Chick

BROODING AND REARING

By

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Oregon State System of Higher Education
Federal Cooperative Extension Service
Oregon State College
Corvallis

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<table>
<thead>
<tr>
<th><strong>Age</strong></th>
<th><strong>Grain</strong></th>
<th><strong>Mash</strong></th>
<th><strong>Drink</strong></th>
<th><strong>Other Factors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>36-48 hours old</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Hold in chick boxes or incubators.</td>
</tr>
<tr>
<td>First week</td>
<td>Sprinkle small handful of scratch in floor litter (or) on mash in trays once daily after third day.</td>
<td>Starting mash kept before chicks. One tray 6&quot; x 4' for each 100 chicks.</td>
<td>Warmed water (100° F.) before chicks at all times.</td>
<td>Raise hover. See that all chicks eat. Scatter small amount of fine hard grit over mash in trays. Get chicks outdoors by end of week. Feed green feed after third day.</td>
</tr>
<tr>
<td>Second and third weeks</td>
<td>Small handful of scratch in litter (or) on mash morning and evening second week. By end of third week feed scratch in litter three times daily (or) leave grain in troughs before chicks.</td>
<td>Starting mash kept before chicks.</td>
<td>Water need not be warmed.</td>
<td>Get chicks outdoors. Feed grit. Feed green feed twice daily. Clean out wet litter. Reduce gradually brooder temperature starting second week. Separate cockerels.</td>
</tr>
<tr>
<td>Fourth to eighth week</td>
<td>Grain in troughs before chicks (or) three daily feeds in litter with liberal amount in evening. Change gradually to coarser scratch. Keep troughs of oats before birds.</td>
<td>Starting mash kept before chicks. Mash troughs 4&quot; by 4&quot; by 6' with reel on top are satisfactory.</td>
<td>Water.</td>
<td>Gradually change to coarser grit. Separate remaining cockerels. Keep all litter dry. Get pullets on perches by fourth and fifth weeks. Use judgment in eliminating brooder heat too soon or during disagreeable days. Provide clean range. Feed green feed liberally. Provide grit.</td>
</tr>
<tr>
<td>Ninth week to age of transfer to laying house</td>
<td>Grain in troughs kept before pullets (or) feed on clean parts of range morning and evening. Grain after 12 weeks should be 50 percent of daily ration. Keep troughs of oats before pullets. Gradually change to hen-size scratch after 12 weeks.</td>
<td>Developing mash kept before pullets. Regular O.S.C. mash troughs are satisfactory for pullets on range.</td>
<td>Water. Arrange wire-covered frame: under water vessel to avoid damp soil.</td>
<td>Provide clean range. Keep range houses, feed troughs, and drinking vessels widely separated. Provide shade on range. Provide grit and oyster shell in hoppers. Provide green feed liberally. See Ext. Bul. 526, Feeding Laying Hens, regarding the transfer of range pullets to laying house.</td>
</tr>
</tbody>
</table>
Chick Brooding and Rearing

BY
FRANK L. KNOWLTON

WHEREVER chickens are raised on a commercial scale, artificial brooding of some kind will be used extensively. Good brooding equipment and management can be made to bring out the best qualities inherited by a group of chicks. Poor brooding equipment or management can ruin the best chicks that were ever hatched. It is important, therefore, that poultrymen understand brooding equipment and management.

BROODER HOUSES

Under Oregon conditions, artificial brooding cannot be carried on with dependable success unless some type of desirable brooder house is provided.

Portable brooder house. Very satisfactory brooding results can be obtained with a house 10 feet by 12 feet or 12 feet by 14 feet built on runners which make it possible at intervals to move the house to clean ground. Extension Bulletin 511, O. S. C. Brooder Houses, contains all necessary information on the construction of a portable brooder house 10 feet by 12 feet.

Stationary brooder houses. Where chicks in commercial numbers are to be brooded annually, a permanently located brooder house is generally desirable. Figure 1 shows such a house. It is 20 feet wide and has an alleyway 4 feet in width running from end to end along the rear wall. The brooding rooms are 16 feet by 16 feet each. A house of this type can be built any length desired, depending on how many brooding rooms 16 feet by 16 feet are needed. Exten-

Figure 1. O.S.C. Stationary Brooder House equipped with wire porches.
sion Bulletin 511, O. S. C. Brooder Houses, contains complete information for its construction.

Artificial yards are essential to continued success with stationary brooder houses.

**Brooding in laying houses.** A shortage of brooding capacity often can be overcome by using a section of a laying house, preferably a new one, as a brooder house. The erection of temporary partitions in the laying house, dividing it into rooms or pens at least 16 feet by 16 feet, gives best results. These temporary partitions can be constructed easily by using a board 1 inch by 12 inches as a baseboard, above which at least 4 feet of wire fencing is stretched. To check cross drafts it is well to put black building paper over this wire for a distance of at least 3 feet above the baseboard. This paper will become torn and the chicks probably will eat some holes in it, but not until they are old enough no longer to require it.

It is very important not to brood chicks on ground previously used by laying hens as such ground is too likely to be contaminated with parasites and disease organisms. When brooding in a laying house, therefore, it is advisable to use a wire porch unless the laying house is absolutely new and on clean ground.

**ARTIFICIAL YARDS**

When chicks are raised brood after brood and year after year on the same ground, that ground usually becomes so heavily infested with parasite eggs and disease organisms of various kinds that satisfactory brooding upon it is no longer possible. Artificial yards tend to overcome this difficulty.

**Wire porches.** One type of artificial yard used extensively in Oregon is the wire porch. A porch 12 feet wide and as long as the brooding room will provide sufficient area if the cockerels are removed as soon as they can be identified. The wire should be of as large a gauge as possible, 18-gauge having given good results. It should be 1-inch mesh and galvanized.

No vegetation should be permitted to grow under the wire porches, at least not high enough to allow the chicks to reach it. Such vegetation is always contaminated from an accumulation of the chicks’ droppings, and if they can reach it the very object of having the porch is defeated. An application of oil or weed poison to the ground under the porch is the best method of handling this phase of the problem.
Cement porches. Another type of artificial yard that may be used is the cement porch. This should be constructed 15 to 20 feet wide and as long as the brooding room. It should slope away from the brooder house at the rate of about three-fourths inch to the foot. Provision should be made for hosing off cement porches every few days during the brooding period. As this hosing requires quite a little time, cement porches require more labor than wire porches.

Board or lath porches. Sometimes board or lath porches are used as artificial yards. They are short lived as a result of exposure to sun and rain and are, therefore, not recommended, except as temporary expedients. When such porches are used, cleaning should be done often.

Gravel yards. Several inches of gravel are sometimes spread over a yard which is then used as an artificial yard. This is satisfactory until the accumulation of droppings fills the spaces between the stones. The gravel should then be removed and washed or replaced with fresh gravel, which in most locations is expensive.

BROODER HOUSE CAPACITIES

It is very important not to crowd chicks or poults in a brooder house. Best results cannot be attained unless sufficient floor space is provided. Observance of the following space recommendations, which apply to floor space inside of the brooder house and do not include the wire porch area, is particularly important where birds are reared to range age in brooder houses using artificial yards exclusively.

Capacity recommendations. Ordinary run chicks—approximately half pullets and half cockerels as they ordinarily hatch—should be given a minimum of 50 square feet of floor space for each 100 day-old chicks, where from 300 to 500 are brooded together. It is assumed that the cockerels will be removed as soon as they can be distinguished, because the growing pullets will need the space relinquished by the cockerels.

Sexed day-old pullets should be provided with a minimum of 100 square feet of floor space for 100 pullets. Since there are no males to remove when they are from three to five weeks of age, the only way to prevent crowding as the pullets grow is to limit the number originally put into the house. Poults require about the same amount of floor space as sexed pullets; namely, 100 square feet to 100 poults.
BROODER CAPACITIES

Satisfactory brooding results are impossible where chicks are crowded under brooders of any type. Unfortunately the advertised capacities of a few commercial brooders are greatly in excess of true capacity. Experiments have shown that best results will be obtained by not exceeding the following recommendations.

Figure 2. An electric brooder in operation in an O.S.C. Stationary Brooder House room.

Figure 3. An electric brooder with ventilating fan attachment operating in an O.S.C. Stationary Brooder House room.
Brooder capacity recommendations. For straight-run chicks a minimum of 7 square inches of floor space under the hover should be available for each chick at the start. The removal of males as soon as they can be distinguished provides for the increasing space requirements of the pullets.

For sexed pullets or poult’s 14 square inches of floor space under the hover should be provided for each.

BROODERS

The heat necessary for artificially brooding chicks may be supplied by a wide variety of devices. Those described in the following paragraphs are the ones most widely used in Oregon.

Electric brooders. During recent years the popularity of the electric brooder has increased greatly. Wherever electricity is available, most poultrymen prefer to use it for brooding. Many commercial makes of electric brooders are on the market that will give satisfactory results. Figures 2, 3, and 4 illustrate types of these operating in O.S.C. stationary brooder houses.

The Oregon Bottom-Heat Electric Brooder shown in Figure 4 and a Home Built Fan-Type Electric Brooder have been developed for those who desire efficient home-made equipment. They have
given satisfactory results under a wide variety of conditions. Building plans of both are available.

**Coal brooders.** Various types of coal-stove brooders are used extensively where electricity is not available. Most of these work very satisfactory. Many poultrymen have found gas briquettes, which are available in most sections of Oregon, a satisfactory fuel for these stoves, as the proper size and grade of coal rarely can be obtained economically here.

**Kerosene or fuel-oil brooders.** Recent improvements in the designs of kerosene or fuel-oil brooders have very greatly reduced the fire hazard which caused this once most-popular class to be surpassed by other types. Several very satisfactory makes are now available.

**Gas brooders.** Satisfactory brooders using gas from city systems or from portable tanks are now available.

**Wood-burning brooders.** Satisfactory commercial brooders burning wood for fuel have been developed and are now available.

**Hot-water brooders.** In very large stationary brooder houses it is possible to install a hot-water system that will convey water heated in a central boiler to each of the brooder rooms. Obviously an installation of this kind is quite complex and each one must be considered an individual problem. Several types of commercial brooders of this kind are on the market.

**Battery brooders.** Commercial battery brooders of several makes are now available. Generally, the starting units, illustrated in Figure 5, are equipped with their own electric heaters. In many types these heaters are removable and are taken out when the chicks no longer require supplementary heat. As the chicks grow, they require more space. Since this is not available in starting units that are filled to capacity with day-old chicks, there are also available intermediate and finishing battery brooders. These are constructed similar to the starting units except that they are progressively larger in their dimensions and have no heating equipment, which reduces their cost price considerably.

In some large installations, instead of the starting units having their own heaters, the entire room in which they are located is heated to the desired temperature by hot water or steam.

In the use of battery brooding equipment the day-old chicks are placed in starting units where they should have a minimum of 9 square inches of floor space each. Due to their progressive growth
it is necessary to allow the chicks more space at one- and two-week periods. Our work and that of others has indicated that the minimum floor space allowances for each chick in batteries at various ages are as follows:

<table>
<thead>
<tr>
<th>Age</th>
<th>Floor Space Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>Square inches per chick</td>
</tr>
<tr>
<td>1st</td>
<td>9</td>
</tr>
<tr>
<td>2nd &amp; 3rd</td>
<td>18</td>
</tr>
<tr>
<td>4th &amp; 5th</td>
<td>25</td>
</tr>
<tr>
<td>6th &amp; 7th</td>
<td>36</td>
</tr>
<tr>
<td>8th &amp; 9th</td>
<td>45</td>
</tr>
<tr>
<td>10th &amp; 11th</td>
<td>60</td>
</tr>
<tr>
<td>12th or over</td>
<td>75</td>
</tr>
</tbody>
</table>

It can be seen from this table that the chicks that will go into one starting battery at the beginning of their brooding period will fill four batteries when six weeks old or when they normally can do without supplementary heat. These same chicks, if they are reared to maturity in battery equipment, will require floor space equal to that supplied by between eight and nine starting batteries.

Figure 5. Battery brooders containing Leghorn broilers. These birds were in a feeding experiment so there are not so many in each compartment as there would be under commercial conditions.
Chick battery equipment undoubtedly has a place in broiler plants that are producing regular volumes over long periods of time. Hatcherymen find chick battery equipment very valuable to them when they have to hold chicks for periods of a few days due to a better hatch than was expected or to the cancellation of orders. An increasing number of poultrymen are finding chick battery equipment very desirable to start chicks for the first four or five days that are thereafter floor brooded. Regardless of the particular objective for which battery equipment is operated, it is very important to house it in well-insulated buildings so constructed as to afford the operator a maximum of control over temperature, ventilation, light, and humidity.

It is possible to rear pullets to maturity in battery equipment, but the practice is not recommended under Oregon conditions as it is believed that better pullets can be produced usually more economically with floor brooding followed by free range than in batteries.

**FEEDING EQUIPMENT**

Baby chicks do not require complicated or expensive feeding equipment. Satisfactory home-made equipment for this purpose is shown in Figure 6. It is very important to see that enough feeding and drinking space is provided.

**Mash troughs.** For the first two weeks a very satisfactory shallow mash tray may be made by edging a 1” x 4” or a 1” x 6” with a lath or blind stop. One of these trays 4 feet long should be provided for each 100 chicks.

For use after the first two weeks of feeding, a trough 4 inches deep, 4 or 6 inches wide, and 4 feet long should be provided for each 100 chicks. It is very desirable to equip the tops of these troughs with a revolving guard to assist in keeping the chicks out of the feed.

**Watering devices.** A deep pan in which is set a can of appropriate size as a guard makes a very good home-made watering device for starting the chicks. At least one drinking vessel with a capacity of from two to four quarts should be provided for each 100 chicks. Square frames made of 1” x 4” boards and covered with ½-inch mesh hardware cloth make desirable stands on which to place drinking vessels after the third day of brooding.

**Scales and feed bucket.** A feed bucket and milk scales, as shown in Figure 6, are convenient for the increasing number of producers interested in keeping accurate cost-account records.
FEEDING THE CHICKS

The chick develops rapidly and grows to maturity in a few months. Errors made in feeding during the growth period cannot be corrected after the fowl is mature. An excess of one class of feeds does not offset a deficiency in another. Where chicks are brooded and reared in large numbers in relatively close confinement, free range cannot be depended upon to correct errors in feeding judgment.

Basic feeding requirements. Any successful method of feeding is based upon supplying in reasonable balance the following classes of feeds:

1. Cracked grains termed "scratch" and a combination of ground grains called "mash or pellets" to supply primarily carbohydrates and fats for heat and energy.
2. Animal proteins in the form of milk, fish meal, and meat scrap, to supplement the vegetable proteins, for feather and tissue development.
3. Minerals (ash) in the form of oyster shell or limestone, bone meal, and a manganese salt to supplement the deficiencies of grains, for bone development.
4. Leafy, succulent, sun-cured or dehydrated green feeds to provide vitamins A and G, for growth.
5. Vitamin D supplements to prevent rickets.

Pullet versus cockerel feeding. When unsexed chicks are considered, approximately half of them are cockerels. Chicks are purchased ordinarily for the purpose of raising pullets for the production of commercial eggs. The feeding program should therefore be based upon the proper rearing of the pullets rather than the rapid development of the cockerel-broiler half of the flock.

The cockerels should be separated from the pullets and destroyed or placed in a separate brooder room just as soon as their sex can be distinguished. Until they are separated they will do well on the ration designed primarily for pullets. After their removal they may be fed for more rapid growth.

For the past several years many poultrymen have followed the practice of feeding both sexes a higher protein ration really designed for early riddance of the broilers. Pullets thus raised were all too often soft and squablike. The unusually heavy weight of the pullet at eight weeks did not mean she would weigh any more at maturity than if she had been grown less rapidly. She has an inherited weight which will sooner or later be reached on any reasonable ration. It is
unsound management to grow pullets like mushrooms for a few months and then retard development by withholding nutrients necessary for normal growth.

The following table gives the average weights per chick in pounds at weekly intervals for properly fed White Leghorn chicks brooded at Oregon State College.

<table>
<thead>
<tr>
<th>Age in weeks</th>
<th>Straight Run pounds</th>
<th>Sexed Pullets pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.09</td>
<td>.08</td>
</tr>
<tr>
<td>1</td>
<td>.13</td>
<td>.14</td>
</tr>
<tr>
<td>2</td>
<td>.32</td>
<td>.32</td>
</tr>
<tr>
<td>3</td>
<td>.33</td>
<td>.32</td>
</tr>
<tr>
<td>4</td>
<td>.45</td>
<td>.45</td>
</tr>
<tr>
<td>5</td>
<td>.54</td>
<td>.54</td>
</tr>
<tr>
<td>6</td>
<td>.78</td>
<td>.78</td>
</tr>
<tr>
<td>7</td>
<td>.96</td>
<td>.95</td>
</tr>
<tr>
<td>8</td>
<td>1.10</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*Pullets only.

**Liberal grain feeding for pullets.** Grains should constitute a liberal part of the pullets' diet throughout life. Fowls have strong muscular organs called gizzards which can readily grind grains. Grain is the cheapest constituent of chick rations.

Approximately one-third of the total feed consumed by eight-weeks-old pullets will be grain. This proportion may be increased as pullets grow older by encouraging increased consumption of oats in addition to the developing mash, or pellets, and scratch grains. Pullets raised on a liberal grain ration take a longer time to mature, but mortality after production starts is usually lower, bodies are larger, eggs are bigger, and the production cost less than for pullets forced into early maturity.

The marked increase in mature pullet mortality during the past few years is common knowledge. Under the heavy physical demands of high production, this death rate arises from many causes, including the lack of breeding for longevity. The practice of growing pullets normally, even if it does mean more slowly, will contribute its part to a lower pullet mortality.

Liberal feeding of scratch grains along with a chick-starter mash of approximately 19 per cent protein is a wiser practice to employ from the time chicks learn to eat than to force exclusive mash consumption for several weeks.

**Starting and developing rations.** In most sections of Oregon very satisfactory commercial chick mashes and scratches are available. Some poultrymen, however, prefer to mix their own. The following formulas are included here in the hope that they may prove helpful to those who elect to do home mixing. The chick-feeding schedule given on the inside front cover of this bulletin may be followed with either commercial or home-mixed feeds.
### O.S.C. Chick Starting Mash

<table>
<thead>
<tr>
<th>No. 1</th>
<th>No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Milk mash</strong></td>
<td><strong>Mash to be fed with liquid milk</strong></td>
</tr>
<tr>
<td>300 pounds bran</td>
<td>300 pounds</td>
</tr>
<tr>
<td>500 pounds ground yellow corn</td>
<td>500 pounds</td>
</tr>
<tr>
<td>100 pounds finely ground oats</td>
<td>100 pounds</td>
</tr>
<tr>
<td>500 pounds ground wheat</td>
<td>700 pounds</td>
</tr>
<tr>
<td>0 pounds finely ground barley</td>
<td>100 pounds</td>
</tr>
<tr>
<td>100 pounds meat scraps</td>
<td>75 pounds</td>
</tr>
<tr>
<td>175 pounds fish meal</td>
<td>75 pounds</td>
</tr>
<tr>
<td>80 pounds dried milk</td>
<td>0 pounds</td>
</tr>
<tr>
<td>80 pounds dried whey</td>
<td>0 pounds</td>
</tr>
<tr>
<td>140 pounds dried alfalfa</td>
<td>100 pounds</td>
</tr>
<tr>
<td>40 pounds oyster shell flour</td>
<td>30 pounds</td>
</tr>
<tr>
<td>20 pounds fine salt</td>
<td>20 pounds</td>
</tr>
</tbody>
</table>

2,035 pounds—plus vitamin D supplement (as recommended on page 14) 2,000 pounds

4 ounces—manganese sulphate 4 ounces

### O.S.C. Chick Scratch Grains

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1,200 pounds wheat (cracked or whole)</td>
<td>800 pounds cracked yellow corn</td>
</tr>
</tbody>
</table>

### O.S.C. Chick Developing Mash

<table>
<thead>
<tr>
<th>Milk mash</th>
<th>Plain mash</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 pounds mill run</td>
<td>480 pounds</td>
</tr>
<tr>
<td>500 pounds ground wheat</td>
<td>500 pounds</td>
</tr>
<tr>
<td>350 pounds ground corn</td>
<td>300 pounds</td>
</tr>
<tr>
<td>200 pounds ground oats</td>
<td>200 pounds</td>
</tr>
<tr>
<td>100 pounds ground barley</td>
<td>100 pounds</td>
</tr>
<tr>
<td>100 pounds meat scraps</td>
<td>100 pounds</td>
</tr>
<tr>
<td>100 pounds fish meal</td>
<td>150 pounds</td>
</tr>
<tr>
<td>100 pounds algae</td>
<td>100 pounds</td>
</tr>
<tr>
<td>80 pounds dried milk</td>
<td>25 pounds</td>
</tr>
<tr>
<td>40 pounds steamed bone meal</td>
<td>40 pounds</td>
</tr>
<tr>
<td>20 pounds fine salt</td>
<td>20 pounds</td>
</tr>
</tbody>
</table>

2,000 pounds—(see vitamin D supplement recommendation on page 14) 2,000 pounds

4 ounces—manganese sulphate 4 ounces

### O.S.C. Developing Scratch

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1,200 pounds wheat</td>
<td></td>
</tr>
<tr>
<td>400 pounds cracked yellow corn</td>
<td></td>
</tr>
<tr>
<td>400 pounds heavy oats</td>
<td></td>
</tr>
</tbody>
</table>

**Vitamin D supplements.** The ration for early hatched chicks and all chicks raised in confinement must carry a vitamin D supplement in adequate amounts to prevent leg weakness or rickets. Chicks grow rapidly and require a balanced supply of minerals in order to build normal bones. Vitamin D makes it possible for the chicks to utilize the needed minerals.

There are many different brands and grades of vitamin D supplements on the market, the majority of which are in the form of fish oils. The amount of vitamin D supplement to use in a ration is determined by the potency of the supplement.

The vitamin potency of materials intended for *human* consumption is usually expressed in U.S.P.* units, while the potency of products intended for *poultry* feeding is expressed in A.O.A.C.†

*United States Pharmacopoeia
†Association of Official Agricultural Chemists.
chick units. It is highly desirable to confine purchases of vitamin-bearing supplements to those on which the manufacturer's label on the original container guarantees a definite vitamin D potency in terms of U.S.P. or A.O.A.C. units. For all practical purposes one A.O.A.C. chick unit is equal to one U.S.P. or International unit of vitamin D.

From work conducted at various experiment stations it is now possible to state both the approximate minimum and optimum levels of intake of vitamin D for chicks raised in confinement. The most favorable level of vitamin D intake is close to 180 A.O.A.C. chick units per pound of total feed. It is generally agreed that the absolute minimum requirement approaches 90 units per pound.

As chicks mature an increasingly larger proportion of their diet becomes grain, which means that the decreasing amount of mash consumed must carry a greater quantity of vitamin D supplement to care for this increased grain consumption. Particularly is this true with birds reared in confinement. For this reason chick starter mashes should carry between 450,000 and 480,000 A.O.A.C. chick units per ton. For chicks being reared on open range, where they are exposed to sunlight, the vitamin D requirements of their mash are only about 60
per cent of the above. For this reason the vitamin D supplement of chick developer mashes is approximately 282,000 A.O.A.C. chick units per ton. By dividing the requirements per ton of a mash by the units of vitamin D per pound of the vitamin D supplement one may determine the quantity of supplement to add to a ton of that mash.

**SEXED CHICKS**

The purchase of day-old sexed pullets is a practice now generally followed on Oregon commercial egg farms where the Leghorn breed predominates. If the chicks are properly handled while being sexed, there is no injury to them as chicks, or later as laying pullets.

The mortality of sexed pullets during the brooding period is generally lower than for unsexed chicks of the same quality. The slightly lower death rate is due to two principal factors: first, day-old pullets have twice as much room under the brooder because only half as many as straight-run chicks are put under one brooder; second, the sexed pullets cost twice as much as unsexed chicks and naturally receive more attention and care.

As the purchaser of day-old pullets pays for the undelivered cockerel and a sexing charge, it is to be expected that the sexed pullet raised to maturity will cost a few cents more than a pullet from an unsexed lot. The sexed pullets have more brooder space; under most farm conditions they mature more evenly, have less severe disease outbreaks, and develop fewer cannibalistic habits. The slight increase in mature-pullet cost is more than justified, except for the farms having ample brooding equipment and special advantageous broiler outlets not available to producers generally.

**BROODING MANAGEMENT**

Poultrymen can brood good chicks by following any one of numerous brooding-management plans. It is highly advisable to select and follow faithfully a definite plan of management that has been used extensively under Oregon conditions and given good results. It is wise to avoid fads and innovations because too often they prove expensive.

**Ventilation.** Fresh air is necessary for the growth of healthy, vigorous chicks. Adequate ventilation should be provided, but floor drafts must be avoided. The windows of O.S.C. brooder houses are equipped with frames covered with muslin or a glass substitute. The top section of these frames can be tipped in, thus providing adequate fresh air with a minimum of direct draft.
Litter. Cut straw, sand, sawdust, or peat moss are used successfully for brooder-house litter in the various sections of Oregon. Litter should be dry when chicks are put on it. Since sand and sawdust are likely to be damp, they should be dried before being used.

Alfalfa hay or chaff is used in some localities, but it makes rather inferior litter because of its marked tendency to ball up on the chicks’ toes.

No matter what kind of litter is used, it is well to cover it with clean burlap for the first two or three days. This precaution prevents the chicks from eating litter instead of food before they have learned the difference.

Cannibalism. The various causes of cannibalism are not thoroughly understood. No simple, positive remedy is yet known. It is known, however, that properly fed chicks, housed in good brooder houses providing ample room per chick, as well as correct brooder and room temperatures generally give less cannibalistic trouble than those improperly handled.

No matter what may be the actual cause of a cannibalistic outbreak, it seems probable that after it has started, habit plays quite a part in its continuance. It is important, then, when an outbreak occurs, to check it before the chicks learn the habit so thoroughly that it can never be stopped. Certain practices have been found
helpful in checking outbreaks of cannibalism, although none of them can be depended upon as a certain cure.

First, correct any shortcomings that may be discovered in the feeding practices or housing facilities.

Next, darken the brooding chamber by placing black or dark-red cloth over the doors and windows. Just enough light should be admitted to permit the chicks to see to move around. In quarters thus darkened they will do a minimum of picking.

There are on the market several brands of red grease designed to control cannibalism. All poultrymen should keep a can of this material on hand. At the first sign of picking, smear this blood-colored, vile-tasting material generously on not only all of the chicks that have been picked but on a dozen or more others that have not yet been. The chicks will immediately start picking at this red material, presumably thinking it to be blood. One or two mouthfuls are sufficient to teach most chicks that all that is red is not good to eat. If taken in time, outbreaks often can be held in check by this means.

Clean litter, frequent feeding of green feed, and the careful avoidance of frightening or overheating the chicks are also helpful in preventing or reducing cannibalism.

It has been demonstrated by the Western Washington Experiment Station that the liberal feeding of heavy whole oats to chicks from the sixth week to maturity will help materially in preventing cannibalism.

**O.S.C. brooding-management plan.** Chicks have been brooded artificially at Oregon State College for about thirty years. During this time many brooding plans have been tried. A description of present practices may be helpful.

Brooding is done in O.S.C. portable or stationary brooder houses.

The brooding rooms and all equipment are thoroughly cleaned and disinfected several weeks before they are to be used. A solution of water and a coal-tar product, such as sheep dip, mixed in proportions to give a good milky color, is a good disinfectant. A cheaper and probably just as effective solution can be made by adding one can of common lye to 15 gallons of water, which solution can then be used for actually scrubbing the brooding rooms and equipment.

At least a week before brooding is to start the litter and burlap are put into the brooding rooms and all equipment is set up. A 24-hour trial run of the brooder is then made. This trial run gives an opportunity to discover and remedy any broken parts or other mechanical failures that may have developed in the brooder. It also
dries out the litter if that be needed and gives an opportunity for adjusting the brooder to the desired starting temperature.

The empty brooder should be regulated to a temperature of 92° to 95° Fahrenheit at a height of about 2½ inches above the floor. After the chicks are put under the brooder, the experienced operator can tell whether they are comfortable by the way they act. If they crowd toward the center of the brooder, it is an indication that more heat is needed. Too much heat will drive them to the outer edge of the brooder.

The temperature should be reduced gradually as brooding proceeds. It is impossible, however, to give an absolutely definite rule as to the extent of this reduction as it will be affected by the out-of-door temperature, the type of brooder house, the number of chicks under the brooder, and other such variable factors. On the average, however, this reduction will be about ¼ degree per day, which amounts to 4 or 5 degrees per week.

Twenty-four hours before actual brooding is to commence the brooders are started. Since they have been adjusted during the trial run, this final starting is a simple matter.

Feed and water are placed in the brooding enclosures just before chicks are put under the brooder. The feeding practice followed is in accordance with the schedule that will be found on page 2 of this bulletin.

A maximum of 500 straight-run chicks or 250 day-old pullets are placed under each brooder when the chicks are from 24 to 36 hours of age, or as soon thereafter as possible. It is wise to cull the chicks as they are placed under the brooder and eliminate all crippled or weak chicks. Since the feed is already before them, the chicks start to eat immediately.

At first the chicks are restricted to the area near the brooder by 12-inch boards hinged in pairs as shown in Figure 4. These enclosures are increased in size gradually until by the end of the first week they are dispensed with entirely and the chicks given the free run of the brooder room. When using electric brooders equipped with pilot lights, the brooding room is darkened for the first two days, except at feeding times, to help teach the chicks the location of the brooder.

The chicks are let out of doors just as quickly as possible. Just how quickly this can be accomplished depends on the weather, whether the chicks have an artificial or a natural outside yard, and other such factors.

The cockerels are separated from the pullets in the case of straight-run chicks and destroyed or removed to other brooders just
as quickly as they can be distinguished. For Leghorns this is when they are three, four, or five weeks of age.

Since it is desirable to teach young chicks to roost as early as possible, the hinged perches are let down the third week. With easily movable brooders like the electrics, the entire brooders are moved gradually toward and finally over the perches, as shown in Figure 7, which renders quite simple the task of teaching the chicks to roost.

O.S.C. RANGE MANAGEMENT PLANS

When the pullets can do without heat they are moved to free range on ground that has had no poultry on it for at least one entire year. A range rotation plan that would make necessary the use of the ground for poultry purposes only one year out of three would be even better. On the average, it should be possible to move chicks to range when they are 8 to 10 weeks of age, although this will depend largely on whether they are early or late hatched chicks. Due to the cooler and usually more rainy weather of early spring, the early hatched chicks will be older before they can be gotten to range. The average range will accommodate not more than 300 pullets per acre. If a greater concentration than this is permitted, disease dangers are multiplied.

The cover illustration shows an ideal pullet range, which should provide a shelter of some kind, together with sod pasture and shade. If available, O.S.C. portable brooder houses may be used for shelter, or cheaper houses may be employed. Any simple structure having a solid back, wire-covered ends that can be closed tightly with solid doors, and a wire front will give satisfactory results if not overcrowded. A house 10 feet by 12 feet, of the shed-roof type, with wire front wall 7 feet high and solid rear wall 5 feet high is suggested. The ends should be solid up to the top of the rear wall, and wire above that point. Solid doors so hinged that they will open out and down should be provided for closing up these triangular gable ends when necessary. The perches should be screened to keep the birds from having access to the droppings that accumulate under them on the floor.

Range houses with four wire sides have proved too drafty except in locations well sheltered by trees or bushes. For this reason they are no longer recommended for general use.

A minimum of 4 inches of perch space per pullet should be allowed in range shelters. This much perch space will not be required at the beginning of the ranging period but it will be needed before the birds reach maturity. It is considered highly desirable not to place
more than 150 pullets in any one range shelter. By holding the num-
ber of pullets per house down to this figure and increasing the num-er of houses available, it is easier to keep the birds distributed more
evenly over the range. Concentration of large numbers of birds in a
restricted area provides conditions that facilitate the spread of many
diseases, and should therefore be avoided.

Another advantage of having relatively light range shelters on
runners is that with this type the tendency toward range contamin-
ation adjacent to the shelters can be counteracted by moving the
shelters 50 to 100 feet every two weeks or so during the ranging
period. Since the birds will follow the shelter if not moved too far,
this procedure distributes the concentration points often enough so
that no point becomes badly contaminated with droppings. If range
shelters are to be moved in accordance with this plan, it is necessary
for them to have board floors, otherwise the droppings that had ac-
cumulated under the perch screens, if they had been permitted to fall
clear through to the ground, would with the moving of the shelter
become exposed to the birds and would constitute an extremely
dangerous source of contamination.

In the case, for example, of a rectangular or square range, the
borders of which are approximately oriented with the main points of
the compass, the range shelters could be located at the start along the
south edge of the field and about 100 to 200 feet from each other.
They would thus be in a relatively straight line from east to west.
Every ten days or two weeks they could be pulled 50 to 100 feet
north, which would still preserve the east-west alignment. The num-
ber of feet covered in each move and to some degree the num-
ber of moves during the ranging season would have to be governed
by the size of the range. This should be calculated in advance and the
successive movings of the shelters so spaced that the line of shelters
which started the ranging period aligned along the south edge of the
range would end the ranging period along the north range border.

The watering devices employed on a range are important because
there must be available an abundance of clean water so handled that
the birds are prevented from having access to any constantly damp
or muddy earth. Such moist areas are dangerous disease-spreading
centers. They can be prevented by setting the watering devices on
wire frames which keep the birds away from the mud holes or
moist earth that always results from the spilled or overflow water.
Frames about 4 feet square made from two-by-fours with inch-mesh
poultry netting on the upper face serve this purpose very well. If
necessary, a shallow hole can be dug into the earth under the frame
to retain the water until it soaks into the ground.