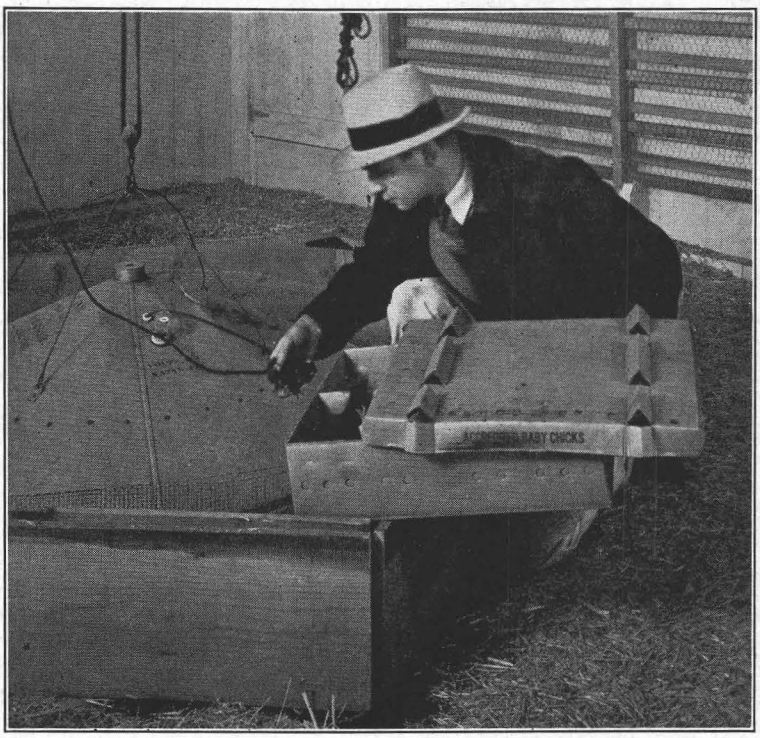
Chick Brooding *and* Rearing

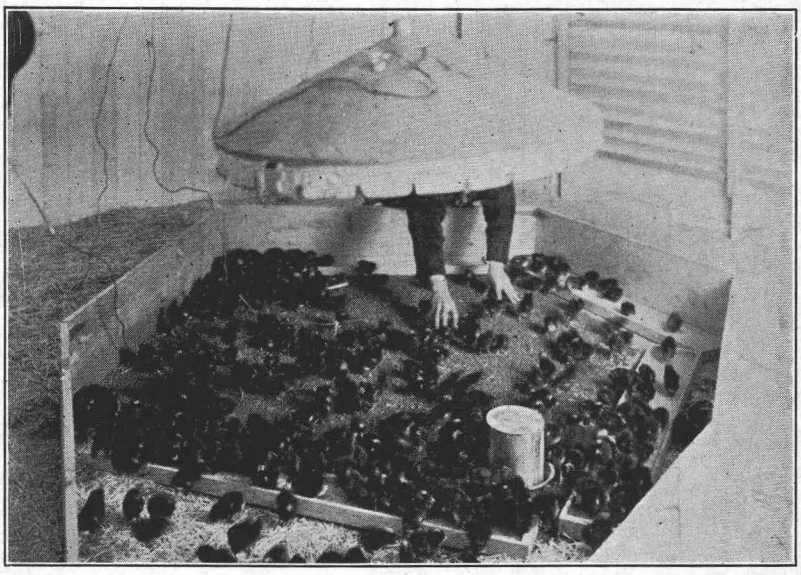
J. E. Parker
N. L. Bennion

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

Extension Bulletin 627
Revised May 1950



Receiving the chicks and putting them under the electric brooder at 92° to 95° F.



A counter weight and pulley arrangement for raising the hover provides a convenient method of inspection and cleaning under the hover.

Chick Brooding and Rearing

Revised by
J. E. PARKER, Professor of Poultry Husbandry,
and N. L. BENNION, Extension Poultry Specialist*

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

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 8 to 10 feet wide by 10 to 14 feet long built on runners that make it possible at intervals to move the house to clean ground. Oregon Extension Bulletin 652, *O. S. C. Brooder Houses,* contains information on the construction of a portable brooder house.

Stationary brooder house. 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

Figure 1. O. S. C. Stationary Brooder House equipped with wire porches.

* Extension Bulletin 627 was issued in January, 1944, by J. A. Harper, assistant professor of poultry husbandry, and Noel Bennion, Extension poultry specialist. The material has been verified and new data have been added for this revision by J. E. Parker and N. L. Bennion, as listed above.

each. A house of this type can be built any length desired, depending on the number of chicks to be brooded. Oregon Extension Bulletin 652, *O. S. C. Brooder Houses,* contains complete information for its construction.

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. Where laying houses are used for brooding chicks, the adult stock should be removed prior to the brooding season and the house thoroughly cleaned and disinfected. The erection of temporary partitions in the laying house, dividing it into rooms or pens, gives best results. These temporary partitions can be constructed by using a board 1 inch by 12 inches as a baseboard, above which at least 4 feet of wire netting is stretched. Plywood may also be used to build partitions in laying houses. Panels of plywood are easy to arrange and provide ample protection from drafts.

It is important not to permit chicks out on ground previously used by laying hens as such ground is likely to be contaminated with parasites and disease organisms. When brooding in a laying house, therefore, it is advisable to keep the chicks confined to the house or to use a wire sunporch.

ARTIFICIAL YARDS

When chicks are raised or brooded year after year and have access to 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 6 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 no smaller than 18-gauge, 1-inch mesh, and galvanized. Either 1 x 1 inch or 1 x 2 inch welded wire, 12½ or 14 gauge, may also be used.

No vegetation high enough to allow the chicks to reach it should be permitted to grow under the wire porches. Such vegetation is contaminated from an accumulation of the chicks' droppings, and if chicks 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 one method of controlling grass and weed growth. Another way is to build the wire porches in removable sections to permit cutting the vegetation.

Cement porches. Another type of artificial yard that may be used is the cement porch. This should be constructed as long as the brooding room with a slope away from the brooder house at the rate of about three-fourths inch to one 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. Board or lath porch floors may be used as artificial yards and, provided they are oil treated for ease of cleaning and protection against weather, satisfactory results are obtained. Lath porch floors can be made from 1½-inch slats placed from 1 to 1½ inches apart.

BROODER HOUSE CAPACITIES

It is very important not to crowd chicks in a brooder house. Best results cannot be attained unless sufficient floor space is provided. Observance of the following space recommendations, which apply only to floor space inside of the brooder house, is particularly important where birds are reared to range age in the confinement of brooder houses equipped with artificial yards.

Capacity recommendations. Straight-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 the chicks are from 3 to 5 weeks of age, the only way to prevent crowding as the pullets grow is to limit the number originally put into the house.

Commercial broiler growers should allow from 60 to 100 square feet of floor space for 100 chicks. For rapid and uniform growth and efficient use of feed broilers must not be overcrowded.

BROODER CAPACITIES

Satisfactory brooding results are impossible where chicks are crowded under brooders of any type. Unfortunately the advertised capacities of many brooders are in excess of their actual capacities. Experiments have shown that best results will be obtained by not exceeding the following recommendations.

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 for the pullets.

For sexed pullets 14 square inches of floor space per chick under the hover should be provided.

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 use of electric brooders has increased in popularity. Many commercial makes of electric brooders are on the market that will give satisfactory results. Figures 2 and 3 illustrate types of these operating in O. S. C. Stationary Brooder House.

The Oregon Home-Built Electric Brooder and a Home-Built Fan-Type Electric Brooder have been developed for those who desire efficient home-made equipment. The plans for these can be obtained in Station Bulletin 478, *Home-Built Electric Brooders.* They have given excellent results under a wide variety of conditions.

Coal brooders. Various types of coal-stove brooders are used extensively where electricity is not available. These work satisfactorily. 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 is difficult to obtain.

Kerosene or fuel-oil brooders. Recent improvements in the designs of kerosene or fuel-oil brooders have greatly reduced the fire hazard that in the past made them objectionable. Several 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 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.

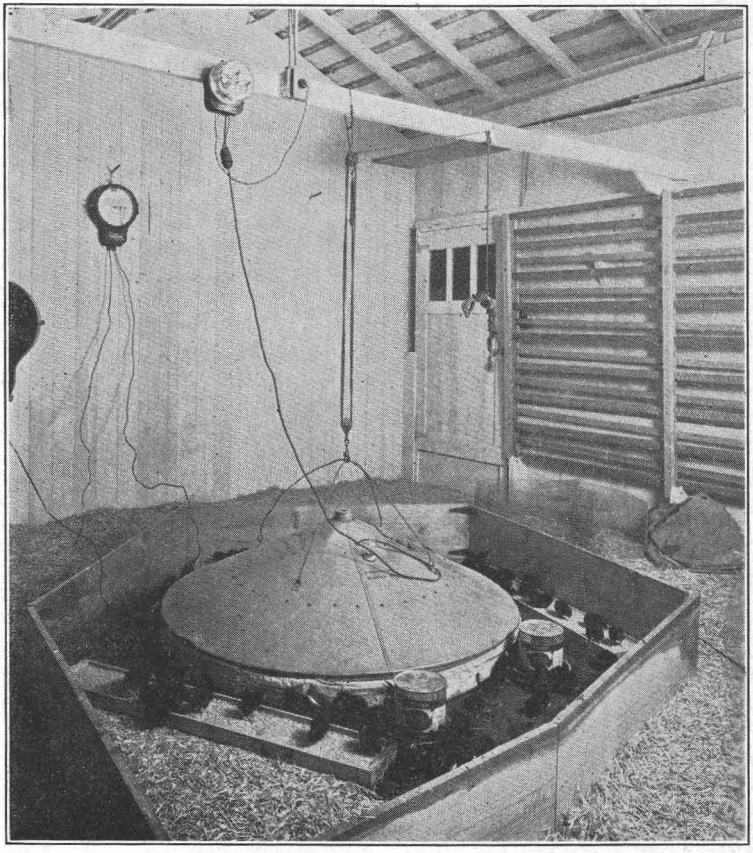


Figure 2. An electric brooder in operation in an O. S. C. Stationary Brooder House room.

Battery brooders. Commercial battery brooders of several makes are now available. Generally, the starting units, illustrated in Figure 4, 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.

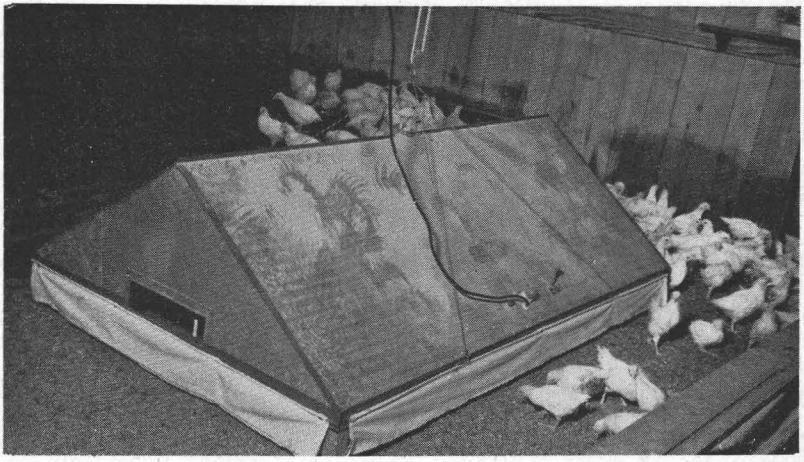


Figure 3. An electric brooder with ventilating fan attachment operating in an O. S. C. Stationary Brooder House room.

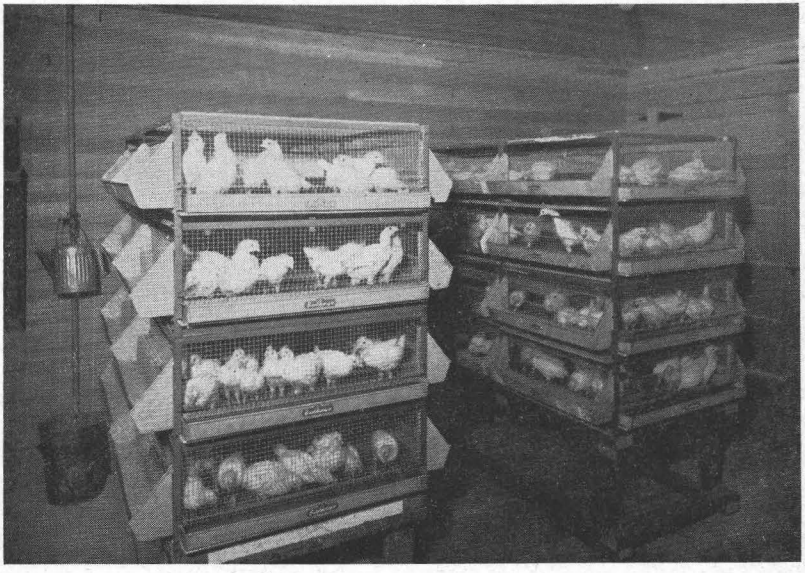


Figure 4. Battery brooders containing Leghorn broilers.

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 10 square inches of floor space each. Because of their progressive growth it is necessary to allow the chicks more space at 2-week periods. The minimum floor space allowances for each chick in batteries should be increased for each two-week interval by 10 square inches. Each chick carried beyond the 12th week should have a minimum of 72 square inches of floor space.

The chicks that go into one starting battery at the beginning of their brooding period will fill four batteries of comparable size when 7 weeks old or when they normally can do without supplementary heat. These same chicks, if they are reared to 10 to 11 weeks of age or to broiler weights will require space equal to that provided by six starting batteries.

Hatcherymen find chick battery equipment very valuable to them when they have to hold chicks for periods of a few days. Some poultrymen use chick battery equipment to start chicks for the first week or 10 days before transferring them to floor brooding equipment. 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 generally recommended under Oregon conditions as it is believed that pullets can be produced more economically with normal brooding methods and free range practices.

Battery feeding. Chicks started and reared in batteries should be fed the same type of well-balanced ration used for chicks raised under a floor plan of brooding. Nearly all nutritionally balanced rations will give satisfactory results for battery feeding.

Batteries for broilers. Battery equipment is used to a considerable extent by broiler growers that are producing regular volumes over long periods of time. Batteries may be best suited to plants that dress their own birds as there is a general belief that battery-reared chicks are soft and the shrinkage or weight loss in shipment of live chickens is greater than with floor-reared birds.

When chicks are raised to weights exceeding 2 to 2½ pounds in batteries they are prone to have breast blisters. Irritation of the skin over the breast bone caused by contact with the wire floor may cause an accumulation of fluid under the skin which resembles a blister.

FEEDING EQUIPMENT

Baby chicks do not require complicated or expensive feeding equipment. Satisfactory home-made equipment for this purpose is shown in Figure 5. It is very important to see that enough feeding and drinking space is provided.

Mash troughs. For the first 2 weeks a very satisfactory shallow mash tray may be made from a 1 x 4 or 1 x 6 inch board edged with lath. One of these trays 4 feet long should be provided for each 100 chicks.

For use after the first 2 weeks of feeding, a trough 4 inches deep, 4 to 6 inches wide, and 4 feet long should be provided for each 100 chicks. It is desirable to equip the tops of these troughs with a square stick pivoted at both ends so that it revolves easily if they attempt to roost on it. This will keep the chicks out of the feed. Feeders should be placed on low stands, as shown in Figure 5, when the chicks reach 4 weeks of age.

Watering devices. A deep can that is set in a pan of appropriate size as a guard makes a good home-made watering device for starting the chicks. At least one drinking vessel with a capacity of from 2 to 4 quarts should be provided for each 100 chicks at the start. Square frames made of 1 x 4 inch boards and covered with ½-inch mesh hardware cloth make desirable stands on which to place drinking vessels to prevent the chicks from contacting wet litter. Figure 5 shows the home-made watering device and stand. After the second week of brooding the watering capacity should be increased. Automatic or drip type fountains are an advantage where running water is available.

Scales and feed bucket. A feed bucket and milk scales, as shown in Figure 5, are convenient for the increasing number of producers interested in keeping accurate feed or cost-account records.

FEEDING THE CHICKS

Any successful method of feeding is based upon supplying in reasonable balance the six so-called essential nutrients; namely, carbohydrates, fats, protein, minerals, vitamins, and water. Lack of any one nutrient from the diet will soon make itself evident either through slowing the growth rate or through the appearance of nutritional deficiency diseases. Each nutrient is necessary for complementing the other, and together in correct proportion they form the balanced ration.

Carbohydrates and fat. Cereal grains furnish the basis for poultry mash and grain mixtures. They furnish large quantities of carbohydrates and some fat to the ration which is used by the body as the chief source of heat and energy.

Proteins. Proteins furnish to the body the necessary elements for growth of tissue and body repair. Vegetable proteins from soybean oil meal, cottonseed meal, and peanut meal have during late years been used to furnish an increasing amount of protein for poultry feeds. When supplemented with as little as 2 per cent animal protein from such sources as meat meal, fish meal, or dried skim milk, they yield highly satisfactory results.

Animal Protein Factor (APF). In the light of results from recent investigations at the Oregon Experiment Station and elsewhere the 2 per cent animal protein increases the efficiency of vegetable-protein rations by supplying a substance, vitamin-like in nature, called the animal protein factor or briefly APF. Vitamin B_{12} and other factors are contained in APF complex. Animal protein feeds, particularly fish meal, are good sources of APF whereas the vegetable proteins are poor sources. Many concerns are offering APF concentrates for sale. Satisfactory growth to broiler weights have been obtained with rations containing no animal protein feeds but small amounts of APF (Ration No. 4, Table 1).

Minerals. Minerals are essential for bone development. Chief sources of calcium and phosphorus, two of the essential mineral elements, are oystershell, limestone, bonemeal, defluorinated rock phosphates, and colloidal clay. Sodium and chlorine are added to the ration as ordinary salt, while manganese is added in very small amounts in the form of a manganese salt. These are essential to supplement the deficiencies of grains and the vegetable protein concentrates.

Vitamins. Vitamins are important for normal growth and when absent produce certain characteristic disease symptoms. Poultry diets are generally checked for the presence of vitamins A and D, riboflavin, and pantothenic acid. Other vitamins, while important, are furnished by the ingredients normally used. Vitamin A is important for preventing infections of the eyes and respiratory tract. It is furnished in the ration by use of dried alfalfa meal, yellow corn, green feeds, and fish oil. Vitamin D is required to prevent rickets and permit normal calcification of bones. Fish liver oils, irradiated products, and sunshine supply poultry needs for this vitamin. Riboflavin is needed particularly in the diets of breeder

Figure 5. Chick feeding equipment.

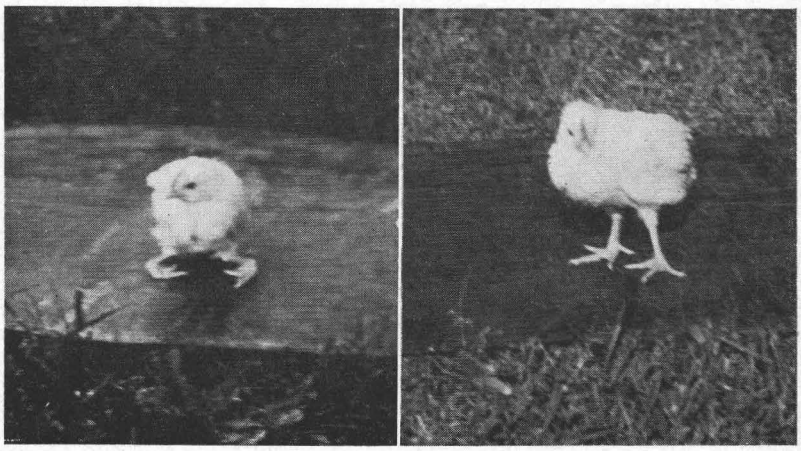


Figure 6. The bird on the left shows a typical case of curly-toe paralysis due to a deficiency of riboflavin in the diet. The bird on the right is the same one 2 days later after being fed a diet containing adequate riboflavin.

hens and starter rations for good hatchability and to prevent curly-toe paralysis, an example of which is shown in Figure 6. Pantothenic acid is required to prevent skin dermatitis. Both of these vitamins are found in about the same list of ingredients; namely, green feeds, dried alfalfa products, dried skim milk, dried whey, yeast, liver meal, and distillery byproducts.

High-energy or high-efficiency mashes. During the past few years there has been considerable interest in chick rations high in energy and low in fiber. Such rations also supply ample amounts of the required vitamins and minerals and a good protein balance

Table 1. CHICK STARTER, BROILER, AND DEVELOPER MASHES

Ingredients	1 Chick mash	2 Chick mash	3 Simple chick mash	4 APF broiler mash	5 Connecticut broiler mash	6 Developer mash
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Millrun	200	300	400	200	.....	260
Ground wheat	700	300	400	.....	.....	800
Ground oats	200	300	200	.....	.....	200
Ground barley	100	.....	.....	.....	.....	100
Ground yellow corn	.....*	300	400	900	1,390	.....*
Soybean meal	250	300	200	700	160	250
Liver meal	.....	.....	.....	.....	60	.....
Fish meal	75	100	.....	.....	160	.....
Meat meal	75	100	280	.....	160	70
Dried skimmilk	40	100	.....	.....	.....	20
Dried whey	40	.....	.....	.....	.....	20
Distillers' dried solubles	80	.....	.....	.....	.....	40
Alfalfa meal	150	100	100	100	20	150
Steamed bone meal	.....	40	.....	40	.....	30
Oyster shell flour	40	20	.....	40	.....	40
Salt	20	15	10	10	10	20
A-D Feeding oil (3,000A-400D)	4	4	4	3	6	4
Manganese sulphate	½	½	½	½	½	½
Irradiated animal sterol (2,000D)	.....	1¼	.....	1	.....	.....
Choline chloride	.....	.....	.....	1½	1¼	.....
APF concentrate (animal protein factor)	.....	.....	.....	5	.....	.....
Butyl fermentation solubles (B-Y 500)	.....	.....	.....	.....	40	.....
Riboflavin, synthetic	.....	2 *gms.*	.....	2 *gms.*	2 *gms.*	.....
Niacin	.....	.....	.....	20 *gms.*	26 *gms.*	.....
Total	1,974½	1,980¾	1,994½	2,001	2,007¾	2,004½

* When corn is available at reasonable cost it may replace part of the wheat or other grains.

CHICK SCRATCH

	Pounds
Cracked wheat (fine)	1,200
Cracked corn (fine)	800

DEVELOPER SCRATCH

	Pounds	*Pounds*
Whole wheat	1,200	800
Cracked corn	400	or 800
Heavy oats	400	400

to supply adequate amounts of the amino acids required by the growing chicks. It is not at all unusual for broiler growers to produce a pound of broiler on as few as 3 pounds of feed with these rations. Although high-energy mashes cost more per 100 pounds, many broiler growers find that the faster growth and more efficient utilization of feed offset the higher cost. The well known Connecticut high-energy ration is shown in Table 1 (No. 5).

Chick rations. In most sections of Oregon satisfactory ready-mixed chick and broiler mashes and scratch feeds are available. Some poultrymen, however, may prefer to mix their own. For these poultrymen there are shown in Table 1 some rations that have been used successfully. Mash No. 3 is a simplified mash, which although not as efficient as the other mashes, may be desired by poultrymen who do not find some of the ingredients readily available. Mashes Nos. 4 and 5 are designed for broilers. Mash No. 2 is designed to meet the needs of laying flocks and breeder flocks as well as growing chicks. It is an all-purpose mash that can be used with chickens of all ages. When fed to developing chickens or mature birds it is fed with scratch grains.

While many poultrymen start feeding scratch grains from as early as two weeks to as late as eight weeks of age, many commercial broiler raisers prefer to feed only mash until the chickens are marketed. The chick feeding schedule given on the back cover of this bulletin may be of value to less experienced chick raisers.

When feeding commercial feeds follow the feeding schedule of the manufacturer.

Water. Water is essential in the diet for aiding in digestion, absorption, circulation, control of temperature, lubrication, and the excretion of waste products.

Table 2. CHICK GROWTH RATE

Age in weeks	White Leghorns, straight run	White Leghorns, sexed pullets	Rhode Island Reds, straight run	New Hampshires, straight run
	Pounds	*Pounds*	*Pounds*	*Pounds*
0	.09	.08	.09	.08
1	.13	.14	.13	.14
2	.22	.22	.24	.28
3	.33	.32	.39	.47
4	.45*	.45	.58	.69
5	.64*	.64	.80	.94
6	.78*	.78	1.07	1.25
7	.96*	.95	1.37	1.50
8	1.10*	1.10	1.61	1.83

* Pullets only.

Growth rate. Table 2 gives the average weights per chick in pounds at weekly intervals for White Leghorn, Rhode Island Red, and New Hampshire chicks brooded at Oregon State College.

Using strains of chicks bred for rapid growth and feeding high-efficiency rations makes it possible for some broiler growers to produce 3-pound chickens in about 10 weeks.

SEXED CHICKS

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

As the purchaser of day-old pullets pays for the undelivered cockerel and a sexing charge, it is to be expected that the sexed pullets raised to maturity will cost a few cents more than a pullet from an unsexed lot. If sexed pullets have more brooder space, under most farm conditions they will mature more evenly, have less severe disease outbreaks, and develop fewer cannibalistic habits. The slight increase in mature pullet cost is justified, except for 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 sections of these frames can be tipped in, thus providing adequate fresh air with a minimum of direct draft.

Litter. Cut straw, shavings, cedar tow, sawdust, sand, 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.

When sand, sawdust, or peat moss is used, it is well to cover it with burlap or cloth for the first 2 or 3 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 on 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 sacks, dark cloth or paper 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 anti-pick paste 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 attacked. 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 can often be held in check by this means.

Broiler growers have found that debeaking the chicks when three to five weeks of age helps in preventing or controlling cannibalism. In debeaking, the upper beak is cut back approximately $\frac{1}{4}$ inch with a knife, a pair of wire side cutters or an electrical debeaking device.

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

O. S. C. brooding-management plan. Chicks have been brooded artificially at Oregon State College for about forty 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 is put into the brooding rooms and all equipment 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 is 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 near the outside edge of the hover. The placing of the thermometer is of great importance in measuring correct operating temperatures of the brooder. It has been found that a wide variation may exist between temperatures taken at various points under the hover, this being particularly true for fanless electric brooders.

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 ¾° per day, which amounts to 4° or 5° 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 enclosure just before chicks are placed under the brooder. Egg-case flats, clean sacks or muslin are used under the hover to cover the litter for an area equal to that of the brooder. Mash is scattered over the covering material in sufficient quantity for chicks to find it readily. The covering is used for 3 or 4 days. At the end of this time chicks have learned to eat from feed trays. Mash should be kept before the chicks at all times. Starting the second week cracked grains and grit can be fed free choice along with the mash. Chicks will balance their own ration and make satisfactory growth under this method of feeding. With certain rations where pasting-up is a problem, it has been found that feeding of scratch grain alone the first two days of brooding will aid in preventing this occurrence.

Feed management for battery-reared birds is similar to that for floor groups. Mash is placed on egg-case flats and the flats pushed in under heating elements on top the wire floor. Hoppers are kept filled with mash from the start. Scratch grain is fed in a separate hopper after the first week. Free access is also permitted to an insoluble grit.

Not more than 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 2. These enclosures are increased gradually in size 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 2 days, except at feeding times, to help teach the chicks the location of the brooders.

The chicks may be let out-of-doors at an early age. Just how early depends on the weather, on whether the chicks have access to an artificial or a natural outside yard, and on other such factors.

The cockerels are separated from the pullets in the case of straight-run chicks and removed to other brooders just as quickly as they can be distinguished. For Leghorns this is when they are 3, 4, or 5 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.

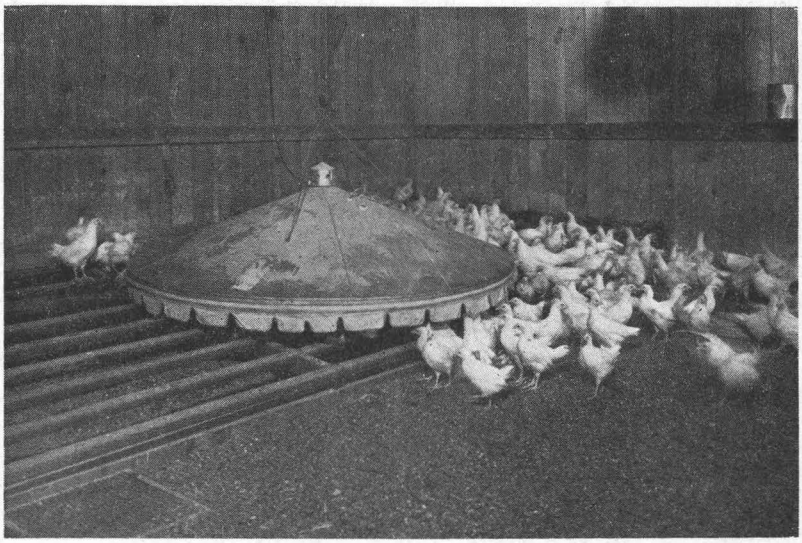


Figure 7. Teaching the chicks to roost.

O. S. C. RANGE MANAGEMENT PLANS

When the pullets can do without heat, they are moved to free range or 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. Because of the cooler and usually more rainy weather of early spring, the early hatched chicks will be older before they can be taken to range. It is quite generally found that the average summer range in Oregon will take care of from 250 to 300 pullets per acre. Oregon Extension Bulletin 659, *Green Feed, Sod and Pasture for Chickens and Turkeys* provides information on crops suitable in different areas of the state.

Range shelters. The cover illustration shows an ideal pullet range that should provide a shelter house of some kind, some green feed, and shade. If available, O. S. C. portable brooder houses may

be used for shelter, or a cheaper type of house employed. Figures 8 and 10 show the 8 foot by 10 foot O. S. C. Portable Range Shelter.* Roosts are the only necessary inside equipment for the range shelter. It is necessary to place wire netting under the roost to keep birds from spreading disease through contact with droppings. A shelter of the foregoing size will accommodate from 100 to 125 pullets.

A shed roof type of shelter, that some poultrymen may prefer to the gable roof, is somewhat cheaper to construct.

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.

Range equipment. Range feeders and water fountains should be built on skids to facilitate their moving as shown in Figure 9. Each shelter should have its own set of equipment so that each group of pullets will stay together. The construction of a range feeder should be of a durable type and of sufficient capacity to hold 3 or 4 hundred pounds of grain and mash, thus cutting down time spent in feeding. Protection should be provided against feed getting wet during rainy weather by building a roof over the hopper, which is hinged to the uprights and can be tipped back when the hopper is being filled.

The watering device may be home-made, as is the feeding equipment. A 30-gallon steel drum may be employed for this purpose, such as that illustrated in Figure 9. The drum is supported on a framework built over wire-covered skids. A pipe connection of about 3 inches in length is fitted into the center bung of the barrel and after the barrel is filled with water it can be inverted into a watering trough so that the neck of the pipe will be below the water level.

When pullets approach the age of sexual maturity, nests should be provided in order to avoid trouble that may come later involving nesting habits. A group of six or eight nests attached to the sheltered side of the range house will provide ample room for early maturing pullets to lay. Figure 8 shows a battery of nests in position on the range shelter. The nests are kept closed until the birds are ready to lay.

It is necessary to have some means to catch pullets when transferring them from the range to laying quarters at the end of the range period. A set of equipment consisting of a three-legged table,

* Blueprints of this house may be obtained at small cost through Oregon county agricultural agents or directly from the Department of Agricultural Engineering, Oregon State College. Request plan No. 2.85.

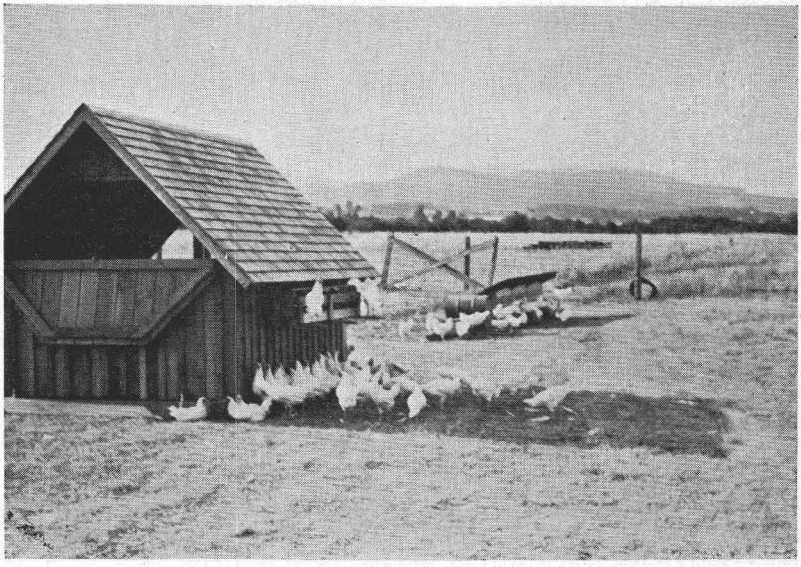


Figure 8. Rear view of an O. S. C. Gable-roof Portable Range Shelter showing hinged door for summer ventilation.

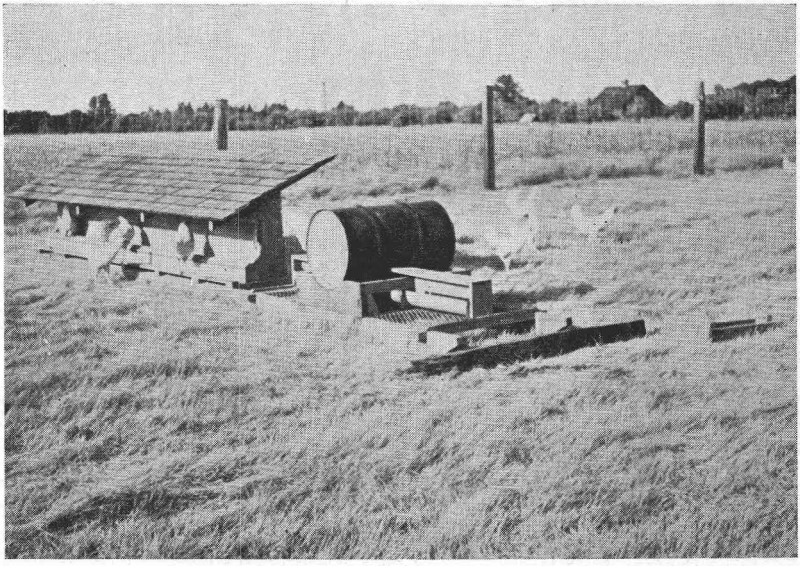


Figure 9. O. S. C. portable range feeder and watering device.

catching crate, and small wire panel to fit the doorway, as illustrated in Figure 10, may be used for this purpose.

Management of the range. The range preferably should be mowed before birds are placed on it. Chickens do not range well in tall green feed nor is it very nutritious or palatable. Green feed that has lodged provides growing places for insects acting as intermediate hosts for tapeworms.

Pullets should be moved to the range during cool weather to reduce the danger of birds smothering while in the crates. The birds should be held in the shelter for a few hours before being released, but this will be determined largely by the weather. If the weather is hot, pullets may become restless and start picking, so that good judgment is necessary to determine when to move birds to range and how long to keep them confined in the shelters. It is advisable to move hoppers used in the brooder house to the range shelters at the same time the pullets are transferred, otherwise some birds may stop eating because of the change in equipment.

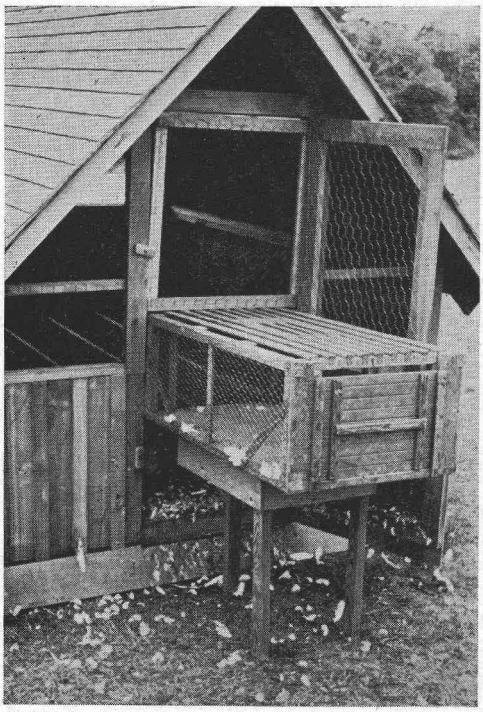


Figure 10. Catching equipment in place that is used with the O. S. C. Portable Range Shelter.

During the second day on range the birds should be allowed outside the shelter, but feed and water fountains should remain inside. The third day some of the feeders may be brought outside and also the water fountain. By the fourth day the pullets should be feeding and drinking from the permanent range equipment.

The most convenient way to feed pullets on range is to give them free choice of mash and scratch grains. They should also have access to oystershell and grit.

Range shelters should be spaced from 75 to 150 feet apart. This permits each group of birds sufficient space to make maximum use of green feed and avoids the problem of birds moving from one shelter to another.

Range shelters and equipment should be moved quite often to avoid soil contamination and also to permit better green feed for the pullets. Houses and equipment built on skids are moved easily through use of a truck or tractor. The birds will follow the shelter if it is not moved too far, and as a general practice this distance will be from 50 to 100 feet. All shelters in a field should be moved about the same distance each time so as to keep the same alignment. The cover illustration shows the proper spacing between range shelters, spacing between shelter and equipment, and the preservation of the alignment in moving.

MANAGEMENT IN CONFINEMENT

Where sufficient range ground is not available, it is possible to raise good pullets in confinement. Confinement rearing affords protection against chicks contacting soil-borne diseases if properly managed. Wire porches are a valuable adjunct to confinement rearing through avoiding contact with contaminated soil, allowing more space for the developing pullets, and permitting the birds access to sunshine.

Providing sufficient space in the confinement pen is an all-important consideration. After pullets reach 12 weeks of age they should be provided a minimum of 2.5 square feet, and preferably 3 square feet, of floor space apiece. Ample room space will serve to check cannibalism. Should the latter vice develop, it may be controlled by affixing to the beak any one of a number of available types of metal guards. The antipick devices may be safely put on when the birds are 12 weeks old.

Rations for pullets reared in confinement should provide a complete balance of all nutrients since the birds do not have access to the green range feeds and sunshine. If possible, green feed should be given as a means of reducing feed cost and also to help curb cannibalism. Many poultrymen find it profitable to maintain a small irrigated plot of green feed for this purpose. Ladino clover has proved to be one of the most satisfactory and highest yielding types of green feed for such plots.

More hopper space should be provided confined birds than for those reared on range. One lineal foot of hopper space for each 5 birds will provide the necessary room at the hoppers.

Table 3. CHICK FEEDING SCHEDULE

Age	Grain	Mash	Drink	Other factors
First week		Chick mash at all times. One tray 6"x4' for each 100 chicks.	Clean, fresh water before chicks at all times.	Cover litter under the hover with egg-case flats, clean sacks or muslin for first 3 days.
Second and third weeks	Chick scratch may be fed as early as two to three weeks.	Chick mash at all times. Gradually change to larger feed hoppers.	Water.	Feed grit. Clean out wet litter. Reduce gradually brooder temperature starting second week.
Fourth to eighth weeks	Change gradually to coarser scratch.	Chick mash at all times. Mash hoppers 4"x4"x6' with reel on top.	Water.	Gradually change to coarser grit. Separate cockerels. Keep litter dry. Get pullets on roost by fifth week. Reduce brooder heat.
Ninth week through to laying age	Grain in hoppers at all times. Change to hen size scratch.	Mash kept before pullets.	Water.	Provide clean range. Keep range houses, feed troughs, and drinking vessels widely seperated. Provide shade on range. Grit and shell in hopper. Supplementary green feed if range grass is dry.

Cooperative Extension Work in Agriculture and Home Economics
Wm. A. Schoenfeld, Director
Oregon State College and United States Department of Agriculture, Cooperating
Printed and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914