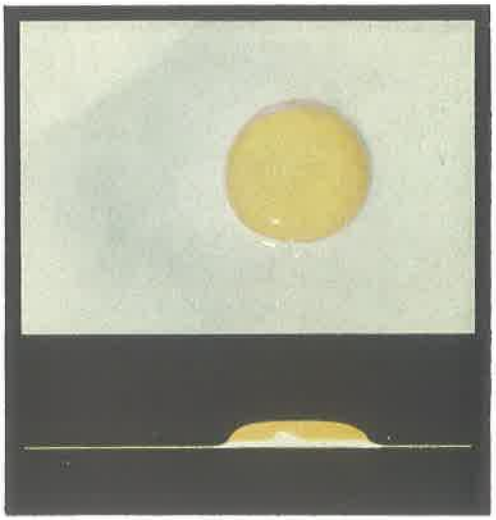
C Quality

1. Shell—clean; to moderately stained; unbroken; may be abnormal.
2. Air cell—may be over 3/8 inch in depth; may be free or bubbly.
3. White—may be weak and watery; small blood clots or spots may be present.
4. Yolk—may be off center; enlarged and flattened; may show clearly visible germ development but no blood; may show other serious defects; outline may be plainly visible.

d side views) of each quality—⅓ actual size



B Egg covers wide area; has small amount of thick white; much thin white; yolk somewhat flattened and enlarged.



C Egg covers very wide area; has no thick white; large amount of thin white thinly spread; yolk very flat and enlarged.

is chart.

U. S. Department of Agriculture, Agricultural Marketing Service

Revised May 1955

Defects. Tears and broken or disjointed wings are sometimes found on live birds. Examine the skin carefully for flesh bruises, watery breast blisters, heavy callouses on the breast, insect bites, and discolorations from broken quills and picking.

A good quality bird is free from tears and broken bones. However, it may have slight scratches and bruises. It may also have slightly thickened, hardened, darkened areas on the skin over the breastbone. It may also have slightly scaly shanks.

A poor quality bird may have skin and flesh bruises and severe breast blisters. A bird that shows any evidence of disease, large flesh bruises, severe discoloration, or injury is not fit for slaughter for human food, and is called a reject.

SAMPLE SCORE CARD

Breast	30 points
Condition	15
Back and ribs	15
Legs and thighs	15
Feathering	15
General appearance	10
	100 points

EXAMINING THE BIRD

To determine the health, vigor, and class, observe the general appearance of all the birds in the flock. To determine the quality and condition, you must examine the individual bird. Remove the bird from the cage or coop, as described in the section on judging techniques under judging for egg production. Handle the bird gently. Hold the bird in one hand with its head against you, leaving the other hand free to examine the bird.

First, examine the breast and drumsticks for fleshing. While you are doing this, turn the feathers back by moving your free hand through them against their natural direction. Look for fat deposits under the skin before the feathers fall back into place. If the bird has dense fluffy feathering next to the skin, you may have to use slight puffs of your breath to blow them apart so that you can see the skin.

As you examine the bird for fleshing and fat, look for bruises, tears, cuts, blisters, callouses, broken or dislocated bones, and pinfeathers that are still under the skin or just barely protruding. Examine the back, hips, and wings. Remember to look for fleshing, fat, defects, and presence of pinfeathers.

QUALITY GRADES

The United States Department of Agriculture has a set of standards for live market poultry. You will want to learn these quality grades so you can place poultry in (A) No. 1 Quality, (B) No. 2 Quality, or (C) No. 3 Quality. Birds that are of such poor quality that they do not fit into No. 3 Quality are classed as rejects because they are not fit for human food.

The following chart shows the U.S. grades for individual birds with the minimum requirements and maximum defects permitted.

Factor	(A) No. 1	(B) No. 2	(C) No. 3
HEALTH and VIGOR	Alert, bright eyed, healthy, vigorous	Good health and vigor	Lacking in vigor
FEATHERING	Well covered with feathers showing luster or sheen Slight scattering of pin feathers	Fairly well covered with feathers Moderate number of pin feathers	Complete lack of plumage feathers on back Large number of pin feathers
CONFORMATION Breast bone	Normal Slight curve, $\frac{1}{8}$" dent (chicken), $\frac{1}{4}$" dent (turkeys)	Practically normal Slightly crooked	Abnormal Crooked
Back	Normal (except slight curve)	Moderately crooked	Crooked or hunched back
Legs and Wings	Normal	Slightly misshapen	Misshapen
FLESHING	Well fleshed, moderately broad, long breast	Fairly well fleshed	Poorly developed, narrow breast, thin covering of flesh
FAT COVERING	Well covered, some fat under skin over entire carcass Chicken fryers and turkey fryers and young toms only moderate covering No excess abdominal fat	Enough fat on breast and legs to prevent a distinct appearance of flesh thru skin Hens or fowl may have excessive abdominal fat	Lacking in fat covering on back and thighs, small amount in feather tracks
DEFECTS Tears and broken bones Bruises, scratches and callouses Shanks	Slight Free Slight skin bruises, scratches and callouses Slightly scaly	Moderate Free Moderate (except only slight flesh bruises) Moderately scaly	Serious Free Unlimited to extent no part unfit for food Seriously scaly

JUDGING DRESSED AND READY-TO-COOK POULTRY

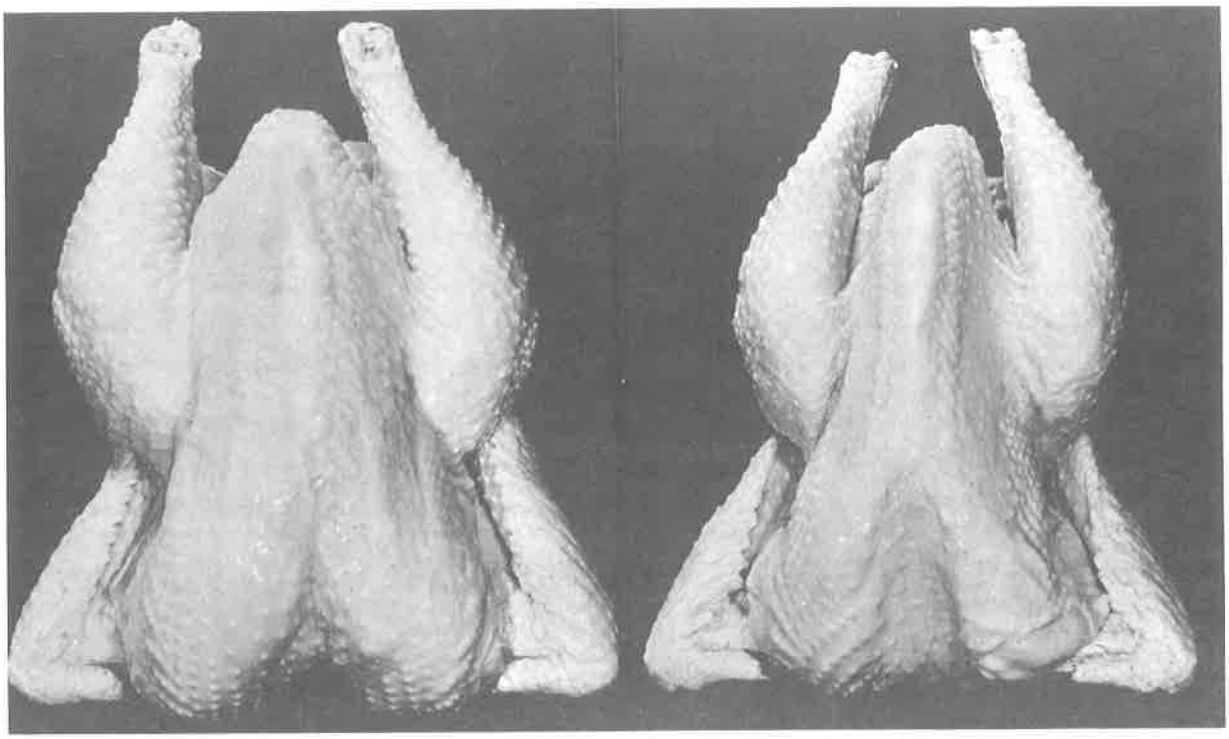


Figure 11. This is an A Quality bird.

Figure 12. This is a B Quality bird.

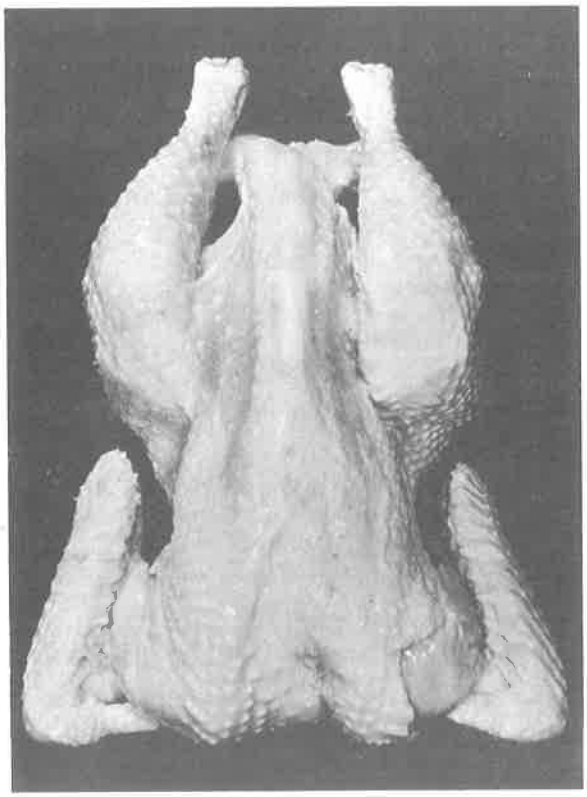


Figure 13. This bird would grade only C Quality.

You may find dressed birds easier to judge than live meat birds because the feathers have been removed and you can see defects more clearly. When you judge dressed and ready-to-cook poultry, you will look for these quality factors:

- Conformation
- Fleshing
- Fat covering
- Pinfeathers
- Freezer burn
- Discoloration of skin and flesh
- Cuts, tears, broken bones, bruises, and other such blemishes

Note that feathering and health and vigor are omitted, and freezer burn has been added. The following chart shows the standards set by the United States Department of Agriculture for grades of ready-to-cook poultry. The minimum requirements and maximum defects for individual carcasses are shown.

FACTOR	A QUALITY	B QUALITY	C QUALITY
CONFORMATION	Normal	Practically normal	Abnormal
Breastbone	Slight curve, $\frac{1}{8}$" dent	Dented, curved, slightly crooked	Seriously crooked) If fairly) well
Back	Normal (except slight curve)	Moderately crooked	Seriously crooked) fleshed
Legs and Wings	Normal	Moderately misshapen	Misshapen
FLESHING	Well fleshed, moderately long and broad breast	Fairly well fleshed on breast and legs	Poorly fleshed
Breastbone	Not prominent	Not prominent	May be prominent
FAT COVERING	Well covered—some fat under skin over entire carcass Broilers or fryers only moderate covering	Sufficient fat on breast and legs to prevent distinct appearance of flesh through skin	Lacking in fat covering over all parts of carcass
PINFEATHERS	Breast/legs Elsewhere		
Dressed:			
Pins and hair	Pract. free Pract. free	Relatively few	Numerous
Ready-to-cook:			
Nonprotruding pins	Pract. free Pract. free	Few scattered	Scattering
Hair	Pract. free Pract. free	Few scattered	Few scattered
Protruding pins	Free Free	Free	Free
CUTS AND TEARS	Free 1½"	Breast and legs 1½" Elsewhere 3"	No limit
Missing skin	None	Breast and legs 3 areas totaling not more than ¾ inch Elsewhere tail to hip bones width of feather tract	No limit
Disjointed bones	1	2	No limit
Broken bones	None (except 1 nonprotruding wing bone if fryer)	1 nonprotruding	No limit
Missing parts	Wing tips	Wing tips and if R-to-C 2d wing joint and tail	Wing tips and if R-to-C wings and tail
DISCOLORATIONS	Breast/legs Elsewhere	Breast/legs Elsewhere	
Flesh bruises	0" ½"	½" 1½"	No limit
Skin bruises	½" ¾"	¾" 1½"	No limit
All discolorations	1" 1½"	1½" 3"	No limit
FREEZER BURN	Few small (1/8") pockmarks	Moderate-dried areas not in excess of ½"	Numerous pockmarks and large dried areas

JUDGING AND GRADING EGGS

STRUCTURE OF AN EGG

Before you can judge eggs properly, you must know the parts of the egg, and how these parts appear in a normal egg. In the following picture of a cross section of an egg, notice the location of the air cell, yolk, and white or albumen.

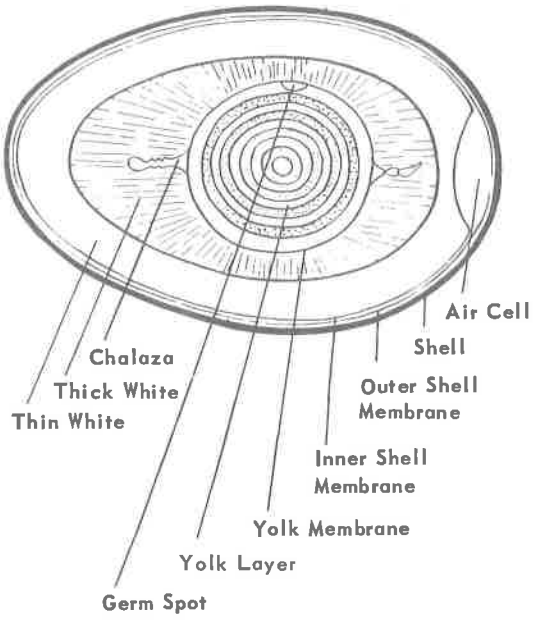


Figure 14. Cross section of an egg.

Air Cell. In a strictly fresh egg, the air cell is small, not more than one-eighth of an inch deep and about the size of a dime. As the egg ages, evaporation takes place and the air cell becomes larger. Keeping eggs in a dry, warm place causes such rapid evaporation that the egg soon loses it good quality. The air cell should not be movable but should remain in the large end of the egg. A movable or bubbly air cell lowers the grade of the egg. Jars or shocks may sometimes loosen the two shell membranes and permit movement of the air cell. Good eggs never have large air cells, but bad eggs can have small air cells.

Yolk. The yolk of a strictly fresh, high quality egg will be surrounded by a rather dense layer of albumen or white. The yolk, therefore, moves only slightly away from the center of the egg when it is twirled before the candle. Because of this, the yolk outline is only slightly defined or partially visible. As the egg ages or deteriorates in quality, the albumen thins. The yolk tends to move more freely and to approach the shell more closely and, therefore, becomes more visible before the candle.

After you have noted the position of the yolk in the egg and how it moves, you should look at the yolk before the candle to see if there are blemishes or damage spots on it. These appear before the candle as areas darker than the rest of the yolk. Every egg has a germ spot. The egg must be fertilized before the germ spot can grow. If the germ increases in size, evidence of this growth appears at first slightly, and later as a distinct area.

Blood spots are rather common defects found on the yolks of eggs. The blood spots on the surface of the yolk occur as the egg is forming, and do not affect its eating quality. However, since some people object to the appearance of blood spots in eggs, such eggs are classed as inedible.

White or Albumen. The character and condition of the white or albumen is determined largely by the movement of the yolk when the egg is candled. If the yolk retains its position in the center when the egg is twirled, the white is usually firm and thick. The chalazas (pronounced kulayzuh from Greek word meaning hail stone) are the white, twisted, rope-like masses at each end of the egg. They help hold the yolk in place. When candling, a beginner must be careful not to confuse the chalazas with blood or meat spots. The chalazas always cast a light diffusing shadow, not a dark one as do blood or meat spots. Blood or meat spots in the white or albumen will cause an egg to be graded down. The whites of eggs of the higher grades should be clear and firm and free from any foreign particles.

GRADING IN THE SHELL

Eggs are graded for size and quality. Market grade of unbroken eggs is determined by candling the eggs and observing the size and condition of the air cell, the position and condition of the yolk, the condition of the white or albumen, and the presence or absence of interior defects.

Candling is grading eggs before a strong light in a dark room. The egg, is held large end up, in a slanted position, in front of the opening in the candling machine. The egg is turned so that the judge can determine the quality of the contents. With a little practice one can judge the eggs easily and quickly.

Quality Grades. The following are specifications for official United States standards for quality of individual shell eggs.

U.S Grade AA – The shell must be clean, unbroken, and normal. The air cell must not exceed 1/8 inch in depth and must be regular or only slightly wavy. The yolk must be well centered, free from defects and blemishes visible before the candler, and the outline only slightly defined. The white must be clear and firm.

U.S. Grade A – The shell must be clean, unbroken and practically normal. The air cell must not exceed ¼ inch in depth and must be regular or only slightly wavy. The yolk may be fairly well centered, practically free from defects and blemishes, and the outline fairly well defined. The white must be clear and reasonably firm.

U.S. Grade B – The shell must be clean to very slightly stained and unbroken, but may be slightly abnormal. The air cell must not exceed 3/8 inch in depth and may be free, but not bubbly. The yolk may be off center and the outline may be well defined. The yolk also may show a few definite but not serious defects visible before the candler. The white must be clear but may be slightly weak.

U.S. Grade C – The shell must be clean to moderately stained and unbroken, but may be abnormal. The air cell may be over 3/8 inch in depth and may be bubbly or free. The yolk may be off center, plainly visible, and appear dark and flattened. The yolk may show clearly visible germ development but no blood due to such development. It may show other defects that do not render the egg inedible. The white may be weak and watery. Small meat spots or blood clots may be present.

Weight Classes for Shell Eggs

Class	Minimum Net Weight per Dozen	Minimum Weight for Individual Eggs (rate/dz.)
Jumbo	30 oz.	29 oz.
Extra Large	27 oz.	26 oz.
Large	24 oz.	23 oz.
Medium	21 oz.	20 oz.
Small	18 oz.	17 oz.

GRADING THE OPENED EGG

A more accurate way of determining egg grades and quality is to break them out of their shells onto a flat surface, such as a piece of glass. Examine the broken-out egg for:

1) Height, shape, and spread of albumen
2) Amount of thick albumen
3) Shape and height of yolk
4) Presence of blood or meat spots
5) Yolk mottling

Points to Consider

Shape and uniformity of albumen. A broken-out egg should retain the general shape of the unbroken shell egg. The albumen spreads over a relatively small area on a flat surface, and its outer edge is rather uniform.

Amount of thick albumen. In a top quality broken-out egg, the thick albumen constitutes most of the entire white of the egg. Only a small amount of thin albumen should be present in high-quality eggs.

Shape and height of yolk. The ideally shaped yolk is perfectly round and covers a small area. The top of the yolk should be round and upstanding.

Presence of blood and/or meat spots. Any blood or meat spot automatically downgrades an egg to Grade C. Blood or meat spots totaling not over 1/8 inch in diameter are permitted in grade C eggs. If more than this, the egg is classed as inedible.

Quality Grades

The following are specifications for official U.S. standards for broken-out eggs.

U.S. Grade AA – Egg covers small area. Much thick white surrounds yolk. Egg has minimum amount of thin white. Yolk is round and upstanding.

U.S. Grade A – Egg covers moderate area. Egg has considerable thick white and small amount of thin white. Yolk is round and upstanding.

U.S Grade B – Egg covers wide area. Egg has small amount of thick white and much thin white. Yolk is somewhat flattened and enlarged.

U.S. Grade C – Egg spreads over wide area. Egg has no thick white and large amount of thin white. Yolk is very flat and enlarged.

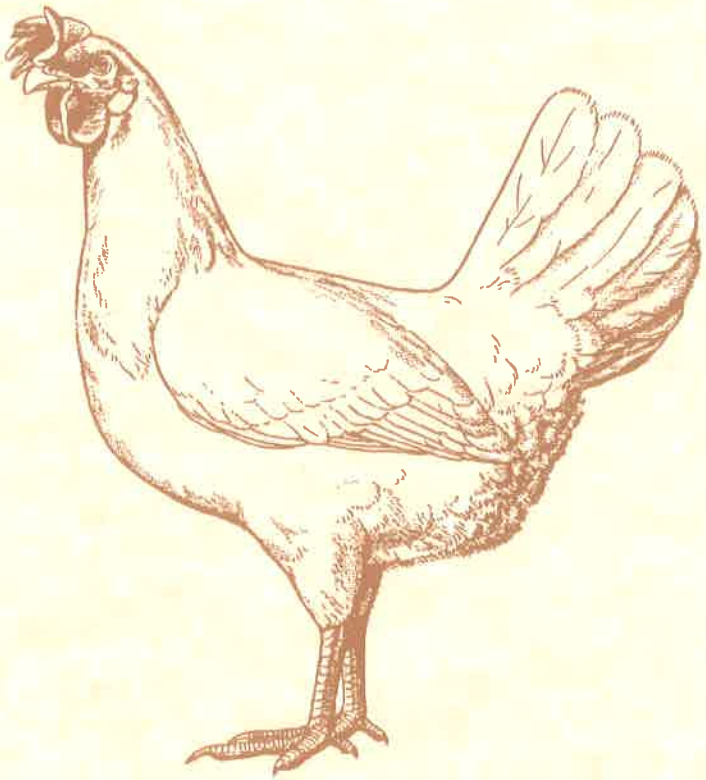
Egg quality is determined by the lowest factor found in the egg. For example, an egg may be of AA quality in every respect, but a small blood spot (less than 1/8 inch in diameter) makes it C quality.

SUMMARY

Judging not only gives you experience and training, but the friendly competition is fun. The following points may help you in a judging competition:

- Wear suitable clothes so you will not get good clothes dirty.
- Be calm when judging.
- Think only of judging. Do not worry about the crowd around you.
- Handle the birds, carcasses, and eggs carefully.
- Remove the birds from the coop head first.
- Return the birds to the coop head first (follow instructions on how to handle birds).
- When you finish the class, check it again to satisfy yourself that your placing is correct.
- Do not ask questions of other contestants; ask the person in charge.
- Stand back and study the class before you begin handling the birds.
- Do not hurry.
- Do your own judging, do not rely on your neighbors.
- Check the number on the bird, carcass, or egg so they are put back in the right place.
- Make a few notes when asked to give reasons.
- In giving reasons, make sure that your statements are accurate.

Animal Care Series:



EGG-TYPE LAYER FLOCK

CARE PRACTICES

California Poultry Workgroup
University of California ♦ Cooperative Extension

FOREWORD

"Egg-type Layer Flock Care Practices" is one of a series of University of California publications addressing the issue of animal care relating to food production in California. This publication is a joint effort of the Poultry Workgroup, Cooperative Extension, and industry representatives.

"Egg-type Layer Flock Care Practices" was edited by Carolyn Stull, Animal Welfare Specialist, Veterinary Medicine Cooperative Extension, University of California, Davis.

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The information in this publication is valid as reference material until January 1, 1998, unless revisions are necessary at an earlier date.

TABLE OF CONTENTS

INTRODUCTION

Egg-type layers are defined as chickens maintained for the production of table eggs. Eggs may be produced for human consumption in the shell form (sold in cartons) or may be broken out of the shell for use in the production of liquid, frozen or dehydrated products.

It is estimated that California has 250 commercial egg production farms and another 50 farms devoted to the rearing of replacements for the table egg industry. The egg production farms maintain approximately 25 million layers (1994) or an average of 100,000 hens per site.

The commercial table egg industry in California produces between $300 and $400 million in gross receipts each year - depending upon the price of eggs. In 1992, table eggs were listed as the 15th leading agricultural commodity in California. Due to California's 24 million laying hens, it is ranked as the number one table egg state in the U.S. with about 10% of the nation's flock. Egg production in 1994 is estimated to provide California consumers with 90% of their need for table eggs.

Poultry require constant care and attention. This care should be performed by experienced personnel. Novices who wish to raise poultry should obtain detailed information on proper care before chicks are obtained. Help and information is available from the University of California Cooperative Extension, experienced industry representatives, and through many books and publications.

MANAGEMENT PRACTICES

Producers utilize many management practices which may affect the flock's performance, profitability or welfare. In general, concern with a flock's welfare will economically reward the owner. Flocks which are mistreated rarely perform to the standards of the industry and therefore such practices tend to lower profits and increase costs. Care must be taken not to prejudge practices which may outwardly appear to be harmful to the flock's welfare. Many such practices are used because they have been shown through research to be of overall benefit to the flock's productivity, livability, and welfare.

Genetics and Strain/Breed Selection

The selection of the strain or breed of chickens for commercial egg production varies throughout the world because of consumer demands. Europe and the New England states are strong consumers of brown shelled eggs, thus the breeds used in these regions are almost exclusively brown shell varieties. On the other hand, the remainder of the U.S. and countries like Japan are consumers of white shelled eggs; therefore producers use the White Leghorn breed.

Within breeds, individual breeders have selected strains for certain performance characteristics which are desirable or in demand by the commercial egg industry. Strains may have unique performance characteristics such as egg numbers, egg weight, or livability. All three traits are obviously of extreme importance, but each breeder places different emphasis on what they consider important to customers and to the profitability of the birds.

Beak Trimming

Flocks may exhibit various vices such as feather pecking and cannibalism. Commercial egg producers commonly trim the beaks of growing pullets before such vices begin. Trimming may be done once at a very early age (first week of age) or twice (a second permanent trimming at 6 to 12 weeks of age). When done correctly, this provides a life-long reduction in the incidence of these problems and also reduces feed waste.

Beak trimming has very minimal effects on the young chicken when performed before six weeks of age. Later trimming tends to affect the birds by depressing feed consumption resulting in lower body weights during following weeks. Careful beak trimming assures desired results. This requires a detailed analysis of the technique to be used, constant monitoring of the crew to assure they are applying all the procedures precisely, and finally, an assessment of the control of cannibalism in the adult flock. To be successful, all parts of the procedure must be adhered to carefully. This includes the age of the flock,

amount of beak to remove, sharpness of the blade, temperature of blade, and angle of the cut. Departures from any of these may result in incorrect trimming and less-than-desirable performance in the laying house.

Moving Programs

Most flocks are moved as day old chicks to a rearing farm and subsequently once or twice before they are finally in the layer house. Moving has always been considered to be stressful to a flock. The degree of stress is dependent upon many factors including age of the flock, concurrent stressors, moving distances, similarity between before and after conditions, environmental factors during the move, and the experience and care exercised by the moving crew.

The moving of day-old chicks often involves shipment over distances of several hundred miles requiring a day or more. It is essential that such shipments be made in temperature controlled trucks equipped with a high quality air circulation system. Delays should be avoided, loading done quickly in temperature controlled facilities, and prompt unloading to assure that the chicks receive water and feed as quickly as possible.

Moving of ready-to-lay pullets should be done before first egg production commences in order to minimize the damage to the more precocious birds coming into lay. Special care should be taken when removing birds from cages, placing them into moving racks or cages, unloading from the traveling containers, and placement into layer cages. The crew needs to be carefully trained in the proper procedures for catching and removing the birds from cages. Depending upon the cage door size, the fewer birds removed at one time, the less chance for injury.

Moving should also include the proper preparation of the new facilities to receive the birds. Feed should be fresh and deep in the trough. Water should be readily available and preferably from the same system used during the growing period. Many producers choose to fill water cups immediately prior to arrival of the new pullets in order to attract them to the water source.

Recycling Layers

Traditionally, layers are kept through one year of egg production and sold for meat at 18 to 20 months of age. By this time, egg production rates are commonly in the mid 60% range and egg interior and shell quality become very marginal. This practice of selling a flock after one cycle of lay is economically justified during high egg price periods, when replacement pullet costs are low and mature hen prices are high. Lower profit margins dictate a second look at the question of optimum selling age. Many producers have found it more economical to recycle their flocks into a second or even a third cycle of lay. Egg production improves after a rest of 3 to 4 weeks, egg quality returns to a much

higher level and the flock's life is extended from 6 to 12 additional months.

Flock recycling is accomplished by stopping the flock's egg production, providing it with a suitable rest and bringing it back into production beginning about 4 to 5 weeks after the initiation of the program. Many systems to accomplish this have been used, but most involve reduced day length and some form of nutrient restriction or fasting. In order to achieve the best results, flocks are generally fasted for seven or more days without removing water. Careful monitoring of the flock's condition is required to assure that body weight and mortality losses do not exceed breeder guidelines. Following the fast, a low calcium-low protein diet is fed to cause the flock to remain out of production during the desired period of time (usually 2 to 4 weeks). After the rest, the flock is returned to a normal lighting program and nutritionally balanced diets which support egg production. Egg production resumes in a few days.

Lighting Programs

Since many of the inherent chicken responses common to wild birds have been bred out of the domestic chicken, responses to lighting programs are far less pronounced than in the past. Seasonal influences on performance are less noticeable and only small differences are noted between lighting programs of widely divergent descriptions. Nevertheless, all commercial producers use lighting programs. Replacement pullets are commonly reared on constant day length programs in environmentally controlled housing, or on decreasing day length patterns in open-type rearing houses. Pullet growers avoid patterns of increasing day length common to the spring months to prevent early sexual stimulation of the flock into egg production. Early sexual maturity can result in an increase in prolapse of the oviduct which commonly results in death.

Laying flocks are usually boosted to at least 13 hours of light when egg production is desired with additional weekly increases of 15 to 30 minutes until a maximum of about 16 hours of total day length is reached. Light intensity is an important part of a lighting program with 0.5 foot-candles considered ideal for rearing pullets and 0.5 to 1 foot-candles recommended for layers. Decreasing light intensity or duration is considered to be detrimental to high sustained egg production rates and should be avoided.

Records and Flock Monitoring

In order to follow the progress of a flock, numerous records are kept by the poultry producer. Such records involve documentation of daily events (temperature, eggs produced, mortality, feed consumption, etc.), periodic sampling of conditions or performance (vaccination dates, body weights, egg weights, etc.), and flock summaries over extended periods (costs, total performance, profitability, etc.).

Additionally, many producers routinely graph many of these measurements to gain a better perspective of their flock's progress.

Progressive producers are now monitoring their houses and flocks electronically with sensing devices and computers. Sub-optimum performance of systems or flocks is immediately noted and corrections are implemented automatically or following the notification of management. House sensors are able to monitor temperature patterns within the house and to adjust ventilation rates of air inlet openings to correct problems. Feed consumption is monitored daily and nutrient intake is compared to requirements on a daily basis. Feed formulas are adjusted to compensate for variations in feed consumption rates, costs of ingredients, ingredient composition, or changing requirements.

ENVIRONMENT

Housing

The principal requirement for housing is to protect the flock from inclement weather conditions including rain, wind, and temperature extremes. Additionally, housing allows closer supervision of flocks, protection from natural predators, and the concentration of poultry populations to allow improved feeding, health promotion and management programs. As a result, chronic health problems are minimized, mortality rates are decreased, productivity is increased and flock profitability is greater. The flock benefits from an optimum environment, the producer benefits from improved returns, and the consumer benefits from improved egg quality and lower prices.

Housing requirements differ with environmental conditions and the desires of the operator. To protect the flock from rain and snow, the house must provide "shelter" and this requires a roof. Roofs should be designed with ample overhang so that rain will not be driven into the interior of the building. Long overhangs are also helpful to keep early morning or late afternoon sunlight from entering the building. Direct sunlight, when temperatures are high, may be life threatening to birds. High light intensities are also conducive to pecking problems.

Roofs are generally made of steel or aluminum and are designed to reflect away the hot summer sun rays. Insulation under the roof is commonly provided to minimize radiant heat reaching the birds from the hot roof and to conserve the in-house temperatures in the winter months. Some producers choose to build their houses with an attic and a flat ceiling, while others may retain an open ceiling to the roof. Variations in design of roofs, as well as of the entire building, result from the use of different building materials, size of house, support requirements for interior equipment and ventilation systems.

Floors are commonly constructed with concrete to facilitate waste removal, accommodate equipment for servicing and moving birds, and enhance the producer's ability to sanitize the building for disease prevention programs. Some facilities use a daily or weekly waste removal program to reduce odor problems and house flies. For such programs to be successful, concrete floors are essential for complete removal of waste. Concrete walkways are also important for employee safety, and to minimize damage to the building and equipment when mechanized equipment is brought into the house to feed, move birds, or remove wastes.

Walls may be relatively open (to allow fresh air into the house), protected with adjustable curtains or totally enclosed for maximum control of environmental conditions. California's environment varies considerably from one poultry area to

another and housing types adjust for these differences and the management style of producers.

Regardless of the system, the walls must protect the flocks from cold winter winds and hot summer conditions. For California egg producers, this means a minimum of a plastic curtain for wind protection. More elaborate facilities will include thermostatically controlled, automatic raising and lowering of curtains. A substantial number of houses utilize solid, insulated walls with thermostatically controlled mechanical ventilation for the ultimate in all-season control of environmental conditions.

In recent years there has been renewed interest in the "free range" method of keeping table egg-type poultry. In some European countries, the trend to this system is quite sizable and a significant number of eggs are sold as "free range eggs". Free range implies that the flock is allowed outdoors for at least a part of the day. Interpretation of the system varies from one facility to another. In many cases, the system merely provides outlets from the house to a small yard so birds can move around freely.

Equipment

Equipment for poultry is used for a wide variety of purposes and includes cages (for confinement), feeders, drinkers, brooders (for heat), egg gathering belts, scrapers and belts for waste removal, lights, ventilation and cooling systems, stand-by power, and other systems. Equipment must be effective in accomplishing its basic function, safe for the operator and not harmful to the birds. Care should be taken to avoid sharp metal edges which may injure the workers or the birds. Equipment should be designed so that birds will not get caught in cages or moving machinery. Doors to cages should be large enough to facilitate moving chickens in and out without injury to their legs or wings.

Cages - Cages have been the preferred way of housing table egg layers since the mid 1940's. Cage sizes and shapes vary and therefore their management varies to allow for different bird responses. Performance can be affected by different floor space allowances and access to feeders and waterers.

Cages became popular in response to the need for improved sanitation practices. Housing layers and replacement pullets in cages removed the bird from its own feces and eliminated many of the feces-related parasite and health problems, especially coccidiosis which has plagued the industry for centuries. As a result of caging, flock nutrition could be better addressed, wastes handled more effectively, and products (eggs) kept cleaner.

A 1991 survey of California farms indicated that nearly 100% of the layers were housed in cages; while nearly 38% of the replacement pullets were raised in cages from one day of age. Additionally, most of the remainder

of the replacement pullets were placed in cages by at least 6 to 8 weeks of age.

Cages for replacement pullets are designed with flat bottoms and narrow wire spacings to provide support for the growing pullet while allowing ample space for wastes to fall through. Wire spacings are commonly 1 inch x 1 inch or 0.5 inch x 1 inch compared to the usual 1 inch x 2 inch used for layers. Paper is usually placed on the floor for the first week to give additional support for small chicks.

Because of the smaller size of the starting chick (0.12 pound) compared to the 18 week-old pullet (2.75 pounds), space allowances change over the course of the rearing program. Most producers choose to start their chicks at one day of age in one-half the space (or half of the available cages) and then to increase their space allowances at about four weeks of age. Allowances for the first four weeks are commonly about 25 square inches and for the remainder of the rearing period about 40 to 50 square inches. The allowances during the latter half of the rearing period depend upon the size of the chickens when moved (16, 18 or 20 weeks.) When replacement pullets are reared on litter, space allowances are usually in the range of 1 to 1.5 square feet per bird ranging up to 16 to 20 weeks of age. Wood shavings, chopped straw, rice hulls or other materials are commonly used to absorb moisture and to provide a comfortable material for the birds to rest upon.

Layer cages are designed with sloping floors to assist in the roll out of the egg for collection. The slope should be approximately 7.5 degrees; more or less than this will increase the amount of egg breakage. Steeper slopes are also thought to be less comfortable for the chickens. Floor wire spacings of 1 inch x 2 inches give ample support for layers and wastes do not accumulate inside the cage.

Cages for layers come in many sizes but most house from 3 to 10 birds per cage. Recent trends favor cages with 6 to 9 birds. The question of floor and feeder space requirements for caged laying hens has been the subject of extensive research for more than forty years. Recommendations and usage still differ throughout the industry, mostly due to economics. Other complicating factors include cage design, type of housing, and strain of bird used.

In general, more space (up to 72 square inches per bird) is associated with the highest egg production and lowest flock mortality. With good management and attention to light intensity, uniformity of flock, environmental conditions within the house, feed formulation, strain selection and excellent beak trimming techniques, space allowances of 50-60 square inches can give comparable results. In general, during periods of low egg prices or high feed costs more space per bird is usually more profitable.

Feeders - Feeding replacement pullets and layers in cages is commonly done with mechanical feed delivery

systems inside a front-of-the-cage feed trough. Other methods include traveling hoppers and mobile feed carts. Young chicks (during their first week) are commonly hand-fed in their cages.

Feed delivery systems should be designed to allow complete access to the entire length of the trough adjacent to the cage with adequate space for all birds. It must be installed at the proper height (or be adjustable) for each class of chickens. Thus, in brood-grow cages, adjustments should be made for chicks from one day of age to pullets at 18 weeks of age. In general, at least 2 inches of feeder space is recommended for each growing pullet and 2.5 inches or more for each adult layer.

In addition to location and space allowances, the producer must also be concerned with the consistency of the feed delivered, the quantity available and the frequency of the feeding program. Feed is formulated to provide the average chicken with specific levels of nutrients relative to its stage of life or production level (e.g., layers). To assure that each chicken is being treated equally, it is imperative that the feeding system provide uniform feed to all points in the feeding system. Ample feed should be available throughout the day and all chickens, even the most timid, given ample opportunity to feed. Feeders which separate feed components should not be used as this results in an unbalanced diet. Proper feed depths must be maintained to assure that all nutrients are consumed and the build-up of moldy feed is minimized. Pullets raised on the floor are commonly fed from troughs equipped with mechanical feeders or from hanging pan-type feeders. In either case, at least 2 inches of feeder space per bird is recommended.

Waterers - Like feeding systems, waterers should be accessible, dependable without stoppage or leakage, and able to provide fresh, cool and clean water required for a healthy and productive flock. Proper installation includes consideration of the normal drinking position of chickens (at back level or higher), protection of the system from excessive heat which may inhibit the quantity of water consumed, and slope of the house which could result in unequal water pressures within the house and non-uniform water consumption patterns.

Nests - Egg production flocks maintained on the floor require nests. Most producers provide one nest for each 4 to 5 birds. Nests should be cleanable, convenient and of adequate size (12 inches x 12 inches). In addition, nests should be kept fairly dark to reduce egg eating and be closeable at night to prevent birds from defecating in the nests.

Miscellaneous Equipment - Effective brooders (heaters) are capable of maintaining chick rearing areas at 85 to 90^{0}F in the coldest weather. In floor brooding systems, where multiple heaters are used, extra brooders and spare parts should be available during this very critical period and constant monitoring is required to assure uniform flock comfort and conditions

for the first few weeks. Routine servicing of mechanical belts and manure scraping devices avoids costly shut-downs of very essential systems. Availability of extra parts and motors minimizes the period of shut-down. Eggs should be collected on time to avoid excessive breakage and manure removed on schedule to maintain proper air quality.

Commercial replacement pullets and layers require reliable artificial lighting systems. Such systems should be designed to provide uniform light intensities throughout the house. Clean and properly spaced lighting fixtures will provide all locations throughout the house with optimum light intensities. Insufficient intensity can reduce egg production rates; excessive intensities are expensive, and may result in higher levels of cannibalism and feather pecking.

Ventilation and cooling equipment selection is based upon the needs of the region and the equipment's ability to operate dependably at maximum capacities. The air delivery system should be designed to provide each portion of the house with comparable air volume, temperature and air quality. Constant monitoring of air quantity and quality is necessary. Short air routes are more desirable than longer pathways. Frequent well-spaced inlets and outlets are required to maintain uniform air conditions. Uniform low volume air delivery for winter conditions is a special problem and deserves careful consideration when designing new poultry houses.

Cooling systems commonly used in the egg industry include foggers (misters), and pad and fan evaporative cooling for environmentally controlled houses. Both systems are effective in lowering maximum temperatures by 10 to 20^{0}F or more depending upon the system design and weather conditions. To be effective, these systems must be carefully restored to optimum operating conditions prior to the first heat spell and then continuously maintained to assure their operation at maximum efficiencies.

Stand-by generators with alarm systems are a "must" in highly mechanized table egg houses. Such systems should be large enough to supply emergency power for lighting, watering birds, ventilation, feeding, egg collection and manure removal. Alarms indicate power interruption and extreme temperature situations. Alarms may include both high intensity sound as well as telephone calling systems.

Waste Management

Manure is a natural by-product of any poultry operation. Poultry manure can be a valuable component of a well integrated agricultural operation. When properly handled, manure may be used as an excellent soil amendment which generates additional revenue to the poultry producer. The method of manure management will vary with the type of operation under consideration. In cage systems, the manure should not be allowed to accumulate to such an

extent that the birds have access to it. For floor type operations, the combined litter and manure must be kept in such a condition that it is neither too wet nor too dry. Wet litter can result in high ammonia levels and foot pad and leg problems. Excessively dry litter may lead to high levels of dust which are irritating to both birds and employees.

Manure may be collected in dry or wet forms on a daily, weekly or periodic interval based upon the system used. Mechanical scrapers, collection belts or mobile handling equipment are used to remove the wastes from the house. High-rise houses (two stories) may be used for longer term manure storage (periods of one year or more). Wet systems include wash-out houses into a pond and underground tank systems with frequent removal. Manure management is just as important once the manure is removed from the house and stored. The producer should take the appropriate steps to insure that the stored manure does not result in any nuisances (run-off, odor, flies, etc.). Particular concern is the potential for polluted drainage from storage units or percolation into ground water. Care must be taken to assure that run-off does not enter streams, ponds, and/or cross property lines. If storage ponds are utilized, there also can be a problem of odor generation. Whatever the type of manure management, the operator must be well informed on local, state, and federal regulations and must be ever vigilant.

NUTRITION

The feeding of replacement pullets and layers is a finely tuned, science based program. Recommendations are well-researched resulting in rations which meet the flock's daily nutrient requirements for optimum growth and egg production at the least cost.

Most commercial pullet growers carefully monitor their flock's growth progress on charts provided by the breeder to assure the success of the resulting layer flock. Likewise, egg producers monitor their flock's performance with dozens of measurements to compare both performance and nutrient intake to the models established by the breeder for optimum flock performance and welfare. The producer is vitally concerned that the flock receive a properly balanced feed to assure that the flock's performance will be optimized and higher economic returns will be realized.

Basically, the objectives of a feeding program are to provide the flock with all required nutrients (not feedstuffs) to satisfy the flock's physiological needs each day. To implement this objective, information is required concerning flock requirements (based upon age and productivity), nutrient availability of feed components, uniformity of feed consumption and feed intake. The farm must also have a system for delivering uniform, well-formulated palatable diets to all birds.

Economic feed formulation and feeding take into account cost differences between ingredients, reliability of the ingredient in supplying required nutrients, and management systems which may affect the usage of the feed such as optimum temperature, uniformity of temperature, and air quality.

Nutrient requirements are affected by the age and productive status of the flock. Young pullets in the growing stages require much lower levels of calcium than laying hens because of the calcium required for egg shells. The production of large numbers of marketable eggs requires careful formulation to assure adequate levels of amino acids, minerals, vitamins, and energy.

HEALTH MAINTENANCE PROGRAMS

The scientific definition of health in an animal is the "absence of disease". Bacteria-free chickens in isolation under laboratory conditions grow approximately 15% faster than similar chickens in a "conventional" environment. This ideal is economically impossible to achieve commercially. The use of immunization, sanitation, preventive medicine and biosecurity are recommended as the major preventatives for infectious disease, with only occasional alternatives such as therapeutic medication.

Immunization

The planned deliberate induction of immunity is one of the most beneficial and effective management tools available for the prevention or suppression of infectious disease (as compared to the natural induction following unpredictable exposure to field infection). Numerous infections, sometimes in combination, can kill or debilitate susceptible poultry causing pain and suffering in addition to losses in performance.

Immunity is of two broad types: passive or active. Passive immunity occurs as antibody in the yolk of developing embryos; it is derived from the maternal bloodstream and is present until metabolized (for 2-4 weeks) in the blood of newly hatched chicks. The presence and level of passive immunity in the chick is therefore dependent on the presence and level of antibody in the maternal parent. Some vaccination programs are aimed at producing high levels of passive immunity in chicks, e.g., for avian encephalomyelitis and infectious bursal disease. Passive immunity is generally effective against viral diseases, but less so or ineffective against bacterial infections, e.g., mycoplasmas or salmonellae.

Active immunity occurs when an antigen is introduced to the bird and processed through the bird's immune system, resulting in various protective responses. These responses include antibody production and/or cellular immunity which will act to protect the bird if it is re-exposed to that antigen.

Active immunity can be produced either by living or inactivated antigens, or a combination of the two. Most living bacterial and viral antigens are either naturally occurring strains of low pathogenicity (mild), or pathogenic strains whose virulence has been reduced by passage in laboratory media (attenuated). Live vaccines can be administered either to individual birds, such as by injection or eyedrop, or to large numbers of birds via the drinking water or by aerosol. Building up a high level of immunity often requires a second or third administration of vaccine, usually with a stronger vaccine strain on each occasion. Inactivated vaccines must be given by injection. These usually incorporate potent adjuvants which enhance the local

cellular reaction and, therefore, increase the immune response. Immunity against some infections can be induced by injection of vaccine into the egg shortly before hatching, so that active resistance is developing before any exposure can take place.

Development of Immunization Programs

The development of an immunization program should be based on knowledge of the diseases to which birds are likely to be exposed and incorporated into the management system of the flock. It requires knowledge of the presence and level of passive immunity so that immunization can be properly timed. Timing is also important so that vaccines do not detract from each other's responses or exacerbate their clinical effects. Vaccines should not be administered when other stressors are acting on the flock.

Vaccines should be purchased and utilized after full consultation with vaccine manufacturers. Where monitoring tests are available, e.g., serology, these should be routinely utilized to ensure that vaccine responses have taken place.

Limitations of Immunization

When a bird responds to an antigen it diverts energy from growth or production, so protective immunity does have a slight penalty. In addition, responses to antigens are influenced by genetic background and previous management, so qualitative and quantitative variations in resistance are found between immunized individuals in the same flock and between strains and breeds.

Finally, immunization must not be a substitute for proper sanitation and biosecurity. The borderline between clinical good health and disease is very narrow, and immunization programs may not totally protect birds which are stressed or in unhygienic conditions. Such deleterious conditions also reduce productivity because birds cannot prevent their responses to foreign antigens. Thus, animals constantly exposed to environmental diseases do not grow and produce as well as those in clean environments. Many multi-age production systems may be examples of this. It is particularly difficult to control infectious disease on multi-age farms since the sites are rarely depopulated. Live vaccines may travel between age groups and interfere with other vaccines or exacerbate disease.

Farm Security

Biosecurity is the utilization of methods which stop the transfer of infection into or between components of production systems. Major components include:

- allow only necessary visitors to production sites;

- restrict movement of workers and equipment between houses, sites and age groups;

- provide sanitizing foot baths, showers and protective clothing at strategic locations;

- maintain cleaning and disinfection programs, especially in hatcheries;

- reduce microbial load on trucks and equipment by washing and disinfecting at critical times;

- locate production sites strategically in relation to other production sites and movement of poultry, thus minimizing transfer of disease;

- restrict contact of workers with other poultry, especially potential carriers of hazardous disease organisms;

- appropriately handle waste and dead birds to minimize the transfer of disease between sites;

- control rodents and wild birds effectively, both are potential disease vectors.

Cleaning and Disinfecting Houses and Equipment

When poultry are removed from houses, the buildings and equipment should be carefully cleaned and disinfected before new birds are introduced. Manure (including litter) should be removed from the immediate vicinity of the poultry houses, preferably to an off-site location.

A successful cleaning and disinfection protocol should include:

1. Removal of all litter and manure.

2. Thorough wash down of the interior of the house and all equipment, preferably using a high-pressure washer.

3. Application of a suitable disinfectant solution.

Careful attention should be given to watering devices and water lines to be sure that these are free of disease agents. Water lines should be flushed and then a disinfectant solution pumped into the lines. These lines are closed and allowed to rest for at least 24 hours, and then thoroughly flushed to remove the disinfectant.

Preventive Medicine

Some disease agents are most effectively controlled in commercial environments with preventive medications. These compounds are usually included in the feed and function by disrupting the life cycle of the coccidia or other disease producing agents. Growth promoting compounds work in a similar way by reducing harmful bacteria in the birds and thereby, allowing growth at a rate which more nearly reflects their genetic potential.

Monitoring Mortality

Daily flock mortality records should be maintained and monitored. Mortality rates above breeder's standards should trigger an investigation to determine the probable cause. If the cause is not readily apparent, a sample of freshly dead birds should be examined by management, a qualified veterinarian, or at a diagnostic laboratory. Routine examination of a sample of daily mortality is recommended as a method of monitoring the causes.

Dead Bird Disposal

Successful methods of dead bird disposal must prevent spread of pathogens to surviving birds and should result in appropriate recycling of nutrients without contamination of surface or ground water. Several methods have been acceptable in commercial systems.

Rendering is a very acceptable method from an environmental standpoint, but may expose the farm to pathogens if proper precautions are not taken to restrict the transporting truck from the production houses. The rendering pick-up area must be kept neat and should be screened from public view. This system is flexible and can accommodate a sudden increase in mortality. Storage containers must be fly tight and pick up should be scheduled at least twice weekly.

Composting, if properly done, is a very acceptable method of carcass disposal and results in a valuable compost by-product which makes an excellent soil amendment. Composting should be done on a concrete pad to prevent leaching and under roof to prevent excessive wetting of the compost. The composting process must be managed to assure that an adequate temperature is achieved to destroy pathogens. The system is flexible and can handle a sudden increase in mortality.

Incinerators are effective from a disease control standpoint, but units must meet local air pollution standards. Incinerators are expensive to operate, require energy input and can not handle sudden increases in mortality. Proper disposal of the ash is necessary to avoid pollution problems.

Disposal pits or burial are environmentally acceptable in soils where movement of nitrogen into groundwater is not a problem. Unfortunately, determination of the suitability of a particular site for pit disposal or burial may cost as much as construction of a suitable composter, with no assurance of success. Pits work best with a constant load of mortality and do not handle sudden increases in mortality. Burial is very flexible, but may effect future use of the site.

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Bogart, GA 30622

DeKalb Poultry Research, Inc., 3100 Sycamore Rd
DeKalb, IL 60115

Euribrid, Inc., Hisex Division, P.O. Box 719
Troutman, NC 28166-0719

H&N International, 3825 154th Ave. N.E.
Redmond, WA 98052

Hyline International, 2929 Westown Parkway
West Des Moines, IA 50265

ISA Babcock, P.O. Box 280
Ithaca, NY 14851-0280

Shaver Poultry Breeding Farms, Ltd. Box 400
Cambridge, Ontario, Canada N1R 5V9

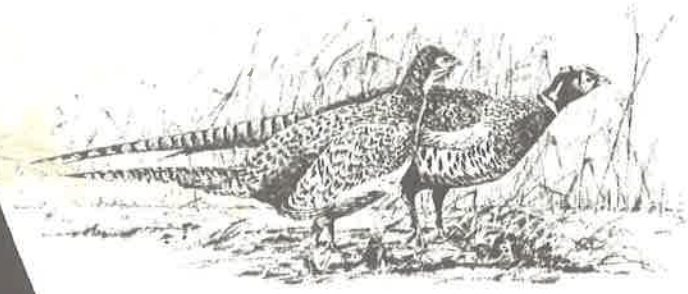
GLOSSARY

Adjuvant	Additives to vaccines to enhance their immunological effectiveness.
Antibody	A protein molecule capable of combining specifically with an antigen.
Antigen	A substance foreign to the host animal, commonly a disease agent or a vaccine which induces an immune response.
Attenuated	Process used in vaccine production to modify organisms to induce immunity without causing disease.
Biosecurity	A management system to minimize the pathogen exposure of flocks.
Brood-grow cage	A cage used for chickens between 1 day of age and start of laying.
Composting	A natural decomposition process for organic wastes.
Depopulation	Removal of all animals from a premise.
Egg type	Chickens that have been genetically selected to produce eggs for human consumption.
Endotoxins	Toxins produced by bacteria.
High-rise	A poultry house with cages on the second floor and manure storage on the first floor.
Immunity	Resistance resulting from previous exposure to an infectious agent or antigen.
Layer	A sexually mature female chicken.
Litter	An absorbent bedding material for floor managed chickens.
Multi-age farm	A farm with more than one age group of chickens.
Pad and fan	An evaporative cooling system utilizing wetted pads and fans.
Producer	Farmer who raises poultry for commercial purposes.
Prolapse	A prolonged or permanent eversion of the terminal end of the reproductive tract with exposure of soft tissues.
Pullet	A sexually immature female chicken (in this publication).
Rendering	The conversion of carcasses to usable animal feed products by heating.
Replacements	Immature females used to replace an older flock.
Serology	Laboratory tests to determine pathogen exposure using blood serum.

Table egg	Eggs for human consumption as opposed to hatching eggs.
Vector	Carrier of a disease agent from one bird to another or even from one farm to another.

INDEX

4-H AVIAN SCIENCE PROJECT



MEMBER'S GUIDE • ADVANCEMENT PROGRAM

This project is designed to give you a variety of experiences related to birds or poultry. You will also have opportunities to speak in public, to teach others, to carry administrative responsibility, to serve as a judge, to do research, and to improve your leadership skills.

Some of the projects require raising birds; others do not. Whether you live in the inner city, in suburbia, or in the country, you can enroll in some type of avian 4-H project.

The Advancement program has been divided into the five achievement units (levels) given in this leaflet. Check each item in a unit when you have completed it and have your leader initial the item. When you have checked all the required items, you and your leader sign the unit sheet at the bottom. (Older members should complete more than the minimum requirements.)

You may earn a 4-H achievement pin that is awarded at the end of the 4-H year. Each county may select an older member in this project to compete for regional and state honors and a trip to the National 4-H Congress in Chicago.

Your 4-H project leader can give you information about exhibiting at county and district fairs.

TYPES OF PROJECTS

For the market

These projects emphasize raising birds in enough volume to sell—or selling the birds' products—for profit. Products can be replacement pullets or poultry for egg production. Birds you can raise for meat are chickens, turkeys, ducks, geese, pheasants, squabs, guineas, quail, or chukars. You might have to develop your own specialty market for some of these. Some birds can be raised for special purposes, such as geese for weeding, pheasants for

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release for hunting, pigeons for racing, and cage birds for pet shops.

For breeding and home production

Breeding on a small scale or hobby-type projects emphasize raising a small number of birds in the house or in the backyard of a town or city—where the zoning laws permit. To make your work interesting, know the written standards of quality that are maintained by the breed association for the species you keep. If you have good quality birds, you can exhibit them in county or district fairs and in specialty shows held by the breed association. You can show both large and bantam chickens, ducks, geese, turkeys, pigeons, parakeets, and canaries. Any of these as well as guineas, pheasants, squabs, parrots, cage birds, quail, peafowl and chukars, can be bred and raised at home on a limited scale.

For science studies

Factual information through the use of either live or dead birds must be demonstrated or developed. Following are some examples of science-type projects:

- Comparing the embryonic development of a type of avian species at regular intervals during the incubation period.
- Demonstrating the results obtained when mating birds with dominant and recessive color patterns.
- Exploring the effect on egg production in poultry of extending the day by use of artificial lights.
- Demonstrating how the daily egg production can be increased or lessened by controlling the house temperature.
- Producing, managing, and marketing ducks of Muscovy-Perkin cross breeding.
- Investigating body measurements that can be used to determine bird quality.
- Developing economic marketing procedures for Japanese quail eggs.
- Developing procedures to obtain year-round egg production from game birds such as quail, pheasants, and chukars.
- Exploring the preference birds have for different colors of feed.

Other science projects can be developed with the help of your project leader. Generally, science-type projects are better suited to older 4-H members.

Important: If you are going to raise game birds of any kind, be sure and check with the California Department of Fish and Game to secure necessary permit or license.

Unit I — THE NOVICE

Type of project _____ **Species** _____

Member's name _____ **Club** _____

Market	Breeds	Science		DATE COMPLETED	LEADERS INITIALS
X	X	X	1. Identify and describe three types of avian species.		
X	X	X	2. Identify three sources of stock.		
X	X	X	3. List the species being raised or studied in your project.		
X	X	X	4. Identify and explain the purpose of that species.		
X	X	X	5. Describe how birds eat.		
X	X	X	6. Describe how birds drink.		
X	X	X	7. Point out and name the major parts of a bird (head, beak, eye, ear, wings, flight feathers, tail, legs, feet, and toes, etc.).		
X	X	(X)	8. Demonstrate how to catch, carry, and hold a bird.		
X	X	(X)	9. Describe the ways you can tell the difference between the male and female birds in your project series.		
(X)	(X)	(X)	10. Describe the requirements of good housing, and list the proper equipment.		
(X)	(X)	(X)	11. Explain what feeds are important for birds in your project.		
(X)	(X)	(X)	12. Discuss the raising of your birds including information on preparation of brooding facilities, operation of the brooder, management of the feed, water and lights, and care of the young birds.		
(X)	X	(X)	13. Submit 60-day management records and parental verification of member's care of project.		

I certify that I have fed, watered, and cared for _____ (number) birds continuously for 60 days or more.

_____ Member's signature _____ Date

Requirements completed:

_____ Leader's signature _____ Date

X = required

(X) = optional unless applicable to projects

Unit II — THE JUNIOR

Type of project _____ **Species** _____

Member's name _____ **Club** _____

Science Project members should set up their own goals. In addition, they may do any of the following goals that may apply. (To complete this unit, you must complete any **10** of these goals.)

	DATE COMPLETED	LEADER'S INITIALS
1. Name and describe six breeds or varieties of birds.		
2. Give one or more examples of birds raised for meat, for white and brown egg production, for showing, for special purposes.		
3. Describe desirable characteristics of an egg-laying bird and a bird for meat.		
4. Participate in a poultry judging or a showmanship contest.		
5. Build a piece of equipment for your project. Describe its use.		
6. List three procedures that prevent death of birds.		
7. Describe in detail the nutritional needs of your birds.		
8. Discuss protection of birds during periods of extreme hot and extreme cold weather.		
9. Demonstrate sanitization of avian equipment.		
10. Describe and give control methods for three different poultry insects or disease problems—for example, mites, flies, Newcastle Disease, Coccidiosis, etc.		
11. Prepare three different egg dishes. Report the comments of those eating them.		
12. Visit an approved poultry operation. Report on how the birds are housed, brooded, fed, watered, cared for, and how the eggs or birds are prepared for market then marketed.		
13. Present a demonstration on some aspect of your poultry project to your 4-H project group, your club, or some other group of people.		
14. Develop and put on a demonstration for your 4-H group or club.		

Requirements completed:

_____ _____
Member's signature Date

_____ _____
Leader's signature Date

Unit III — THE SENIOR

Type of project _____ **Species** _____

Member's name _____ **Club** _____

Science Project members should set up their own goals. In addition, they may do any of the following goals that may apply. (To complete this unit, you must complete any **10** of these goals.)

	DATE COMPLETED	LEADER'S INITIALS
1. Discuss value of breed standards. Name several sources of this type of information.		
2. Describe and demonstrate successful incubation of eggs.		
3. Instruct project members on how to select good birds.		
4. Discuss use of lights with baby birds, growing birds, laying birds, and meat birds.		
5. Describe the use of molting procedures with adult birds.		
6. Report on three diseases of birds, giving characteristics of disease and procedures for control.		
7. Attend two bird exhibits.		
8. Describe market classifications or categories of avian species of your choice (eggs, meat birds, qualities of cage birds, etc.)		
9. Help kill and pick a meat bird and demonstrate procedures in cutting up birds.		
10. Cook and help eat a meat bird.		
11. Train a bird to pose.		
12. Invite and introduce a guest speaker at one of your club meetings—for example, a local breeder, a pet store operator, a feed man, a farm advisor, etc.		
13. Keep production records for entire year's project.		
14. Develop a reference library of bird information that can assist you in your projects. This may include clippings, bulletins, books, pictures, etc.		
15. Develop and put on a demonstration for your 4-H group or club and at the area or county level.		

Requirements completed:

_____ _____
Member's signature Date

_____ _____
Leader's signature Date

Unit IV – THE LEADER

Type of project _____ **Species** _____

Member's name _____ **Club** _____

(To complete this unit, you must complete item **one** and any other **six** of these items.)

	DATE COMPLETED	LEADER'S INITIALS
1. Complete a Junior or Teen Leader project in an Avian Science Project. required for this unit		
2. Enroll and assist other members in an Avian Project.		
3. Assist younger members in designing and constructing equipment.		
4. Prepare teaching materials for use at project meetings.		
5. Develop a breeding program for an avian species. Diagram expected results and make a written or oral report.		
6. Plan and conduct a complete project meeting.		
7. Develop and put on an Avian Science Project demonstration at a county (or area) demonstration event or train a junior team for such an event.		
8. Speak on an avian science subject before an organization other than your 4-H club.		
9. Assist at a bird show or other countywide event as a clerk, secretary, recorder, assistant to the judge, master of ceremonies, panel member, speaker, etc.		
10. Assist in judging an avian event.		

Requirements completed:

_____ _____
Member's signature Date

_____ _____
Leader's signature Date

Unit V—THE RESEARCHER

Type of project _____

Name _____ **Club** _____

For your researcher project, do the following:

- Discuss your ideas with your project leader.
- Write your goals and the plan you expect to follow.
- Get your leader's approval.
- Follow your plan.
- Analyze the results and summarize.
- Report your results at a project or club meeting using charts and visual aids where appropriate.

Suggestions:

A. Compare measurable differences of one of these:

1. Bird weight gain on different feeding programs.
2. Percent of eggs hatched under a female bird with those hatched in an incubator.
3. Number of eggs laid by birds receiving artificial light during the fall with birds not receiving the added light.
4. Customer's preference among whole fryers, cut up fryers, breasts or thighs at a store.
5. Effects of age or rate of growth on the tenderness of the meat when cooked.
6. Results of crossbreeding—for example, color patterns, singing ability, livability of progeny, deformities and defects.

B. Do or learn about:

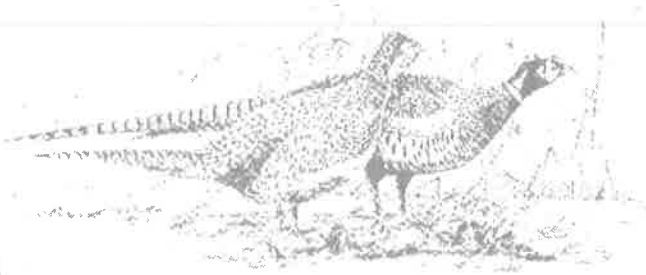
1. Incubation of eggs.
2. Brooder management.
3. Raising a quality replacement pullet.
4. Bird nutrition.
5. Protecting birds against disease.
6. Raising profitable poultry meat birds.
7. Obtaining year-round egg production.
8. Merchandising meat or eggs.
9. Keeping and using records as a basis for improving an Avian Science Project.
10. Other subject approved in advance by leader.
11. Plan and conduct a county or multi-county education avian event.

Requirements completed:

_____ _____
Member's signature Date

_____ _____
Leader's signature Date

4-H



MEMBER'S GUIDE • ADVANCEMENT PROGRAM

AVIAN SCIENCE PROJECT

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture, Jerome B. Siebert, Director, Cooperative Extension, University of California.

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4-H CLUB POULTRY PROJECT ADVANCEMENT PROGRAM

OVERVIEW

One of the major goals of the 4-H Club Program is the development of leadership abilities in youth. The 4-H club poultry project advancement program has been developed as a means of better allowing young people enrolled in the poultry project opportunity to attain this goal.

The advancement program has been divided into five achievement levels. At all levels member achievement must be recognized only by the members' project leader. A member's progress through the different achievement levels may be as rapid or as slow as the member desires. The completion of the member's 4-H poultry project is not dependent on the member's advancing from one achievement level to another.

This program is designed to provide the member a variety of experiences and a knowledge of poultry subject matter. The members will be required to learn about new things, to speak in public, to teach others, to carry administrative responsibility, to serve as a judge, and to do research--all activities designed to develop the member's own skills. As the member achieves, recognition should be accorded, first at the project club level, later as part of the county poultry project educational program, and finally at county member achievement event. The program at the county level will be supervised by a committee made up of both adult leaders and older 4-H members actively involved in the poultry project. This committee, with the approval of the extension advisor responsible for the poultry project will develop and interpret the information and the regulations required in initiating and maintaining member advancement activity in the poultry project.

UNIT I

THE AMATEUR POULTRY RAISER

	Date	Leader's Initials
1. Identify and describe three types of fowl.	____	____
2. Identify three sources of stock.	____	____
3. Identify and explain purpose of breed being raised in project	____	____
4. Describe the requirements of a good poultry house and list the equipment it should have.	____	____
5. Explain what feeds are important for poultry.	____	____
6. Discuss the brooding of chicks presenting information on preparation of brooding facilities, operation of the brooder, management of the feed, water and lights, and care of the chicks.	____	____
7. Demonstrate how to catch, carry, and hold a bird.	____	____
8. Point out and name the following parts of a bird: comb, beak, eye, ear, hackle, wings, breast, keel, tail, legs, feet, toes.	____	____
9. Describe several methods of differentiating cockerels from pullets	____	____
10. Discuss several procedures by which picking can be stopped or minimized.	____	____
11. Submit 60 days management records and parental verification of member's care of flock.	____	____

"I certify that _____ has fed, watered, and cared for _____ birds continuously for 60 days or more."

_____
Parent

Completed _____ _____
Leader's Name Date

UNIT II

THE JUNIOR POULTRY RAISER

	Date	Leader's Initials
1. Name and describe six breeds of chickens	____	____
2. Give one or more examples of poultry raised for meat, for white and brown egg production, for showing, for special purposes.	____	____
3. Describe desirable characteristics of a laying hen--of a broiler or fryer.	____	____
4. Participate in a poultry judging or showmanship contest.	____	____
5. Build a piece of equipment for your project--describe its use.	____	____
6. Indicate the bird characteristics that should be observed during care of birds as signs of developing health problems.	____	____
7. Describe in detail the feeding of project birds through one production cycle.	____	____
8. Discuss protection of birds during periods of extreme hot and cold weather.	____	____
9. Demonstrate sanitization of poultry equipment.	____	____
10. Describe and give control methods for three different poultry insect or disease problems. Example, mites, flies, Newcastle Disease, Coccidosis, etc.	____	____
11. Prepare three different egg dishes and report comments of those consuming them.	____	____
12. Visit an approved poultry operation, reporting on how the birds are housed, brooded, fed, watered, cared for, and the eggs or birds prepared for market and marketed.	____	____
13. Present a demonstration covering information on poultry to a group of people.		

Completed _____ Date _____

Leader's Signature

UNIT III

THE SENIOR POULTRY RAISER

	Date	Leader's Initials
1. Demonstrate value of Standard of Perfection.	____	____
2. Describe and demonstrate successful incubation of eggs.	____	____
3. Instruct project members on culling of chickens.	____	____
4. Discuss use of lights with baby chicks, growing pullets, laying hens and meat birds.	____	____
5. Describe use of force molting procedures with adult birds.	____	____
6. Report on three diseases of poultry, giving characteristics of disease and procedures for control.	____	____
7. Attend two poultry exhibits.		
8. Describe grades and sizes of eggs.	____	____
9. Help kill and pick a chicken and demonstrate procedures in cutting birds up.	____	____
10. Cook and help consume a chicken.	____	____
11. Invite and introduce a guest speaker at one of your club meetings. Example, a local poultryman, a builder, a feed man, a farm advisor, etc.	____	____
12. Keep production records for entire year's time.	____	____
13. Develop a reference library of poultry information that can assist you in your projects. This may include clippings, bulletins, books, pictures, etc.	____	____

Completed _____ _____
Leader's Signature Date

UNIT IV

THE POULTRY LEADER

		Date	Leader's Initials
1.	Complete a junior leader poultry or avian science project.	____	____
2.	Enroll and assist other members in the poultry project.	____	____
3.	Assist younger members in designing and constructing equipment.	____	____
4.	Preparing teaching materials for use at project meetings.	____	____
5.	Develop a breeding program. Diagram results and make written or oral report on findings.	____	____
6.	Plan and carry through a complete project meeting.	____	____
7.	Develop and put on a poultry or avian science project demonstration at a county or area demonstration judging event or train a junior team for such an event.	____	____
8.	Serve as a speaker, presenting poultry or avian science subject matter before an organization other than your 4-H club.		
9.	Assist in a skilled capacity at a poultry show or countywide poultry event serving as a clerk, secretary, recorder, assistant to the judge, master of ceremonies, panel member, speaker, etc.	____	____
10.	Assist in judging a poultry showmanship event.	____	____

To complete Unit IV, the member must complete 7 of the 10 items listed above.

Completed_____ Date_____

Leader's Signature

UNIT V

THE POULTRY RESEARCHER

Step 1. Carry through and report on a result demonstration comparing measurable differences in management procedures.

Examples of such an activity might include:

1. Fryer weight gain on different feeding programs.
2. The number of chicks hatched under a hen as compared to in an incubator.
3. The number of eggs laid by hens during the fall receiving artificial light as compared to hens not receiving the added light.
4. Determine the customers preferences when choosing among whole fryers, cut up fryers, breasts or thighs.
5. Determining the affect on age or rate of growth on the tenderness of the meat when cooked.

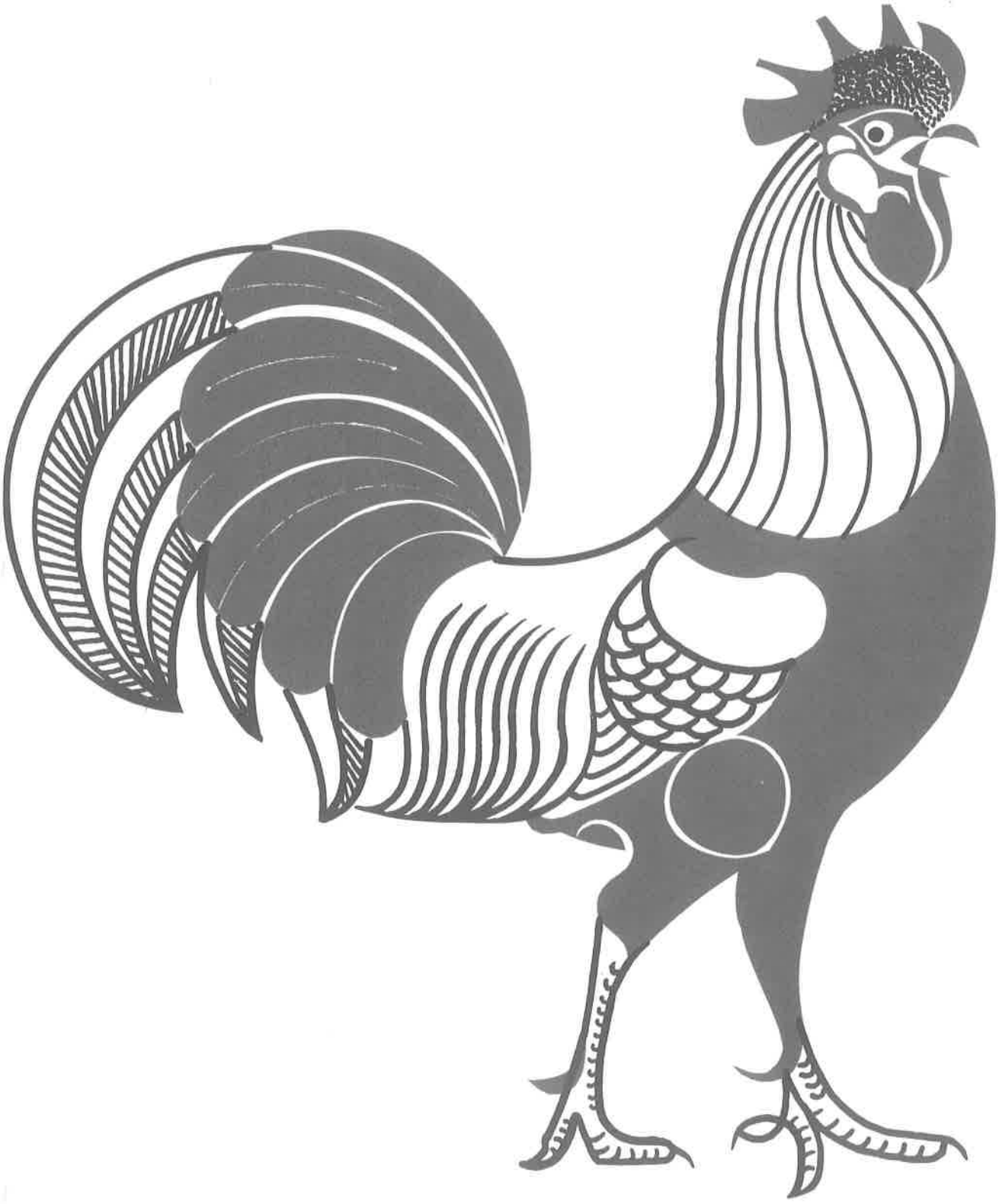
Step 2. Prepare a paper of 300 words or more on one of the following subjects. Orally summarize the report at poultry project meeting or county members educational event.

1. Incubation of poultry
2. Brooder management
3. Raising a quality replacement pullet
4. Poultry nutrition
5. Protecting poultry against disease
6. Raising profitable poultry meat birds
7. Obtaining year round egg production
8. Merchandizing poultry or eggs
9. Keeping and using records as a basis for improving poultry or avian science project.
10. Other

Completed _____ Date _____

Leader's Signature

4-H POULTRY PROJECT MANUAL



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This publication was prepared by Robert F. Davis, former State 4-H–Youth Leader; P. Dean Smith, Farm Advisor, Inyo-Mono counties; and a Poultry Committee including: W. E. Newlon, Agriculturist, Emeritus; John W. Melendy, Farm Advisor, Santa Cruz County; W. Stanley Coates, Farm Advisor, Sonoma County; and Virgil S. Stratton, Agriculturist, Emeritus. A. S. Rosenwald, Extension Poultry Pathologist, Davis, was the consultant on health, sanitation, and disease control.

Revised by Milo H. Swanson, Extension Poultry Specialist, Riverside.

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4-H POULTRY PROJECT MANUAL

In this 4-H Poultry Project Manual you will find three units: Pullet Growing, Egg Production, and Poultry Meat Production. Any one of these units will satisfy the requirements for participation in the Poultry Project. However, you may if you like, and we hope you will, consider doing one unit each year, or perhaps you will be able to do two at the same time. What you are able to do will depend on a number of things like available space, your time, your parents' consent, which you should weigh carefully at the outset.

PULLET GROWING UNIT

In the 4-H Pullet Growing Unit you will brood and rear 50 or more sexed pullet chicks to 6 months of age. These chicks should come from stock bred for egg production. You must keep an accurate record of your work on the Annual Project Report.

At the end of 6 months when you complete and turn in your record book, you will have a flock of laying pullets. This will be your egg production unit for the next year.

CHOOSING YOUR BIRDS

Choose your chicks wisely. Order them from a breeder or hatchery that produces chicks that live and produce well. They should be Pullorum - Typhoid Clean. See page 6 for explanation.

With adequate housing, chicks can be brooded at any time of the year you choose. Hatcheries operate year round, but you should place your order several months in advance of the desired delivery date. The most popular egg producing breed today is the White Leghorn.

BROODER HOUSE

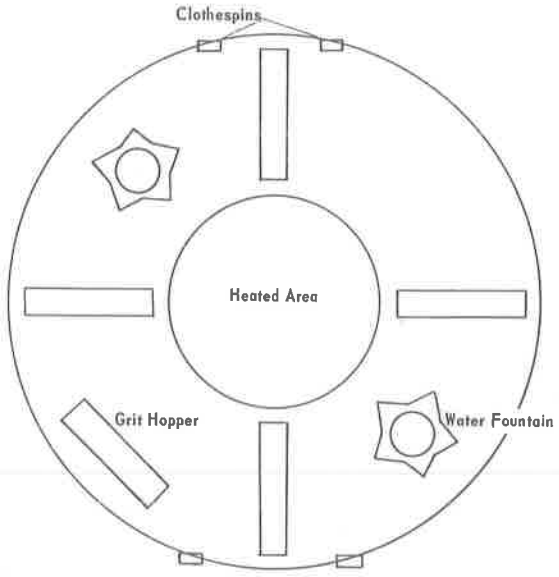
You will need a brooder house where you will have at least 75 to 100 square feet of space for 50 chicks. If you raise more than 50 chicks, 1 square foot for each chick is enough.

Your house should have a tight roof and be dry and clean. If you use an outdoor brooder with a wire floor, the heated brooder box (heat controlled by a thermostat) should be 4 by 4 feet for each 100 or less chicks. It should have a wire-floored porch about 4 by 10 feet. Use $\frac{5}{8}$-inch wire for day-old chicks. Don't brood on wire unless your laying flock will be housed on wire floors.

Your chicks will need heat. You will need a brooder that will warm 7 square inches per

chick to 90 degrees at the floor level. Several kinds of brooders will do this. Infrared lamps, electric hovers, and gas hovers are the most common. The heat from your brooder should be adjustable with a thermostat to hold a uniform temperature. If you use an infrared lamp, the height should be adjustable.

Here is a diagram of a good layout for your brooder and equipment. The circular fence shown should be about 12 inches high and can be made of tar paper, woven wire, or similar materials. Use clothespins to adjust it for size.



For 3 inches of space per bird, 4 feeders 18 to 20 inches long are needed. Feeders should be at least 4 inches wide and 2 inches deep. One small hopper, 1 foot long, 4 inches wide and 2 inches deep should be used for granite grit.

Use fountain-type waterers; use at least two 1-quart jar size fountains at the start. Add more or increase jar size as the chicks grow.

You should have a bed at least 2 inches deep of dry litter to start. Chopped straw, shavings, rice hulls, or sand will do.

BEFORE YOUR CHICKS ARRIVE

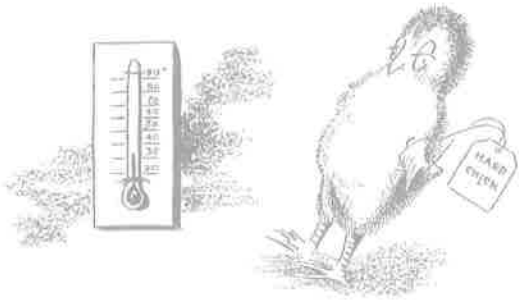
Scrub the floor and other equipment with lye water (1 can of lye to 10 gallons of water). This is a good disinfectant. Or use a recommended dilution of quarternary ammonium compound. **Caution: lye burns and must be used carefully.** After the floor is thoroughly dry spread litter 2 inches deep. Set up the brooder. Hang a thermometer under the edge of the brooder with the bulb 2 inches above the floor. Operate the brooder long enough to maintain a steady temperature of 90 to 95 degrees. Fill the hoppers with **starting mash.** Fill the grit hopper. Put fresh water in the containers. Set up a circular fence 2 to 3 feet away from the brooder, enclosing the feed, grit, and water containers. Get the chicks in the daytime when they are 24 to 36 hours old.

AFTER CHICKS ARRIVE

Place the chicks under the brooder immediately. The thermometer should read 90 to 95 degrees. Scatter mash on newspaper or egg flats placed on the floor around the brooder. This will help the chicks to learn

to eat. Watch the chicks carefully the first few days. Extend the fence each day, until by the 4th day it can be removed.

7th to 14th Day — Reduce the temperature of the brooder to 85 to 90 degrees. Too much heat is as bad as too little. It is not necessary to heat the whole house. The cold air away from the brooder "hardens" the chicks. Move the feed and water farther away from the brooder. Keep fresh mash before the chicks at all times.



2nd to 6th Week — Reduce heat about 5 degrees each week but do not let the temperature fall below 70 F until the end of the brooding period. Feed a good quality starter mash throughout the brooding period. Such a mash, obtainable at your local feedstore or mill, is complete in all nutrients required by the chick. There is no need to supply green feeds or grain separately. Avoid wastage of mash by keeping the feeders only half full. At 6 to 8 weeks of age change to **growing mash.**

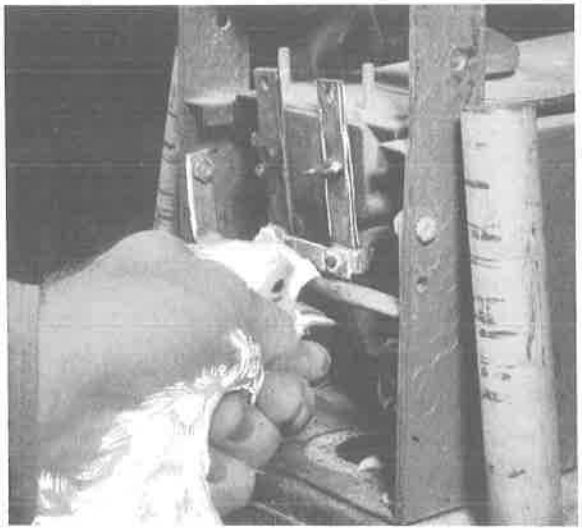
6th to 8th Week — Your pullets should be transferred to the growing house when they are between 6 and 8 weeks of age. Each bird should have 2 square feet of floor space. If your brooder house has 144 square feet or more, you can use it for growing. Allow 2 inches of feeder space for each pullet. Three 1-gallon fountain waterers should take care of your flock until it is 4 months old.

If your laying flock will be housed on wire, you should transfer your birds from the outdoor brooder to wire-floored growing pens. The floor should be made of 1- by 1-inch wire mesh, allowing 1 square foot of space for each bird. A pen 5 feet wide, 10 feet long and 15 inches high will handle 50 birds. Allow 4 inches of feeder space and 1 inch of water trough for each bird. Troughs for grit should be available.

Discontinue heat at 6 to 8 weeks, weather permitting. Chicks crowd together when they are sick or cold. Watch them at night as heat is reduced to see that they do not crowd. Birds of the heavy breeds may feather out later than lighter breeds, so they will need heat longer.

Debeaking — Pullets may be debeaked as early as 1 week of age (see Precision Debeaking of Week-old Chicks, Leaflet 2655), or debeaking may be delayed until after brooding. This operation prevents them from

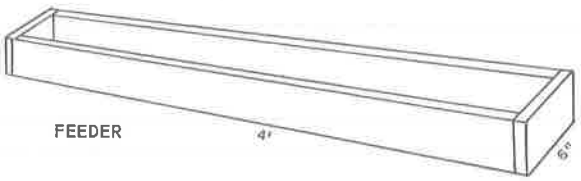
developing bad habits like tail picking, feather pulling, and cannibalism. Below is a picture of a debeaking machine in use.



10th to 20th Week — Continue to feed your pullets a good quality growing mash. You may wish to obtain from your hatchery a chart that will have a standard body weight curve for your particular strain. By weighing a sample of birds every 3 or 4 weeks and comparing their weights with the chart curve, you will know whether or not your birds are growing at a normal rate. If they are behind schedule, you should determine the reason and take corrective steps.

INTO THE LAYING HOUSE

At 4 to 5 months transfer your birds to the laying house. They may be housed in individual cages, wire-floored community cages or on floor litter. The exact type of house is not important if it provides adequate floorspace, good ventilation and a roof that doesn't leak. Three to four square feet are needed on solid floor housing.



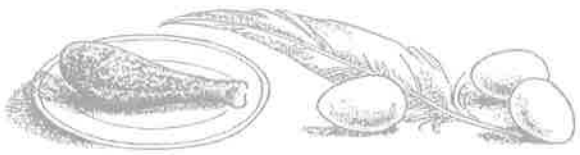
Provide layers on the floor with feeders 6 inches wide and 6 inches deep. Allow 4 inches of feeder space for each bird. Two feeders will provide space for 48 birds if they can reach the feeders from both sides. You should have from 40 to 45 pullets left after culling. A hopper 4 inches deep and 4 inches wide, 4 feet long with a partition in the center is large enough for granite grit and oystershell. Have enough 1-gallon fountain waterers to provide 1 inch of drinking space for each bird. Other waterers are satisfactory if they give the same amount of drinking space.

Place nests in the laying house as some of your birds will start to lay soon. (See next unit — 4-H Egg Production.)

If you put your laying flock in cages, allow a minimum of ½ square foot per bird. For example, a cage 12 inches wide and 18 inches deep will accommodate 3 birds. See Cooperative Extension publication AXT-191, How Many Hens in a Cage? for further details.

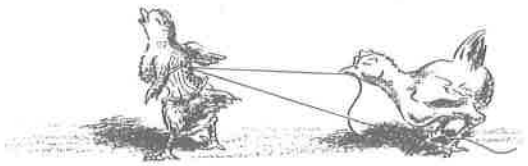
POULTRY FEEDING

Feed is used by poultry for two main purposes. Feed builds the cells and supplies energy. This energy provides power for the muscles, and heat for keeping the bird warm. A young bird uses feed mainly for rapid growth. An older bird uses feed mainly to produce eggs and to keep up its size and strength. In the feed are substances called proteins, carbohydrates, fats, vitamins, minerals, and water.

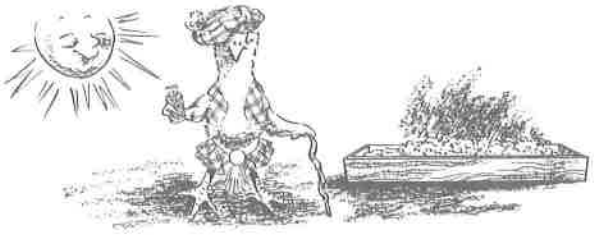


Proteins are needed for growth, maintenance, and egg production. Common protein supplements of animal origin are fish meal, ground meat—scraps, and dried skim milk. Cottonseed meal, soybean meal, and alfalfa meal are good sources of plant protein. Proteins are made up of "building blocks" called amino acids. Certain ones are known as "essential amino acids" for the chicken cannot survive without them in its diet. Therefore a good quality protein will contain most or all of these in proportion to the bird's requirements.

Carbohydrates supply energy. Like wood and coal, they "burn up" to produce heat and power. Barley, corn, wheat, and milo are some of the common carbohydrate feeds that supply energy.



Fat also supplies energy. Proteins and carbohydrate feeds, particularly when consumed in excess, are converted to fat. Animal grease and tallow are now added to some poultry rations to increase the energy level of the feed.



Vitamins are necessary for thrifty growth in chicks and for normal health in older birds. Modern poultry rations contain vitamin supplements to make up for deficiencies in grains and other natural ingredients. Green feeds and sunshine are no longer required for good performance.

Minerals are needed for bone, eggshells, and tissues. Grains and protein supplements do not supply all mineral needs. Calcium, phosphorus, manganese, common salt, and a number of trace minerals are added to the ration to prevent deficiencies.

LIGHTING

The age at which pullets begin to lay eggs is dependent in part on the lighting program used during the growing period. Too early sexual maturity results in many small eggs and other undesirable effects. Spring and early summer hatched chicks will be maturing during months of decreasing day length. Therefore, they need no special lighting program to control sexual maturity. But fall and early winter hatched chicks will mature too rapidly due to increasing day length the first half of the year unless light is controlled. For more detail see California Circular 529, Artificial Lighting for Poultry.

MANAGEMENT AND HEALTH

Here are four rules for good management and health:

- Cleanliness — Start with a clean house and clean equipment. Change water and feed several times each day when chicks are young. Clean the water containers every day. Add fresh litter weekly, or whenever it gets moist or dirty.

- Dryness — Rain and spilled water cause damp litter. Disease organisms develop in warm, moist litter. Empty, wash, and refill water fountains outside the house. Change damp litter in wet spots at once.

- Fresh Air — Birds can stand cold, fresh air if they can go to warm brooders when they are cold.

- Sunshine — Sunshine in the house helps keep litter dry and adds to the comfort and health of the birds.

SANITATION AND DISEASE CONTROL FOR GROWING REPLACEMENT PULLETS

You raise replacement pullets in order to have laying birds that will produce eggs profitably without disease outbreaks during the laying year. To do this, good poultrymen prevent serious disease costs by good management. This means that you must grow your pullets well isolated (100 feet or more) from older chickens or turkeys. Older, apparently healthy birds often carry disease that can spread to the young chicks.

We've already mentioned that you should buy healthy day-old chicks with Pullorum-Typhoid Clean or equivalent ratings and you should buy from hatcheries whose chicks live and do well in your area.

There are some diseases for which good vaccines are available. These are: fowl pox, Newcastle disease, infectious bronchitis, and laryngotracheitis. It is not possible to tell you exactly how or when to use these vaccines or even to suggest that you should use any or all of the vaccines. The conditions where you live and the experience of established poultrymen, together with the advice of your project leader, your farm advisor, and your veterinarian should help you decide. Remember, you are not only trying to grow healthy vigorous pullets; you also want them to lay well and will thus protect them with with needed vaccinations before they start to lay and by sound management during the laying year.

Coccidiosis is another disease that can kill your birds or make them stop laying eggs. One outbreak of any one kind gives them lifelong protection. If you raise and keep birds on the floor, it is important that your pullets get enough of the disease before they start to lay so that they will be protected after egg production starts. Watching the birds and getting an early accurate diagnosis is a must so you can treat the birds with an effective drug if they need it. Coccidiosis is seldom a problem in any birds kept on wire.

Because the drugs (Nicarbazin, Amprol, Zoalene, etc) used in feed for fryer chicks to prevent coccidiosis often do not allow the chicks to develop immunity (they prevent infection), it may be best not to use them for your replacements. You can discuss this problem with your farm advisor, your leader, or your veterinarian.

It is particularly important in growing replacement pullets that you take advantage of the diagnostic laboratories or veterinary practitioners as well as the advice of the farm ad-

visor doing poultry work in your county. Should any disease outbreaks occur or should you have a high percentage of sick birds or dying birds, be sure to find out what is wrong so that you can either treat the flock as a whole or can prevent further trouble.

There are a number of drugs and materials that are either injected or added to the feed or water and that are good to treat certain diseases, but you need to be sure that the chicks' diseases are being treated with the proper drug or that you are using the proper management to reduce your losses or the effect of the disease. The use of drugs and medicines without a definite purpose or reason is expensive and has very little value or may actually be harmful to the birds. Proper management, plenty of feed trough space, and plenty of water without "dope" in it are much more important than adding some new wonder drug which just increases the costs.

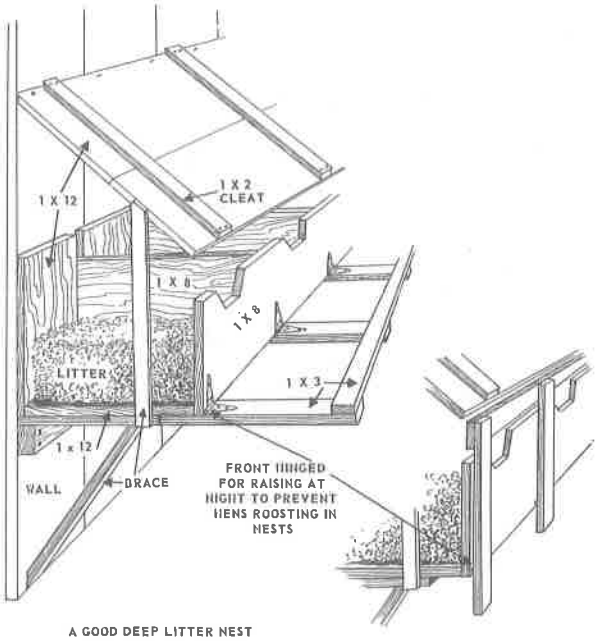
EGG PRODUCTION UNIT

LAYING HOUSE

Housing and space requirements for layers have already been discussed on page 4. If you wish to learn more about the type of modern housing being used by commercial poultrymen, see California Circular 526, Light and Temperature Controlled Housing for Poultry.

HOUSE EQUIPMENT

Nests — There are many kinds of satisfactory nests for laying hens. Enough nesting space is very important. One litter-type nest, 12 inches square, is required for each 5 hens. Each nest should be 10 inches deep and contain 6 inches of loose, fluffy nesting material such as rice hulls, shavings, or chopped straw. If group or community litter-type nests are used, allow 1 square foot of nest space for each 8 to 16 hens.



A GOOD DEEP LITTER NEST

Wire bottom (roll-a-way) nests can be used in any type of house. Litter-type nests are not recommended for use in wire-floored houses.

Feeders — For each laying bird provide 6 inches of feeder space. This means 25 feet of feeder space for 50 birds. If the birds can eat from both sides of each trough, 2 feed troughs, 6 feet long, will be adequate. These troughs should be 6 inches wide and 6 inches deep.

Prevent feed wastage. Never fill the feeders over ⅓ to ½ full.

Waterers — A continuous supply of fresh, clean water is necessary for laying birds. Running water in a narrow v-shaped trough is recommended. Other types of troughs or fountains are satisfactory if they are kept clean. Care should be taken to see that no water is allowed to drip or spill into the litter, or into droppings if cages are used. One inch of drinking space per bird will be adequate—even in hot weather. Remember the birds will drink twice as much water during hot days.

FEEDS AND FEEDING

Laying Ration — For proper nutrition your hens need a good laying mash. Although at one time it was popular to supply both a mash concentrate and a mixture of whole grains, we now recommend an all-mash ration properly balanced in all nutrients. Your feed-store or mill can supply you with a mash formulated for the age and production rate of your birds. Pullets during their first few months of lay require a higher level of protein, vitamins, and minerals because they are still gaining in body weight as well as laying eggs. Toward the end of the laying year as production rate goes down, nutrient density can also be lowered proportionately.

Feed Required — Laying hens will eat about ¼ pound of mash per day or approximately 90 pounds of mash between 6 and 18 months of age. At this rate, 50 pullets will consume 12½ pounds of feed daily. Mash should be available to the hens at all times. They will not overfeed. Keep feed wastage to a minimum by filling the hoppers only ⅓ to ½ full.

LIGHTING

Egg production is directly affected by day length. A minimum of 14 hours of light per day is required for top performance. Layers should never be subjected to decreasing day length. Use artifical lights to maintain a constant day length of 14 to 16 hours or use a "step-up" program to give increasingly longer days. See California Circular 529, Artificial Lighting for Poultry for more specific details.

EGG HANDLING

Eggs should be gathered at least once each day during cool weather and twice or more per day during warm weather. Plastic or rubber-covered wire pails are better than metal buckets for handling eggs. Place the pails of eggs in a cool location immediately after gathering. A room temperature of 55 degrees Fahrenheit with 75 percent humidity is ideal for an egg room. Let the eggs cool out overnight before putting them into cases or cartons. Always put the small end down.

If you plan to sell your eggs in cartons, you will need an egg candler and an egg-weight scale. Clean your dirty eggs before selling them by buffing or washing in warm water and quickly drying.

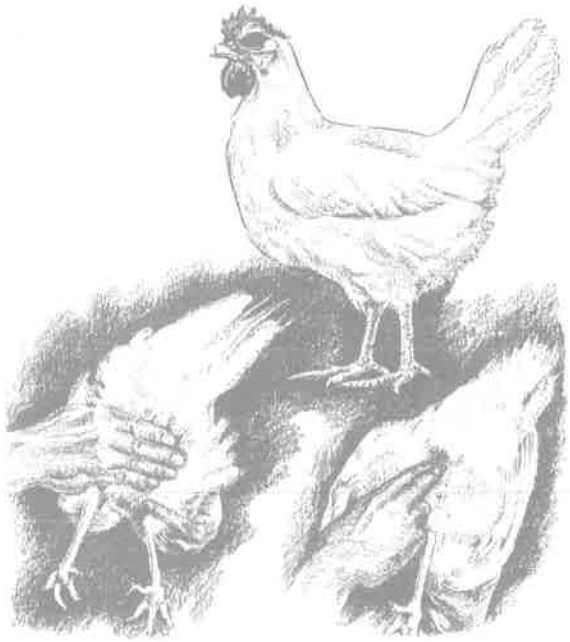
CULLING

Cull out and sell, or eat, all nonproducing hens, especially during the last half of the laying year. During the first half of the year most of the birds will lay profitably unless they are sick. Heavier culling is usually necessary during the last half of the laying year. Sick hens should be removed from the flock as soon as you see them.

These points will help you decide which hens to keep and which ones to kill:

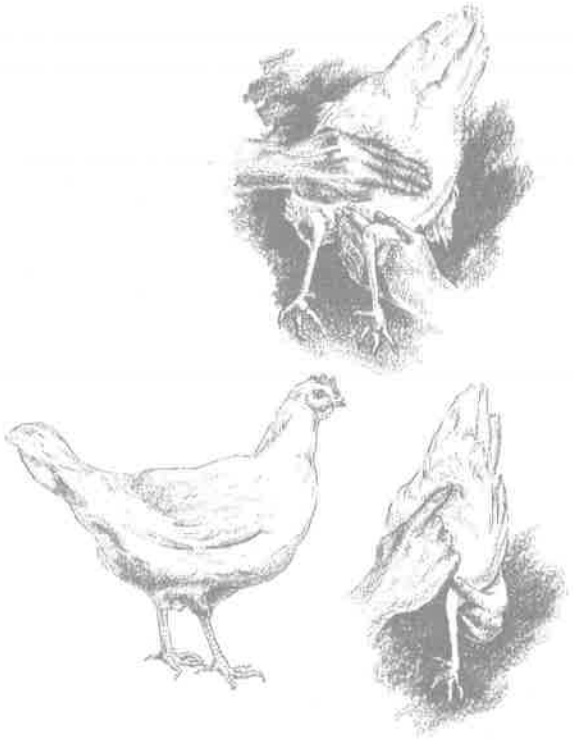
A laying hen has

- bright red comb
- soft pliable abdomen
- large moist vent
- 3 to 4 fingers' spread between pelvic bones
- nonmolting—no new feathers growing—old plumage.



A nonlaying hen has

- dull shriveled comb
- hard and often fat abdomen
- small round puckered vent
- 1 to 2 fingers' spread between pelvic bones
- molting—new plumage—many pin feathers.



DISEASE CONTROL

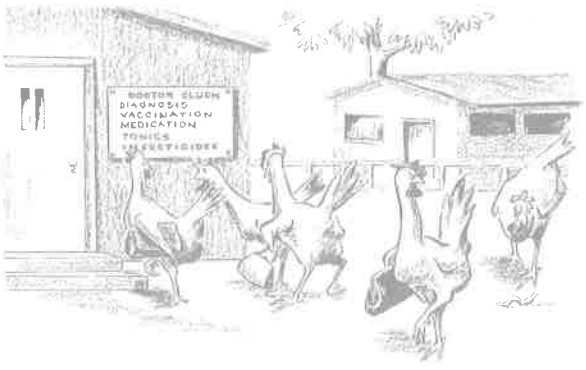
In any laying flock losses occur, such as those caused by leucosis (a tumor-forming disease). Therefore you must expect a few birds to die during the course of the laying year. If something happens to the birds that causes a marked drop in egg production or some unusual losses, find out what the cause of the trouble is and handle it through management, proper medication, or vaccination.

However, the use of drugs, tonics, medicines or appetizers just for the sake of using them or to pep up the birds is expensive, frequently has no value, or may even be harmful. Plenty of good feed and water, ample floor and watering space, and a proper lighting schedule—these are much more important

than fancy, high-priced preparations for preventing trouble.

It is particularly important not to mix birds of two different age groups and that you keep visitors out of the house and away from your birds. **Quite often people foolishly buy started or mature birds and add them to a flock.** These birds may seem perfectly healthy but carry the germs causing such infections as chronic respiratory disease (CRD), fowl cholera, or infectious coryza. When apparently healthy but actually diseased birds are added to the flock, the infection spreads, and the birds may drop out of egg production or become unthrifty.

Before the birds are in the laying house a vaccination program should be decided upon to give the best protection for your flock against the diseases that cause problems in laying birds in your area. Talk this over with your leader and your farm advisor, or with men in diagnostic laboratories of your veterinary practitioner. All vaccination should be done and immunity well established by the time the birds are 6 months old, preferably before they start to lay.



If you keep layers on litter or if the birds were brooded with no opportunity to pick up enough infection to cause immunity before they start to lay, you may have trouble with coccidiosis. Coccidiosis occasionally occurs on wire too. Prompt, careful, accurate diagnosis is important. Also important is the proper use of proper drugs to treat the birds and the use of wire mesh platforms under the feed and water to reduce the amount of droppings the birds can eat. If you use such platforms, make them big enough so that the droppings go underneath and the birds cannot reach them. To avoid, treat, and manage outbreaks of coccidiosis, consult your farm advisor or leader, who will guide you in seeking advice.

External parasites, such as mites, ticks, and lice, may cause some trouble and reduce lay. Proper use of proven insecticides should help you control these. You need to know the pest against which you are spraying. If you run into trouble, talk with your leader and farm advisor.

RECORDS

Keep your records up to date. Successful poultry raisers keep accurate records. For this project you will need

- Annual 4-H Project Report and Calendars
- 4-H Personal Development Report (optional)
- Daily Egg Record (one for each two months)
- California 4-H Member's Record Book Cover (optional, 15¢ each)

Five minutes a day will keep your records up to date. Keep records every day! When you have completed your record at the end of the club year, turn it in to your leader. If you have problems with your records at any time during the year, ask your leader or junior leader to help you.

POULTRY MEAT UNIT

In the Poultry Meat Unit you must raise, market, and keep records on 50 or more meat-type chickens. This unit is complete only when you have finished your records and have returned them to the farm and home advisors' office in your county.

Remember! Outstanding poultry meat projects are those returning profit to the 4-H member. You can make a profit by so managing your flock that you market a high percentage of top quality meat poultry.

Read and study the instructions in this publication. Pay close attention to sound management information.

GOOD HOUSING IS A MUST

Your poultry house need not be fancy if it provides ample room, a dry floor, fresh air and, if possible, sunshine. Meat-type poultry needs at least 1 square foot of floorspace per bird. However, for 50 chicks, do not use floor-type housing that provides less than a total of 75 square feet of floorspace.

Your brooder house should be thoroughly cleaned and scrubbed with a household or dairy soap or detergent. Let it dry before you put in litter.

For meat-type poultry, solid floor-type housing is preferred. You can, however, raise excellent fryers in wire batteries if you overcome the problems of cannibalism and breast blisters. In wire batteries, flooring under the brooder should be made of $\frac{5}{8}$-inch hardware cloth. After 6 weeks, the flooring used should be 1- by 2-inch rectangular mesh poultry wire.

With either wire or solid floor it is important that they be dry. Your chicks must be protected against both overheating or chilling.

All poultry requires plenty of fresh air. Your brooder house should provide this without any direct draft. If your house becomes stuffy or smells of ammonia, you do not have enough fresh air.

BROODERS MUST BE DEPENDABLE

The brooder is your chicks' source of heat. In your project you can use any commercial

or homemade-type brooder that will furnish a dependable source of heat that you can measure and control. Select the type brooder that best fits the cheapest and surest source of heat that is available to you. Electricity and gas are the most common heat sources.

Your brooder must be able to maintain temperature up to 95 degrees at floor height. A control device (thermostat) should allow you to regulate the temperatures according to the age needs and health of the flock.

Brooders that have hovers should furnish 7 square inches or more of hover space per chick. If an infrared heat bulb is used, one 250-watt bulb will supply enough heat for 50 to 75 chicks. Hang the bulb so that the bottom of it is 18 inches from the floor. Be sure that this light hangs from the rafter or ceiling on a chain or rope so that it cannot fall on the litter and start a fire. Do not suspend the light by the electric light cord alone. Take all temperature measurements 2 inches above the floor or at the height of the chicks' backs. Under hovers, make these measurements near the outer edge of the hover.

Watch your chicks closely. If they huddle or pile up, they are too cold, so give them more heat. If they are close to the edge of the hover trying to keep away from the heat, then the temperature is too high. If they spread out evenly under the brooder, the heat is just right.

Start your brooder at least 2 days before the chicks arrive. This gives you a chance to see that the brooder will maintain a steady temperature of 85 to 95 degrees (depending on the weather conditions) and will help dry the house. Have the brooder set so that chicks can be placed under it as soon as they arrive. Brooder temperatures should be lowered about 5 degrees each week so that by the end of the 5th or 6th week the brooder no longer need be used. The temperatures under infrared brooders are lowered by raising the height of the lamp from 2 to 3 inches each week. During periods when the chicks are sick, increase the heat until the sickness is over.

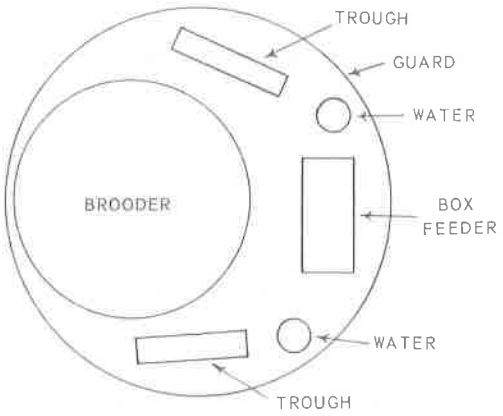
THE LITTER TO CHOOSE

Shavings, rice hulls, or chopped straw make good litter. Place 1 inch of litter in the brooder house before the chicks arrive. When the litter gets dirty, add another inch of litter. Take out and replace any areas or spots of damp litter.

GUARDS SAVE CHICK LIVES

For the first 4 days, a guard or fence 12 inches high should be placed around the brooder to prevent your chicks from wandering too far away from the heat. Your fence can be made from long strips of cardboard, corrugated paper, or wire fencing covered with burlap.

Place the fence so that the birds have room to eat and drink. If one edge of the fence is placed close to the brooder, your chicks will be able to find the source of heat. Enlarge the circle each day until you remove it on the 4th day.



FEEDING IS IMPORTANT

Feed a commercially mixed fryer mash. This type feed will contain everything your chicks need. Good feed will enable your stock to live and grow. Birds on the wrong feed do not make rapid growth.

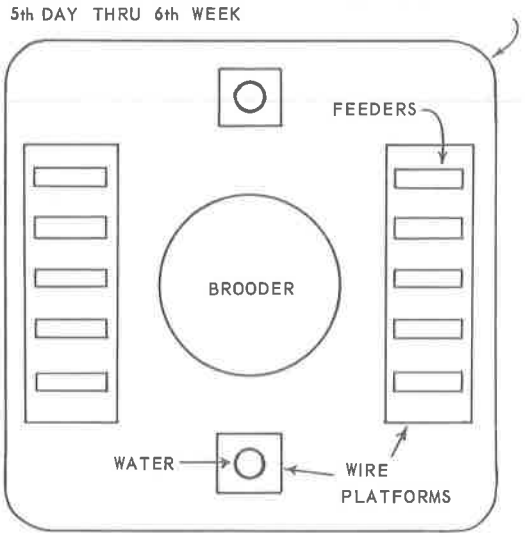
You will need about 8 pounds of mash for each chick during the 8- to 9-week period. Feed bought in 100-pound sacks is usually cheaper than that purchased in smaller amounts. When a sack is nearly empty, it is time to buy another. In this way you will always have fresh feed for your birds.

Start your chicks eating as soon as they arrive. Place mash on egg flats, shallow pie tins, wide shingles, or other easy-to-get-to surfaces. Supplement this with mash in small troughs or shallow box feeders. One 2-foot-long trough, 2 to 4 inches wide and very shallow, is a good size to use the first few days. A little chick scratch and grit sprinkled on top of the mash will attract the chicks to the feed. For 50 chicks, 1 pound of scratch should be plenty.

As the chicks get bigger, use wider and deeper troughs. There must be enough space for all birds to eat at the same time. Never fill the troughs over ⅓ to ½ full. If you have to fill your feeders over this level in order to keep mash in front of your birds at all times, you do not have enough feeder space. This means that before you are through with your project you will need about 3 inches of trough space per bird.

Remember, birds that are eating are healthy and active. Birds that refuse to eat are usually getting sick.

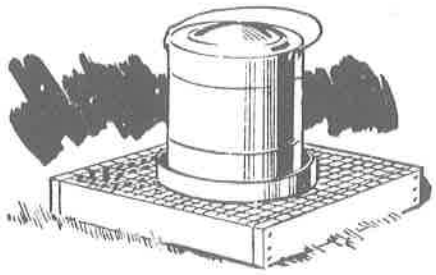
After the first few days, place wire platforms under the feeders to assist you in keeping the feed clean.



WATER IS IMPORTANT

Keep fresh clean water in front of the chicks at all times. Always keep two or more containers of water in the house.

After the first several days, place the drinking fountains on wire platforms that chicks cannot get under. A 2- by 2-foot wire platform 6 inches high for each 1-gallon waterer is a good size.



BUY THE RIGHT CHICKS

To start your project you will need 50 or more day-old chicks. These chicks should be meat-type stock—not stock bred primarily for egg production. Some meat-type birds are New Hampshires, White Rocks, or crosses of these or other heavy breeds.

Bring your chicks home in the daytime when they are from 24 to 36 hours old. Place them under the brooder immediately while there is still daylight so that the chicks can see to eat and drink.

DON'T LET YOUR BIRDS PICK

When birds pick each other, this is called "cannibalism." If your birds start picking, debeak them immediately.

KEEP YOUR BIRDS HEALTHY

The management suggested here should prevent serious disease outbreaks in your chicks. Your birds should be as far away from other poultry as possible. A minimum distance of 100 feet is desirable.

Coccidiosis is an intestinal disease caused by a very small parasite and can be a major problem. You can buy mashes that contain drugs that will prevent expensive losses. Some of these are Nicarbazin, Amprol, Zoalene, and sulfaquinoxaline. Use a feed that has one of these in it.

You can buy vaccines which help prevent fowl pox, laryngotracheitis, Newcastle disease and infectious bronchitis. For fryers it may not be necessary or desirable to vaccinate the chicks at all. If you are wondering whether you should vaccinate or not or how to do it, discuss the problem with your leader and farm advisor.

If your chicks get sick, you should try to find out what is wrong before spending money for medicine or vaccines. Be sure to take out dead birds as soon as you find them. There are diagnostic laboratories and practicing veterinarians to help you. Your farm advisor can tell you just how to get this help. He can also suggest things to do to keep the birds eating and cut down losses until you find exactly what to do.

MARKETING IS PART OF THE PROJECT

If you have done a good job, your birds should be ready to sell when 8 to 9 weeks old. At this age, good pullets will weigh 3¼ pounds and good cockerels 3¾ pounds each.

No matter how well you raise your birds, you cannot make a profit unless you sell them. Of the 50 chicks you started in the project, you should have between 45 and 50 to sell. Birds can be sold live or dressed. Dressed

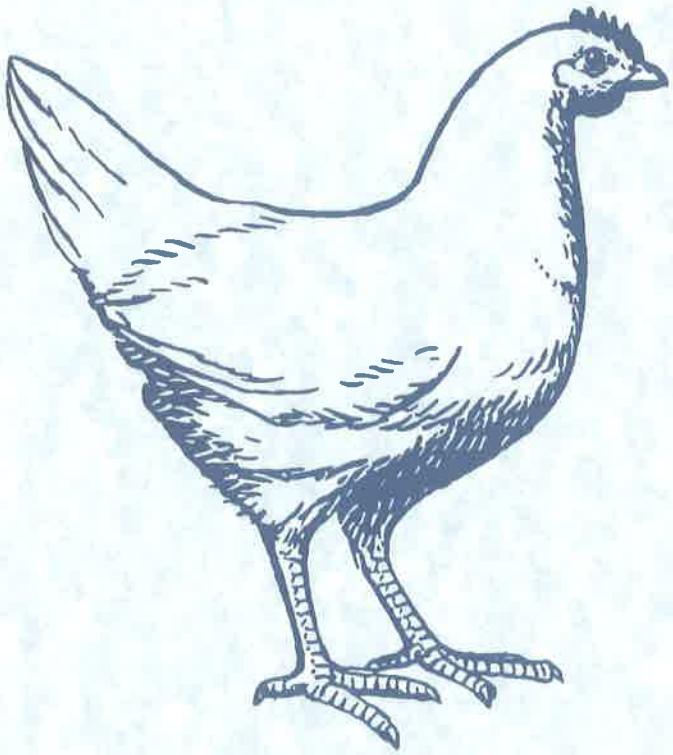
birds bring more money but take more time and labor on your part.

Your ability to market your birds is an important factor in making your project a success. They may be sold to your parents or friends, to markets, or to commercial buyers.

Attention to details is the key to success. If you expect to raise top quality birds you must do a good job of caring for your stock and noting the many small details. Spending time with your birds may help you to stop many troubles before they start. Take a good look at your birds several times a day.

To complete your project you must fill in your record book and have your leader check it. Your project is not complete until the farm advisor receives your book.

Animal Care Series:



BROILER

CARE PRACTICES

California Poultry Workgroup
University of California ♦ Cooperative Extension

FOREWORD

"Broiler Care Practices" is one of a series of University of California publications addressing the issue of animal care as it relates to food production in California. The information was contributed jointly by the Poultry Workgroup, Cooperative Extension and industry representatives.

"Broiler Care Practices" was edited by Carolyn Stull, Animal Welfare Specialist, Veterinary Medicine Cooperative Extension, University of California

The authors include: Ralph Ernst, Poultry Specialist, Department of Avian Sciences; Duncan McMartin, Extension Veterinarian, School of Veterinary Medicine; Francine Bradley, Poultry Specialist, Department of Avian Sciences; Donald Bell, Poultry Specialist, Department of Avian Sciences; James Millam, Associate Professor, Department of Avian Sciences.

The information in this publication is valid as reference material until January 1, 1998, unless revisions are necessary at an earlier date.

TABLE OF CONTENTS

INTRODUCTION

Animal care recommendations have evolved from years of scientific research and practical experience. This publication was designed to outline acceptable practices for the care and rearing of meat-type chickens (rock-cornish game hens, broilers, fryers, or roasters) and breeding stock.

Poultry meat production is an important industry in California. In 1993, California produced 216 million meat chickens valued at $353 million. The majority of these meat chickens were grown on an estimated 175 ranches in the San Joaquin Valley. In addition, there are many smaller farms in California producing specialty chickens.

Poultry require constant care and attention. This care should be performed or supervised by an experienced person. Novices who wish to raise poultry should familiarize themselves with detailed information on proper care before chicks are obtained. Help and information is available from the University of California, Cooperative Extension, experienced industry representatives, and through many books and publications.

HATCHING AND SERVICING CHICKS

Incubation

Proper incubation conditions are necessary to produce healthy chicks. Optimum conditions vary with the age, shell quality and size of eggs to be set. Dry bulb temperature in forced draft incubators, should be between 99.5 and 100°F (37.5 - 37.8°C) with a wet bulb temperature of 83 to 87°F (28.3 - 30.5°C). Eggs should be set large end up and turned hourly, or more often, during the first 14 days of incubation but never after 18 days of incubation.

Hatchers, hatching trays and other equipment should be cleaned and sanitized after each use. Nest clean eggs are preferred. They may be sanitized on the farm or at the hatchery using approved procedures. Egg sanitation is more effective if it is done as eggs are collected or immediately after collection.

Setter and hatcher rooms require proper ventilation (approximately one air exchange per minute) to provide oxygen and remove carbon dioxide produced by developing embryos. Most commercial setters perform best when the room temperature is maintained at about 78°F (25.6°C) with a relative humidity of 50 to 55 percent.

Chick Processing

Chicks should always be transported in new disposable boxes with new pads or plastic boxes which have been freshly cleaned, sanitized and fitted with new pads. The boxes should have a lining that provides good footing (such as excelsior pads or absorbent mats) and be constructed to allow adequate ventilation. The number of young in the box should take into consideration the outdoor temperature and transit time. Chick handling from hatcher tray through servicing (sexing, beak trimming, injection, etc.) should be controlled to avoid internal or external injury.

Boxes of young chicks should always be handled carefully and never thrown or dropped. If boxes must be stacked, care should be taken to insure adequate ventilation.

If chicks are to be held in the hatchery, they should be placed in well ventilated rooms held at no less than 74°F (23.3°C) and 55 percent relative humidity. An air exchange of 25 cubic feet per minute (cfm) per 1000 chicks is recommended.

Prior to hatching, the chick absorbs the remainder of the yolk sac into its body cavity. The yolk sac contents are rich in energy and moisture and can sustain the young bird for up to 72 hours, in the absence of food and water. However, chicks should be placed on feed and water as soon as possible after hatch.

Chick delivery vehicles should be properly ventilated to control temperature and humidity, and to

remove carbon dioxide and provide oxygen (ventilation capacity 25 cfm/1,000 chicks). Chick deliveries should be scheduled early in the morning during hot weather to minimize heat stress whenever possible. Heat stress during loading and unloading of chicks can be critical. Delivery trucks should be cleaned and sanitized after each delivery.

Beak Trimming

Many meat type strains are non-aggressive and do not require beak trimming. Beak trimming in the hatchery protects chicks from cannibalism later in life. If beaks are to be trimmed, a hot blade trimmer with a blunt blade should be used to notch the upper beak. By 10 days of age the tip of the upper beak will separate. An electric spark trimmer can also be used. The spark arcs between two electrodes and leaves a small hole in the beak. After a few days the tip of the upper beak will separate leaving a trimmed upper beak. These methods leave the tip of the beak intact until the chick learns to eat and drink which reduces early stress.

Hatchery Vaccination

Vaccination in the hatchery is essential to protect meat type chickens from Marek's disease and sometimes other disease agents. The vaccination program should be customized to protect chicks from disease agents likely to cause mortality on the farm where they will be grown. Vaccines can be applied in the hatchery by injection or by spray methods (for details see HEALTH MAINTENANCE PROGRAMS page 11).

Vaccines can also be applied successfully by egg injection at the time of egg transfer from the setter to the hatcher. This procedure initiates an earlier immune response to protect chicks after hatching.

Hatchery Losses

Unhatched eggs and cull chicks should be humanely euthanized as soon as possible after the hatch is pulled. Carbon dioxide inhalation or maceration are acceptable methods of accomplishing this.

BROODING AND GROWING

Brooding Temperature

Newly hatched chicks are unable to control their body temperatures at extremely high or low ambient temperatures and must be provided a narrow temperature range for optimum health and growth. At hatch, chicks require an ambient temperature of 85 to 87°F (29.5 -30.5°C) or a cooler ambient temperature with supplemental radiant heat. Chicks can also be raised successfully in a cool room adjacent to an area (or hover) with a warmer temperature (95°F, 35°C at day-old). This is sometimes referred to as cool room brooding. As chicks grow and feather out, their ability to regulate body temperature improves until about six weeks of age when they can control their body temperature within the ranges normally experienced in commercial poultry houses. Brooders should be started 24 hours in advance of chick arrival to warm litter and drinking water.

Litter

Chicks are often started on floors covered by two to four inches (5-10 cm) of new litter material. Several types of litter material can be used successfully. Wood shavings and rice hulls are preferred but chopped straw, peanut hulls, sawdust, and other materials are sometimes used. The litter material needs to be free of chemicals, pathogens or other contaminants and should not be excessively dusty. Materials which are absorbent and have high insulating qualities are preferred. Litter can be reused if the previous flock has not experienced health problems or unusual mortality. Wet and caked areas should be removed and new litter material added as required. With proper ventilation, litter can be maintained in good condition. If litter cake begins to develop, it should be removed or the litter should be stirred (e.g. rototilled). Waterers are often moved at frequent intervals to avoid cake build-up.

Light For Brooding

During the first week, chicks should have a minimum light intensity of 1 foot candle (10 lux). Subsequently, the light intensity can be reduced to help control cannibalism.

Chick Guards

Chick guards are used to closely confine the chicks until they learn the location of the heat, feed and water. The area within the brooder ring is gradually increased in size and the guard is removed when the chicks reach 6 to 8 days of age. Guards may not be necessary if chicks are started in a more confined area such as with partial house brooding. Chick guards can be made of welded wire, metal, corrugated cardboard or any other

suitable material. Guard material should be 12 to 15 inches (30 to 38 cm) in height and long enough to form an ample ring around the heat source.

Feeding and Watering Procedures

Adequate numbers of feeders and waterers are important during the early life of chicks. Water is the most critical nutrient for the newly hatched chick. Chicks are often given water before feed to prevent dehydration and assure that they locate water sources. Water should be in place 24 hours before chicks are introduced so that water temperature approximates ambient temperature. Feed may be introduced immediately or within a few hours of chick placement.

Feeding and watering equipment used to start chicks must be properly sized so that chicks can eat and drink comfortably. The edge of the feeder should be located at the average level of the chicks' backs. Feed is often placed on egg flats or in plastic trays during the first few days to help chicks locate feed. Changes in placement of feeders should be made gradually so that the chicks find the new feeder locations.

Chickens should always be grown on diets which meet their nutrient requirements. Guidelines for nutrient requirements appear in the "Nutrient Requirements of Poultry" as published by the National Research Council, National Academy of Science (1994). Feed should contain a mold inhibitor to protect against mold development and contain an antioxidant to protect fat soluble vitamins from oxidation. Prolonged storage of mixed feeds should be avoided. Feed should always be protected from rodents and moisture.

Space

Space required for meat type chickens varies with their size, housing and management system. Broiler chicks should be provided a minimum floor space of 72 square inches (465 cm^2) per bird up to 49 days of age if grown on litter.

CARE OF JUVENILE AND ADULT BREEDING STOCK

Care practices for replacement breeding stock should follow the general principles previously discussed for meat stock with the exceptions noted in this section.

Feeding

To achieve successful reproduction, meat-type breeding stock must be raised on a feeding program which limits growth rate and controls mature body weight. This requires feeding predetermined amounts of feed adjusted for the age, egg production, temperature and body weight of the flock. During the juvenile growing period, male and female chicks must be housed separately and grown on separate feeding programs to assure proper weight for successful reproduction. Samples of males and females should be weighed at frequent intervals so that nutrition programs can be adjusted to maintain appropriate body weights throughout life. When the flock approaches sexual maturity, it should be transferred to breeder housing with an appropriate male to female ratio (usually about 15 males per 100 females). In the breeding facility, separate male and female feeders should be used so that the body weight of both sexes can be controlled.

Nests

Nests for breeder hens should be properly sized to provide a comfortable environment for hens to lay. If nest holes are too large, more than one hen may attempt to enter the same nest resulting in injury and egg damage. One nest space should be provided for every 4 to 6 hens. The nests should be maintained with clean nest pads or nest litter. Nest boxes should have perches in the front of the nest for safe entry.

Lighting

Developing pullets of meat-type strains which are exposed to increasing daylengths will begin laying eggs before they have reached optimum body size. This can result in excessive production of small eggs and these hens are more susceptible to prolapse of the oviduct which often leads to death. To prevent these problems, pullets should be raised on short days (e.g., 8 hours) in a darkened house or on decreasing daylengths if housed in open-side housing. The daylength should be increased to initiate lay when adequate body development and age have been achieved. Males should be light stimulated at least a week before

females to assure good fertility at the start of lay. Lamps in breeder housing should provide a minimum light intensity of one half foot-candle (5 lux) at the level of the feed trough.

Hens need to receive artificial light to maintain a daylength of at least 14 hours to initiate and maintain egg production. The lighting system should be controlled by a reliable timer which will turn the lights on and off at appropriate times. In open-sided houses, lights are normally used to supplement natural daylength. The light schedule should assure that daylength does not decrease. To achieve this, artificial daylength must exceed the longest day at the latitude where the flock is located.

Egg Care, Handling, Sanitation and Storage

Eggs should be collected at least two times per day. If they are to be sanitized, this should be done as soon as possible after collection using an approved procedure. Only sound, nest-clean eggs are recommended for hatching. If floor eggs are to be set, they should be washed using an approved procedure, as soon as possible after collection and set in separate machines from nest-clean eggs.

Eggs which are stored before setting should be held in clean rooms at a temperature of 55 to 65°F (12.8 - 22.1°C) and 75 percent relative humidity. The higher temperature (65°F) is preferred for storage of 1 to 7 days. Eggs held more than 7 days will benefit by storing in plastic bags and turning daily.

ENVIRONMENT

Housing

The purpose of a poultry house is to confine birds and protect them from environmental extremes which might increase mortality or reduce growth, immunocompetence, fertility or egg production. Many types of structures are used successfully and houses may be constructed from materials which are readily available in the area. Wood frame or steel structures are popular. Some insulation is necessary in most climates to maintain a suitable environment. Interior surfaces which can be easily sanitized are preferred.

If environmental temperatures are expected to exceed 90°F (32°C), some provision is necessary for cooling. Successful systems include roof sprinkling, inside fogging, fans positioned to move air over birds, building insulation and evaporative pad cooling of incoming air. The amount of protection required varies with the severity of the environment.

Air Quality

The progression in poultry management from extensive to more intensive systems has resulted in increased bird density and concentration of their waste products. There is the potential for harm to both birds and workers if airborne contaminants exceed the limits recommended by the National Institute for Occupational Safety and Health.

Of the airborne contaminants, dust is the most obvious. Poultry house dust may be the product of feed, manure, litter, and/or dander. The California Division of Occupational Safety and Health (Cal/OSHA) set permissible exposure limits for total and respirable "nuisance" dust at 10 and 5 mg/m^3, respectively. Cal/OSHA defines nuisance dust as the total dust measured. This is an industry standard measurement that approximates the total dust in the air.

Cal/OSHA also has established ammonia exposure limits for workers. The 8-hour TWA (time weighted average) exposure limit for ammonia is 25 ppm and the 15-minute short term exposure limit is 35 ppm. While Cal/OSHA does not have a permissible exposure limit for endotoxins (derived from bacteria), employees exposed to endotoxins and dust can develop the following symptoms: cough, chest tightness, diarrhea, eye irritation, fatigue, fever, headache, nasal irritation, nausea, and phlegm.

It is incumbent on the poultry manager to manage the environment so that dust, endotoxins, and ammonia levels are kept as low as possible. If these levels cannot be kept at a minimum, efforts should be taken to reduce the employee-exposure time and provide respiratory protection in the form of a two-strap, OSHA-approved dust mask.

Ventilation

Ventilation is required to maintain good air quality for poultry and appropriate litter moisture for a healthy environment. Air exchange is necessary to remove carbon dioxide and ammonia from poultry houses and to bring in oxygen; however, removal of heat and moisture from litter houses usually requires greater air exchange than required for carbon dioxide and ammonia removal. Long term ammonia exposure of birds should not exceed 10-20 ppm. If this limit is consistently exceeded, damage will occur to lungs, trachea and eyes; young birds are more sensitive than older birds.

Ideal moisture levels for litter are 25 to 35 percent. Lower levels result in excessive dust which is detrimental to the respiratory system. Higher moisture levels result in excessive caking of litter which can contribute to breast blisters, disease problems and lameness.

HEALTH MAINTENANCE PROGRAMS

The scientific definition of health in an animal is the absence of disease. Bacteria-free chickens in laboratory isolators grow approximately 15 percent faster than similar chickens in a "conventional" environment. This ideal cannot be achieved economically on commercial farms. The use of immunization, sanitation, preventive medications and biosecurity are discussed as the preferred preventives for infectious disease, with only occasional alternatives such as strategic medication.

Immunization

The planned deliberate induction of immunity is one of the most beneficial and effective management tools available for the prevention or suppression of infectious disease (as compared to the natural induction following unpredictable exposure to field infection).

There are two types of immunity: passive or active. Passive immunity occurs as antibody in the yolk of developing embryos; it is derived from the maternal bloodstream, and is present for 2-4 weeks in the blood of newly hatched chicks. The presence and level of passive immunity in the chick is therefore dependent on the presence and level of antibody in the maternal parent. The goal of some vaccination programs is the production of high levels of passive immunity in chicks, e.g., for avian encephalomyelitis and infectious bursal disease. Passive immunity is generally effective against viral diseases, but less so or ineffective against bacterial infections, e.g., mycoplasmas or salmonellae.

Active immunity occurs when an antigen is introduced and processed through the bird's immune system, resulting in various protective responses. These responses include the production of antibody and/or macrophage cells which will act to protect the bird if it is exposed to that antigen at a later time.

Active immunity can be produced either by living or inactivated antigens, or combinations of the two. Most living bacterial and viral antigens are either naturally occurring strains of low pathogenicity (mild), or pathogenic strains whose virulence has been reduced by passage in laboratory media (attenuated). Live vaccines can be administered either to individual birds, by injection or eyedrop, or to large numbers of birds via the drinking water or by aerosol. Certain vaccines can be given by injection into the eggs before hatching. Building a high level of immunity often requires a second or third administration of vaccine, usually with a stronger vaccine strain on each occasion. Inactivated vaccines must be given by injection. These usually incorporate potent adjuvants which enhance the local cellular reaction and therefore increase the immune response.

Development of Immunization Programs

The development of an immunization program should be based on knowledge of the diseases to which birds are likely to be exposed, and incorporated into the management system of the flock. It requires knowledge of the presence and level of passive immunity, so that immunization can be properly timed. Timing is also important so that vaccines do not detract from each other's responses, or exacerbate their clinical effects. Vaccines should not be administered when other stressors are acting on the flock.

Vaccines should be purchased and used after consultation with vaccine manufacturers. Where serological monitoring tests are available, these should be routinely utilized following vaccination to ensure that an immune response has taken place.

Cleaning and Disinfecting Houses and Equipment

Periodic cleaning and disinfection of commercial poultry houses are recommended to reduce disease agents. These may be performed once per year or more often if disease problems have occurred. When poultry are removed from houses, the building and equipment should be carefully cleaned and disinfected before new birds are introduced. Manure (including litter) should be removed from the immediate vicinity of the poultry houses and preferably from the premises.

A successful cleaning and disinfection protocol should include:

1. Removal of all litter and manure.

2. Washing down of the interior of the structure and all equipment, preferably using a high-pressure washer.

3. Application of a disinfectant solution or fumigant.

Careful attention should be given to watering devices and lines to be sure that they are free of disease agents. Water lines should be flushed and a disinfectant solution pumped into the lines. The lines should be closed and allowed to rest for at least 24 hours and then thoroughly flushed to remove the disinfectant.

Preventive Medication

Some disease agents can most effectively be controlled in commercial environments with preventive medications. These compounds are usually included in the feed. They function by disrupting the life cycle of the coccidia or other disease producing agents. Growth promoting compounds work in a similar way by reducing harmful bacteria in the birds and thereby, allowing growth at a rate which more nearly reflects their genetic potential.

Farm Security

Biosecurity is the utilization of methods which can stop the transfer of infection into or between components of production systems. Biosecurity systems include the following components and procedures:

- allow only necessary visitors on production sites;
- restrict movement of workers and equipment between houses, sites and age groups;
- provide foot baths or boot washing stations, showers and protective clothing at strategic points;
- maintain ongoing cleaning and disinfection programs, especially in hatcheries;
- reduce microbial load on trucks and equipment by washing and disinfecting at critical times;
- locate production sites strategically in relation to other production sites and movement of poultry to minimize disease transfer;
- restrict contact of workers with other poultry, especially potential carriers of hazardous disease organisms;
- control rodents and wild birds effectively, both are potential disease vectors;
- confine pets away from commercial poultry.

Monitoring Mortality

Daily flock mortality records should be maintained and monitored. Crippled, unthrifty, immobile or sick birds should be removed from flocks at frequent intervals to prevent spread of disease to healthy birds. Culled birds should be humanely euthanized. Any unusual level of mortality should trigger an investigation to determine the probable cause. If the cause is not readily apparent, a sample of freshly dead birds should be examined by management, a veterinarian or diagnostic laboratory. Routine examination of daily mortality is recommended as a method to monitor the causes.

Dead Bird Disposal

Successful methods of dead bird disposal prevent spread of pathogens to surviving birds and result in appropriate recycling of nutrients without contamination of surface or ground water. The following methods are acceptable in commercial systems:

Rendering is a very acceptable method from an environmental standpoint but can expose the farm to pathogens if a rendering truck is used for pick up. It is highly desirable to establish a road side pick up area so the rendering trucks do not come onto the farm for more than a few feet. The rendering pick up area must be kept

neat and should be screened from public view. It should be located downwind from the poultry houses if possible. This system is flexible and can accommodate a sudden increase in mortality. Storage containers should be fly-tight and pick up should be scheduled at least twice per week if the carcasses are not refrigerated.

Composting, if properly done, is a very acceptable method of carcass disposal and results in a valuable compost by-product which is an excellent soil amendment. A concrete pad is necessary to prevent leaching and a rain shelter to prevent excessive wetting of the compost. The composting process must be managed to assure that an adequate temperature is achieved to destroy pathogens. The system is flexible and can handle a sudden increase in mortality.

Incineration is effective from a disease control standpoint but units must meet local air pollution standards. Incinerators are expensive to operate, require energy input and cannot handle a sudden increase in mortality. Proper ash disposal is necessary to avoid pollution problems.

Disposal pits or burials are environmentally acceptable in soils where movement of nitrogen into groundwater is not a problem. Unfortunately, determining the suitability of a particular site for pit disposal or burial may cost as much as constructing a suitable composter, with no assurance of success. Pits work best with a constant load of mortality but do not handle sudden increases in mortality. Burial is a more flexible method.

MINIMIZING NUISANCE ASPECTS OF FARMS

Air Quality

Dust and other airborne particles may be generated on a production facility. The producer should pay particular attention to prevailing winds and avoid operations that create dust (house clean-out, tractor work, etc.) on days when the wind will blow particulate matter onto neighboring property.

It should also be noted that while Cal/OSHA uses dust level exposure limits for healthy persons as official limits for the internal environment of poultry houses, air quality control boards use limits that are 10-100 times less than these for their environmental limits. The term PM-10s is the regulatory term for dust particles smaller than 10 microns. These extremely small particles generate haze and can be minimized by use of cover crops and by paving roads surrounding the poultry facility.

Manure Management and Odor Control

When removed from the poultry house, litter should be moved off the site as quickly as possible. If temporarily stored, it should be stacked in piles to prevent excessive wetting. Manure storage areas should be graded so that run-off from buildings and impervious surfaces does not run into the storage area. Run-off from the manure storage area should be confined to the site and should not drain toward the poultry house(s). Manure is a valuable fertilizer and soil amendment when properly handled.

Fly Control

Flies are unsightly and can transmit disease agents. *Musca domestica*, the house fly, is most active at temperatures between 80 and 90°F (26.7 - 32.2°C) and at a humidity of approximately 40 percent. The house fly is inactive below 45°F (7.2°C) and dies at temperatures below 32°F (0°C). *Fannia canicularis*, the little house fly, is active throughout the year, but its reproduction peaks in the spring and fall. Therefore, fly control on California poultry farms is difficult during these seasons. Care must be taken to eliminate any areas that would be conducive to fly breeding, such as wet areas in the litter, spilled feed outside poultry houses, etc.

Landscaping

The sight of an animal production facility, or especially of a manure storage area, may create the perception of nuisance in the minds of some individuals. The producer may effectively screen these entities from view with the use of appropriate shrubs and trees. Vegetative screens can also be effective in reducing dust leaving the premises and will shield against the influx of airborne disease agents.

BIRD HANDLING AND TRANSPORTATION

The manner in which birds are handled will affect their reaction to the restraint. Birds should always be held in a manner that provides as much support as possible and reduces the likelihood of the bird struggling which may injure its wings or legs. An appropriate manner in which to hold an adult chicken is to support the bird's breast in the palm of the hand while restraining the bird's legs between the handler's fingers or by holding both legs. When carrying an adult chicken from one location to another, the bird can be carried by both legs or both wings. The period of time a bird is held in a vertical position, with its head down, should be minimized.

After handling, birds should be placed directly onto the floor or released from a low height that allows them to land feet down, without flying.

Catching

It is necessary to remove feed 8-12 hours before slaughter to reduce carcass contamination. The catching process should be as efficient as possible, minimize the stress on the birds, and be done in such a way as to prevent piling of the birds. Dimming of the house lights or catching at night have long been employed to create a less stressful environment for catching.

The manner in which a market age bird is caught can have significant effects on carcass quality. All personnel involved in bird catching and transport operations should be given training in appropriate bird catching and handling methods.

Loading

The crates, cages or bins used for live-haul should be properly constructed to allow loading, transportation, and removal without injury to the birds. All containers must be kept clean and in good repair. Stocking density will depend on the size of the crate, the size of the birds, and transportation conditions (transit time and temperature). When the crate is full, there should be sufficient floor space so that all birds can be resting simultaneously on the floor and each bird should have free head movement.

During hot weather, birds should be moved during the cooler part of the day whenever possible. Additional space in transport containers will minimize heat stress. Trucks waiting to unload poultry at processing plants should be provided shade, fan ventilation and during very hot weather, evaporative cooling. To provide for bird comfort, ventilation and bird density in transport containers should be adjusted with changes in weather. The time birds are kept on trucks should be minimized.

Vehicles

Vehicles must be kept clean and in good repair. The truck driver is responsible for assuring that all crates, cage doors, and bins are secured before leaving the live production site.

Transportation Conditions and Route

The driver should be prepared to cover the vehicle and protect the birds from possible severe winds and/or rain. Care must be taken that the loaded vehicle is not left standing for any extended period of time. In the case of required stops (inspection stations, truck maintenance, etc.), the birds must be protected from environmental extremes and provided adequate air circulation.

While the shortest route between the live production facility and the processing plant may seem most logical, the driver should avoid passing other sensitive poultry establishments, agricultural operations or residential areas.

PROCESSING

Procedures at processing plants should be designed to prevent unnecessary pain, insure maintenance of optimal meat quality and microbial safety, and preserve the product's visual appeal.

Unloading

Care taken in unloading at the plant, will prevent injury of birds. While speed is of importance, it should not be achieved by inappropriate handling of birds, crates, or bins. The crates and bins should never be tossed or dropped. If a mechanized system is used for unloading the crates from the truck, care should be taken so that the crates are never at an angle which would cause piling of birds.

Shackling

Birds must be hung carefully on the shackles to avoid injury. The shackles should be size-appropriate to the age and species of birds being slaughtered.

Stunning

State or Federal Guidelines must be followed depending on the type of inspection being done at the processing plant. When stunning is employed, the electrical current is applied in such a manner that the animal be rendered insensible to pain. Stunning immobilizes the bird and prevents wing breakage, dislocation of joints and bruising. The instrument used for stunning should be safe for plant personnel and should deliver the required electrical shock (appropriate amperage may vary with equipment, age of bird, etc.).

Appropriate State and Federal regulations may be consulted for any exemptions based on the nature and/or size of the operation and those related to ritual slaughter (religious) practices.

Slaughter

Once stunned, birds are slaughtered by having the jugular vein and carotid artery cut with a sharp hand-held or mechanical knife. Again, all pertinent State and Federal regulations must be adhered to. Any exemptions which apply will be listed in the State or Federal Regulations.

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GLOSSARY

Adjuvant	Additive to vaccine to enhance its effectiveness.
Antibody	A protein molecule capable of combining specifically with an antigen.
Antigen	A substance foreign to the host animal, commonly a disease agent or vaccine.
Bacterin	A killed bacterial vaccine, consisting of a suspension of whole bacteria.
Biosecurity	A management system to minimize the disease exposure of flocks.
Broiler/fryer	A young chicken (usually under 8 weeks of age) of either sex (usually under 6 pounds in ready-to-cook weight).
Composting	A natural decomposition process for organic wastes.
Cornish game hen	A young chicken (usually 4 to 6 weeks of age) not more than 2 pounds in dressed weight.
Dander	Small particles of dead skin or feather particles.
Depopulation	Removal of all animals from a premise.
Diet	A feed prepared from a mixture of ingredients.
Endotoxins	Toxins produced by bacteria.
Hatcher	Incubator used during the final three days including the hatching period.
Immunity	Resistance of a bird to disease challenge.
Litter	An absorbent bedding material used to cover the floor in poultry houses.
Macrophage	A cell which can ingest and destroy foreign cells such as bacteria.
Multi-age farm	A farm with more than one age group of chickens.
Pad cooling	An evaporative cooling system which uses wetted pads with fans to move the air into or out of the house.
Prolapse	An eversion of the terminal end of the reproductive tract with exposure of soft tissues.
Pullet	A sexually immature female chicken.
Rendering	The conversion of dead animals to feed ingredients by cooking and separation of fat from protein.

Replacement	Young bird grown to replace breeding stock.
Roaster	A young chicken (usually under 15 weeks of age) of either sex (usually 5 pounds or more in ready-to-cook weight).
Serology	Tests on blood serum to determine the level of circulating antibody to specific disease agents.
Set (as an egg)	Placed in an incubator to produce a chick.
Setter	Incubator used during the first 18 days of incubation.
Shackles	Metal hangers which hold poultry securely by the feet during processing.
Vector	Carrier of a disease agent from one bird to another or even from one farm to another.

INDEX

Poultry Brooding Tips

A well-equipped brooder room provides comfortable quarters

Paul C. Barker
4-H Club Specialist
and
W. E. Newlon
Extension Poultryman

SUGGESTIONS FOR 4-H CLUB MEMBERS

THERE ARE four kinds of brooding projects for 4-H Club members. All are interesting. Some are simpler than others. Beginning with the simplest, you have a choice of:

White Leghorn Broilers and Fryers—Brood at least 50 day-old male chicks. Sell them as *broilers* weighing 1¾ pounds each, or as *fryers* weighing 2¼ pounds each. The project will require 8 to 12 weeks to complete. This, like all brooding projects, is best undertaken in the spring when the weather is favorable. Total mash required for 50 chicks will be 250 to 300 pounds.

Heavy Fryers and Roasters—Brood at least 25 day-old chicks of the "heavy" or "meat" breeds. Sell them at a weight of 3 to 4 pounds as *heavy fryers*, or 4 to 5 pounds as *roasters*. This project will take from 12 to 16 weeks. The grain and mash required will range from 300 to 500 pounds.

Pullets—Brood at least 25 day-old female chicks from any of the popular commercial laying breeds. Sell or eat the culls for meat at 10 to 12 weeks of age. Keep the remainder for *laying pullets*. These can be kept for your home flock or be sold at 3 to 5 months of age. This project will be completed in 4 to 6 months. Feed requirements will vary. Grain and mash required for 25 Leghorn pullets, reared to 6 months, will approximate 500 pounds. Feed for pullets of the heavy laying breeds will approximate 800 pounds.

Straight-run Chicks—Brood 50 or more *straight-run* chicks. There will be about an equal number of males and females. Any of the usual breeds will do. Separate the male birds or *cockerels* from the pullets as soon as the chicks are "weaned" from the brooder. This should be at 6 to 8 weeks. Sell the cockerels and cull pullets for meat. Raise the pullets. Six months will be needed to complete this project. Light breeds will require about 600 pounds of grain and mash; heavy breeds about 1,000 pounds.

When you have decided upon the type of brooding project, you should next think about the source of stock. A few simple rules will guide your choice: 1) buy from a source as near home as possible; 2) buy only from a person who can guarantee freedom from *pullorum disease;* 3) buy chicks from stock known for early maturity or high egg production.

UNIVERSITY OF CALIFORNIA
College of Agriculture **Agricultural Extension Service**

An inexpensive wire-floored house for pullets. Best adapted to areas where high winds and heavy rainfall are not common.

THE POULTRY HOUSE

Any building will do that can provide: 1) sunshine, 2) fresh air, 3) a dry floor, 4) ample room, and 5) is easy to clean. A shed-roof house with three sides boarded up and the fourth side open, has several advantages. It is easy to build. A maximum amount of sunshine will enter the open side, which should always face the east or south. The fourth side should have boards to a height of 3 feet, and above the boards chicken netting extending to the eaves. Wooden shutters, muslin or glass sash, or even burlap curtains, will keep out driving rain on the open side. Cracks and knotholes can be covered with heavy paper or slats to prevent drafts along the floor. A wooden or concrete floor will be easy to keep dry and clean. A door should be in one end of the house.

The house should provide 2 square feet of floor space for each chick. For grown pullets there should be at least 4 square feet of floor space per bird.

Water containers need to be so handled that water does not spill on the floor. Two quart-size containers will do for 25 chicks. Add others as the chicks grow.

Feed hoppers should provide 1 inch of feeding space for each day-old chick. One shallow trough, 2 feet long and 2 to 4 inches wide will provide 48 inches of feeding space—enough for 50 chicks feeding from both sides. Full grown birds will require 6 inches of feeding space per bird. A small hopper, 1 foot long, 4 inches wide, and 2 inches deep should be used for grit.

Wire netting, fastened under the roosts, will keep birds out of the droppings. Roosts should not exceed 2 inches in width. Six inches of roosting space per chick will be ample until birds reach 3 months of age. For grown pullets, 12 inches of space should be provided for each bird.

Use a floor litter of rice hulls, chopped straw, shavings, or sand. This absorbs moisture from droppings and makes the floor easier to clean.

Yards provide additional room and sunshine but they are not essential. If yards are used, care must be taken to see that there are no permanent wet spots. Such places may harbor disease organisms and parasites.

BROILERS, FRYERS, AND ROASTERS

Before Chicks Arrive—Scrub the floor and other equipment with lye water (1 can of lye to 10 gallons of water). This is a good disinfectant. Spread litter 1 inch deep. Set up the brooder. Hang a thermometer under the edge of the brooder with the bulb two inches above the floor. Operate the brooder long enough to maintain a steady temperature of 90° to 95°. Fill the hoppers with *starting mash*. Fill the grit hopper. Put fresh water in the containers. Set up a circular "fence" 2 to 3 feet away from the brooder, enclosing the feed, grit, and water containers. This fence should be 12 inches high, made of chicken wire or heavy building paper. Get the chicks in the daytime when they are 24 to 36 hours old.

After Chicks Arrive—Place the chicks under the brooder immediately. The thermometer should read 90° to 95°. Scatter mash on newspapers or egg flats placed on the floor around the brooder. This will help the chicks to learn to eat. Watch the chicks carefully the first few days. Extend the fence each day, until by the fourth day it can be removed.

4th to 7th Day—Start daily feedings of finely chopped fresh greens, such as lettuce, chard, lawn clippings, clover, or very tender barley. Freshen mash several times each day. Let the chicks go outdoors from 11:00 a.m. to 2:00 p.m., if the weather is sunny and the yard dry.

7th to 14th Day—Reduce the temperature of the brooder to 85° or 90°. *Too much heat is as bad as too little.* It is not necessary to heat the whole house. The cold air away from the brooder "hardens" the chicks. Move the feed and water farther away from the brooder. Keep fresh mash before chicks at all times. Change the litter.

2nd to 5th Week—Reduce heat about 5 degrees each week. Change litter whenever it becomes moist or dirty. Increase depth to 2 inches. Increase the hopper space. Feed mash only. This increases the weight of young meat birds more rapidly than a mixture of grain and mash. Change to *broiler mash* at 4 weeks. Continue feeding fresh greens daily. Watch for signs of *coccidiosis* when chicks are 3 weeks of age. This disease may develop up to 9 weeks. (Read page 4 on "Management and Health.")

5th to 10th Week—Start teaching chicks to roost. Discontinue heat at 6 to 8 weeks, weather permitting. If there is an outbreak of coccidiosis, continue or renew heat. Chicks crowd together when they are sick or cold. Watch them at night as heat is reduced to see that they do not crowd. Birds of the heavy breeds may feather out later than lighter breeds, so they will need heat longer. Sell White Leghorns at 1¾ pound weight if the broiler price is good. Otherwise, let them grow to fryer weight.

10th to 16th Week—Put the slow-developing birds into a separate pen at 10 weeks of age. Sell the heavy fryers at 3 to 4 pounds in weight. Sell the roasters at 4 to 5 pounds weight. After roasters are 12 weeks old, feed costs can be reduced by feeding 1 pound of grain to each 4 pounds of mash.

PULLETS AND "STRAIGHT-RUN" CHICKS

PULLETS

1st to 4th Week—During this period, pullets will be handled like broilers. Read page 2 on "Broilers, Fryers, and Roasters" as far as 5th to 10th week.

4th to 10th Week—Pullets, unlike meat birds, will need grain or "energy" feeds when they begin to lay. Teach them to eat these feeds by giving them *scratch* grains—cracked corn, whole milo, kaffir, wheat, barley, etc. Select two or three which are lowest in price. For every 9 pounds of mash fed daily, feed 1 pound of grain. Put this on top of the mash for a period of 2 weeks. Then use separate hoppers for the grain. Increase the amount of grain each week. At 10 to 12 weeks of age the birds should be getting equal amounts of grain and mash. For the first few weeks, feed the grain in the late afternoon. As the birds near 10 weeks of age, leave grain and mash in front of them at all times. Renew the mash in the morning, the grain in the late afternoon. If skim milk is being fed instead of mash, supply 2½ pounds of grain for every gallon of milk. As birds approach 10 weeks of age, gradually increase the grain to 6 pounds for each gallon of milk. Teach your birds to roost, and discontinue heat. Follow directions in "Broilers, Fryers, and Roasters," 5th to 10th week. At 8 weeks, change to *growing mash.*

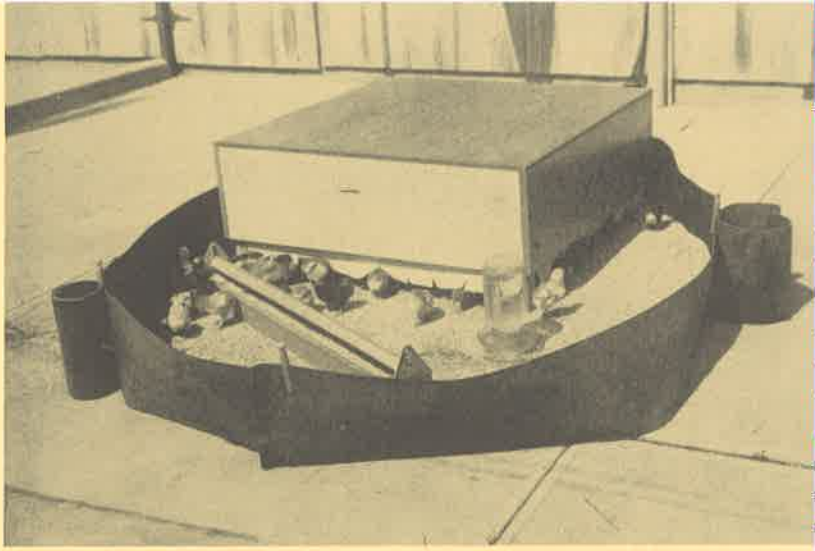
10th to 12th Week—Observe your pullets carefully during this stage of their growth. Some will be growing faster than others. This is the time to separate them. Make three groups—the big, middle-sized, and the "runts." Put each group in a separate pen. *Sell the "runts."*

3rd to 6th Month—The middle-sized birds, with more room, will begin to catch up with the big pullets. When they have caught up, put all the birds together. Out of 100 pullets to start with, there should be 75 to 90 good pullets. Fresh greens are more important now than ever. Change to *laying mash* when the pullets are 4½ to 5 months old. Another form of coccidiosis may appear when pullets are 4 months to 8 months of age. It is called *intestinal coccidiosis.* (Read page 4 on "Management and Health.") When birds are about 4½ months of age, install nest boxes. There should be one nest for every 5 pullets. Feather pulling, tail-picking, and cannibalism may appear as pullets approach laying age. One method of control for these vices is debeaking. A debeaked pullet is pictured on page 4.

"STRAIGHT-RUN" CHICKS

1st to 5th Week—Brood like broilers or pullets.

5th Week On—At five weeks of age, White Leghorn cockerels should be separated from the pullets. Cockerels of the heavy breeds will be several weeks older before they can be separated. As a rule, the cockerels are larger, have longer legs, and more prominent combs. Feed the cockerels as you would broilers. Raise the pullets as explained above.



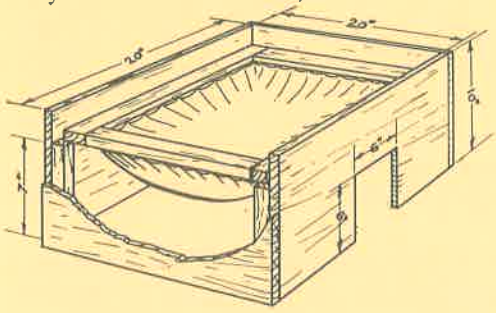
The homemade electric brooder accommodates 100 chicks comfortably.

THE BROODER

All brooders are heating stoves. They are designed to warm the floor and the backs of the chicks. Mechanical brooders provide an artificial source of heat from above. Fireless brooders secure heat from the bodies of the chicks themselves.

Homemade Electric Brooder—Heat is provided by three electric light globes suspended beneath the cover of the box. By changing the size of the globes, the amount of heat is regulated. The box is raised and lowered by adjustable legs. Successful use of the brooder will depend upon careful supervision and judgment by the operator. For detailed instructions on its manufacture and use, read the College of Agriculture leaflet, "An Emergency Homemade Electric Brooder."

Commercial Brooder—This depends upon gas or oil burners or electrical resistance coils for heat. It is usually equipped with an automatic heat regulator, called a *thermostat.* It can be hung from the ceiling or can be supported by legs. Commercial brooders vary in size—from a capacity of 250 chicks to 2,000.



Heat in the fireless brooder is conserved by the flannel cloth. It sags enough to rest on the backs of the chicks.

Fireless Brooder—This brooder is a homemade wooden box without a bottom or a top. It is designed to house 50 baby chicks. Seven-inch upright strips in each corner support a cover frame. An air space of ⅜ of an inch is left between the frame and each side of the box to provide ventilation. To the frame is tacked a double thickness of soft wool flannel. A jar of hot water inside the brooder attracts the chicks to the brooder when they are cold. Newspaper under the brooder, changed daily, makes it easy to keep the brooder clean.

Debeaked pullet. Debeaking young chickens prevents feather pulling and cannibalism. It has no harmful effects.

POULTRY FEEDING

Feed is used by poultry for two main purposes. Feed builds the cells and supplies energy. This energy provides power for the muscles, and heat to keep the bird warm. A young bird uses feed mainly for rapid growth. An older bird uses feed mainly to produce eggs and to keep up its size and strength. In the feed are substances called proteins, carbohydrates, fats, vitamins, minerals, and water.

Proteins are needed to manufacture flesh, feathers, and eggs, and to replace worn-out cells. Animal proteins come from ground-up fish (fish meal), ground-up meat (meat scraps), dried skim or butter milk. Plant proteins come from oil meals, such as soybean, sesame, coconut, and cottonseed. All young animals require proteins for rapid growth. Mash contains more protein than does whole grain. For that reason, you have been advised to start chicks on mash. Poultry mash should have protein from both animal and plant sources.

Carbohydrates supply energy. Like wood and coal, they "burn up" to produce heat and power. Barley, corn, wheat, and milo are some of the common carbohydrate feeds which supply energy.

Fats also supply energy. Protein and carbohydrate feeds of good quality furnish all the fat needed by chickens.

Vitamins are necessary for thrifty growth in chicks and for normal health in older birds. Most vitamins are present in the usual feeds. Fresh greens provide several important vitamins. Sunshine is a cheap and ready source of Vitamin D. A good poultry mash will provide all the necessary vitamins.

Minerals are needed for bone and tissue. These are found in mash, grain, and green feed. Calcium is one mineral which, if fed in excess, may harm growing chicks. Avoid this by using coarse sand or fine granite for grit rather than so-called limestone grit. Oyster shells or limestone grit should be fed to laying birds only.

MANAGEMENT AND HEALTH

RULES OF HEALTH—There are four rules:

Cleanliness—Start with a clean house and clean equipment. Change water and feed several times each day when chicks are young. Clean the water containers every day. Change the litter weekly, or whenever it gets moist or dirty.

Dryness—Rain and spilled water cause damp litter or damp soil in the yards. Disease organisms develop in warm, moist soil or litter. Empty, wash, and refill water fountains outside the house and yard. Change damp litter at once.

Fresh Air—Birds can stand cold, fresh air if they can go to warm brooders when they are cold.

Sunshine—Sunshine in the house helps keep litter dry and adds to the comfort and health of the birds.

PARASITE AND DISEASE CONTROL—There are several common causes of sickness or death in young birds:

Pullorum Disease—is caused by bacteria which may be in the body of the chick when it is hatched. Buy chicks which are guaranteed to be "pullorum free."

Roundworms—are common parasites of poultry found in the intestines. Prevent any permanent wet spots in the yard, or keep your birds on concrete, wood, or wire floors throughout their lives.

Coccidiosis—is a disease caused by another intestinal parasite. Chicks from 3 to 9 weeks of age may develop one form of this infection. Another form of coccidiosis may appear when pullets are 4 to 8 months of age. The organism causing this disease develops in warm, moist earth or litter. Dry yards and dry litter will help control infections.

Mites and Lice—When birds begin to roost, oil the roosts to control mites. Watch for lice on the older birds. Apply Black Leaf 40 to the roosts to control lice.

SOME "IDEAS FOR SUCCESS." Of the many ideas in this circular, a few are most important for your success:

1. Buy good chicks, guaranteed "pullorum free."
2. Keep the house and yard clean and dry.
3. Let the birds have sunshine every day if possible.
4. Purchase your feed in 100-pound lots to save money.
5. Feed fresh greens daily to save feed and promote growth.
6. Separate slow growing birds. Dispose of the culls.
7. Spend some time every day watching your birds. In this way you learn to "catch up with trouble before trouble catches up with you."

A LIBRARY OF USEFUL INFORMATION—You should use two University of California publications for reference:

A revision of Agricultural Extension Service Circular No. 127, *Brooding and Rearing Chickens.*

College of Agriculture Leaflet, *An Emergency Homemade Electric Brooder.*

Coöperative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture coöperating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. J. Earl Coke, Director, California Agricultural Extension Service.

4m–9,'51(7142s) 141

DAILY EGG RECORD—4-H CLUB EGG PRODUCTION PROJECT

....., 19.....
Month

Date	Eggs Laid	Eggs Lost	Eggs Sold or Used at Home					Hens Died	Hens Sold	Hens Added	Total No. of Hens
			Large	Medium	Smalls Chex Bloods	Hatching Eggs					
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
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21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
Totals											

Average number of laying hens (Divide) $\frac{\text{Total number of hens first day of month} + \text{Total number of hens last day of month}}{2} =$ _____

Number of eggs per hen (Divide) $\frac{\text{Total number of eggs laid}}{\text{Average number of laying hens}} =$ _____

Per cent production (Divide) $\frac{\text{Total number of eggs laid}}{\text{Average number of laying hens} \times \text{days in month}} =$ _____

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture, Jerome B. Siebert, Director Cooperative Extension, University of California.

6m–5/82–LB/FB

REPRINTED MAY 1982

DAILY EGG RECORD—4-H CLUB EGG PRODUCTION PROJECT

..... Month ....., 19.....

Date	Eggs Laid	Eggs Lost	Eggs Sold or Used at Home					Hens Died	Hens Sold	Hens Added	Total No. of Hens
			Large	Medium	Smalls Chex Bloods	Hatching Eggs					
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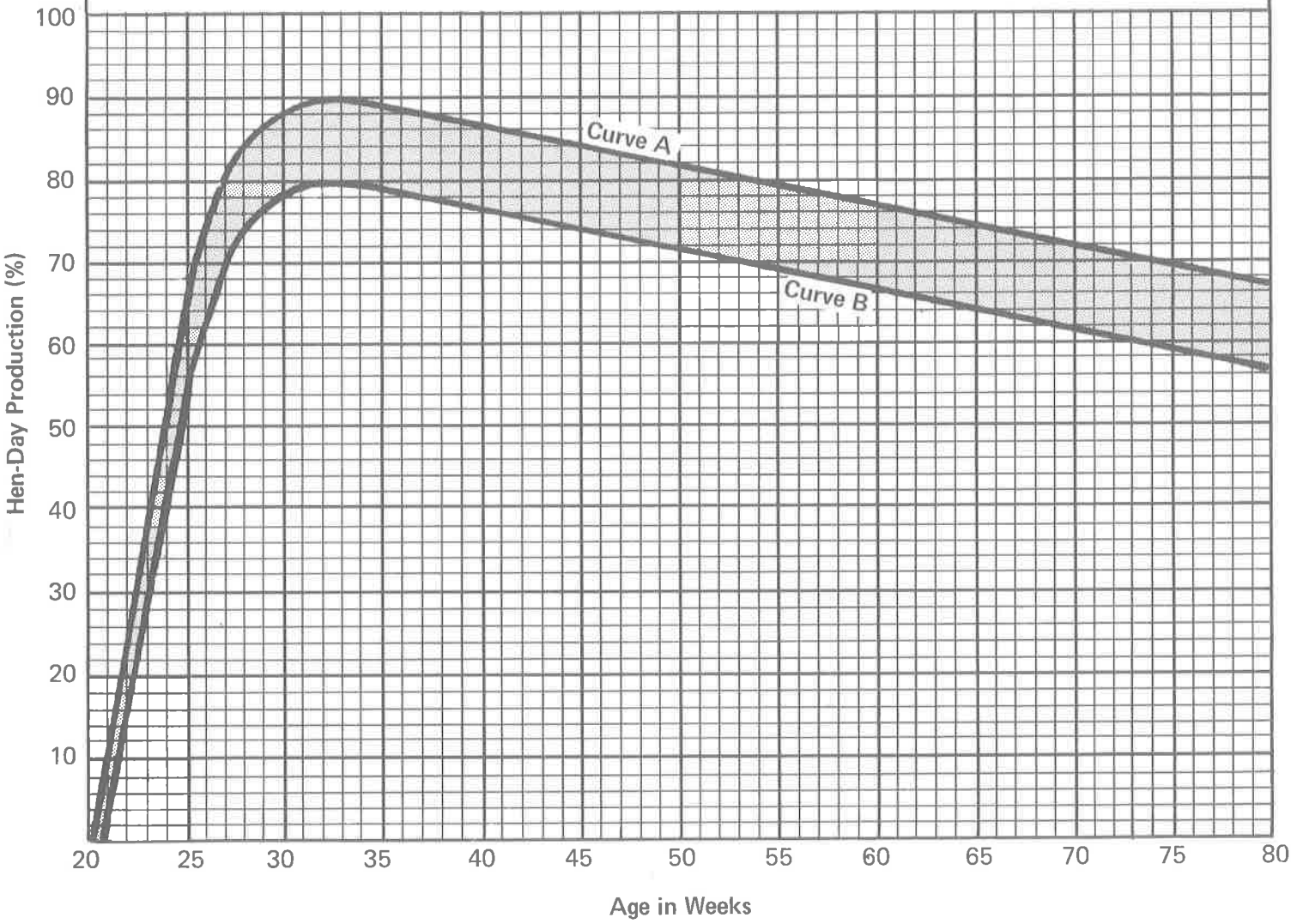
Per cent production (Divide) $\frac{\text{Total number of eggs laid}}{\text{Average number of laying hens} \times \text{days in month}} =$ _____

COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

4-H—1067

HEN-DAY EGG PRODUCTION GRAPH

Flock: _____ Strain: _____ Hatch date: _____



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SPECIAL PUBLICATION
3045

PRINTED OCTOBER 1975

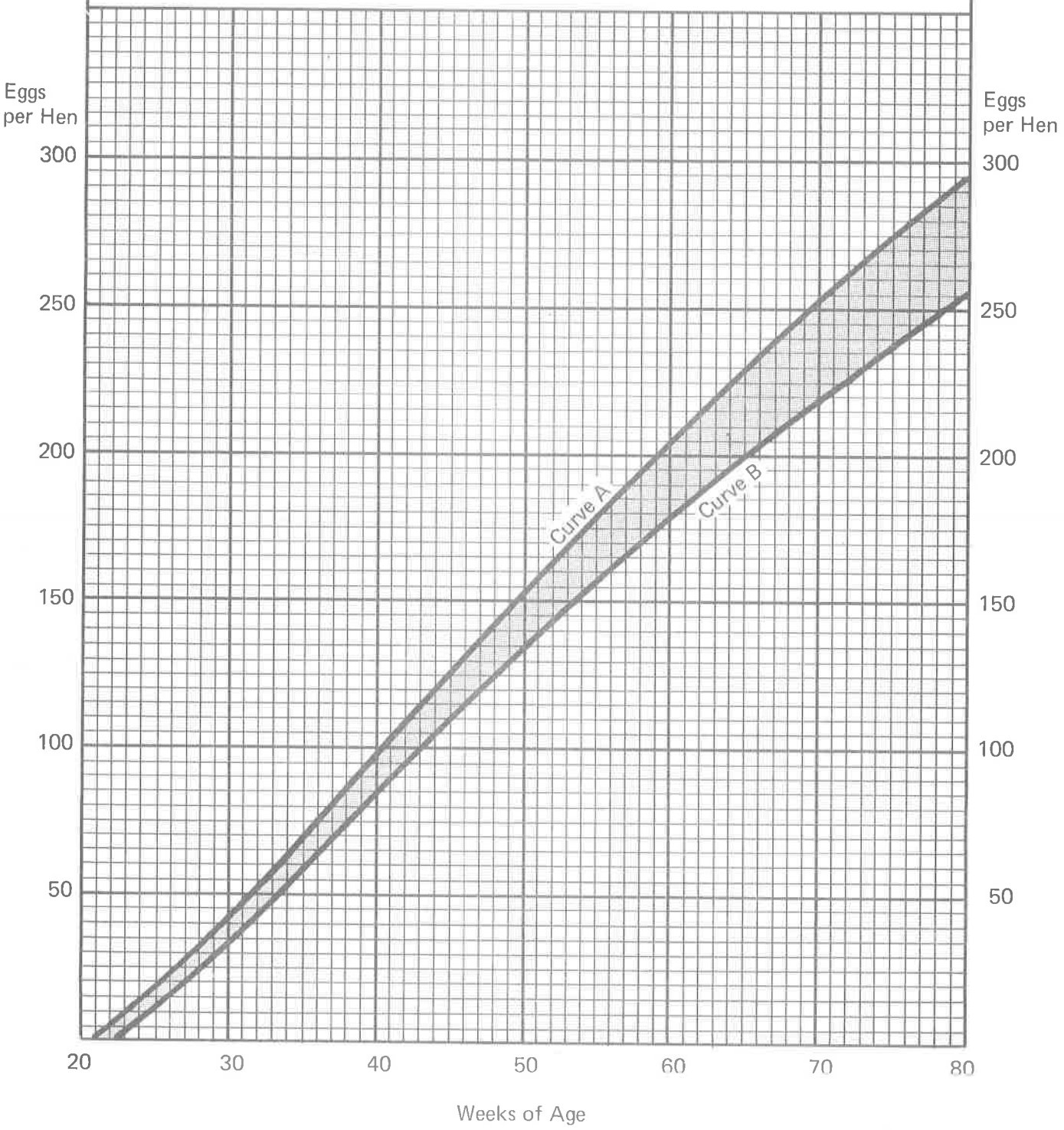
EGGS PER HEN HOUSED PRODUCTION GRAPH

(Curve A = 90% hen-day peak and 0.2% mortality per week)
(Curve B = 80% hen-day peak and 0.2% mortality per week)

Flock: _____ Date at 20 weeks: _____

Strain: _____ Number of hens at 20 weeks: _____

Hatch date: _____



HEN-HOUSED EGG PRODUCTION RECORD

Flock: _____ **Date at 20 weeks:** _____

Strain: _____ **Number of hens at 20 weeks:** _____

Hatch date: _____

WEEK	Eggs Laid During Week	Total Eggs Laid To Date	Eggs Per Hen* To Date	WEEK	Eggs Laid During Week	Total Eggs Laid To Date	Eggs Per Hen* To Date
21				43			
22				44			
23				45			
24				46			
25				47			
26				48			
27				49			
28				50			
29				51			
30				52			
31				53			
32				54			
33				55			
34				56			
35				57			
36				58			
37				59			
38				60			
39				61			
40				62			
41				63			
42				64			

*To determine eggs per hen housed, divide total eggs laid to date by the hen count at 20 weeks of age. Hen-housed records are only valid as long as no additional birds are added to the flock.

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SPECIAL PUBLICATION
3046

PRINTED OCTOBER 1975

WEEK	Eggs Laid During Week	Total Eggs Laid To Date	Eggs Per Hen* To Date	WEEK	Eggs Laid During Week	Total Eggs Laid To Date	Eggs Per Hen* To Date
65				103			
66				104			
67				105			
68				106			
69				107			
70				108			
71				109			
72				110			
73				111			
74				112			
75				113			
76				114			
77				115			
78				116			
79				117			
80				118			
81				119			
82				120			
83				121			
84				122			
85				123			
86				124			
87				125			
88				126			
89				127			
90				128			
91				129			
92				130			
93				131			
94				132			
95				133			
96				134			
97				135			
98				136			
99				137			
100				138			
101				139			
102				140			

Growing a Small Flock of TURKEYS

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

LEAFLET
2733

COOPERATIVE EXTENSION **UNIVERSITY OF CALIFORNIA**

This information is provided by Cooperative Extension, an educational agency of the University of California and the United States Department of Agriculture.

Support for Cooperative Extension is supplied by federal, state, and county governments. Cooperative Extension provides the people of California with the latest scientific information in agriculture and family consumer sciences. It also sponsors the 4-H Youth Program.

Cooperative Extension representatives, serving 56 counties in California, are known as farm, home or youth advisors. Their offices usually are located in the county seat. They will be happy to provide you with information in their fields of work.

The authors are W. F. Rooney, Farm Advisor, San Bernardino, Riverside, and Los Angeles Counties; Stanley Coates, Farm Advisor, Sonoma, Alameda, Napa, Monterey, and Santa Clara Counties; and J. Price Schroeder, Area Farm Advisor—Turkeys, Parlier, California.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. James B. Kendrick, Jr., Director, Cooperative Extension, University of California.

Growing a Small Flock of TURKEYS

Turkeys can be raised successfully on small farms, but they require special care and equipment. Young turkey poults must be kept warm and dry. Raise turkeys away from chickens and other birds in order to prevent disease. Sinusitis and blackhead can be serious problems when turkeys and chickens are raised together.

STOCK

The most common variety of turkey in California is the Large White (figure 1). Similar in size, but less available, is the Broad Breasted Bronze (figure 2). With good management, roaster-size turkeys can be produced efficiently using either of these varieties. Hens will grow to live weights of about 15 pounds at 22 weeks of age; toms will weigh about 25 pounds at 24 weeks of age. The Beltsville Small White also satisfactorily produces roaster-size turkeys—at 22 weeks hens average 8.7 pounds, and toms average 13.6 pounds. Excellent fryer-roasters are produced with Beltsville Small Whites when they are marketed at about 16 weeks. Large White females, marketed at 13 weeks, make satisfactory fryer-roasters.

Flocks are usually started with day-old poults purchased from a hatchery or feed store. The poults should come from sources free of pullorum, sinusitis, and other diseases. Start with a healthy flock! The operation of a brooder is practical if you buy 20 or more poults. If you want to raise fewer than 20, try to purchase turkeys that are 6 to 8 weeks old, from a commercial grower, when they no longer require brooding.

Fig. 1. This heavy Large White tom is 24 weeks old and ready for market. Note desnooding and debeaking.

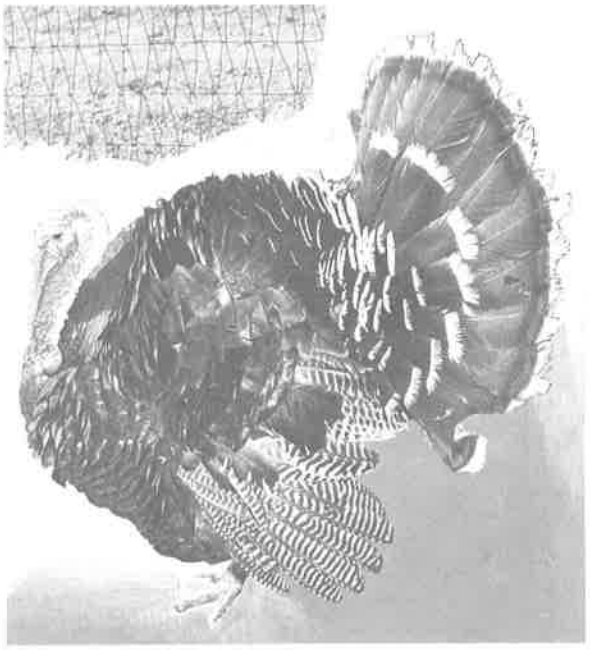

Fig. 2. The Broad Breasted Bronze variety is now far less popular than the Large White with commercial growers. Day-old poults may be hard to find. Note that this tom has not been desnooded.

HOUSING AND EQUIPMENT

Poults need a dependable source of artificial heat during the first few weeks of life. The first week provide uniform temperatures of about 95° F. Thereafter, lower the temperature 5 degrees per week. For a small group of poults, use an infra-red bulb, an electric coil, a shielded electric light, or the heating element of an outdoor (sunshine) wire-floored brooder.

To brood a hundred or more poults, you might consider a commercially-used gas or electric brooder that has a hover and automatic temperature controls (figure 3). During the first week, confine the poults to the heated area containing feed and water. Corrugated cardboard, at least 12 inches high and available in rolls, is often placed in a circle about 3 feet from the hover to confine poults during this period. In hot weather a guard may be made of poultry netting. Check temperature closely, especially the first week, adjusting it if the poults show signs of distress. Although heat may be discontinued at 4 weeks of age in warm weather, provide heat until 6 or 7 weeks of age in cool weather.

Poults on litter need at least 1 1/2 square feet of floor space per poult to 6 weeks of age. When brooding poults on the floor, you can use 1/8 inch of sand for litter the first 2 weeks; then add 1 inch of chopped straw or shavings. During hatching and brooding, avoid slick surfaces (such as newspaper) which can cause serious leg problems. Be sure to protect the poults from cats, dogs, and other predators, both during and after the brooding period.

After brooding the poults, place them in a yard, allowing at least 30 square feet of yard space per turkey. A 4-foot fence usually will confine turkeys of the heavy varieties. Avoid standing water by selecting a well-drained site. Roosts are generally unnecessary but, if used, can be made of two-by-fours laid flat 20 to 24 inches apart and supported about 15 inches off the ground. Allow 8 to 12 inches of roost space per bird. Select feeding and watering equipment that is easy to use and remains as clean as possible. Provide the turkeys with a shelter to protect them from sun and rain—100 to 180 square feet of roof per 100 turkeys, 7 to 8 feet off the ground. Temperatures of 100° F or more can cause mortality, particularly when there is insufficient shade or water. On extremely hot days, when temperatures are 105° F or above, either wet the turkeys hourly with a hose, or use foggers. Mature and near-mature turkeys do not tolerate high temperatures as well as young turkeys do.

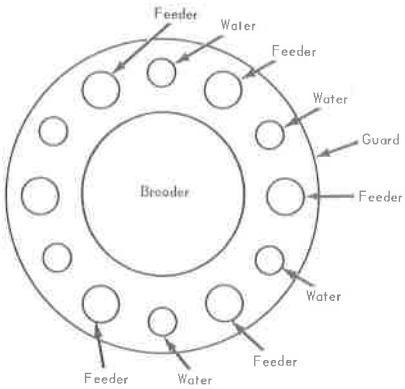

Fig. 3. A gas brooder provides heat for these poults; nearby are feeders and waterers. The diagram shows an arrangement for brooding with a ring to confine the poults.

FEEDING AND MANAGEMENT

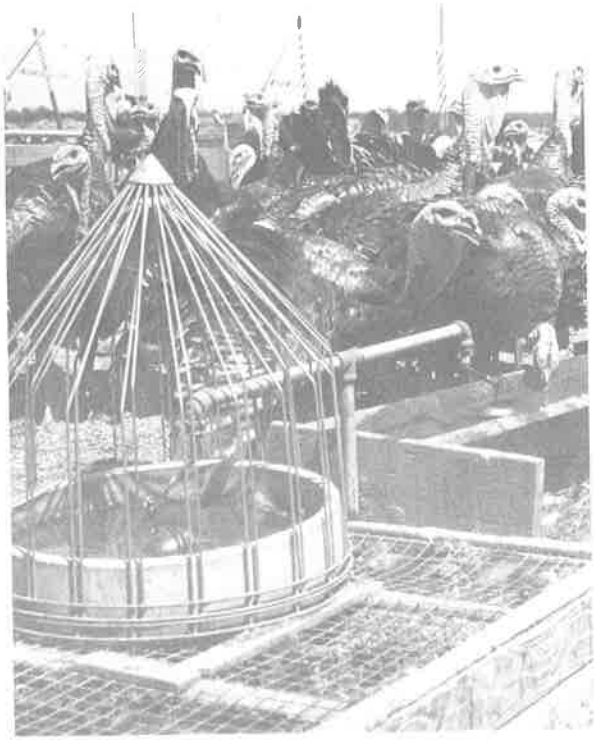

Fig. 4. Float valves make it easy to supply water. The crock with a guard will keep water cleaner than will the open wooden trough.

Feed and water the poults as soon as possible after bringing them home, dipping their beaks in water to help them learn to drink. The first 2 days, place some feed in paper plates or on the lid of the poult box. Feed and water should be available at all times.

Provide a 1-gallon drinking fountain for each 75 poults. Allow 0.9 linear inches of water trough space per turkey after 8 weeks of age. Water may be piped to the turkey pen and controlled with a float valve (figure 4), or commercially available waterers may be used (figure 5). Provide a 4-foot feeder, or its equivalent, per 100 poults (1 inch per turkey) to 3 weeks (figure 3), 2 inches per turkey to 8 weeks, and 3 inches per turkey thereafter. With circular feeders, less feed space is needed. For example, a range feeder with a 300 pound feed capacity is adequate for 75 turkeys after they reach 8 weeks of age (figure 6). It takes about 70 pounds of feed to raise the average large turkey to market age. Weekly growth rate and feed consumption for large turkeys are shown in table 1.

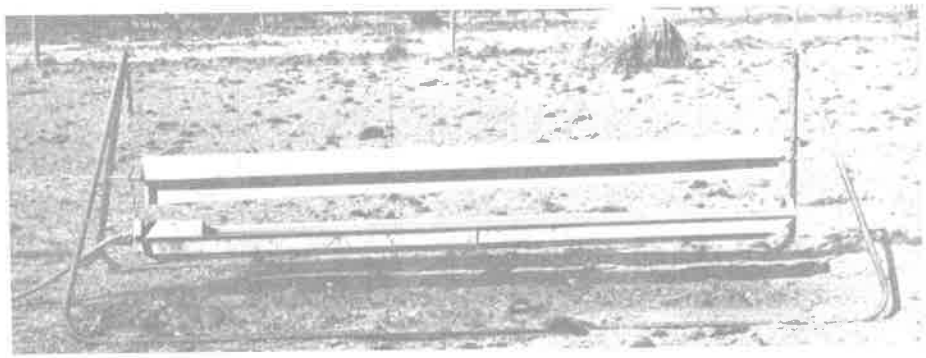

Fig. 5. With commercial growers, this kind of waterer is popular for older turkeys.

Fig. 6. Metal circular feeders (A) are widely used for older turkeys. Feed troughs also can be made of wood (B). For younger turkeys, the adjustable type of metal feeder (C) would be ideal.

TABLE 1

Growth Rate and Feed Consumption of Large White and Bronze Turkeys
(Toms and Hens Combined)

Age		Live weight		Feed Required	
Months	Weeks	Average	Gain for period	Total cumulative	Per pound of turkey to date
		(pounds)			
	1	0.24	0.11	0.3	1.3
	2	0.50	0.26	0.8	1.6
	3	0.90	0.40	1.5	1.7
	4	1.53	0.63	2.6	1.7
1	Total	1.53	1.4	2.6	1.7
	5	2.4	0.9	4.1	1.7
	6	3.5	1.1	6.0	1.7
	7	4.5	1.0	8.0	1.8
	8	5.6	1.1	10.5	1.9
2	Total	5.6	4.1	10.5	1.9
	9	6.8	1.2	13.2	1.9
	10	8.1	1.3	16.1	2.0
	11	9.4	1.3	19.3	2.1
	12	10.7	1.3	22.8	2.1
3	Total	10.7	5.1	22.8	2.1
	13	11.9	1.2	26.9	2.3
	14	13.3	1.4	31.0	2.3
	15	14.6	1.3	34.9	2.4
	16	15.9	1.3	39.4	2.5
4	Total	15.9	5.2	39.4	2.5
	17	17.0	1.1	43.2	2.5
	18	18.1	1.1	48.2	2.6
	19	19.0	0.9	52.7	2.8
	20	20.0	1.0	57.5	2.9
5	Total	20.0	4.1	57.5	2.9
	21	21.0	1.0	63.5	3.0
	22	22.0	1.0	67.9	3.1
	23	23.0	1.0	73.2	3.2
	24	23.9	0.9	78.7	3.3
6	Total	23.9	3.9	78.7	3.3

Since turkeys are fast growing, it is very important to buy correctly-formulated turkey feeds (see figure 7). If the feed manufacturer's directions are available, follow them. Percentage of protein in the total ration required by turkeys at various ages is shown in table 2; rations are assumed to be high in calories.

For the first 4 weeks, when feed intake is low, poults need a turkey starting mash containing 28 percent protein. After 4 weeks, turkeys can be fed a less expensive mash with lower protein content. At 8 weeks of age, a grow mash with 22 percent protein is recommended. Feed with less and less protein can be used thereafter. Whole or cracked grain, such as milo, which is commonly used in California, can be fed to turkeys over 11 or 12 weeks of age. Equal parts of growing mash or pellets (22 percent protein) and grain (about 10 percent protein) provide an overall ration containing about 16 percent protein. Turkeys fed on whole grains should receive granite grit also. Hen turkeys in lay should have access to a feeder containing oyster shell or limestone grit.

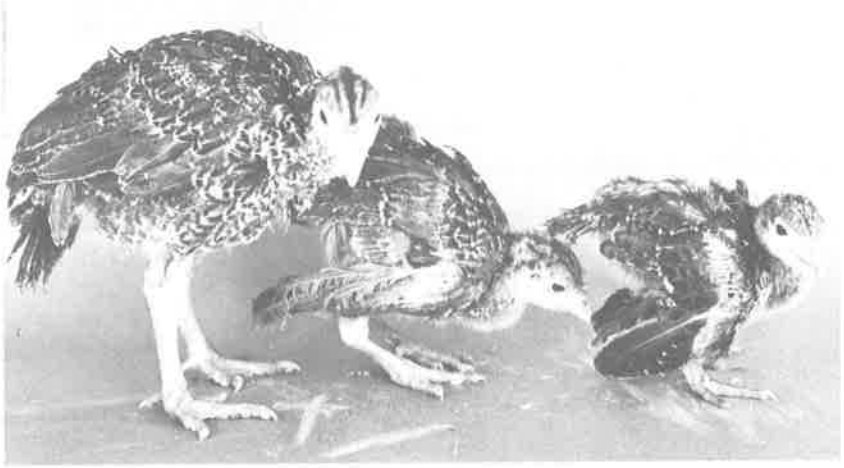

Fig. 7. Turkeys have high requirements for protein, vitamins, and minerals, so use feed especially formulated for turkeys. These 3-week-old turkeys had feed containing (from left to right) adequate zinc, insufficient zinc, and no zinc. Zinc deficiency causes poor growth, poor feathering, bone deformities, and mortality.

TABLE 2

Protein Requirements of Turkeys

	Age (weeks)						
Males	0-4	4-8	8-12	12-16	16-20	20-24	Mature Breeders
Females	0-4	4-8	8-11	11-14	14-17	17-20	Mature Breeders
Percentage of Protein Required in Total Ration	28	26	22	19	16.5	14	16[a]

Source: National Research Council, 1971.

[a] Recommendation, University of California, Davis, 1974.

PREVENTING DISEASE PROBLEMS

To a large extent, the health of your flock will depend upon sanitation and avoiding contact with other flocks of turkeys and other birds of all kinds. Clean feeders and waterers help prevent coccidiosis and infestations of blackhead and roundworm. When the poults are young, wash the waterer at least once a day and supply clean water. At the same time remove any droppings or litter that may be in the feeder. Never use moldy feed or litter. Molds may cause serious respiratory or intestinal problems. Placing feeders and waterers on wire platforms reduces the chance of disease by making it easier to keep them clean and by preventing turkeys from picking at nearby droppings. As far as possible, exclude from your turkey pen visitors who have contact with poultry and all kinds of birds, especially chickens and upland game birds.

Take precautions to prevent cannibalism. If you don't have a debeaker (figure 8), borrow one from your feed store or from a friend. A mild debeaking, removing about one-third of the upper beak, can be performed easily when your turkeys are about 3 weeks old. Cannibalism is more likely to occur in older turkeys. Hens nearing maturity sometimes try to pick toms, or hens may be injured during mating. When raising turkeys for meat, it is advisable to keep the sexes separate after 4 months of age. Desnooding day-old poults at the hatchery is a common commercial practice that makes fighting and resulting injury less likely.

Fig. 8. Cannibalism can be avoided by using an electric debeaker.

The Large White tom shown on the cover of this publication is desnooded and is well debeaked.

Fig. 9. Pox on the skin of the neck and wattle often occurs in the fall and can be prevented by vaccination. Turkeys successfully vaccinated for the first time at the beginning of September will have enough immunity to last through the breeding season, ending late in June.

Fowl pox, which produces wart-like spots or blisters on the head and wattles (figure 9), and in some cases ulceration of mouth and windpipe (figure 10), is prevalent in the San Joaquin and Sacramento Valleys. It also is apt to occur in other areas of California when mosquitoes are numerous. In baby turkeys, it can cause poor or uneven growth and sometimes death. In older turkeys, pox can cause slower growth and a drop in egg production. Treatments are of doubtful value, though Lugol's solution of iodine painted on the lesions or warts helps dry them up. Older turkeys recover without treatment in 3 to 4 weeks. Successful vaccination provides an immunity lasting about 6 months and revaccination is not effective until immunity expires. If you vaccinate for pox, vaccinate in time to prevent a natural outbreak and prior to egg production. Though the smallest package of pox vaccine available is the 500 dose size, the procedure is the same whether you vaccinate 5 turkeys or 500, and you can't overdose birds. If pox does not occur in your area, there is no need for you to vaccinate.

Fig. 10. Wet pox is less common but more serious, producing lesions in or around the mouth, eyes, or nostrils. It can occur in unprotected turkeys, and is probably more frequent during the winter.

Fig. 11. Swollen sinuses are typical of a disease called sinusitis. One or both sinuses may swell, sometimes impairing vision. The disease also may involve the lower respiratory system, sometimes causing the turkey to cough. Treatments are available, but prevention is more satisfactory.

Raising turkeys and chickens together may lead to trouble with sinusitis and blackhead. Chickens may harbor the causative agents of sinusitis or blackhead without appearing sick. Sinusitis (figure 11) is caused by a small, bacteria-like organism called *Mycoplasma gallisepticum*. Blackhead, which is less common in California, is caused by a microscopic protozoan parasite called *Histomonas meleagridis*. It causes pathological changes in the intestinal tract and liver and, if uncontrolled, can cause high mortality in turkeys. If your premises are heavily contaminated with blackhead parasites, consult your veterinarian or a veterinarian at a diagnostic lab about preventive feed or water medications. Medications are also available for treatment.

If your flock becomes sick, an accurate diagnosis should be obtained. An infectious disease may be involved, or perhaps the problem is poor nutrition or management. It is important to know what is wrong with the turkeys in order to treat them properly and manage the flock to prevent further losses. Be sure to take typically sick or fresh, dead birds to a laboratory and provide an accurate history on the course of the sickness. The state and county pathology laboratories listed below offer diagnostic services at a nominal cost.

Diagnostic Laboratories in California

Livestock and Poultry Pathology Laboratory
P. O. Box 9702 (3290 Meadowview Road)
Sacramento, California 95823
Area Code 916—428-3172

Livestock and Poultry Pathology Laboratory
1500 Petaluma Boulevard South
Petaluma, California 94952
Area Code 707—762-7386

Poultry Pathology Laboratory
P. O. Box 272 (Fulkerth Ave. & Soderquist Rd.)
Turlock, California 95380
Area Code 209—634-5437

Livestock and Poultry Pathology Laboratory
P. O. Box 313 (2789 South Orange Avenue)
Fresno, California 93725
Area Code 209—266-9418

Livestock and Poultry Pathology Laboratory
P. O. Box 255
(714 South Santa Anita Street)
San Gabriel, California 91778
Area Code 213—282-6127

San Diego County Livestock Department
Building 4, 5555 Overland Avenue
San Diego, California 92123
Area Code 714—298-4181

MARKETING

If you have raised more turkeys than you need, you might consider selling the extra turkeys, either alive or processed. Sometimes it is most convenient to have them custom processed at a small poultry processing plant. Although state and federal laws regulate the processing of poultry for sale, limited direct sales of home-grown and home-processed turkeys may be exempt. For details, contact city or county health departments or the California Department of Food and Agriculture, Bureau of Meat Inspection.

HOME PROCESSING

Remove feed 8 to 12 hours before killing, but allow turkeys access to water. Suspend the turkey by its legs held by a light rope or metal shackle. With the head held in one hand, make a deep cut across the throat from the outside, severing the jugular vein. When bleeding and movement cease, submerge the turkey in hot water to loosen the feathers. The subscald method is the most common: dip the turkey in water at 140° F for 30 to 40 seconds. Now rehang the turkey and remove the feathers.

After picking the turkey, wash the skin with clean water. Remove the legs at the hock joint and then remove the head. Eviscerate the turkey, saving the gizzard, liver, and heart. Finally, rinse the body cavity with clean water.

Chill the turkey by placing it in ice water for several hours. After chilling, drain the turkey and put it in a plastic bag. Either freeze the processed turkey or keep it at refrigerator temperature, preferably not over 4 days. After washing up, it is a good idea to sanitize the tables and other items used in processing with diluted household bleach.

These suggestions may be all you need for raising a small flock. If you want more details on growing turkeys, order *Turkey Production*, Agricultural Handbook No. 393, 1971 (77 pages) from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. The price is 75 cents.

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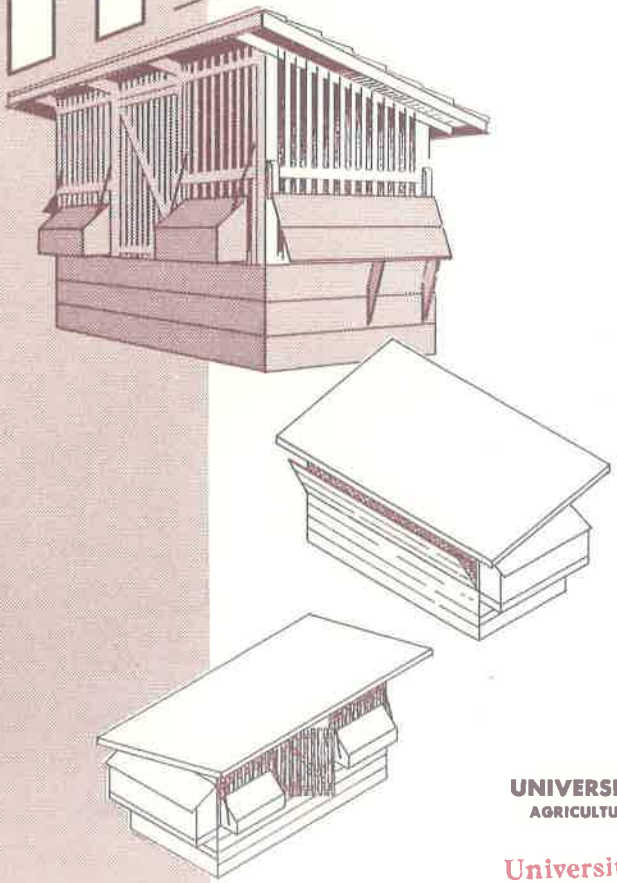
THIRD CLASS

A POULTRY HOUSE for the Backyard Flock



UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXTENSION SERVICE

The author, Stanley Coates, is Farm Advisor, Alameda County.

INEXPENSIVE FLYPROOF EFFICIENT

Housing for Brooding, and Raising Pullets, Laying Hens, or Fryers

Eggs and poultry meat are important to the healthful diet. Home produced eggs and meat are usually fresher and better than market products. Two of these houses will take care of the family poultry needs for the year.

- The poultry house will easily take care of 10 to 12 laying hens or 25 to 35 fryers at one time. Standard dimensions eliminate waste lumber. Old lumber can be used. Not having a solid floor of wood or concrete makes the house less expensive to build. Furthermore, it is light enough to be moved from one place to another.

- The birds are easy to take care of. You need never enter the house. The chores of brooding, feeding, watering, collecting eggs, catching the stock, and cleaning can be done either from the doorway or from outside the house. It is not necessary to move the birds from one house to another, nor do they need an outside run.

- With good management, flies or odors have little chance to develop. All droppings enter litter on the floor; flies have no place to deposit eggs. Built-up litter, worked daily by the birds, becomes a composted material.

- The house is adaptable to a wide range of weather conditions, with minor changes in construction.

This poultry house has been designed to be as easy as possible to make.

The house is 4 feet wide by 8 feet long, 5 feet high in front and 4 feet high in back (see cover, construction plan, and figure 5). The bottom 2 feet on all four sides of the house are covered with rot-resistant solid siding. The siding allows for 6 inches of gravel fill and 12 inches of built-up litter inside the house.

The ground underneath the house is covered with welded wire to prevent rodent infestation.

The top halves of the front and one end of the house are covered with laths; the other end and back are solid. In warm weather, the back of the house can be opened for more ventilation.

The roof overhangs the front and ends 1 foot, and overhangs the back 1/2 foot.

A water trough (figure 1) is attached to the lath end of the house beneath a sun shield. The amount of water is automatically controlled by a float valve. Feeders are attached to the front of the house (figures 3 and 5). They can be filled from outside the house by turning them on their wire supports. Once filled, the feeders are turned back for the chickens to eat out of them. Feed is protected from rain and dirt.

Perches for feeders and water troughs (figure 2) are adjustable for different sizes of chickens. Lath panels between the feeders and water trough and the house are reversible (figure 3). Laths at the bottom of the panels are 1-1/2 inches apart; they are 2 inches apart at the top. (One half of one side of each lath is cut diagonally for greater space between laths. See the drawing of the lath panels.) The 1-1/2-inch space between laths is for young pullets and for fryers. When the chickens are older and bigger, the panels can be reversed for more head space.

A community nest is attached to the solid end of the house (figure 4). A removable nest box rests on a wire platform. The bottom of the nest box is fly screen. The fly screen is covered with rice hull litter. The wire screening allows more air circulation and, with the litter, results in fewer dirty eggs. Eggs are collected from outside the house.

Chickens roost at the back of the house or on the feeder or water trough perches.

An electric socket, just inside the door on the right side, can be used either for a light or for a brooder.

Before building, be sure you study the plan of construction carefully and that you have all the materials you need. Materials listed below are those used in the model house. Substitutes may be made.

Materials You Will Need

LUMBER

QUANTITY	SIZE	USE
10	2" × 3" × 8'	BASE FRAME, BLOCKING, PLATES
4	2" × 3" × 9'	STUDS, SHADE BLOCKS
6	2" × 3" × 6'	RAFTERS, CORNER BRACES
1	1" × 12" × 8'	NEST BOX BACK, NEST BRACKET ENDS
1	1" × 10" × 10'	NEST BOX FRONT, TOPS TO FEEDERS
1	1" × 8" × 9'	FEEDER BOTTOMS AND ENDS
1	1" × 6" × 9'	FEEDER BACKS, ROOST SUPPORTS
4	1" × 4" × 8'	FEEDER FRONTS, NEST BRACKET AND SUPPORTS, BRACES
5	1" × 3" × 12'	DOOR FRAME, WATER TROUGH, ROOF FASCIA
4	1" × 2" × 8'	ROOSTS, ROOST SUPPORTS, BRACES
3	1" × 1" × 10'	FEEDER LIP, NEST LID CLEAT, LATH PANEL FRAMES
50	4' LATH	LATH SIDING

SIDING

9	1" x 8" x 10'	ROOF SHEATHING
20	1" x 8" x 8'	PLYBOARD OR REDWOOD SOLID SIDING. HINGED BACK PANEL, NEST LID, NEST SHEATHING, SUN SHIELD FOR WATER TROUGH

ROOFING

2 STRIPS	8 FT. LONG ROOFING PAPER	MOISTURE BARRIER FOR FLOOR
46 SQ. FT.	ASPHALT FELT	ROOF COVER

WIRE AND SCREENING

9' x 4'	1" x 2" RECTANGULAR MESH WELDED WIRE	FLOOR, NEST BRACKET BOTTOM
2' x 8'	1" POULTRY NETTING	BACK WALL SCREENING
1' x 4'	HEAVY FLY SCREEN	NEST BOX BOTTOM
12'	HEAVY SINGLE STRAND WIRE	FEEDER HANGERS, HOOKS

HARDWARE

1 PR.	1-1/2" BUTT HINGES	LATH DOOR
1 PR.	2" BUTT HINGES	SUN SHADE
1 PR.	4" STRAP HINGES	BACK PANEL
2	4" HOOKS AND EYES	FOR BACK PANEL HOOKS
4	1-1/4" BOLTS WITH NUTS	FEEDER SWIVELS
1	4" STRAP HASP	FOR BACK PANEL LOCK
1	FLOAT VALVE	FOR WATERER
1	ELECTRIC LIGHT SOCKET	ELECTRIC OUTLET

NAILS

2 LBS.	8-PENNY CEMENT-COATED NAILS	SIDING, SHEATHING
1 LB.	12-PENNY GALVANIZED NAILS	FRAME
1/2 LB.	2-PENNY CEMENT-COATED BOX NAILS	LATH, SCREENING
1/4 LB.	3/4" FENCE STAPLES	WIRE, EYES FOR WIRE HOOKS

PRESERVATIVE

1 QT.	CREOSOTE	PRESERVING BASE

How to Build the House

FRAME

1. Cut 2-by 3-inch framing to size. Cut A and C 8 feet long; cut B, D, E, and F 3-1/2-feet long. Nail E and F 32 inches from each end. (Framing may also be made of 2 by 4 inch or 1 by 4 inch lumber, or any combination of these dimensions. However, the 2-by 3-inch is preferred.) Material used should be rot-resistant.
2. Cut corner studs, G, H, I, J, and nail in place. Cut G and H 4 feet 7 inches, I and J 3 feet 7 inches.
3. Cut top plates K and L 8 feet long. Nail them to the tops of studs G and H, I and J.
4. Cut the four center studs M, N, O, P. Studs M and N are 4 feet 7 inches long, O and P are 3 feet 7 inches. Notch the studs so that lower blocking, Q and S, will fit in place. The top of the notches should be 24 inches from the lower edge of the framing. Nail the studs in place.
5. Cut the four rafters, Aa, Bb, Cc, Dd. Rafters are 5 feet 8 inches long to allow for a 1-foot overhang in front and a 1/2-foot overhang in back. Nail the rafters in place. The two end rafters, Aa and Dd, serve also as end plates.
6. Cut the blocking, Q, R, S, T, U, V, W. Blocking Q and S are 7 feet 8 inches long. They fit into the notches in studs M, N, O, P. Blocking R, T, U are 3 feet 6 inches long. Blocking V and W are 30 inches long. Blocking U must be toe-nailed into position.
7. The four corner braces, Ww, Xx, Yy, and Zz, complete the frame. Braces are about 35 inches long. Check the exact length against the frame before cutting. Nail braces in place.

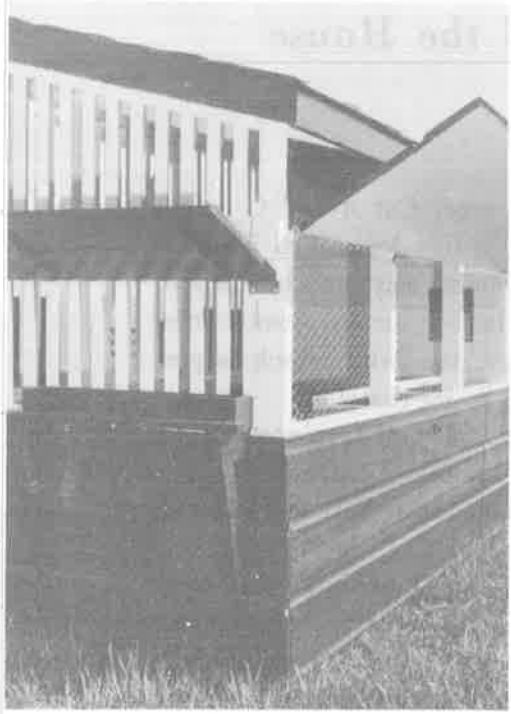


FIGURE 1. Exterior of the poultry house with solid siding, lathing, and poultry netting. The back panel and water trough shield are hinged.

FLOOR COVERING

1. Staple the 1–by 2-inch rectangular mesh welded wire to the bottom of the frame. Use 3/4-inch fence staples.
2. Trim wire to fit.

NOTE: Other sizes and types of small mesh wire can be used if they are strong enough to keep out rats, gophers, and moles, and are rust-resistant.

ROOFING

1. Nail roof sheathing to the rafters. Sheathing extends 1 foot beyond the ends of the house. Use 8-penny cement-coated nails.
2. Cover sheathing with asphalt felt.
3. Nail the 1–by 3-inch fascia, Ff, X, Y, Z to the under-edge of the sheathing. Use 8-penny cement-coated nails for the sheathing and fascia.

NOTE: Sheet metal, shingles, or roofing paper may be used to cover the roof instead of asphalt felt. Use cross-pieces instead of sheathing with sheet metal or shingles.

BASE SIDING

1. Cut siding if not already cut, and nail in place. Nail siding to the front and back first, then to ends.
2. At the nest end of the building, notch the upper piece of siding and one of the lower pieces so that the 1-by 4-inch nest framing and bracing will fit in place (see construction plan). The nest bracing is nailed directly to studding. Use 8-penny cement-coated nails.

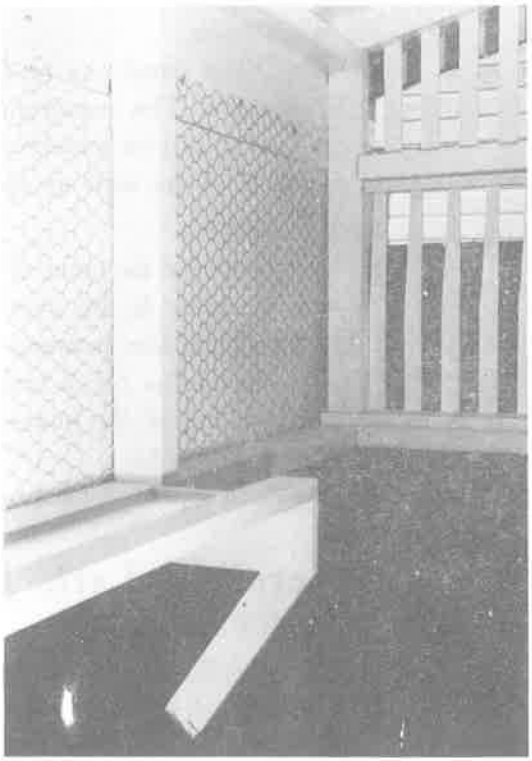


FIGURE 2. Inside construction of the poultry house with the back roost. The wire screening on the back wall and the hinged back panel allow for increased ventilation in hot weather.

BACK OF HOUSE

1. Staple 1-inch mesh poultry netting to the back of the house. It should completely cover the open area under the swinging panel.
2. Notch an 8-foot board so that it fits around the rafters directly under the sheathing across the back of the house. Nail the board in place.
3. To make the back panel, nail three 8-foot lengths of siding together and brace. Attach hinges to the top of the panel and to the solid back board. Attach a strap hasp or some other type of fastener to keep the door tight when closed.
4. Attach hooks to the fascia and panel to hold the panel when open.

NOTE: The panel can be made in one or two sections as well as three. The important point in making the panel is to be sure it will be weatherproof. The panel can be hinged to swing down as well as up.

LATH SIDING

1. Nail laths for the front of the house to blocking V and W and top plate K. Be sure to make laths long enough to cover the space between the top plate and roof sheathing. Nail laths 1-1/2 inches apart.
2. For the end of the house, nail laths to upper blocking U and rafter Aa.
3. Use 2- to 4-penny cement-coated box nails.

Reversible Lath Panels

FOR THE FEEDERS

1. Cut laths 31-1/2 inches long.
2. Cut laths diagonally from the center of one side to the end (see construction plan). The lath is 3/4 inch wide at the narrow end, 1-1/4 inches (full width) at the wide end.

3. Nail laths to 30-inch long 1-by-1 inch supports. Supports should be 3/4 inch from the ends of the laths. Space laths 1-1/2 inches apart, at the wide end. With the wide ends down, the panel has just enough head room for young chicks. Reversed, the panels have space enough between laths for larger chickens.
4. Fit the panels between blocking Q, V, and W. Panels are held in place with small nails at the bottom and turning latches of wood at top. The nails can be pulled easily when removing the panels.

FOR THE WATER TROUGH

The panel for the water trough is the same as the feeder panels except that it is 42 inches long instead of 30 inches.

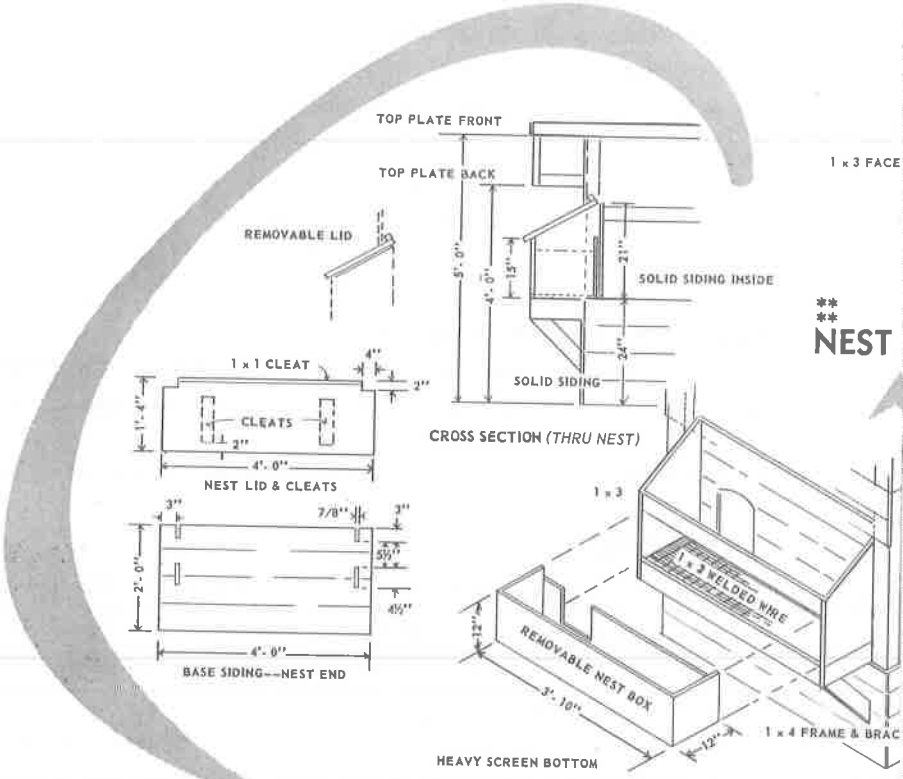
LATH DOOR

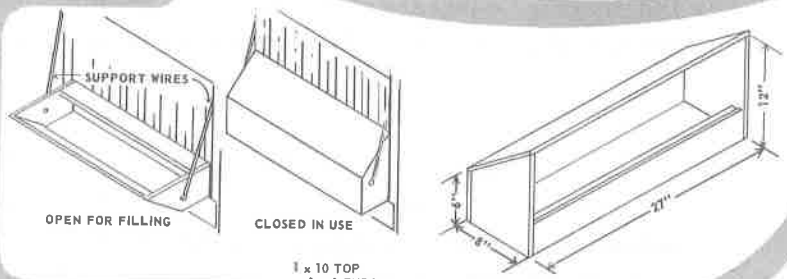
1. Make a Z-frame with 1-by-3 inch material. The frame fits the door space between center blocking Q, center studs M and N, and top plate K. Use corrugated fasteners to hold the frame together.
2. Nail laths to the frame about 1-1/2 inches apart. Laths extend above the frame to the roof sheathing and below the frame about 3/4 inch (see figure 5). Attach hinges to the cross pieces of the frame and to the stud in grooves under the laths. Attach turning latches of wood.

ROOSTING AREA

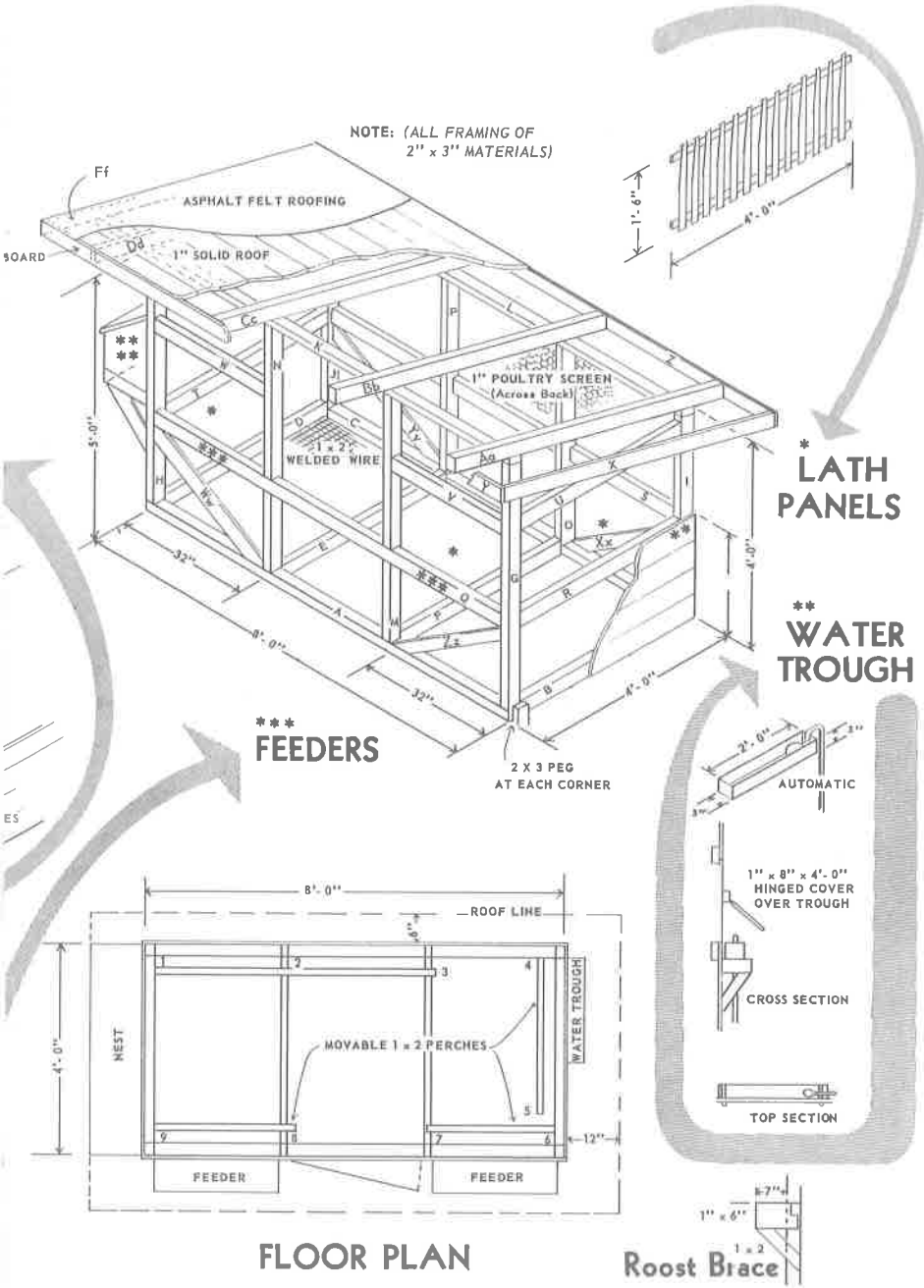
1. Roosts are supported by braces and the lower blocking. They are braced at points 2, 3, 5, 7, 8 on the floor plan, and are supported by blocking at points 1, 4, 6, 9. Except for the back perch, the roosts are movable. Cut 7-inch lengths of 1-by 6-inch material for upper parts of the braces.

POULTRY HOUSE
Construction Plan





1 x 10 TOP
1 x 8 ENDS
1 x 8 BACK
1 x 8 BOTTOM
1 x 4 FRONT
1 x 1 LIP


NOTE: (ALL FRAMING OF 2" x 3" MATERIALS)
Ff
ASPHALT FELT ROOFING
Dd
1" SOLID ROOF
1" POULTRY SCREEN (Across Back)
1 x 2" WELDED WIRE
5'-0"
32"
8'-0"
32"
4'-0"
4'-0"
1'-6"
4'-0"
* LATH PANELS
** WATER TROUGH
*** FEEDERS
2 X 3 PEG AT EACH CORNER
2'-0"
3"
3"
AUTOMATIC
1" x 8" x 4'-0" HINGED COVER OVER TROUGH
CROSS SECTION
TOP SECTION
8'-0"
ROOF LINE
4'-0"
NEST
MOVABLE 1 x 2 PERCHES
WATER TROUGH
12"
FEEDER
FEEDER
FLOOR PLAN
7"
1" x 6"
1 x 2
Roost Brace

2. Notch the 1-by 6-inch pieces to fit around blocking, level with the top (see figure 2).
3. Nail braces to studs.
4. Nail the 1-by 3-inch diagonal brace supports to studs.

NOTE: Brace at point 5 is nailed directly to the wall surface and to the base frame. The brace must be toe-nailed into position.

5. Nail the 1-by 2-inch back perch with the outside edge 11 inches from the wall. The end and front perches are left movable. They can be adjusted to suit different size birds at the feeders and water trough.
6. For smaller birds, place a second roost inside the first at the feeders and water trough.

NOTE: 1-by 4-inch material may be used for the perch, especially for fryers.

NEST SUPPORT

1. Make supports from 1-by 4-inch material. Supports extend from the house 11-1/4 inches.
2. Nail supports directly to the studs and plate (see construction plan).
3. Supports are braced at each end. Nail braces directly to the studs (see construction plan).
4. Complete base for nest by nailing a lengthwise piece between the supports. This base is then covered with 1- by 2-inch welded rectangular-mesh poultry wire (see construction plan).

NOTE: If the bottom of the nest box is 1/8-inch mesh hardware cloth, instead of heavy fly screen, the 1-by 2-inch welded wire need not be used since the support wire is used only to give strength to the screen bottom.

NEST

1. Sheath the inner surface between studs H and J, from blocking T to the top of the nest compartment (21 inches). Use plywood, tongue and groove flooring, siding, or any similar solid material. When cutting the sheathing, allow for the 8-by 9-inch nest opening that is centered directly above the end of the perch at the back of the house. Notch the lower edge of the sheathing to fit over the perch and allow the perch adjusting surface.
2. Nail a cleat to inside surface of the facing next to the nest opening if it is necessary to make the facing tight. Make the cleat of 1-by 2-inch material.
3. Cut the ends of the nest bracket from 1-by 12-inch material. The ends of the bracket are 21 inches high at the back, next to the house, and 15 inches high at the front.
4. Cut the lid for the nest bracket so that it is 16 inches wide and 4 feet long.
5. Notch the lid so that the upper 2 inches turn within the nest box (see construction plan). Nail a 1-by 1-inch cleat to the upper surface of the lid at the top (see construction plan). The 1-by 1-inch cleat holds the lid in place by catching against the inner wall surface directly above it. Nail two cleats to the undersurface of the lid. They rest against the back of the nest box when the lid is closed.
6. Place a hook on the end rafter to hold the nest lid when open.
7. Cut the back and ends of the removable nest box from 1- by 12-inch material. Cut the front (the side next to the wall) from 1- by 10-inch material.
8. Cover the bottom of the box with strong fly screen or 1/8-inch mesh hardware cloth. (See note, Nest Bracket, above.)

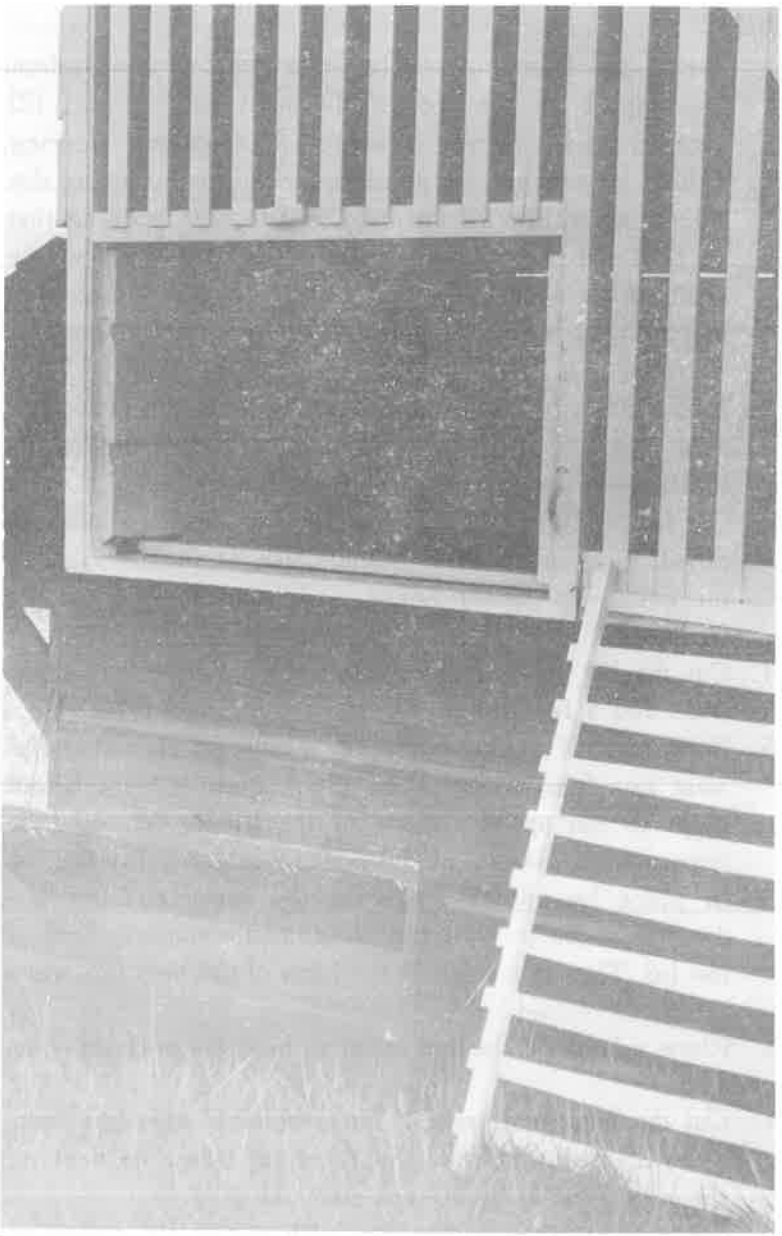


FIGURE 3. Front lathing and feed box opening. Feed boxes are supported by wires hooked to the facing laths.

NEST WALL

1. Complete the wall above the nest.
2. Bevel the lower edge of the bottom piece of the wall so that the nest lid will fit securely in place (see construction plan).

FEEDERS

Feeders are 27 inches long. They are made so they can be opened and closed easily and the chickens can eat from them without difficulty. Feeders are made of 1-inch material or plywood.

1. Cut material to size and nail together. Nail a strip of quarter round or 1-by 1-inch material to the inside of the front of the feeders (see construction plan). This strip prevents feed wastage.
2. Put bolts in the ends of the feeders. Bolts should be just below the center and slightly to the back. The head of the bolt is inside the feeder. Jam threads to prevent bolts from unscrewing.
3. Attach wires to bolts and studding. Use heavy staples or large nails. Feeders on the wires can be turned easily. When turned to feeding position, they hang flat against the lath.

WATERER

The water trough can be made of redwood. It should be be deep enough and wide enough for a 3/4-inch level of water to be maintained automatically with a float valve. The trough is 2 feet long.

1. Cut bottom of the trough from 1-inch material, the sides from 1/2-inch material. Nail sides, bottom, and ends together. Use galvanized nails.
2. Coat the joints to prevent leaking.

3. Make drain holes at each end of the trough. Use corks or plugs so the drains can be opened and closed easily.
4. Mount the trough on brackets level with the lower blocking at the lath end of the house. Use 1-by 3-inch or 1-by 4-inch material for the trough bracket. Brackets are attached directly to the lower wall of the house. They extend 6 inches from the wall.
5. Nail one or two lengthwise strips parallel to the trough to hold it in position (see construction plan). The trough can be easily removed for cleaning. It can be adjusted to the desired position.
6. Mount a small float valve on the water line, or use a small narrow light bulb as a valve.

SUN SHADE

The sun shade for the water trough is hinged so that it can be turned up or down. It is mounted on blocks so that the reversible lath panel can be removed.

1. Make the shade of 1-by 8-inch material. The shade is 14 inches wide and 4 feet long.
2. Hinge the shade on 2-by 3-inch blocks, 4 inches long. The blocks are attached to the corner studs.
3. When up, the shade is held by a hook attached to the fascia.

ELECTRIC OUTLET

Mount an electric socket for light or for a brooder on the inner surface of stud M. The socket should be 1 foot from the ceiling. Cover the lightbulb, when used in the house, with a wire guard.

PRESERVATIVES

Apply undiluted creosote to the underside of the house, the entire base frame, and the inner surface of the 2-foot high base siding. The lower 6 inches on the outside of the house may also be covered. However, paint will not cover creosote. This preservative prevents rotting.

ANCHORING HOUSE

The house should be located so that heavy rains and winds hit the solid end and back. The site should be level before placing the house on it. After the house has been put in its permanent location, stake it to the ground.

1. Paint four 2-by 3-inch redwood stakes with creosote. The stakes are 15 inches long.
2. Drive the stakes into the ground at each corner of the house.
3. Bolt or spike the stakes to the studding.

FIGURE 4. The community nest showing the bracket base and removable nest box. The top of the bracket base is 1- by 2-inch welded wire. The bottom of the nest box is fly screen.

Keys to Managing the House

1. Place 6 inches of medium fine gravel directly on top of wire base of house. Lay a layer of moisture-proof paper on the gravel. Start litter on paper, using, at first, only as much litter as necessary to keep the chickens off paper. As litter gets dirty, add more. Litter should be no more than 8 to 12 inches high by the time you clean the house.
2. Litter must be kept dry at all times. Feed barley or other grains in the litter as soon as the chickens are old enough to eat the whole grain. Pine shavings, straw, rice hulls, or other good litter material can be used. If kept mixed and dry, the litter need only be changed every 1-1/2 to 2 years between batches of stock.
3. Chicks and fryers should be blocked out of the nest. Remove blocking when pullets are 4 months old. Two inches of clean rice hulls should be maintained in the nest during laying period.
4. A small electric brooder may be built to operate in the house. If the brooder has a canopy, it should be attached directly to the ceiling with a pull-rope so the hover can be raised easily for observation as chicks get older. Small troughs and water fountains on wooden bases are necessary during early brooding.
5. If you have a large number of fryers in the house, place a low self-feeder with two days' supply of mash in the center of the house.
6. The labor of caring for the stock should be at a minimum. For older birds, one trip for gathering eggs, feeding, and checking should be all you need to make.
7. For disease control, stay out of the house as much as possible, keep the litter dry, and be careful in managing the house.

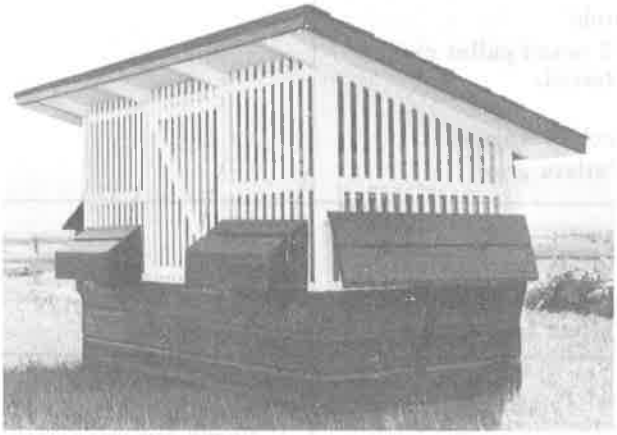


FIGURE 5. The completed poultry house, showing the sheltered water trough and outside feed boxes. Notice that laths extend above the top plate to the roof.

Plan of Operation

HOUSE NO. 1	HOUSE NO. 2
	January: House contains laying pullets from previous year. January to October: Hens produce eggs. Non-layers are killed.
March: 15 sexed pullet chicks started. March to August: Pullets grow.	
August: Pullets start laying. August through December: Pullets lay.	
	October: Remaining hens killed. House cleaned.
	October through December: 25 to 35 fryers raised, killed, and frozen.

Note that the house with layers and fryers and the house with growing pullets alternate from year to year. This way you do not have to move the stock from one house to the other and you get maximum use of the houses. Each house is empty for two months every other year, which gives you a chance to remove the litter and clean the house and equipment.

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BREAST | WATTLES

BEAK | COMB

CAPE | EAR | BLADE

POINTS | SPUR

CLAW | SHANK

HOCK | THIGH

FLUFF | BACK

BODY | PRIMARIES

SADDLE | SICKLES

LESSER SICKLES

HACKLE

SADDLE FEATHERS

VENT

WING-BOW

SECONDARIES

WING-BAR

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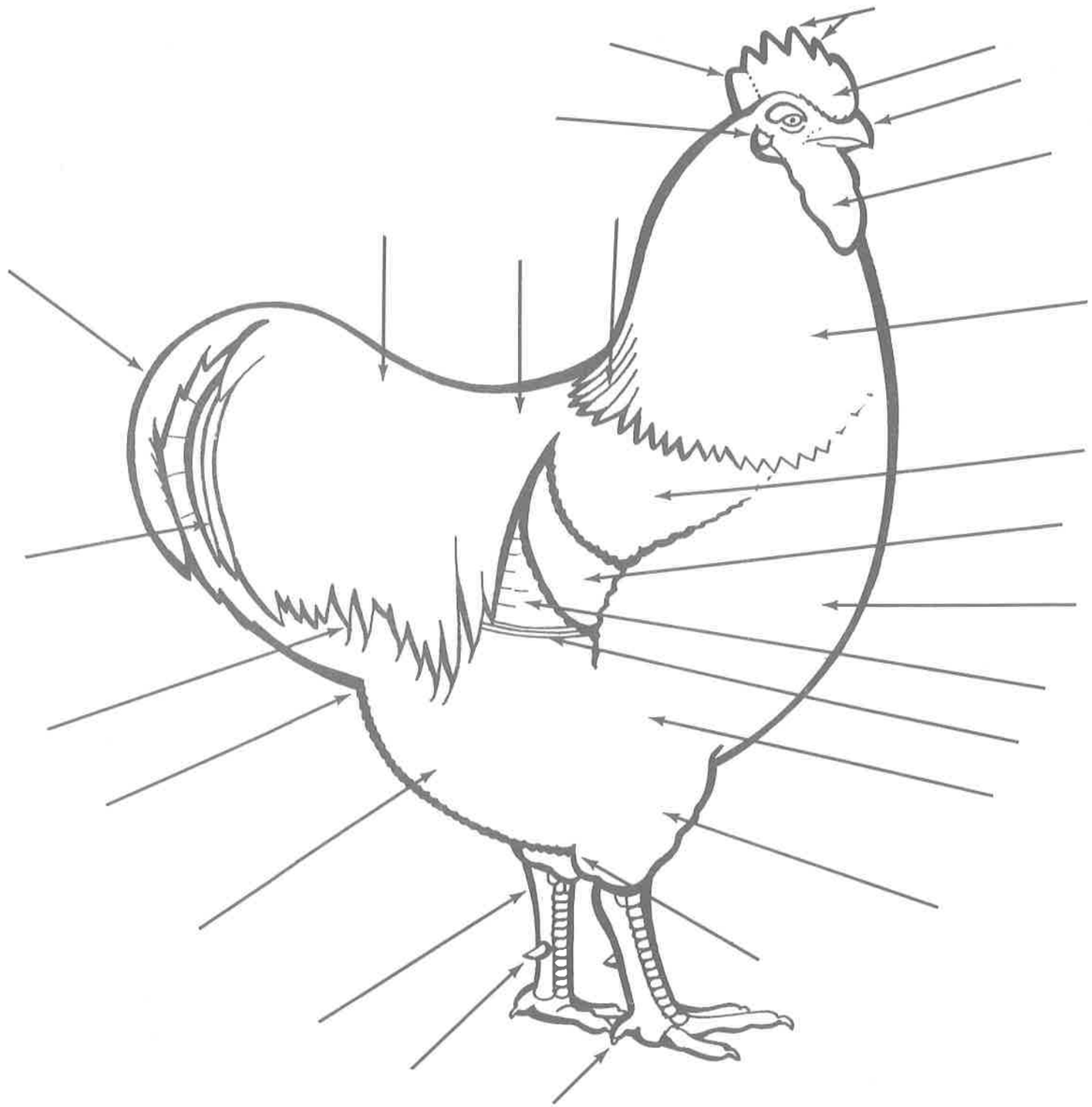

POULTRY ... PARTS IDENTIFICATION

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture, Kenneth R. Farrell, Director of Cooperative Extension, University of California.

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Cooperative Extension **University of California**
Division of Agriculture and Natural Resources

4-H-2036

POULTRY

PROJECT OUTLINE

AGRICULTURAL EXTENSION UNIVERSITY OF CALIFORNIA

PULLET GROWING UNIT

In the 4-H Pullet Growing Project you will brood and rear 50 or more sexed pullets from stock bred for egg production to an age from 20 to 24 weeks. This is not a moneymaking project; it will help you raise a flock of laying birds to use in your egg production project in your next year of club work.

Keep a complete record of this project on your 4-H Club Project Record Sheets. Include the cost of raising your pullets in the cost of your egg production project.

Read the unit on Pullet Growing in your Poultry Project Manual before you start this project.

Discuss with your parents and leader the following equipment and supplies you will need for your project. Be sure that you can obtain these things before you sign up. Success in this project depends on your doing a good job with the proper equipment.

4-H–Ag 42
Rev. 12/70

You will need

Housing

- Adequate brooder house or outdoor brooder providing 1 square foot per bird
- Growing enclosure for birds between the ages of 8 to 16 weeks:
  a. Floor type — 2 square feet per bird
  b. Wire floor pen — 1 square foot per bird
- Adequate laying house (see Egg Production Project house equipment section)

Equipment

- Adequate brooder with controlled heat
- Feeder space
  3 linear inches per bird under 12 weeks old
  4 linear inches per bird 12 weeks old and over
- A drinking fountain for every 25 birds under 12 weeks old
- Circular guard fence

Water space

- 1 linear inch per bird 12 weeks old and over

Materials

- For solid floor, 2 inches of dry litter (increased as birds grow)
- 50 sexed pullet chicks
- 14 to 20 pounds of feed per bird
- Vaccines and medicines—10 cents worth per bird
- You will need to use for all three units the following report forms
  Annual 4-H Project Report and calendars
  4-H Annual Achievement Report (optional)

EGG PRODUCTION UNIT

In this project you will usually begin with 40 or more 6-month-old pullets. As part of your project you will have to pay for raising your pullets. You must keep complete and accurate records in order to know how much you have made. A daily egg and flock record will help you.

Here is a list of supplies and equipment you need to have by the time your pullets are ready to lay. Read your 4-H Club Poultry Project Manual before you start.

You will need

Housing

- Floor house – 3 square feet per bird
- Wire-floored or caged house – ½ or more square foot per bird
- All types of housing should be dry, well ventilated, and well lighted

Equipment

- Nests – 1 deep litter nest for each 5 hens in floor-type house—rollaway nests in wire house—none in cages
- Feeder space – 4 inches by at least 6 inches deep per bird
- Water space – 1 linear inch per bird
- Rubber-covered wire pails, a cool storage room (55 F), and an egg candler, scale, and buffer, if you sell your eggs direct

Materials

- Feed – 100 pounds per bird for 12 months
- Vaccines and medicines (5 to 10 cents per bird)
- One year to complete project
- Daily egg and flock record

Marketing

You should find a market for your eggs before pullets start production. Here are some suggestions:

- An egg delivery route to nearby homes
- Local community stores
- Egg marketing cooperatives (where you can also purchase feed)
- Some feed stores

POULTRY MEAT UNIT

Can you—a 4-H Club member—make money raising meat poultry? The 4-H Club Poultry Meat Project is planned to answer this question by helping you to successfully raise, market, and keep records on at least 50 meat-type chickens.

Here is a checklist of the things you will need in this project. Before you plan to start, you should read over this list to be sure that you have or can obtain these items.

- Adequate brooder house (1 square foot per chick)
- Adequate brooder with controlled heat to maintain 90 degree temperature 2 inches from the floor
- 3 inches of linear feeder space per bird
- 1 drinking fountain for each 25 chicks
- Circular guard fence
- 2 inches of dry litter on floor (shavings, chopped straw, etc.)
- 50 meat-bird chicks
- 8 pounds broiler mash per chick
- Finish birds 8 to 9 weeks time
- Market for finished birds
- Management and disease control

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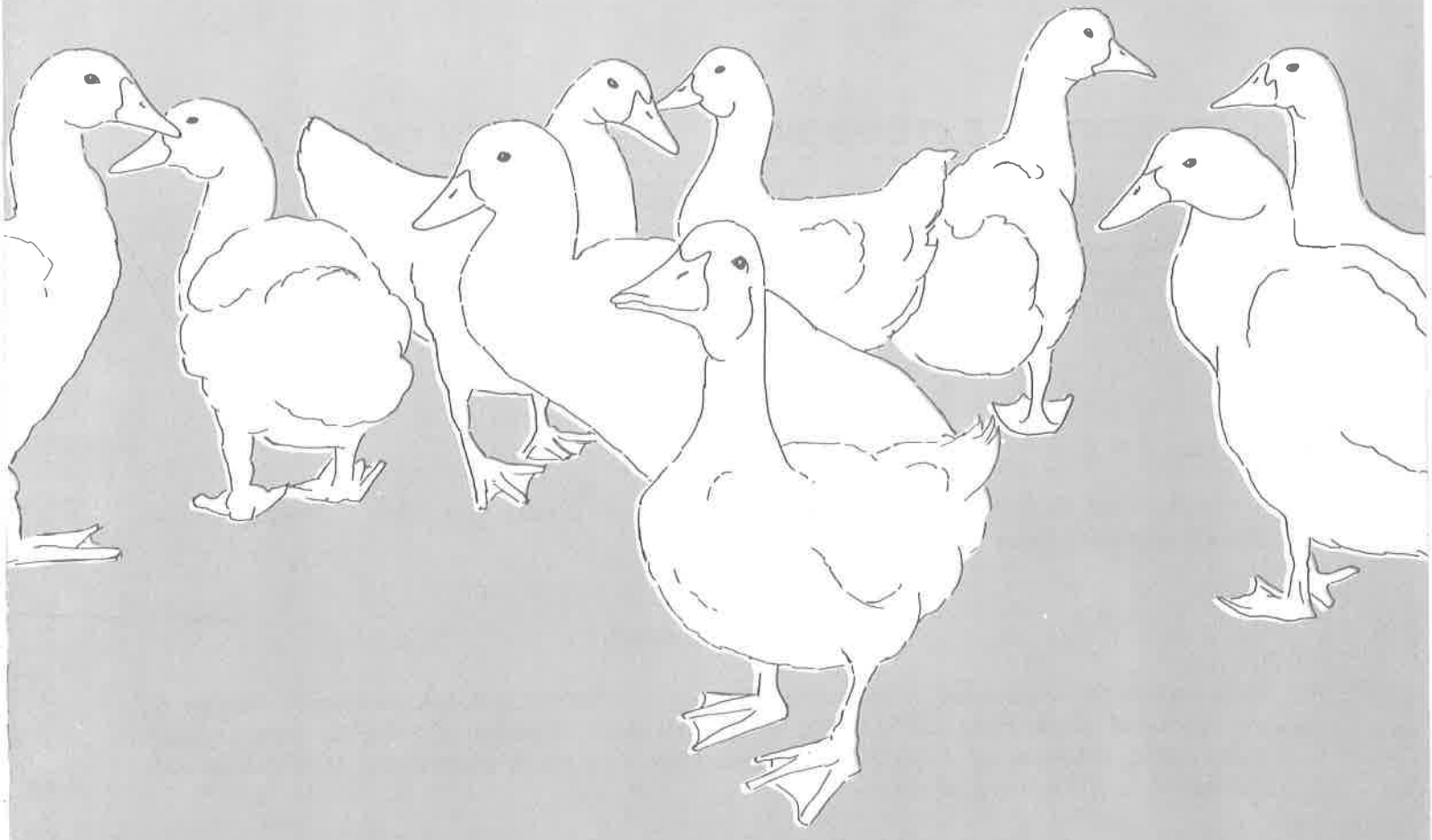
Raising Ducks in Small Flocks



Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA
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COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

This information is provided by Cooperative Extension, an educational agency of the University of California and the United States Department of Agriculture. Support for Cooperative Extension is supplied by federal, state, and county governments. Cooperative Extension provides the people of California with the latest scientific information in agriculture and family consumer sciences. It also sponsors the 4-H Youth Program. Cooperative Extension representatives, serving 56 counties in California, are known as farm, home or youth advisors. Their offices usually are located in the county seat. They will be happy to provide you with information in their fields of work.

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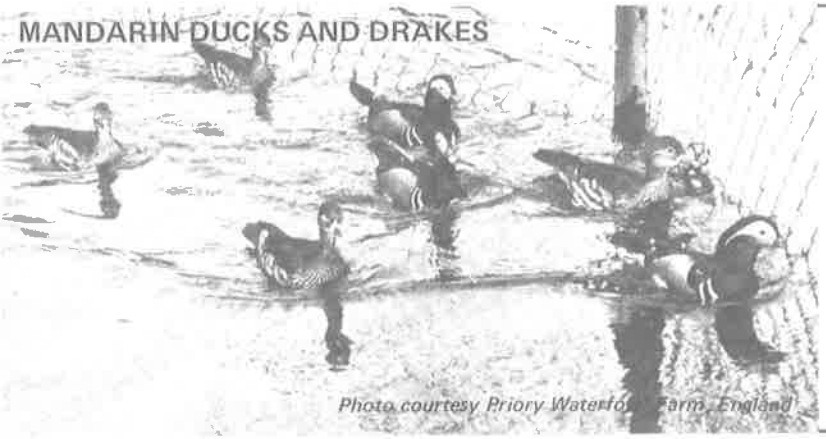


MANDARIN DUCKS AND DRAKES

Photo courtesy Priory Waterfowl Farm, England

Raising Ducks in Small Flocks

INTRODUCTION

In California, ducks are raised to gain a source of food, a family learning experience, insect control, or interest and beauty in yards. There are numerous breeds and varieties, and stock can be obtained by purchasing hatching eggs, ducklings, or adult birds from hatcheries, retail sales outlets, or breeders.

BREEDS

The best breed for you to raise depends on your objectives. *White Pekin, Aylesbury,* and *Muscovy* ducks are good breeds for meat production, while *Khaki Campbell* and *Indian Runner* ducks are good breeds for egg production. The *Crested* duck, the *Rouen,* the *Mallard,* the *White* or *Gray* varieties of *Call* duck, and the *Mandarin* duck are breeds with attractive feather patterns, small size, or other special physical characteristics. They are often raised for pets, for insect control, or for their beauty.

Anyone interested in developing commercial duck production must consider the potential market and how ducks or their products are to be prepared for market. In California, few (if any) commercial poultry processors will buy ducks.

UTILITY AYLESBURY

Photo courtesy Priory Waterfowl Farm, England

PEKIN

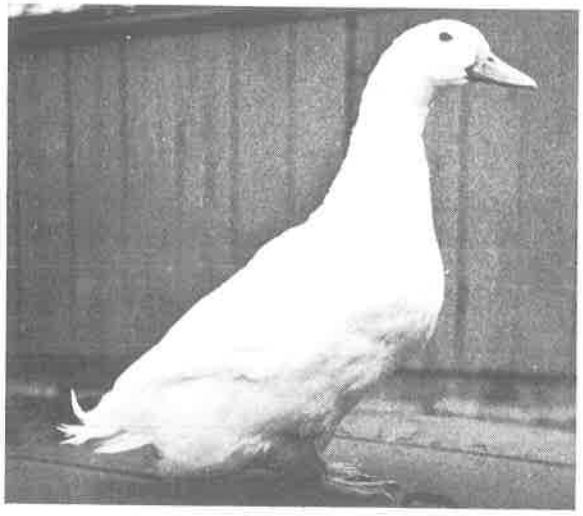


Photo courtesy Department of Agriculture and Fisheries, South Australia

White Pekin

California's commercial duck industry relies on the White Pekin. Seven-pound ducklings at 8 weeks of age become attractive dressed carcasses. The adults are large and white-feathered with orange-yellow bills, reddish-yellow shanks and feet, and yellow skin. Adult males weigh about 9 pounds; adult females weigh about 8 pounds. In one season, each female will lay about 160 eggs; often Pekins are nervous and are not good mothers.

Aylesbury

The Aylesbury is as popular in England as the White Pekin is in California. Aylesburys have white feathers, white skin, flesh-colored bills, and light orange legs and feet. They are slightly larger than the White Pekin (8 to 10 pounds), and in England they are often considered a deluxe table bird because of their light bone and creamy flesh. Egg production and fertility are normally lower in the Aylesbury than in the Pekin. The Aylesbury hen is less nervous than the Pekin hen, but she is also not inclined to incubate her own eggs.

Muscovy

The Muscovy, which does not appear to be related to other breeds of ducks, does not quack and does not have feathers on the face; there are no curled feathers in the male's tail. The incubation period is between 34 and 36 days, compared with 28 days for most ducks. Matings with other breeds result in sterile ducklings. *The American Standard of Perfection* lists three varieties of Muscovy: blue, colored, and white. The face is featherless and bright red; the male has a knob on the top of the head; the skin is white. Adult males weigh from 10 to 12 pounds—adult females, close to 7. Up to 17 weeks of age, the Muscovy produces meat of excellent quality. As a layer, it does not excel; however, it is an extremely good setter and often raises as many as 30 ducklings per hatch. Because of its silence, its inclination to set and brood, and its meat quality, this breed is popular in small flocks.

MUSCOVY

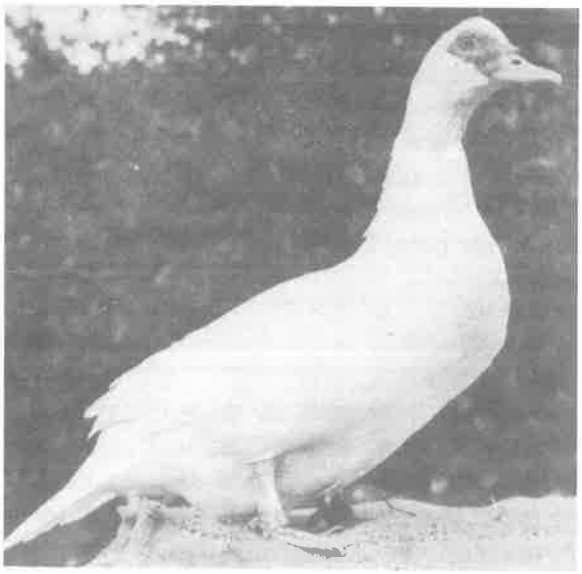


Photo courtesy Department of Agriculture and Fisheries, South Australia

KHAKI CAMPBELL

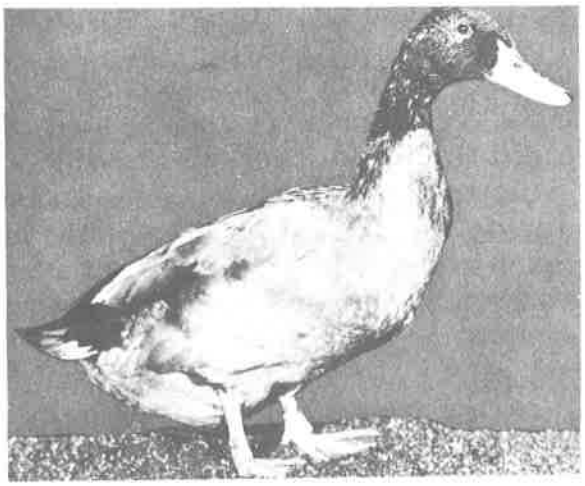


Photo courtesy Department of Agriculture and Fisheries, South Australia

Khaki Campbell

Amazing egg production has been recorded by Khaki Campbell ducks. Selected strains have averaged nearly 365 eggs per bird per year. This is a small duck; both males and females weigh close to 5 pounds. The males have brownish-bronze lower backs, tail coverts, heads, and necks; the rest of the plumage is khaki-colored. They have dark green bills and dark orange legs and feet. Females have seal-brown heads and necks, khaki plumage, greenish-black bills, and brown legs and feet. Two additional varieties of this breed are recognized in England: the White Campbell and the Dark Campbell.

Indian Runner

The Indian Runner, an East Indian duck whose egg production capabilities were further developed in Western Europe, today rates in egg production second only to the Khaki Campbell duck. A small breed, its mature males and females average close to 4½ pounds.

The duck is characterized by its upright carriage. Unlike other breeds, it has no pronounced shoulders and little depth of body. Viewed from the front, the body appears as a gentle and gradual expansion of the neck. Excited, the duck often stands perfectly upright, and in this position it forms a perfectly straight line from the head through the feet. The wings are small and are carried closed, crossing over the rump.

Three varieties of Indian Runner are recognized: white, pencilled, and fawn and white. Each variety has reddish-orange shanks and feet.

Cayuga

A black-colored American duck weighing between 7 and 8 pounds when mature, the Cayuga is a hardy, thrifty egg producer that dresses clean and provides a good carcass for roasting.

Crested

A medium-sized white duck (adult males average 7 pounds; adult females, 6 pounds), the Crested duck is characterized by a crest of feathers attached to the back of the head. One drawback: a gene carried by all individuals allows only a percentage of the fertile eggs to hatch. Two-thirds of the ducklings that hatch should develop crests.

Buff or Orpington

The Buff or Orpington is a medium-sized breed that can be an excellent egg producer, a good market duck, and an exhibition bird of merit. *The American Standard of Perfection* lists this breed as the Buff duck; in England the Buff is one of the four varieties of Orpington ducks. The duck is buff in color, with brownish-orange bill and orange-yellow feet. Adult males average 8 pounds; adult females, 7 pounds.

Blue Swedish

A medium-sized thrifty forager and a good roasting duck, the Blue Swedish duck hatches and raises its offspring effectively. Maintenance of the blue color is difficult since it is not a dominant color, but one resulting when black and splashed-white colored Swedish-type ducks are mated. The duck has blue plumage, an inverted heart-shaped bib of white on the lower neck and upper breast, a blue head and bill, and orange-to-brownish orange shanks and feet. Adult males weigh about 8 pounds; adult females, 7 pounds.

Rouen

A very popular breed, the Rouen carries attractive feather patterns and desirable body proportions. Grown males weigh close to 9 pounds; grown females, 8 pounds. This breed, although slow to grow, is a good forager and produces a quality roasting duck. The feather patterns carried by the male and the female are sex linked. The male's color is similar to that of the male Mallard; the female's coloring and pencilled feathers resemble partridge plumage patterns found in chickens.

Mallard

The Mallard, a native wild duck of North America, has been easy to domesticate, and today it is on menus of hotels and restaurants and is used on some hunting preserves. Ducklings, brooded under artificial conditions, tend to become tame and heavier in weight, so that they are less interested in flying than are those raised with their mothers. The adult drake weighs about 3½ pounds and has a dark green head with a distinctive white neck ring. The adult female weighs about 3¼ pounds and has predominantly brown-colored plumage.

MALLARD

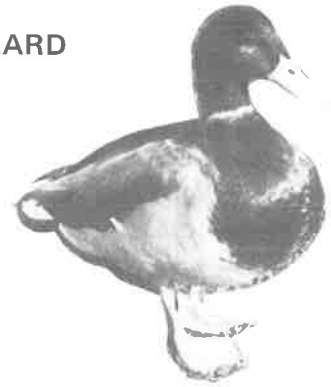


Photo courtesy Ministry of Agriculture, Fish, and Food, London

Call Duck

Often described as a bantam duck because it is small and compact, the Call duck becomes oversized and loses its compact appearance if hatched too early or overfed. Delicate at birth and normally requiring special handling during the first few days, the breed possesses good natural flying ability. There are two varieties: White and Gray. The color pattern of the Gray Call is similar to that of the Mallard.

East Indie

A breed of miniature black duck, admired for its small size and its black color, the East Indie possesses good natural flying ability. Its husbandry is similar to either of the Call varieties. Adults weigh about 2 pounds.

Mandarin

The beautiful feather patterns and colors of the Mandarin duck make this breed a popular addition to a rural home environment. In Asia it has been semi-domesticated for many years and has proven a hardy breed that will become tame in captivity. The eggs hatch after 29 to 31 days incubation. The adult male weighs about 1½ pounds; the adult female, about 1 pound.

HOUSING

Mature ducks do not require housing, but they will lay better and eat less feed if given some protection. Adult ducks that are confined at night should have 5 to 6 square feet of floor space per bird, one nest for each four females, and an artificial light to prevent piling at night. Any simple rain shelter with protection from the prevailing wind is adequate. The floor can be of dirt, wood, or concrete. Straw bedding should be provided inside sheds or houses, and this should be kept reasonably dry by adding or changing straw as necessary. Ducks *do not* require swimming water, but if they are allowed to swim, the pond should be kept fresh by constant addition and overflow of water.

Ducklings are best raised in areas away from adults. Clean houses and yards that provide adequate shade and no standing water are recommended.

All ducks (especially ducklings) should be protected from such predators as rats, racoons, skunks, cats, hawks, crows, and bass.

MATING

Ducks saved for breeders should have desirable weight, conformation, and feathering. Young, vigorous ducks and drakes from parents that gave good egg production, fertility, and hatchability are the best breeders. One male may be mated with five or six females. The male should be with the females a month before eggs are to be saved for hatching.

SEXING

The sex of ducks can be determined at 1 day old. Pressure applied to the vent area will cause the sexual organ of the male to extend and become identifiable. At six weeks in some breeds, a difference can be noted between the sound of the female—a definite "quack"—and the voice of the drake, which is lower pitched and slightly rougher. In most breeds (not the Muscovy) the male develops curled tail feathers at the time it grows its adult plumage. Size is also helpful in determining sex, since the male in all breeds is usually larger than the female.

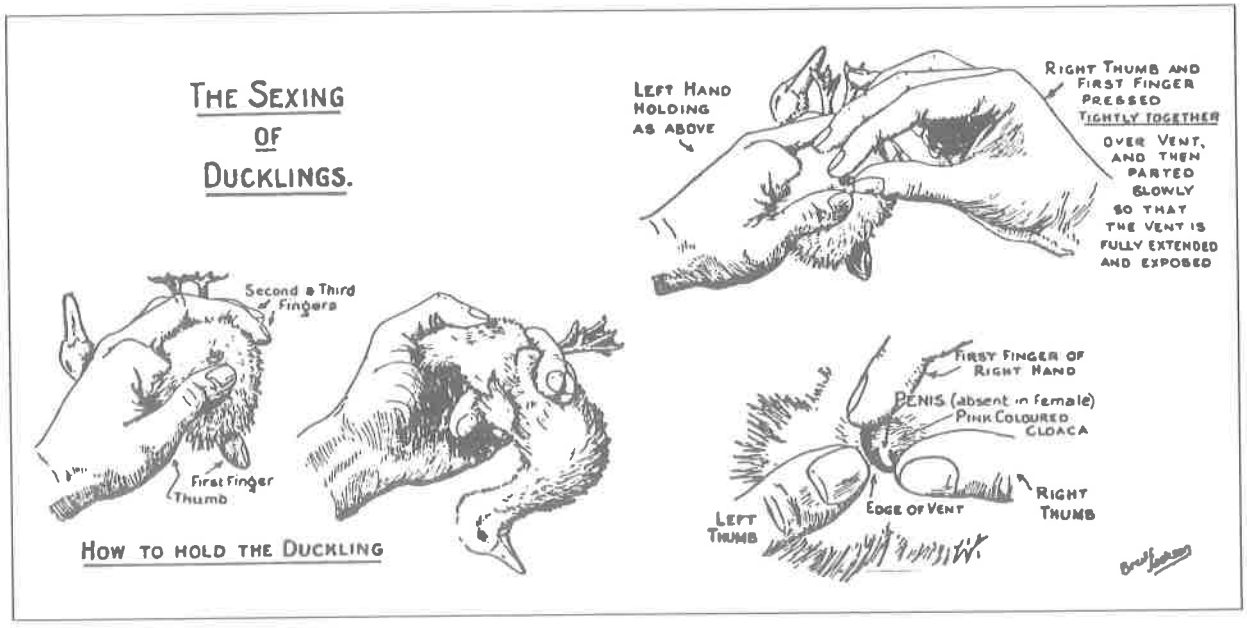


Photo courtesy Beacon Milling Company

EGG CARE

Duck eggs for table use should be dry cleaned, refrigerated soon after gathering, and cooked prior to being eaten.

When eggs are to be incubated, nests (12 inches wide by 14 inches long by 12 inches high) with clean bedding (rice hulls, shavings, etc.) should be provided. Hatching eggs should be gathered each morning, cleaned with sandpaper or steel wool, and stored in a cool place (50° to 70° F and 75 percent relative humidity).

When you want ducks to set and hatch their own eggs, allow three or four eggs to collect in the nest, mark them with a pencil, and then remove the fresh eggs as laid and place them in a cool storage area. When the duck begins to set, replace the marked eggs with the freshest eggs available.

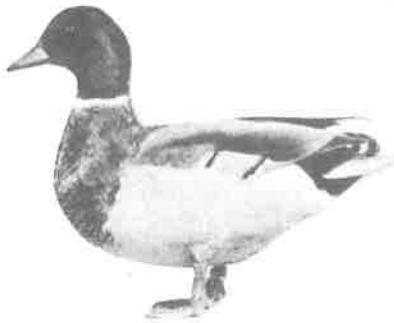
Eggs which are more than 2 weeks old, cracked, misshapen, or abnormal in size will not hatch well.

INCUBATION

You can incubate eggs naturally (under a female) or with an artificial incubator. Natural incubation requires a broody duck or chicken hen. Some breeds incubate more effectively than others. If females do not become broody, try leaving eggs in the nest. If this fails, it is probably best to try a different female or artificial incubation.

To set your duck or hen, prepare a nest well bedded with straw or shavings in a quiet and secluded area. Darken the nest by partially closing the entrance with a cloth or canvas flap. Put as many eggs in the nest as your female can cover comfortably (eight to ten for a medium-sized hen) and then allow her to start setting. To be sure you have selected a consistent setter, take her off the nest a few times and see if she returns to the nest promptly. Be sure to provide feed and water close to the nest. It is advisable, but not essential, to separate setting birds from the rest of the flock. Most duck eggs hatch in 28 days (Muscovy, 35 days; Mandarin, 29 to 31 days).

GRAY CALL DRAKE



A Gray Call drake shows the compact type and characteristic level carriage of this breed, even though his head is not quite as typical as that of the female pictured.

Photo courtesy American Bantam Association

To incubate eggs artificially, you can buy or build an incubator. If instructions are available with the incubator, follow them exactly. Duck eggs should have high humidity during the hatching period. In small incubators it is advisable to sprinkle the eggs daily with warm water during the last 3 days of incubation. For additional information on incubation and sources of incubators, see Cooperative Extension Leaflet 2653, *Incubating Eggs in Small Quantities.*

NATURAL BROODING

In natural incubation, broody chicken or duck females will brood ducklings effectively. Ducklings and their mothers should be kept in clean areas away from other ducks and protected from predators. Feed and water should be available to both the mother and the baby ducklings soon after they leave the nest. By the time the ducklings are 3 weeks old, the mother can normally be returned to the flock.

GRAY CALL DUCK

An excellent Gray Call female is seen here. Although in somewhat startled pose, she nevertheless has the "buffle" head so important in true Calls.

Photo courtesy American Bantam Association

ARTIFICIAL BROODING

Ducklings can be taken from the incubator soon after they are dry and placed under a heat lamp or a brooder stove. For the first few days, restrict the ducklings to an area close to the brooder, the feed, and the water. A dim light at night will also help curtail wandering, as well as reduce the tendency of birds to crowd.

Initial brooder temperatures should average between 85° and 90° F. Observe the birds closely. If they huddle and are noisy, the temperature is too low; if they pant or stay away from the heat, the temperature is too high. Brooder temperatures should be reduced gradually, so that by the time the birds are feathered the heat can be discontinued. Brooding areas should be dry and draft-free. Cover the floor with a 4-inch-deep layer of absorbant litter, such as pine shavings or chopped straw. If damp spots develop, the moist material must be removed and replaced.

Provide ½ square foot of floor space per bird for the first two weeks, 1 foot of floor space the third and fourth week, and at least 2 square feet of floor space during the remainder of the time the young birds are confined.

FEEDING

Ducklings should be fed as soon as they are placed under the brooder and never later than 36 hours after they are hatched. All ducklings can be started on a commercial duck or chick starter mash that contains about 20 percent protein. If you prefer, you can moisten the mash with water or skim milk. During the first few days, place mash on egg flats or in shallow box lids lined with rough paper. (Do not use a slick surface because the duckling may slip and damage its legs.) Once the birds have learned to eat, they should eat from troughs or hoppers. Be sure ducklings do not get any spoiled or moldy feed; discard wet mashes over a day old.

Use waterers that the ducklings cannot get into. (Ducklings still in the down stage chill easily when allowed to become damp.) Poultry waterers that permit the ducks to get their bills wet to the nostrils are satisfactory. Place the waterers on raised wire platforms or metal grills that prevent the ducklings from gaining access to damp litter which develops around the fountain. Clean the waterers every day.

After two weeks on starter rations, ducklings can be switched to a pelleted or mash growing ration, which can be supplemented with chick-size grain and young pasture or cut greens. If the birds appear to be too fat, restrict the amount fed daily. As soon as the birds begin laying, they should be fed egg-laying mash or pellets. One month prior to the incubation of fertile eggs, the adult stock should be fed a breeder ration. It is advisable to feed oyster shell free choice to ducks if the laying feed has less than 2½ percent calcium and they continue to lay for more than a month.

A common practice with ducks is to locate the feeders some distance from the waterers. In this way, the ducks excercise constantly by moving back and forth between the feeders and waterers.

DISEASE PREVENTION

Ducks raised in small numbers and away from other ducks normally do not encounter major diseases. Providing protection against extreme temperatures, access to clean housing and equipment, quality feeds, and regular attention also helps preserve flock health.

An occasional death may be expected, but if two or more birds die on the same day, you should suspect a disease problem and prompt action should be taken. Affected birds should be submitted to a diagnostic laboratory or a veterinarian familiar with the disease problems of ducks, and the veterinarian's recommendations should be followed as completely as possible. Dead birds should be removed from pens promptly and placed in fly-tight cans or buried at least 1 foot deep.

KILLING AND PICKING

Starve a duck for at least six hours before killing it, but do not restrict water. To kill, cut the duck's throat in the soft spot where the head joins the neck. Do not remove the head. It is important that the jugular vein be severed and that the bird be allowed to bleed.

A bird to be picked dry should be vented soon after bleeding. Venting is the procedure of removing the feces from the vent of the bird by applying pressure to the abdomen. For best results, hold the duck's tail downward. Once vented, the bird should be stored for up to 12 hours in a refrigerator at a temperature of about 33° F. Refrigeration allows the skin and the flesh under the skin to firm so that the feathers can be removed without tearing the skin.

An alternative to dry picking is to immerse the freshly bled duck in water heated to 140° to 160° F for three minutes or the time required to release the feathers. If you heat the water to boiling and then let it stand while you kill the duck, the temperature will be about right. Add a small amount of detergent to the scalding water to better wet the feathers. Hold the duck by its bill and keep it completely immersed and moving in the water until the feathers on the head can be easily removed.

After removing the feathers, singe the duck's body to remove any remaining hair or down. When many ducks are to be picked at one time, wax picking is often used, a procedure *requiring* the use of special duck waxes. Once most of the duck's feathers have been removed, the bird is immersed in a water solution heated to 165° F which is covered with a 1-inch layer of heated liquid duck wax. The duck is then removed from the wax solution and dipped in a chilled water bath to harden the wax. Peeling the wax from the bird removes remaining pinfeathers and down. If the carcass is not clean after one wax procedure, the process can be repeated. The duck wax can be separated from the feathers with a screen and melted again.

Duck feathers and down, following sorting, washing, and drying, may be used in pillows, quilts, and cushions, as part of household decorations, and for certain recreational equipment, such as arrows and fishing flies.

MARKETING

Small producers will need to develop local markets for ducks. Ducks may be sold to local stores or restaurants, to neighbors or at farmers' markets. A 7- to 9-week-old meat-type duck will weigh between 5 and 7 pounds and yield an oven-ready carcass weighing between 3 and 4½ pounds. Roasting ducks are older ducks, often weighing between 6 and 9 pounds. Other markets include those for ducklings, incubated eggs, hatching eggs, and fresh eggs.

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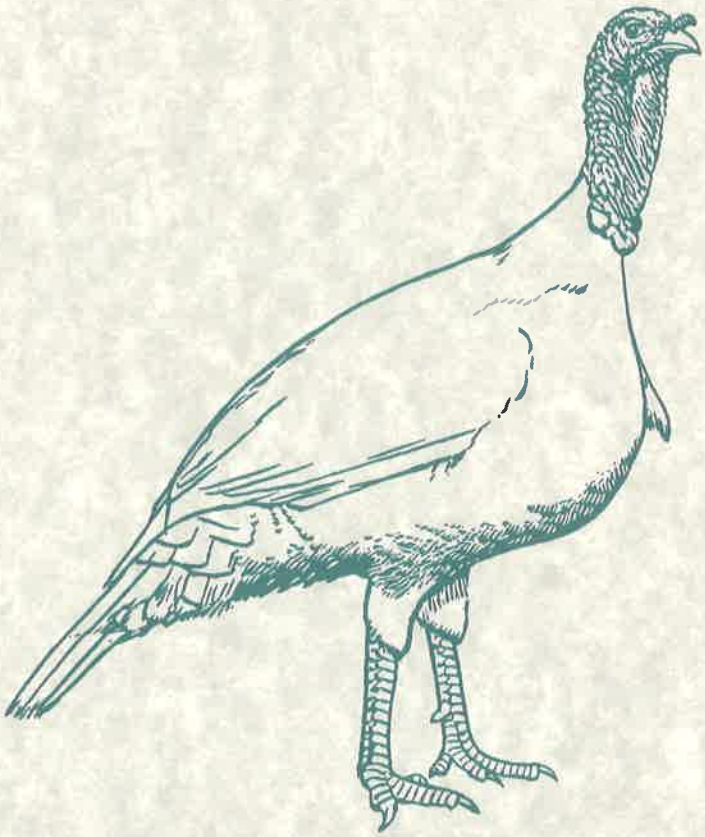

TURKEY

CARE PRACTICES

California Poultry Workgroup
University of California ♦ Cooperative Extension

FOREWORD

"Turkey Care Practices" is one of a series of University of California publications addressing the issue of animal care relating to food production in California. This publication is a joint effort of the University of California Cooperative Extension, poultry industry representatives, and members of the Poultry Workgroup.

"Turkey Care Practices" was edited by Carolyn Stull, Animal Welfare Specialist, Veterinary Medicine Cooperative Extension, University of California, Davis.

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"Turkey Care Practices" was reviewed by the major turkey industries in California. In addition, technical reviewers include: Bill Mattos, Executive Director, California Poultry Industry Federation, Modesto, California; Dr. Ralph A. Ernst, Poultry Specialist, Cooperative Extension, University of California, Davis; and Donald D. Bell, Poultry Specialist, Cooperative Extension, University of California, Riverside.

The information in this publication is valid as reference material until January 1, 1998, unless revisions are necessary at an earlier date.

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INTRODUCTION

Turkey management practices have evolved from years of practical experience coupled with scientific research. The care and management of turkey flocks depend on age, location, season, facilities, health, and many other factors. This publication was developed to outline currently acceptable practices for the care and rearing of turkeys for meat products and the breeding stock used to produce commercial poults. Continued research is necessary to provide additional information about the needs and preferences of turkeys along with exploring alternative or innovative practices. As new scientifically based economically feasible practices are developed, management should implement these methods into existing systems.

The well-being of the turkey is an ethical concern as well as an economical one. Management practices that promote animal care are probably the most effective from a production standpoint. Properly managed turkeys benefit by providing a higher quality product at a lower cost.

In California, there is an estimated 235 commercial turkey production farms. The average meat production unit has a brooding and growing capacity for 50,000 birds at one time. Typically, these facilities manage 3.5 production cycles per year.

Nearly all turkeys in California are grown under contract with one of several large integrated companies or their subsidiaries. These large integrated companies own all or part of the following enterprises related to turkey production including breeders, hatchery, feed manufacturing, processing plant, brooding/growing facilities, and transportation services.

The number of turkeys produced in California peaked at 32 million in 1990 and dropped to an estimated 24.5 million by 1993. The major causes for this reduction was the necessity to import feed grain and the unfavorable business climate in California. Production costs in California are higher than in other areas making it difficult for the California industry to competitively produce turkey meat products for the consumer.

HATCHERY PRODUCTION PRACTICES

Turkey hatcheries, both commercial and those devoted to primary breeding, concentrate their efforts on maximizing the hatching of fertile eggs and the marketing of viable poults. Although environmental conditions for incubation are controlled automatically, these need to be supplemented with an alternative power source in case of disruption of the primary energy source. Hatcheries should have an ongoing training program to teach and update employees on the latest techniques for servicing poults and minimizing poult discomfort.

Servicing Poults

"Servicing poults" refers to the preparation of poults for shipment to the customer. Services available include: sexing, beak trimming, various vaccinations, the removal of the snood on tom poults and the removal of toe nails. Hatchery personnel are taught to remove poults from hatching trays and service them with a minimum of stress.

Beak trimming to prevent cannibalism is usually done in the hatchery using an electric arc trimmer or hot blade. An electric arc trimmer leaves a small hole in the upper beak; whereas the hot blade trimmer leaves a small indentation on top of the upper beak. Within a week, the tip of the upper beak will separate. Some producers still trim the upper beak between 10 and 21 days with a hot blade or clippers. Beak trimming should not coincide with vaccinations or other stressful activities. Iodine may be put in the drinking water the day of beak trimming and the day after to reduce the incidence of subsequent infection. The practice of desnooding for reduction of cannibalism, and toenail removal for identification and prevention of scratching should be conducted by trained and competent personnel.

Poult Vaccination

Vaccination either by injection or aerosol can be administered in the hatchery to protect the poult from disease agents prevalent in the environment to which the poult is being shipped. Vaccination by injection in the hatchery is considered less stressful for the poult than when administered in brooder or growing houses.

Poult Shipment

Poults awaiting shipment should be held in ventilated, temperature-controlled rooms in clean and sanitized poult boxes fitted with new pads. The boxes should have a lining such as excelsior pads or absorbent mats which provide secure footing. They are shipped to their destination soon after hatching in properly ventilated, temperature-controlled vehicles. Because of the availability of yolk

material to newly hatched poults, poults can be maintained without food or water up to 72 hours. However, the best industry practice is to place poults under brooder stoves (for details see page 6) with food and water within 24 hours after hatching. An exception would be poults shipped great distances either within the continental U.S. or to foreign countries.

Hatchery Waste

Hatchery waste is composed of infertile eggs, fertile but unhatched eggs, pipped eggs, and cull poults. In the case of live cull poults, unhatched and pipped eggs, euthanasia is performed to produce a total and irreversible loss of consciousness. Instant loss of consciousness is the best measure of proper euthanasia. The most immediate loss of consciousness occurs with high speed maceration or grinding. Another acceptable method is carbon dioxide gas inhalation.

Hatchery waste may be disposed of in a variety of ways depending on local regulations and ordinances. Most hatchery waste is ground and\or crushed and taken to local landfills.

BROODER BARN PRACTICES

Brooding

The term brooding refers to the period of the poult's life extending from day old to about 6 weeks. Poults are usually placed in brooder rings for the first 5 to 6 days. Then from 7 days to 5 or 6 weeks of age depending on the sex of the bird and the integrator's guidelines, they are given from 1 to 1.5 square feet of floor space per bird. During this time, the poult needs supplemental heat, special starter feed, and protection from exposure to disease. One method of reducing disease exposure is by separately locating the brooding phase from growing and reproductive phases.

If it is necessary to have brooder barns on the same property with growing or breeding birds, they should be located up-wind from older birds and a minimum distance of a 0.5 to 1 mile away. Brooder barn personnel should be restricted from working part-time with older birds or interacting with personnel taking care of older birds.

Clean Out

Current industry standards for California include the washing and disinfection of all barns prior to receiving a new flock of turkeys. The used litter is pushed out of the barn and hauled away, preferably the same day. The lesser mealworm, *Alphitobius diaperinus* (Panzer) considered an agricultural pest, may have the opportunity to reinfest the barn being cleaned and other nearby facilities if the litter is not immediately removed. Utilizing the same litter for a new flock may be a possible source of infection from residual microbes of the previous flock. However, reuse of litter is an economic necessity with some companies.

The floor is swept and the area around the barn raked to remove litter and feathers before washing down the barn. The barn is usually washed thoroughly using plain water under high pressure. This washing usually removes at least 90-95% of residual microbial contaminants. Ceilings, walls and curtains subsequently are washed using a high pressure sprayer with water and a disinfectant such as quaternary ammonia. Frequently, the entire barn is then sprayed with another disinfectant.

Washed and disinfected brooder barns should be allowed to dry and air out before swabbing for bacterial cultures as a check on the effectiveness of the cleaning and disinfection. If harmful bacteria are found, the last disinfection is repeated. After disinfection, clean litter such as softwood shavings are placed in the barn. Rice hulls are not used by choice for brooding turkeys since poults may ingest these causing digestive dysfunction, and the dust from rice hulls may predispose poults to aspergillosis and eye irritation. Good

quality litter is free of excessive dust and/or mold. Cleaned and disinfected barns are off-limits to all personnel until it is time to re-stock the barn with a new flock.

Brooder Stoves

Brooder stoves are the source of supplemental heat provided poults from the time of placement until they are "ranged" or relocated to growing facilities. They are usually saucer-like with a diameter of 3 to 4 feet and with the concave surface facing the floor. The stove is suspended from the roof and can be raised or lowered as needed. Each stove has a thermostat controlled heat producing element attached to the underside of the saucer.

Brooder Guards

Brooder guards are used to keep poults close to brooder stoves for heat, food and water for the first 5 to 7 days of age or longer in colder weather. In the summer, brooder guards may be made of poultry netting, 18 inches high and placed in a 12 to 15 foot diameter around each stove. In colder seasons, solid wall brooder guards made with cardboard or other solid material are suitable. Brooder guards are used either for individual stoves or for units of 2 stoves.

Poult Placement

Industry prefers the delivery of poults as soon after hatching as possible. Poults are placed quickly but gently around the brooder stove. They should not be placed directly under the hot stove. Immediately after placing poults in brooder rings, personnel leave the brooder barn for about one hour to allow the poults time to settle down and find water, feed and the source of warmth.

Brooder Stove Arrangement and Temperature

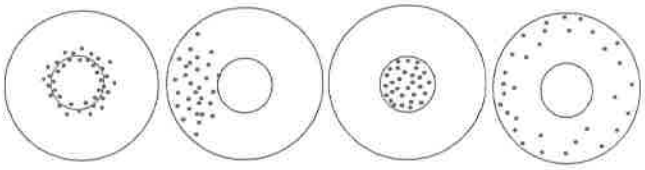
Traditionally, each stove has 3 waterers with or without satellite waterers and at least 3 feeders. To encourage day-old poults to start eating and drinking, 3 to 5 clean egg flats may be placed around each stove with feed sprinkled on each one.

Stove Adjustment and Temperature

Depending on the season and the temperature of the barn, stoves should be adjusted in such a manner as to provide a comfortable environment for the poults. The height of some brooder stoves may need to be increased slightly each day after 2 days of age. Stoves in curtain type buildings do not have to be raised as often, but do need to be adjusted to keep poults from roosting on them and burning their foot pads.

In general, each stove is set to produce a temperature of 90 to 95°F at floor level under the stove and a room temperature of 75°F when poults arrive. The temperature is lowered 5°F per week for the next 3 weeks. However, actual temperatures may vary since the

best management practice is to adjust the temperature in accordance to the poult behavior as shown in the diagram below. Stoves are turned on at least 12 hours prior to poult arrival to assure that they are functioning and the proper room temperature is obtained. Feeders and waterers should be filled the day before poult delivery to attain the proper room temperature before poults arrive. The following schematics demonstrate the reaction of poults to temperature and indicate their comfort range:



Just Right	Too Drafty	Too Cold	Too Hot

Sanitation - Waterers and Feeders

Poult drinkers are routinely sanitized 2 or 3 times a day during the first 10 days to avoid respiratory and other disease problems. Often the drinking water is chlorinated to a level of 2 to 3 ppm total free chlorine measured at the drinkers. Dirty water should be removed and dumped outside the barn and each drinker scrubbed with a brush using an approved disinfectant.

The feed on filler flats is checked several times daily and added as needed. A small amount of poult grit may be placed on top of the feed to promote gizzard health and to avoid impaction. Feeders and waterers should be relocated each day to avoid a build up of manure around them. Accumulated fecal material around drinkers and feeders in the brooder rings should be removed 3 to 4 days after placement to promote healthy foot pads in poults.

The brooder ring is taken down at about 7 days of age or whenever the poults start jumping over the barrier. At this time, automatic feeders are turned on and filler flats are gradually moved to a position near the automatic feeder. About the 10th day, half of the feeder flats should be removed and the remainder the following day.

Ventilation

Fresh air is vital to the poults' survival and subsequent performance. There should be adequate ventilation to supply oxygen necessary for the birds' respiration, maintain comfortable temperatures for the birds without causing drafts, remove excess moisture, minimize dust, and maintain good litter conditions.

Light

Most producers do not restrict natural light for poults. Some will leave lights on all night for the first 2 or 3 nights only. Poults should be checked every 3 hours during the first 2 or 3 nights.

GROWING BARN PRACTICES

The growing phase refers to the period in a turkey's life between the brooding phase and market or the breeding phase. Housing concerns for commercial turkeys from the sixth to seventh week until market are similar to brooding including washing, disinfection, and litter as described previously. However, litter is removed from growing barns annually rather than after each brood.

Space

The amount of space allowed per bird varies with the environment, sex and market weight, but is generally 2.5 square feet per hen and 3.5 square feet per tom. Many operators give the toms the space vacated by hens since the latter go to market earlier. Hens are usually grown for 14 to 16 weeks and toms from 17 to 21 weeks before being marketed.

Moving Poults

Poults are routinely moved from the brooder barn to the growing barns on large trailers. Birds are herded onto the trailers and placed in divided sections to prevent scratching and piling. Hens and toms are moved separately and placed in separate barns. An accurate count assures the proper number of birds of each sex is placed in each barn. Approximately 10,000 hens or 7,000 toms are placed in the typical 50 by 500 foot barn.

Feeders and Waterers

Growing barns must have adult size feeders and waterers. The numbers of feeders and waterers should be determined by the number of linear inches of feeding and watering space required. Each type of feeder and waterer comes with a recommendation from the manufacturer. Individual producers may vary the numbers of feeders and waterers placed based on their experience, and the comfort and performance of their birds.

Ventilation

Ventilation is one of the most important considerations in brooding and growing turkeys. The minimum fresh air flow should be 1.5 cfm per pound of body weight at all ages when the barn is filled to capacity. Ventilation rates can be adjusted to remove dust, moisture and to provide adequate oxygen and temperature control. To remove moisture, the temperature inside the barn is allowed to increase from the body heat of the turkeys and/or with supplemental heat. Additional moisture is picked up by the warmed air and exhausted from the barn during normal ventilation.

Moving large volumes of cold, fresh air through a cold barn will not dry out the litter. In some cases, litter may become so dry that it needs to be dampened to reduce the production of

dust. Properly operated foggers can be used to reduce ambient temperature and maintain litter moisture.

NUTRITION

Modern turkeys grow rapidly. A tom poult at day one weighs about .25 pound, and at 22 weeks weighs almost 37 pounds. The producer and the feed supplier work together to ensure that the proper nutrients are available to the flock in a palatable form. The producer is provided with a chart of the expected weights for various ages. This chart is developed from the breeder's expectations of the strain of turkey.

Nutritional requirements for growing turkeys and for breeders have been extensively researched. The modern turkey nutritionist uses formulas developed by scientific research and modifies these to meet the needs of a particular company and strain of turkey. These diets use various feed grains and other ingredients on a least cost basis. In addition, there may be additives included to address health needs.

Turkey flocks may utilize 4 to 8 different diets from hatch to market age. They may be fed on a slightly different schedule depending on their sex. Day old poults require a high protein, low energy diet. Diets gradually decrease protein and increase energy levels as they approach market age.

BIRD HEALTH

Health Maintenance Programs

The scientific definition of health in an animal is the absence of disease. Bacteria-free chickens in laboratory isolators grow about 15 percent faster than similar chickens in a "conventional" environment. This ideal weight gain under ideal conditions is impossible to achieve economically and commercially. Some short-term studies to limit bacteria using filtered-air positive pressure (FAPP) housing have been reported. However, the vast majority of poultry producers use immunization and biosecurity as major preventive measures for infectious diseases, with only occasional alternatives such as strategic medication for coccidiosis.

Immunization

The planned deliberate induction of immunity (as compared to the natural induction following unpredictable exposure to field infections) is one of the most beneficial and effective management tools available for the prevention or suppression of infectious disease.

There are two types of immunity: passive and active. Passive immunity occurs as antibodies in the yolk of developing embryos, derived from the maternal bloodstream, and is present for 2-4 weeks in the blood of newly hatched poults. The presence and the level of passive immunity in the poult is therefore dependent on the presence and level of antibodies in the maternal parent. The goal of breeder hen vaccination program is the production of high levels of passive immunity to poults. Passive immunity is generally effective against viral diseases, but less so or almost ineffective against bacterial infections, e.g., mycoplasmas or salmonellae in turkeys.

Active immunity occurs when an antigen is introduced and processed through the bird's immune system, resulting in various protective responses. These responses include the production of antibodies and/or macrophage cells which will act to protect the bird if the bird is re-exposed to that antigen or disease agent.

Active immunity can be produced either by living or inactivated antigens (vaccines and bacterins), or combinations of the two. Most living bacterial and viral antigens are either naturally occurring strains of low pathogenicity (mild), or pathogenic strains whose virulence has been reduced by passage in laboratory media (attenuated). Live vaccines can be administered either to individual birds, by injection or eyedrop or to large numbers of birds via the drinking water or by aerosol. Building up a high level of immunity often requires a second or third administration of vaccine, usually with a stronger vaccine strain on each occasion. Inactivated vaccines must be given by injection. These usually

incorporate potent adjuvants which enhance the local cellular reaction and therefore increase the level of immune response.

Development of Immunization Programs

The development of an immunization program and its incorporation into the management system of the flock should be built around knowledge of the diseases to which birds are likely to be exposed. It requires knowledge of the presence and the level of passive immunity, so immunization can be properly timed. Timing is also important so vaccines do not detract from each other's responses, or exacerbate their clinical effects. Vaccines should not be administered when other stressors are present in a flock.

Vaccines should be purchased and utilized only after consultation with vaccine manufacturers. Where serological monitoring tests are available, these should be routinely utilized to ensure an immune response has taken place.

It is particularly difficult to control infectious diseases on multi-age production systems. Since the sites are rarely or never free of stock, the continuous presence of infection in the site is probable. Live vaccines may travel between age groups at inappropriate times and may interfere with other vaccines or exacerbate a disease.

Limitations of Immunization

Immunization must not be a substitute for poor sanitation and biosecurity. The borderline between clinical good health and disease is very narrow. Thus, immunization programs may not totally protect birds which are stressed or are in unhygienic conditions. Deleterious conditions will also reduce productivity. Stressful conditions will render the birds more susceptible to disease organisms. In other words, animals that are constantly exposed to environmental diseases do not grow and produce as well as those in well managed environments.

Biosecurity

Biosecurity is the utilization of measures which can stop or slow down the introduction and spread of infection into or between components of production systems. Major components of biosecurity systems include:

- allow only necessary visitors to production sites;
- install fence enclosures;
- control movement of workers and equipment between barns, production sites and age groups;
- provide well-managed foot baths, showers and protective clothing at strategic points;

- maintain ongoing cleaning and disinfection programs, especially in hatcheries;

- reduce microbial load on trucks and equipment by washing and disinfecting at critical times;

- locate production sites strategically in relation to other production sites and movement of poultry to minimize transfer of disease;

- restrict contact of workers with other poultry, especially potential carriers of hazardous disease organisms;

- control rodents and wild birds effectively, both which are potential disease vectors;

- confine pets away from commercial poultry.

In situations where expensive breeders or experimental birds are housed, all visitors and employees must shower and change into clean farm clothing before entering the complex. A general rule for personnel sanitation for premises without showers is the use of coveralls over clothes, boots and a hat or hair net. It is important that only one facility be visited on any given day unless the visitor showers and changes clothes between facilities.

Stress and Pain

Stress can be measured objectively, e.g., heart rate, corticosteroid hormone levels, neutrophil:lymphocyte ratios, and behavior patterns. These parameters can indicate severe stress, particularly if acute, but the effect on a condition such as deprivation of a behavioral need, is still not possible to measure.

It is often argued that high flock productivity in intensive systems is an excellent indicator of welfare. Productivity as a flock parameter is an indicator, but not an infallible measure; it does not consider individual birds nor does it measure immune status. There are indications that intense selection for growth rate *per se* may not, in the long run, be in the best interests of bird welfare, e.g., musculo-skeletal and other anatomical imbalances. On the other hand, comparison of the many individual components which contribute to welfare in intensive versus extensive production systems shows neither system is uniformly better than the other.

ENVIRONMENTAL ISSUES

Location of Facilities

The turkey industry in California has learned to operate with a minimum of complaints by properly selecting new building sites and maintaining those facilities once constructed. The turkey industry has made an effort to educate producers in selecting sites for turkey production units.

The industry developed guidelines for locating poultry facilities including set-backs, minimum distances to neighbors and the distance between existing poultry units. The distance between the proposed poultry facility and neighbors was formulated using average wind direction and velocities. The minimum distance between poultry facilities was established at two miles. However, this may vary depending upon local conditions.

Farmers have long been thought of as stewards of the land and animals. This section addresses those aspects of poultry management which may affect the working environment on the production premises and/or the environment of the district/ neighborhood.

Air Quality

The change in turkey management from fairly extensive systems to more intensive systems has resulted in the concentration of birds, along with the concentration of their waste products and contaminants. There is potential harm to animals and workers alike if airborne contaminants are not controlled.

Of the airborne contaminants, dust is the most obvious one. Poultry barn dust may be the product of manure, feed, litter, and/or dander. Turkey producers should attempt to maintain their litter moisture at about 30% to reduce the amount of dust. Litter dryer than 25% becomes dusty and can increase the risk for turkeys to become infected by molds. On the other hand, litter moisture of 40% or above allows the production of flies and an increase in the ammonia and other odors.

Although Cal/OSHA has established human exposure limits to ammonia at 25 ppm, it is almost never a problem in growing turkeys in the relatively mild and temperate climate of California. Ammonia levels approaching 25 ppm will have a negative effect on the performance of turkey flocks, producing irritation to the eye and respiratory system. Brooding turkey poults in the coldest part of the winter may lead to an increase in the ammonia level. This occurs when the brooder farm ventilation is reduced to conserve heat, thus allowing an accumulation of ammonia.

Respiratory protection in the form of dust masks should be available

to employees. Usually, the level of dust and ammonia in California is not sufficiently high to require the use of dust masks. Under certain circumstances, such as moving and loading turkeys in preparation for the trip to the processing plant, the dust level may be great enough to warrant respiratory protection in the form of a two-strap, OSHA-approved dust mask.

Waste Management

Manure is a natural by-product of all poultry operations. Poultry manure can be a valuable component of a well-integrated agricultural operation. Manure is an excellent soil amendment and provides revenue to the poultry producer. The method of manure management will vary with the type of operation under consideration.

Turkeys are maintained on litter to facilitate the evaporation of moisture and gases from the feces. The combination of litter and manure should be maintained in a balanced condition neither too wet nor too dry. Wet litter can result in foot pad and leg problems while excessively dry litter may lead to high levels of dust which can be irritating to birds and employees alike.

Litter management is equally important once it is removed from the barn and stored. The best situation is to simultaneously remove all litter from the barn and off the premises. There are two important reasons to remove litter as it comes from the barn. The most critical is to remove the old litter to avoid contamination of the new flock and to avoid reinfestation with beetles and other insects. The second is to be a good neighbor. Dust and odors are generated during the process of moving and piling the litter. Once the pile is established, it will seal, thus eliminating the escape of odor and dust.

If used litter must be stored for a short period of time, appropriate steps can be taken to reduce the possibility of producing nuisances such as flies or odors. Of particular concern is the potential for pollution of ground water or any part of the water shed.

Flies

The house fly, *Musca domestica*, is most active at temperatures between 80 to 90°F and at a humidity of approximately 40%. The house fly is inactive below 45°F and dies at temperatures below 32°F. The little house fly, *Fannia canicularis*, is active throughout the year, but is at its reproductive peak in the spring and fall. Therefore, during these two seasons, both types of flies tend to be problems for California turkey producers. The best fly abatement is the elimination of any areas conducive to fly breeding, such as wet areas in the litter, areas where feed is spilled, and stored manure that becomes wet. If stored manure is kept dry, there is very little likelihood of fly breeding. The recommended moisture level for manure is less than 33% as no fly emergence will take place at this level or lower.

Dead Bird Disposal

A certain number of turkeys die during the life of a flock. Carcasses are usually removed and recorded each morning from each barn. The mortality for the entire flock is calculated to help the manager decide if the mortality is within the normal range, or if there is a disease outbreak.

Burying - The turkey industry in California traditionally has disposed of dead birds by "on-site" burying in pits and trenches. The common method was a pit covered by a removable metal top with fly tight openings. After the pit was filled with carcasses, the metal top was relocated to a new pit nearby and the old pit was covered with soil.

The California Water Resources Board, in an effort to avoid ground water contamination, has made it extremely difficult for farmers to bury dead birds at new facilities or ones recently expanded. To comply, the producer must build an engineered disposal unit. If the soil type is unsuitable and the system does not work according to recommendations, the producer must develop an alternative method of disposal. Current regulations allow existing poultry facilities to continue burying dead birds until the producer plans to expand production or has a nuisance problem.

Incineration - Incinerators for disposal of carcasses have also been used in the past. Disadvantages included expense and labor. Recently, it became even more expensive because of increased stringent air pollution regulations.

Rendering - Today, in California, most turkey producers either transport dead birds to a renderer or have dead birds picked-up by a rendering service. To make this program successful, the producer should prepare an area at the edge of the facility where carcasses can be placed in a dumpster and moved outside the facility fence for pick-up. The dumpster is then cleaned and sanitized and brought back onto the facility. The renderer's pick-up truck does not enter the producer's facility and thus there is no biosecurity breach. Carcasses may also be hauled by the producer from the facility to the rendering plant. In this case, the producer's truck must enter the rendering plant and there is a possibility of a biosecurity breach.

Composting - Some producers may wish to utilize composting of their dead birds to keep it "on site" and reduce their biosecurity risk. Aside from the savings they will make by not having to pay for pick up or delivery of their dead birds, they will have the flexibility of being able to put their dead birds into the compost on a daily basis. Being able to take care of dead birds daily is often the most effective method of disposal during the long hot period of the year.

Landscaping

Merely the sight of an animal production facility, or especially of a

manure storage area, may create the perception of nuisance in the minds of some individuals. The producer may effectively screen these areas from view with the use of appropriate shrubs and trees. Vegetative screens can also be effective in keeping dust from leaving the premises.

HANDLING AND LOADING

Moving and Handling Turkeys

The moving of turkeys is one of the most difficult tasks the producer has to perform and thus turkey producers move their birds as little as possible. The least stressful move is from the hatchery to the brooding area. The next move from the brooding area to the growing area is more stressful for the young turkey. The number of birds is extensive and the birds must be walked onto a trailer to be moved. At the new growing area they will encounter different size and placement of feeders and waterers which requires adaptation.

Turkeys of all ages resist change, but this second move seems to be one of the hardest for them. Turkey handlers should be informed about the stress of moving and strive to handle and transport birds in an efficient manner which minimizes stress and injury.

The transportation of turkeys to market is an important part of the overall production process. Birds incorrectly caught or improperly placed in cages may sustain injuries and bruises which could be harmful to the birds as well as increase the downgrading. Therefore, all personnel involved in the bird catching and transport operation should be given appropriate training. The most important part of this training is the development of a positive attitude about why these methods are so important.

Turkeys are often moved at night to reduce the stress of heat and because the birds are more calm in the absence of light. Dimming of the barn lights has long been employed to create a less stressful environment for catching. Another practice is to use blue light which provides adequate light for the catching crew, but is perceived as very dim light by the birds. These practices minimize the stress on the birds and help prevent piling.

The cages used for live-haul are constructed to allow loading, transportation, and removal without injury to the birds. The entire truck and especially all the cages should be cleaned and disinfected after each load. The stocking density for each cage will depend on the size of the cage, the size of the birds, and transportation conditions (transit time and temperature). When the crate is full, there should be sufficient floor space so all birds can be resting on the floor simultaneously and have free head movement. Maximum stocking density can be used during cold weather. When the ambient temperature and humidity are too high, bird transport should be restricted to the cooler times of early morning and evening. Special care should be exercised to secure all cages thus eliminating the possibility of turkeys falling from the truck.

Occasionally, turkey producers need to handle each turkey for procedures such as vaccination. The manner in which turkeys are held will affect their reaction to the restraint. Turkeys respond best to being held in a manner that provides support, which reduces the likelihood of struggling with the possibility of injuring wings or legs. Adult turkeys can be picked up by various methods depending on their age and the operation. Turkeys of all ages can easily be injured if picked up by one leg only. The best method involves securing both legs in one hand and grasping the turkey's far wing with the other.

Transportation Conditions

Common sense requires turkey producers to adjust their hauling schedules to avoid inclement weather. Should inclement weather develop in transit, the driver should be prepared to seek protection. Likewise, a loaded vehicle should not be left standing for any extended period of time. The length of time a loaded vehicle may be left standing depends on the circumstances. In the case of required stops (inspection stations, truck maintenance, etc.), the birds' safety should be considered and adequate steps taken to insure air circulation and protection from environmental extremes.

The shortest route between the live production facility and the processing plant may seem the most logical route, but there may be sound reasons to take longer routes. Although turkey producers are always concerned about feathers being lost from the live haul truck, it is especially serious if those feathers "contaminate" another food item. Feathers are also considered a nuisance by some neighbors and the considerate turkey producer takes all steps possible to avoid feathers being blown from the trucks.

SLAUGHTER

Procedures at processing plants are designed to prevent unnecessary pain and discomfort to the turkey, to insure optimal meat quality for the consumer, and to preserve the product's visual appeal.

The processing of turkeys begins with the unloading of the birds at the plant. Just as with loading the birds at the live production facility, great care should be taken in unloading so the birds are not injured or bruised. Birds are carefully removed from the transport truck and hung on shackles on the processing line going into the plant.

Shackles are size-appropri-ate to the age, sex and species of bird being slaughtered. The instrument used for stunning is designed to deliver an electrical current to each bird that will render each bird insensible to pain. Once stunned, the birds are slaughtered by having their throats cut by hand or with a circular knife. Under certain circumstances related to a ritual (religious) practice there are exemptions for the method of stunning and slaughtering of the birds.

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GLOSSARY

Adjuvant	Additive to vaccines to enhance their immunological effectiveness.
Antibody	A protein molecule capable of combining specifically with an antigen.
Antigen	A substance foreign to the host animal, commonly a disease agent or vaccine which induces an immune response.
Attenuated	Strains of microorganisms with reduced virulence used to induce immunity.
Bacterin	A killed bacterial vaccine, consisting of a suspension of whole bacteria.
Biosecurity	A management system to minimize the pathogen exposure of flocks.
Brooding	Growing of poults with supplemental heat from day one to five to six weeks of age.
Brooder Guards	Rings of poultry netting or a solid material like masonite used to contain poults around the brooder stove or other heat source.
Composting	A natural decomposition process for organic wastes.
Condemnation weight	The weight of birds condemned in the processing plant.
Cull Poults	Poults not of saleable quality due to various defects
Desnooding	The removal of the snood from newly hatch poults.
Endotoxins	Toxins produced by bacteria.
Foggers	Water lines running the length of turkey barns with emitters placed at regular intervals to produce a cooling fog.
Gizzard	Turkey's muscular stomach; has a strong grinding ability.
Hen	Female turkey
Infertile	Eggs that do not contain a fertile embryonic unit and are incapable of developing.
Immunity	Resistance resulting from previous exposure to an infectious agent or antigen.
Integrated	A single company in control of most aspects of production and marketing.

Litter	An absorbent bedding material used in brooding and growing barns.
Live Haul	The hauling of live turkeys to the processing plant.
Macrophage	A cell which can ingest and destroy foreign cells such as bacteria.
Pipped	Fertile hatching eggs at the stage of development when the hatching poult has made a hole in the egg shell.
Poult	Newly hatch turkey.
Producer	Farmer who raises commercial poultry.
Renderer	A company that converts dead animals to usable products by cooking and separation of fat from the protein portion.
Serology	Tests on blood serum to determine the level of circulating antibody to specific disease agents.
Snood	Fleshy appendage falling across and down from the upper beak of the turkey
Tom	Male turkey
Vector	Carrier of a disease agent from one bird to another or even from one farm to another.

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