Growing chickens

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Chick Management Schedule

Order Chicks Early

Order strong, healthy chicks early. Hatcheries producing U. S. Approved, U. S. Certified, or U. S. Record of Performance stock and those producing U. S. Pullorum Tested, U. S. Pullorum Controlled, U. S. Pullorum Passed or U. S. Pullorum Clean chicks are subject to inspection, and information is available on their practices.

Before Chicks Arrive

Scrape, sweep and then scrub the house with hot lye-water. Disinfect the walls and ceiling. Adjust the brooder to correct temperature. Have fountains and feeders filled and in place.

The First Week

Give close attention until the chicks learn to eat, drink and brood properly. Kill and burn the weak chicks.

The Third Week

Put chicks onto the sun porch for 15 minutes on a warm sunny day. Increase the time daily for 4 or 5 days, then let them use it at will. Lower the brooder temperature 5° F. Put the early hatched chicks onto the sun porch when 4 or 5 weeks old.

The Fourth Week

Change to medium size chick feeders and waterers. Omit the fish oil by 5-6 weeks if chicks are in sunlight daily. Put perches into place. Lower the brooder temperature 5° F. each week until brooder is not needed.

The Eighth to Twelfth Week

Put pullets into summer shelters on clean range. Provide large-capacity feeders and waterers. Keep market cockerels confined to the house and sun porch. Change pullets to concentrate mash.

The Market Cockerels

Keep them on full feed of mash and grains. Feed more corn to fatten them. Remove the fish oil and fish meal from the ration 4 weeks before the birds are sold.

Before the Pullets Lay

Move the hens to the house for older birds, then clean and disinfect the pullet house. Save the large, healthy pullets that will lay when 5 to 7 months old. Confine them to the house and sanitary pen.
GROWING CHICKENS

BY W. M. VERNON, W. R. WHITFIELD AND H. L. WILCKE

This bulletin deals with the growing of chicks in houses with commercial brooders and other equipment especially designed for securing rapid chick growth and protecting their health; also with cutting labor costs and growing early-laying pullets.

GET READY FOR THE CHICKS

Several days before the chicks arrive the brooder house should be swept clean and the floor scrubbed with scalding lye water, using 4 ounces of lye to 10 gallons of water. Repair any broken windows or leaks in the roof. When the house is dry, spray all interior surfaces with a good coal tar disinfectant, using $1 \frac{1}{2}$ pints of concentrated cresol to 5 gallons of water. In case the house is infested with mites or bedbugs spray the cracks with a mixture of equal parts of kerosene and concentrated cresol. Observation should be made later to see if another treatment is needed to kill all of the insects. See pages 549 to 552 for cautions about chick diseases.

Start the brooder to help dry the house. Any parts that do not operate properly should be replaced. Clean and disinfect the feeders and fountains. Regulate the brooder so that it maintains proper temperature. Have litter on the floor and the chick guard in place. Provide a gravel or board walk to the brooder house to reduce the likelihood of tracking diseases and parasites into it.

Before the chicks are placed under the brooder, have the fountains filled with water (40°—80° F.) and the feeders brim full of mash. After the chicks learn to eat do not fill the feeders so full that feed is spilled over the sides. Feed is one of the most expensive items of chick raising; therefore, do not waste it.
BATTERY BROODING

This is a relatively new method of brooding, and it is most popular with hatcherymen and commercial poultrymen who start many broods of chicks a year.

In battery brooders chicks sleep, eat and drink in compartments located one above the other as shown in fig. 1. Some batteries have heating units located at one end or in the center of each compartment. Such battery brooders should be operated in a room held at 65° to 80° F. Battery brooders that do not have heating units in each compartment are less satisfactory and should be operated in a room held at 85° to 90° F. The room temperature should be gradually lowered to 65° F. as the chicks grow older.

Battery brooders provide good sanitary conditions for brooding chicks because the droppings fall through the wire screen floors to dropping pans, and the feeders and waterers are located on the outside of the brooder where it is difficult for the chicks to contaminate the feed and drink. When chicks are to be grown as breeders they should be moved from the battery brooders to floor brooders before they are 4 weeks old to avoid development of lopped combs on the males. This is especially true of all large-combed breeds.

Some commercial broiler producers grow the birds to...
market age in batteries. In this case all chicks in one room should be the same age, and special care should be taken to purchase healthy chicks from a hatcheryman who pullorum-tests his hatchery flocks carefully, operates a clean hatchery and hatches all the chicks he sells.

When the chicks are about 4 weeks old they should be moved from the starting room to another room that is lower in temperature and into the batteries designed for older birds. For suggestions on precautions to be taken against the diseases, bronchitis and laryngotracheitis, see page 550.

**FLOOR BROODERS**

The oil-, electric-, coal- and gas-heated floor brooders are used in Iowa because of their adaptability to temporary or continuous use, availability of the fuel and because the chick equipment can be placed upon the house floor. The manufacturers of these types of brooders provide instructions

![Figure 2. Oil brooders are popular on many Iowa farms. These chicks are bedded down for the night but can eat and drink by the light from the lantern that hangs 3 inches above the floor. Straw is being used for litter.](image-url)
regarding their setting up, operation and storage. Producers should follow those instructions closely. It is best to place the brooder near the center of the pen and be sure that direct sunlight does not strike the thermostat.

Floor brooders are suitable for use in one room or multiple unit brooder houses. The present trend, even on general farms, is toward stationary brooder houses with concrete floors and enclosed sanitary sun pens or porches.

Floor brooders heated with oil or coal usually supply a volume of heat sufficient to keep the house warm and the litter dry. When these types of brooders are used the temperature for day-old chicks should be 90° to 95° F. at the edge of the hover and about 2 inches off the floor. Reduce the temperature at the edge of the brooder about 1 degree each day until the brooder is no longer needed in the house. Some producers are using brooders heated with natural gas. The fuel is supplied from compression tanks or pipe lines. Reports on these indicate satisfactory results.

The electric- and some gas-heated floor brooders heat only the area under the brooder, leaving the other floor area only slightly warmer than outdoor temperature if no supplementary heat is provided. The brooder should provide 11 square inches of floor space per chick under the brooder during the brooding period.

When brooding with electric brooders in cool weather the litter on the outside of the brooder becomes damp quickly, necessitating frequent change of the litter. The chick guard should be placed close to the edge of the electric brooder for the first days to teach the chicks where to locate the source of the heat. Feeders and waterers should be placed under the brooder or near the edge of it to teach the chicks to eat and drink before they become hungry and eat litter. Move the feeders and waterers to the outside of the brooder as soon as practical.

An off-current alarm should be located in the dwelling house and attached to the wires leading to the brooder house to warn the flock owner when the power is off the line. In such cases the flock owner should place the chicks in boxes and take them into the furnace room or some other place
where they will be warm, being careful not to crowd the chicks in the boxes or cover them tightly.

**FLOOR BROODING MANAGEMENT**

During the brooding period each chick needs one-half square foot of floor space; also a similar amount of sun porch space. This will provide the total of about 1 square foot of space per chick. Place the summer shelter by the brooder house when the chicks are 4 to 6 weeks old to provide adequate room and to accustom the pullets to the shelter. When the pullets are 8 to 12 weeks old they should be placed in summer shelters and moved to clean range along the edge of a field of corn, alfalfa, small grain or pasture. The market cockerels should remain in the brooder house and be allowed outside only in a gravel or screen wire pen. The cockerels then should have 2 square feet of space per bird.

Location of feeders and waterers as shown in fig. 4 provides maximum opportunity for the chicks to eat and drink; also to return quickly to the brooder to get warm. Changing the location of the fountain and raking the litter daily help to dry the litter and this aids in preventing coccidiosis and other...
diseases. Wire netting attached across the corners of the house prevents chicks from crowding into corners and smothering.

The chick guard such as shown in fig. 3 should be used for several days to confine the chicks to the comfortable area near the brooder. Move the guard farther away from the brooder each day until it is no longer needed.

**TABLE 1. BEST SIZE OF BROODS.**

<table>
<thead>
<tr>
<th>Size of house</th>
<th>Size of sun porch</th>
<th>No. of chicks</th>
<th>Brooder size</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'x10'</td>
<td>8'x10'</td>
<td>200</td>
<td>Small</td>
</tr>
<tr>
<td>10'x12'</td>
<td>8'x12'</td>
<td>250</td>
<td>Medium</td>
</tr>
<tr>
<td>12'x12'</td>
<td>10'x12'</td>
<td>300</td>
<td>Medium</td>
</tr>
<tr>
<td>12'x14'</td>
<td>10'x14'</td>
<td>350</td>
<td>Large</td>
</tr>
<tr>
<td>14'x14'</td>
<td>10'x14'</td>
<td>400</td>
<td>Large</td>
</tr>
</tbody>
</table>

The sizes of broods recommended in table 1 are smaller than the listed capacity of floor brooders as given by some manufacturers, but they are in agreement with the experimental results and experiences of most successful poultrymen.

The windows should be opened little or not at all during cold-weather brooding. A slot ventilator as shown in the Agr. Ext. Iowa Victory Brooder House leaflet provides a most satisfactory method of ventilating the brooder house during the brooding period with all windows closed. During hot summer days the windows on the east, west and south sides should be removed, and on some days it is advisable to leave the door open.

Figure 4. These chicks have learned where to go to get warm and, therefore, no longer need the guard. Crushed corn cobs provide a good litter. The feeders are now half filled because the chicks are old enough to bill the feed over the sides if the feeders are too full.
HEATING COSTS

When oil or coal brooders are used the fuel cost is influenced mostly by the tightness of the house walls, size of house, roof insulation and opening of windows or ventilators. The cost of electric or gas brooding is influenced mostly by the insulation of the brooders and brooder houses and the cost rate of the current or gas. While the heating cost for January to April brooding is greater than April to July brooding, the early chicks produce more profitable market cockerels, and earlier laying pullets are secured than from late chicks. An average fuel cost of 2 cents per chick is reasonable.

LITTER FOR FLOOR BROODING

A 2-inch covering of suitable dry litter on the floor provides a warm bedding for the chicks and a fairly clean surface for them to walk on. Dry litter will absorb the moisture from the droppings and allow them to settle to the floor. This is an aid in combatting coccidiosis. Leaky fountains should be repaired or replaced by a more suitable kind. The mounting of fountains on wire screen frames prevents the chicks from picking in damp litter.

Crushed corn cobs, shavings and oat hulls are suitable low-cost kinds of litter. Peat moss, cotton seed hulls and other commercial litter are satisfactory but more expensive.

Litter should be changed when it becomes damp or dirty in either parts or all of the house. If the chicks appear to be sick the litter should be changed daily, and the chicks should be confined to the brooder house to check the spread of disease or parasite attacks as suggested on page 551.

PROVIDE A SUN PEN

A sanitary sun pen protects the chicks against such parasite infestations as coccidiosis and worms, and it also affords an opportunity for the chicks to be exposed to the direct rays of the sun after they are 2 or 3 weeks old and provides more room for the chicks so that there is less tendency for the development of feather-picking or cannibalism. The sun pen should consist of a wire enclosure with a floor of deep, coarse gravel, concrete, wood slats or wire cloth. If wire cloth or
Figure 5. This sun porch prevents the chicks from ranging on contaminated soil but exposes them to sunlight. It can be moved away from the house for removal of the droppings. The Agricultural Extension Service will send plans for a good brooder house and sun porch upon request.

Wood slats are used, the pen should be raised 1 or 2 feet off the ground or made so that it can be moved away from the house to permit easy removal of the manure.

At first, permit the chicks to be in the sun pen for only 10 to 15 minutes on a warm sunny day. Increase the time each day until the chicks know how to return to the brooder.

**PREVENT PILING UP**

Insufficient heat from the brooder will cause chicks to crowd under the hover where some will smother in an effort to keep warm. Chicks may pile against the chick guard or against the side of the house when the brooder is set to provide too much heat. A 15- or 25-watt light about 6 feet above the floor and in the center of the room permits chicks to eat and drink at night and helps prevent their smothering from piling. Excessive window space causes great variation in house temperature and development of the habits of piling and cannibalism. Covering the inside of the windows with calcimine will reduce the excessive light.
When chicks are moved from batteries to floor brooders they should be moved early in the morning so that they will have time to get acquainted with their new equipment before night-fall. For the first 3 days the attendant should visit the brooder house frequently, especially at night, to teach the chicks to brood.

Chicks should sleep on the roost when they are 4 to 6 weeks of age. Several perches should be placed about 12 inches off the floor at the rear of the building. Add more perches as the chicks learn to roost.

**WATER**

When chicks do not have water, growth declines because of reduced feed consumption. The water should be 40° to 80° F. and in fountains as shown in fig. 3 so that it is kept clean. Chicks should not walk into the water nor pick in damp litter near the fountains.

**PROTEINS**

Proteins are used by chicks for growth of muscles, feathers and other body tissues. Such products as milk, meat meal, fish meal, soybean oilmeal, corn gluten meal and peanut meal are the principal protein feeds for chicks. When soybean oilmeal, peanut meal or corn gluten meal are used, 1 pound of bone meal should be added to each 5 pounds of the vegetable protein supplement used. A variety of protein feeds promotes fast chick growth. The protein content of a starting chick mash should be 18 percent but not more than 22 percent.

**MINERALS**

Minerals, such as calcium, phosphorus, sodium, chlorine and manganese, should be added to the chick ration in fairly definite amounts for normal bone development, also to maintain proper ratio between the different minerals that
Figure 7. The chick on the left ate a normal ration except that it was low in fiber, and corn alone supplied the grain portion of the ration. The chick on the right was given the same ration except that ground whole oats was used instead of ground corn.

make up part of the body fluids and influence the activity of the muscles. Of the total ration the calcium content should be .75 to 1.4 percent, phosphorus .5 to .7 percent, salt .5 to 1 percent and manganese .004 percent. These amounts are supplied in the formulas given on page 544.

CARBOHYDRATES AND FAT
These substances are supplied mainly by common farm grains and their by-products and provide heat and energy needed by the chicks. Grains are deficient in proteins, minerals and vitamins, therefore, they should be supplemented to provide a satisfactory ration.

FIBER
Fiber is supplied by grain and green feeds, and it should make up 6 to 10 percent of the total rations. A desirable fiber content provides correct bulk to the ration, aids in feather growth and the prevention of cannibalism.

VITAMIN A
Vitamin A is necessary for the normal growth and the prevention of infection of the respiratory tract. Good sources are fish liver oil, yellow corn, egg yolk and bright green
alfalfa meal or other green feeds. Chicks require 1,000 to 1,200 International units of vitamin A per pound of feed consumed. This amount will be supplied by a ration containing about 30 percent yellow corn, 5 to 10 percent bright green alfalfa meal and fish liver oil as allowed under wartime restrictions. The alfalfa and fish liver oil need not be fed when chicks have abundant green feed and direct sunlight.

Vitamin B₁ or thiamin prevents a nervous disorder known as polyneuritis. It is abundant in common green feed, milk and the outer coating of grains used in chick rations.

VITAMIN B₂

Vitamin B₂, G or riboflavin, is necessary for growth and prevents a peculiar paralysis in which the toes of the chicks curl inward. It is considered that 1,200 to 1,500 units of riboflavin are required in each pound of chick feed. This amount is supplied in the chick rations on page 544.

PANTOTHENIC ACID

Pantothenic acid is another vitamin recently found to be necessary for prevention of dermatitis or skin disease. The best sources of this vitamin are yeast, dried whey, peanut meal, dried milk, green feeds and the germs of cereal grains. Most chick rations have an abundant supply of this vitamin.
VITAMIN D

Vitamin D is necessary for the prevention of rickets. When an insufficient amount of this vitamin is supplied, growth is slow and the chicks have soft, crooked bones, especially breast and leg bones. The best sources of vitamin D are direct sunlight, fish oil and light from ultra violet lamps. A number of vitamin-D-rich synthetic products have been developed because of the shortage of fish liver oil. Chicks require a minimum of 175 A. O. A. C. chick units of vitamin D per pound of feed. This amount is supplied by the addition to the mash of .5 percent of standard fish liver oil carrying 85 units of vitamin D per gram, or its equivalent in concentrated fish liver oil or some other dependable source of vitamin D.

VITAMIN E

Vitamin E is known as the fertility vitamin and is probably necessary for growing chicks. It is supplied abundantly in young, green feed, the grains and alfalfa usually included in chick rations.

VITAMIN K

Vitamin K promotes normal clotting of blood and, therefore, prevents hemorrhages. Abundant quantities are supplied in good alfalfa and other green feeds commonly used in poultry feeding.

OTHER GROWTH FACTORS

A lack of the anti-gizzard erosion factor causes crater-like erosions or rupture of the lining of the gizzard. Gizzard

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1 Amount used is dependent upon vitamin A content. A War Production Board ruling limits the use of animal sources of vitamin A to 1,000 International Units per pound of feed as consumed.
erosion does not seriously interfere with chick growth. Oat hulls and young green feed carry the factor that prevents gizzard erosion. Another growth factor recently found in wheat by-products, yeast, milk and liver meal appears to be necessary only when chicks are grown in confinement. A number of other factors have been proposed, but these are not likely to be deficient in a practical ration.

**MASH FORMULAS**

Mash formula No. 1 and 2 should be used as long as the chicks are confined to the brooder house. The choice depends upon the relative price of grains. When chicks can run out onto the sun porch regularly the fish oil may be omitted. Change to formula No. 3 or 4 for the pullets when they are moved to clean range where green feed and sunlight are abundant. For suggestions in changing the feed, see top of page 545 and bottom of page 546.

**GRAIN FEEDING**

Extra feeders containing whole oats, whole wheat or whole barley should be supplied when the chicks are 6 weeks old. In case broilers are to be sold the grain should consist of equal parts of cracked corn and small grain to fatten the market birds. Cockerels to be marketed as fryers or roasters, also pullets, should be given equal parts of whole corn and small grain when they are 8 weeks old. The amount of grain eaten should be gradually increased in proportion to the amount of mash consumed.
TABLE 2. CHICK MASH FORMULAS.

<table>
<thead>
<tr>
<th>Kinds of feed</th>
<th>Rations for indoor feeding*</th>
<th>Rations for range feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. 1 lbs</td>
<td>No. 2 lbs</td>
</tr>
<tr>
<td>Ground yellow corn</td>
<td>125</td>
<td>177</td>
</tr>
<tr>
<td>Pulverized oats or barley</td>
<td>122</td>
<td>150</td>
</tr>
<tr>
<td>Ground wheat</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>White shorts or std. mids.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa meal (br. green &amp; 17% protein or higher)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Meat and bonemeal</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Dried milk**</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Soybean oilmeal or corn gluten meal</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Oyster shell, clam shell or limestone (95-98% Cal. Carb.)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Steamed bonemeal</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Fine salt</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Manganese sulphate</td>
<td>500 lbs</td>
<td>500 lbs</td>
</tr>
</tbody>
</table>

*When chicks are not exposed to direct sunlight or under ultra violet ray lamps for the proper amount of time daily they should have added to the above ration a minimum of 87,500 A. O. A. C. units of vitamin D for the 500-lb. mixtures and not over 500,000 International Units of vitamin A from animal sources.

**Omit when 1/4 of the drink consists of liquid milk. When chicks have access to both water and milk all day, omit the dried milk, also 1/2 of the meat and bonemeal and 1/2 of the soybean oilmeal from the formula. When no milk of any kind is available, or if price makes substitutions necessary, the 25 pounds of dried milk in the above formulas may be replaced by one of the following combinations:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat and bonemeal</td>
<td>10 lbs</td>
<td>10 lbs</td>
<td>10 lbs</td>
</tr>
<tr>
<td>Corn gluten meal</td>
<td></td>
<td></td>
<td>15 lbs</td>
</tr>
<tr>
<td>or soybean oilmeal</td>
<td></td>
<td>10 lbs</td>
<td>5 lbs.</td>
</tr>
<tr>
<td>Alfalfa meal</td>
<td></td>
<td>10 lbs</td>
<td></td>
</tr>
<tr>
<td>Dried whey</td>
<td></td>
<td>5 lbs.</td>
<td></td>
</tr>
<tr>
<td>Fermentation by-products (such as distillers dried grains with solubles and others)</td>
<td></td>
<td>5 lbs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 lbs</td>
<td>25 lbs</td>
<td>25 lbs</td>
</tr>
</tbody>
</table>

CHANGE TO GROWING MASH CONCENTRATE

Many producers change to a concentrate growing mash because they feed their laying flocks a concentrate mash of about 26 percent protein and also corn and small grains, all of which are fed in hoppers free choice or cafeteria style. This reduces the labor required in hauling grain to the mill and also mixing of mash on the farm. The pullets should be changed to this plan of feeding when they are about 12 weeks
old so that they will be accustomed to the free choice feeding of whole corn, whole oats and concentrate laying mash.

This change to a high protein mash should be preceded by using a mixture of mash to last 3 or 4 weeks consisting of equal parts of the 18-percent protein mash and 26-percent

<table>
<thead>
<tr>
<th>Age of birds</th>
<th>Mash feeder space (ft.)</th>
<th>S. grain feeder space (ft.)</th>
<th>Corn feeder space (ft.)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 wks.</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>Change to medium size feeders at 4 weeks.</td>
</tr>
<tr>
<td>4-8 wks.</td>
<td>16</td>
<td>4</td>
<td>---</td>
<td>Add 4-foot feeder for cracked corn if broilers are sold.</td>
</tr>
<tr>
<td>8-12 wks.</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>Start feeding whole corn to pullets and fryers or roasters at 8 weeks.</td>
</tr>
<tr>
<td>12-16 wks.</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td>Cockerels and pullets should be separated and adult bird feeders used.</td>
</tr>
<tr>
<td>16-24 wks.</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Figure 12. *Small chick trough feeder or waterer.*—When made to hold water (1 gallon capacity) the edges of the bottom and ends should be treated with asphalt paint before nailing on the sides, and then all of the inside surface should be waterproofed. Two trough waterers and four to six feeders should be provided for each brood of chicks. Material for one: 2—3/8"x2 1/2"x36", 1—3/8"x4"x44", 2—3/8"x1 1/4"x34 1/2", 1—2"x2"x16" and 3/4 lb. 4d box nails.
Side Elevation

Figure 13. Large chick trough feeder or waterer.—As shown in table 4, chicks rapidly increase the amount of feed and drink consumed. Therefore, larger size feeders and waterers are needed to reduce the frequency of filling them. The trough waterer (6-gallon capacity) should be water proofed as described for fig. 12. Material for one: 2—1"x6"x48", 1—1"x8"x66", 4—1"x4"x48", 4—3/4"x2"x46", 1—4"x4"x16", 1/6 lb. 4d box nails and 1/2 lb. 6d nails.

growing concentrate. Grain consumption should be increased more than if the chicks had continued on the 18-percent mash. Another way is to fill 1/3 of the mash feeders with 26-percent protein mash and 1/3 of the 18-percent protein mash for a period of 3 or 4 weeks. The number of grain feeders should be doubled.

TABLE 4. THE FEED BUDGET*.
(FOR GENERAL PURPOSE BREED CHICKS.)

<table>
<thead>
<tr>
<th>Age in weeks</th>
<th>Market Cockerels</th>
<th>Pullets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total lbs. feed per bird</td>
<td>Av. wt. of ckl's lbs.</td>
</tr>
<tr>
<td>4</td>
<td>1.02</td>
<td>.48</td>
</tr>
<tr>
<td>8</td>
<td>5.14</td>
<td>2.20</td>
</tr>
<tr>
<td>12</td>
<td>9.15</td>
<td>3.05</td>
</tr>
<tr>
<td>16</td>
<td>16.15</td>
<td>3.91</td>
</tr>
<tr>
<td>20</td>
<td>21.74</td>
<td>4.59</td>
</tr>
<tr>
<td>24</td>
<td>28.77</td>
<td>5.33</td>
</tr>
</tbody>
</table>

*Average of results secured at Colorado, New York, Connecticut, New Hampshire and Nebraska Agricultural Experiment Stations.
A Leghorn pullet will consume 22 pounds of feed, average 3.26 lbs. body weight and require 6.6 lbs. feed per pound of gain at 6 months of age.

For more detailed information on broilers, fryers, roasters and capons see Iowa Ext. Pam. 21, Farm Feeding Market Poultry.

**GROWING GOOD PULETTES**

When the pullets are 8 to 12 weeks old they should be placed in summer shelters and moved to clean range along the edge of a field of corn, small grain, alfalfa, clover or pasture where they will have access to abundant green feed and sunshine. Such range conditions are considered an aid in improving the health, vitality and well-rounded development of the pullets preparatory for a busy year in the laying pens.

When the pullets are moved to the summer shelters before June 1, also when they stay in the shelters after October 1, it is advisable to cover the east, north and west sides of the shelter with muslin or some other inexpensive material to

![Figure 14. The pullets in this brood are ready to be moved to summer shelters on clean range when weather conditions are favorable.](image)
Figure 15. The summer shelter is a good place for the pullets from about 10 weeks to 5 or 6 months of age. Note the built-in trough feeders on the sides of the shelter. The sacks over the north end and above the feeders on the sides protect the pullets from cold wind during spring and fall. Summer shelter plans can be secured from the Agricultural Extension Service.

protect the birds from cold winds. It is important that the pullets be moved to the laying house before they start to lay.

Summer shelters such as shown in fig. 15 have 1-inch wire netting on the ends and sides and 14 or 16 gauge 1-inch hexagonal galvanized netting over the skids to protect the pullets from predatory animals at night. In case of danger of attack during the day by foxes, dogs and other animals, the range equipment should be inclosed in a 5-foot fence allowing ¼ acre to 500 to 1,000 birds. The fencing used for this corral should be movable so that after the area has been used for 3 or 4 weeks the birds and equipment can be moved up hill to another clean area. Early-planted corn, forestry plantings or small brush piles provide protection from hawks and crows.

Adequate shade for the pullets will help to keep them gaining in weight during hot weather. Simple structures that provide extra shade can be made. Feeders and waterers should be placed in the shade.

The use of barrel waterers and range feeders, also the attachment of feeders to the sides of the shelters such as

Figure 16. Along the edge of a corn field is a good place for pullets.
shown in fig. 17, will save much labor in growing pullets on range when the free choice feeding plan is used. The use of a truck or wagon can save much time in hauling feed and water to the range. Some poultrymen pipe water from a large tank of convenient locations near the shelters.

Pullets should be sorted before any of them start laying on the range. Those of good size and showing good comb, feather and body development should be moved to the laying house. Those not possessing these traits should be marketed. Pullets should be housed separately from yearlings or older hens and should not range upon ground recently used by older birds. The confinement of both the pullet and hen flocks to houses and sun pens will materially aid farm poultrymen in the control of poultry diseases and parasites. This will prevent the spread of diseases between chickens and other livestock.

When the pullets start to lay they should be continued on the free choice plan of feeding, and they will eat about 300 pounds of whole grain while consuming 100 pounds of 26-percent protein mash. When 100 pullets start to lay they should eat 23 to 25 pounds of total feed a day. This should increase to 25 to 30 pounds a day as production increases.

**BUY PULLORUM FREE CHICKS**

Producers should buy chicks from hatcherymen known to do the most careful pullorum testing of breeding stock and do no custom hatching except from carefully pullorum-tested flocks. Many hatchery flocks require retesting two or more times a year to remove all pullorum carriers.
Pullorum disease causes death loss during the first week and up to 3 weeks of brooding. Positive diagnosis can be made only by a laboratory test. Hens infected with pullorum disease may lay eggs that are infected and some infected chicks hatch. Fumigation of incubators, one or more times during the hatch, is done by many hatcherymen, but this will not completely prevent the spread of the disease to healthy chicks. The disease can also be spread in the brooder house, especially when no litter is used, and by contaminated feeders, waterers and by contamination of the feed and drink with droppings of infected chicks.

**BEWARE OF CHICK BRONCHITIS AND LARYNGOTRACHEITIS**

Chick bronchitis is a highly infectious disease of the lungs, windpipe and bronchial tube, causing chicks to gasp for breath. Many affected chicks die from asphyxiation. It affects chicks from 1 to 3 weeks old, and the death loss is usually high. Medical treatment is not effective.

Do not put healthy chicks in the same building where there are chicks that have, or recently have had bronchitis. Do not use buildings, brooder stoves or other equipment that has not been thoroughly washed and disinfected after all chicks were removed from the building.

There is less danger of chick bronchitis if the chicks are purchased direct from a breeder or a hatchery that does not buy chicks from sources other than his supervised hatchery flocks.
Laryngotracheitis is a highly infectious disease that causes birds to gasp for air and may affect chicks as young as 1 month of age and any age thereafter. Like bronchitis, treatment for this disease is of little benefit, therefore extraordinary precautions should be taken against its introduction into the flock. Birds that recover from an attack may be carriers of the disease and may spread it to healthy birds added to the flock even many months later.

STOP COCCIDIOSIS ATTACK

Coccidiosis is an infestation of the intestinal tract by large numbers of small single-cell parasites. Coccidia that are expelled in the droppings of infested birds may lie dormant for many weeks in cold, moist places, but in warm, moist places such as around leaky fountains in the brooder house the coccidia eggs go through a process of incubation or change into an infective stage within 2 or more days.

The usual occurrence of coccidiosis is when the chicks are from 3 to 12 weeks of age. The following are indications: crowding around the brooder stove, ruffled feathers and droopiness. Bloody droppings may be noticed in the later development of this disease.

Special effort should be made to prevent infestation of coccidiosis by having a board or gravel walk to the brooder house, dry litter on the floor or frequent change of damp litter, feeders and fountains that protect feed and drink from contamination and a sanitary sun porch. By all means refrain from going from old birds to brooder house unless a special pair of rubbers are worn while in the brooder house. If chicks show symptoms of coccidiosis prompt action should be taken to carry out a simple sanitary management program to rid the birds of the coccidia and to prevent reinfestation as follows:

(a) Keep the chicks confined to the brooder house and sanitary sun porch.

(b) Change the litter each day for a period of 10 days.

(c) Burn the litter removed or spread it on land not used for poultry range.
(d) Scrub the fountains each day and put reels on the feeders that do not have them.

(e) At the end of the 10-day period scrub the brooder house with scalding lye water using 4 oz. of lye to 10 gallons of water.

(f) If the chicks cannot be provided with a sanitary sun porch with a floor of deep coarse gravel, concrete, wood slats or wire cloth, the brooder house should be moved to clean range.

**CONTROL ROUND WORMS AND TAPEWORMS**

There are several species of worms that infest chicks. They cause loss in weight and vitality and in case of severe infestation cause death or render the birds easy prey to other diseases.

Confinement of the laying flock to the hen house or to the house and a sanitary sun porch throughout the year, also confinement of the chicks or ranging them on clean ground, is the program that poultrymen depend upon for control of worm infestation. It is most difficult to control these parasites on Iowa farms where the hens or the chicks are permitted to range about the farmstead for even a part of the year.

Infested chickens void worm eggs in their droppings which in case of tapeworm eggs are taken in by beetles, earthworms, slugs, grasshoppers and possibly other insects that serve as intermediate hosts, and the parasite egg goes through part of its development in its intermediate host. Chickens eat these insects and earthworms and become infested with tapeworms. The management program given above prevents the chickens from ranging over the infested areas.

In case chickens appear unhealthy several of the sick ones should be taken to a veterinarian for post-mortem examination. In case they are infested with worms the chickens should be confined to a house with a permanent floor and each bird treated as recommended by the veterinarian. Birds infested with tapeworms may require two or three treatments to reduce the infestation. Following the worm treatment the birds should be confined to the house and sanitary sun pen as an aid in preventing reinfection.