



Farm Poultry Management

For 4-H Poultry Projects I and II

- I. Young Stock Production -
- II. Flock Management



Fig. 1.—Club member in young stock production project.

POULTRY'S PLACE IN THE FARM BUSINESS

It is of real importance that poultry raising occupy its proper place in the farm business. A thorough study and analysis of the entire farm operation is necessary in making such a determination. The size of farm, proper use of the land, market outlets, other enterprises on the farm, likes and dislikes of the farm family, and available labor are some of the factors that farm families will want to consider in deciding how poultry can best fit into their farm operations.

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The farm flock should either be large enough to be a real source of profit or it should be reduced to the number of chickens required to supply the eggs and poultry needed for family use. From 250 to 300 hens and pullets are recommended as the smallest number of chickens to be kept by farmers expecting to sell market eggs as one of the important money crops. From 25 to 50 hens are recommended for flocks intended to supply no products for market, but furnish all the eggs and poultry needed for home use.

Flocks that are between these two sizes frequently are not a fully appreciated source of income and do not receive the attention necessary to make them profitable. Surplus eggs, above family needs, particularly during the summer months do not receive the necessary care to preserve their quality and must be sold for less. The price may be lower than their production cost. Eggs of poor quality also discourage housewives from buying and using eggs.

Equipment such as laying houses, brooder houses, summer range shelters and brooder stoves also cost more for each hen kept because the cost of this equipment remains about the same whether it is used to full capacity, or for only a much smaller number. Very often the owners of these "in-between-sized" flocks do not have this equipment and do a much less efficient job of raising pullets and managing their laying flocks. Lower priced eggs, higher death losses, poor production and other items of cost under these conditions frequently cause the

flock to lose money which must be made up from other sources of income on the farm.

Poultry raising can no longer succeed by hit and miss methods. It has become a specialized industry which is not difficult to learn. Club members may learn proper methods of management, feeding, sanitation and disease control and secure a net income from their flocks. It is well to keep in mind, however, that a profitable sized unit is important for market production or family use. Raisers of poultry should decide which sized flock fits into their farming program to the best advantage.

If producing market eggs and poultry is of minor importance the smaller flock will prove more satisfactory because of reduced hazards from disease, lower equipment and investment costs and small labor requirements.

If poultry income is intended to be one of the important ones on the farm a flock of 250 or 300 layers, as a minimum number, will prove more profitable than a lesser number. The owner will receive greater returns on his investment and for his labor. He will be justified in planning his other farm operations, the kind and amount of grains to be grown to provide feed and to provide time for necessary attention to details upon which success depends.

Records Are Important

Every producer of eggs should know the average number of eggs produced per hen every month and year, the cost of production, the per cent of flock loss from disease, cost of producing pullets for replacement, and the income from

eggs and poultry meat. If poultry meat is being produced in the form of broilers, friers, or roasters the producer is interested in knowing the pounds of feed required to produce a pound of gain, the percentage of chicks raised to market age, how quickly the bird reaches market age, and the return secured from sale of the bird.

Without this easily obtained information it is impossible to secure a true idea of the poultry enter-

prise. The records point out the weak places in the program. They make improvements and increased income possible.

Few business men hope or try to succeed without accurate records. Poultry raisers and 4-H Club poultry members are truly business men and should keep accurate records. These may help decide the question of whether or not poultry numbers on their farm should remain the same or be increased or reduced.

EQUIPMENT FOR BROODING AND REARING

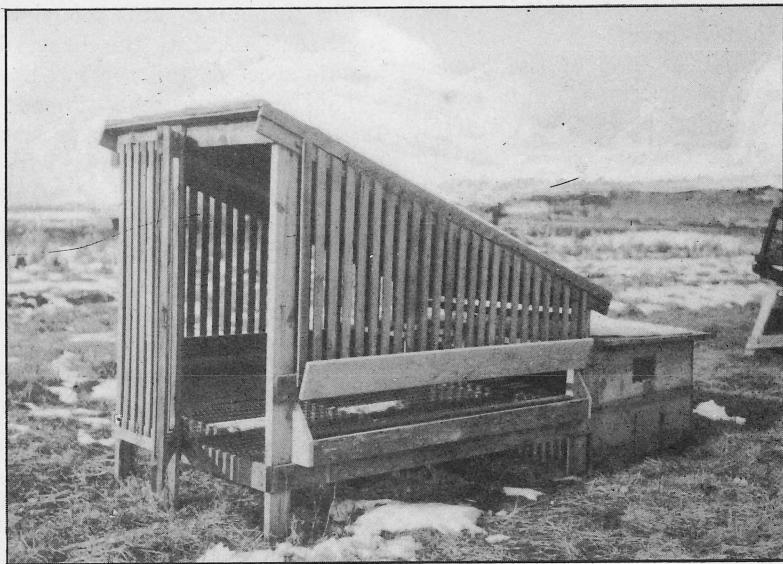


Fig. 2.—The combination brooder and range shelter.

Proper equipment makes possible the carrying out of a sanitation program and the use of proper management methods. In the production of young stock, the club member and parents should first decide on the scope of the club members operations. It might be

decided that the club member should produce all of the chicks to be raised on the farm. Another way would be for the club member to produce 50 chicks which would be kept separate from those produced by the parents.

The combination brooder and range shelter is a most satisfactory piece of equipment for use where 50 chicks are being raised. This is true whether the club member is raising 50 chicks separate from others on the farm or whether only enough chicks are being raised for family use and the chicks raised by the club member would be the only ones produced on the farm.

For early spring brooding, which club members will wish to do, this unit is designed to brood 50 chicks. The brooder is heated with kerosene lamps or burners. The cost of kerosene will normally not exceed \$1.00 a brood.

The material cost of the combination brooder house and range shelter equipped with a kerosene unit is approximately \$15.00 to \$18.00. This is the cost when new materials are purchased and a durable type of roofing is used. If scrap lumber or native material is used and a less durable type of roof the cost, of course, would be lower.

The chicks are raised in confinement on the wire floor of the shelter until they are old enough no longer to need artificial heat. The shelter should then be detached from the brooding unit and moved to a clean ground location, for use as roosting quarters for the remainder of the growing period. Clean ground can be provided by selecting a place where poultry droppings have not been spread and chickens have not been raised for two years.

The provision of clean ground is most important. This fact adds value to this equipment because it may be located near the dwelling while the chicks require more atten-

tion, and later it provides cool, well ventilated quarters on range where the pullets may develop properly. Many failures in poultry production can be traced to the failure to provide clean range and a well ventilated roosting shelter for the developing pullets. On farms where these essentials are not provided, the principal reason for this failure is the lack of portable equipment. This combination brooder, sun porch and range shelter meets all of these problems at one time.

Brooding Unit

The brooding unit consists of four sections, i.e., the base, floor, middle section, and roof.

The base (Figure 3) is made of 1x12-inch lumber, rough or smooth. The floor is made of tin and framed with 1x4 material. Sand is placed on this tin to a depth of $\frac{1}{2}$ to $\frac{3}{4}$ inch and the brooder is started at least two days before the chicks are to be placed in it, so the sand may become warm and thoroughly dry. Six $\frac{1}{2}$ -inch holes should be bored in the end of the base opposite the door to permit the fumes from the lamp to escape.

The floor should not be permanently fastened to the base, since it is more easily cleaned when it can be removed separately.

In making the middle section (Fig. 4) a board 10 inches in width is used for the back of this section. The ends are made of 1x12 material and ripped to the width of the back (10 inches). In this way the slope for the roof is provided, since it fits directly on this middle section.

Many of these brooders have been built without windows in the end

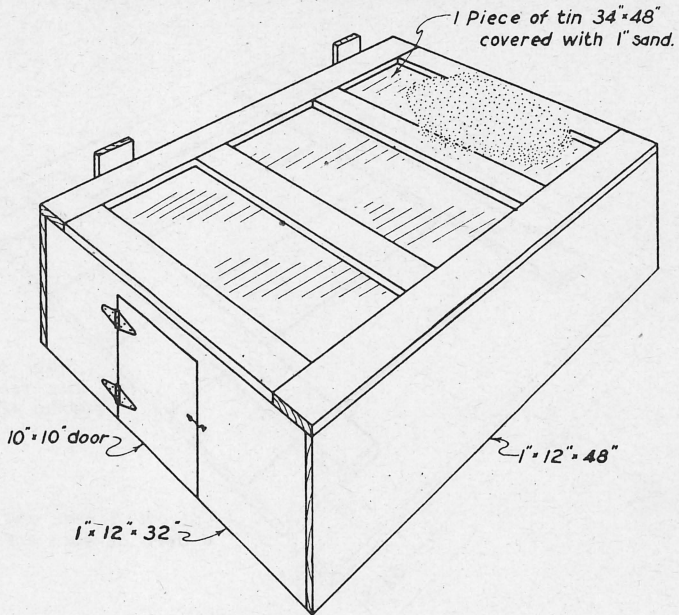


Fig. 3.—The base section of the brooder.

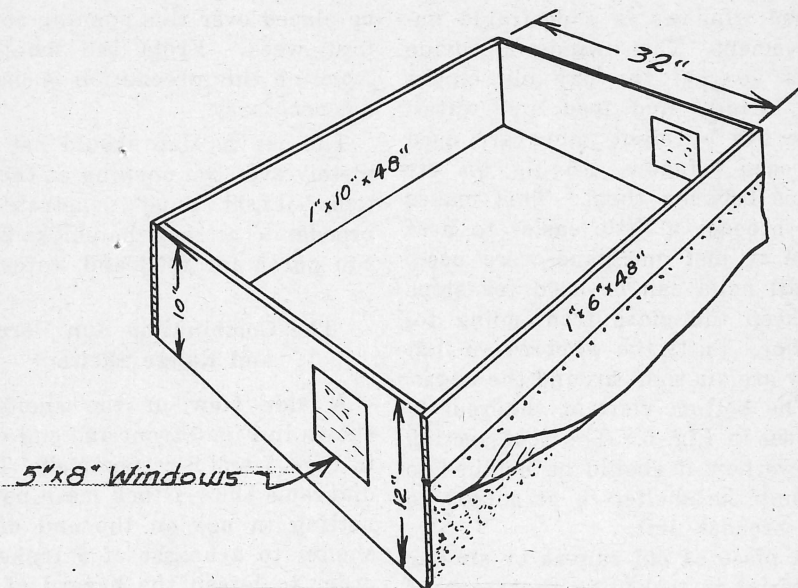


Fig. 4.—The middle section of the brooder.

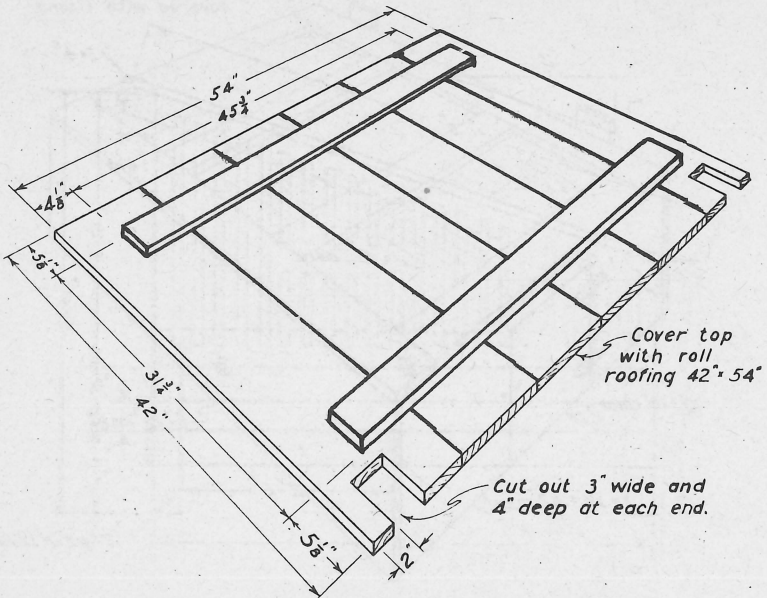


Fig. 5.—The under side of the brooder roof.

and have been giving good results. However, the addition of double-paned windows is a desirable improvement. These windows provide light so that the day old chicks can readily find feed and water. Two five by eight panes are used in each window, leaving an air space between them. This makes the brooder a little easier to heat than if just one pane were used. Small nails can be used for stops to keep the glass from going together. Putty the windows so that they are air tight around the edges.

The bottom view of the roof is shown in Fig. 5. The roof section shows how it should be notched to permit the shelter to fit snugly to the brooder unit.

A piece of old canvas or similar material is tacked to the front of

the brooder. In early season brooding, a piece of cardboard may also be placed over this opening for the first week. From the month of April on this precaution is usually not necessary.

The canvas flap should not completely over the opening at the bottom. Light must penetrate the brooder to attract the chicks to the sun porch for feed and water.

The Combination Sun Porch and Range Shelter

A side view of the shelter is shown in Fig. 6, front and end views in Figs. 7 and 8 respectively. These diagrams show 1-inch mesh poultry netting in use on the end of the shelter to a height of 9 inches, in order to lessen the hazard of rats

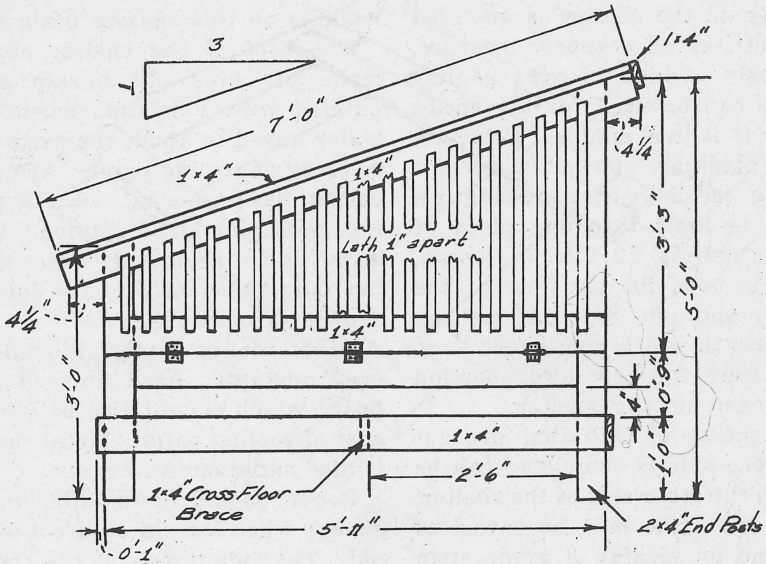


Fig. 6.—A side view of the shelter.

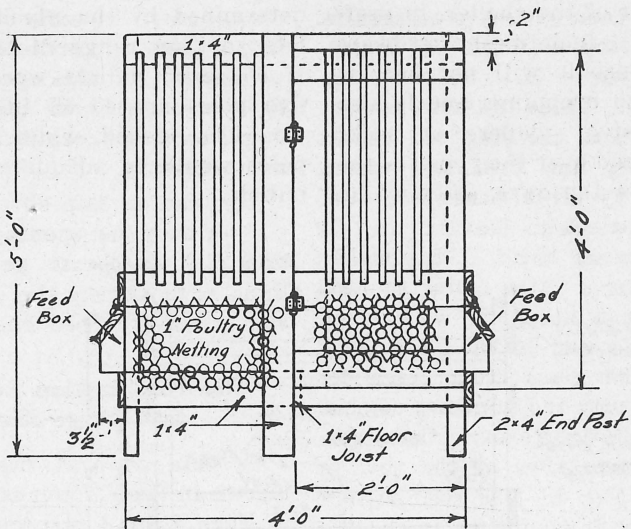


Fig. 7.—Front view of the range shelter.

getting into the brooder. The remainder of the shelter is enclosed with lath as an economy measure. Obviously 1-inch mesh poultry netting can be used for the entire shelter if it is available. However, as the plans are shown the amount of inch mesh poultry netting required is limited to one piece of 24-inch netting 12 feet in length, which is used for the floor of the shelter, and one piece of netting 12 inches in width and 4 feet long, to be used for the lower portion of the end of the shelter.

The pieces of lath that are cut off as one side is completed can be used on the other side of the shelter. All of the laths may be sawed at one time by tacking a guide strip along the top of the laths at the proper angle.

Inch mesh poultry netting is used for the floor of the shelter, in preference to $\frac{1}{2}$ -inch mesh hardware cloth, because it will not become clogged with droppings and is also less expensive. Papers or sacks may be spread over the floor for the first week or ten days, after which

the chicks will have no difficulty walking on this coarser mesh wire.

The roof of the shelter can be made of three old burlap sacks painted with Portland cement and water mixed to about the same consistency of roofing paint. After the cement has hardened, a coat of roofing paint should be applied. Such a roof is not absolutely water-tight, but is sufficiently so for summer growing conditions.

Other roofing materials could be used, including hard finished fiber board which should also be given a coat of roofing paint. Metal roofing is also satisfactory.

Roosts should be installed in the shelter when the chicks are 4 weeks old. The side braces of the shelter are placed at the proper height to serve as roost supports. The amount of roosting space needed will be determined by the number of pullets kept on range in the shelter. If 50 sexed pullets were brooded, five poles spaced 12 inches apart would be needed, while three such poles would be adequate for 20-25 pullets.

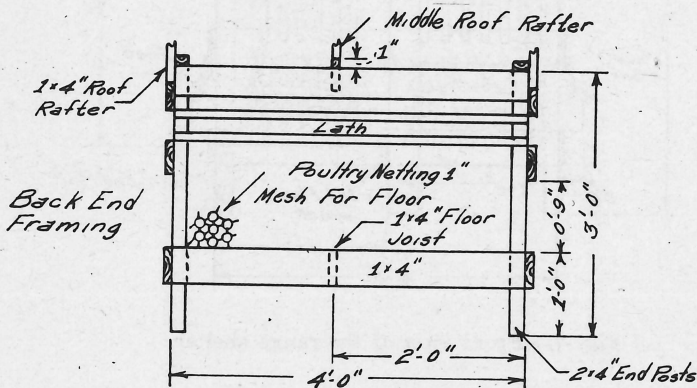


Fig. 8.—End view of range shelter, with details of framing.

One bundle of 50 laths is sufficient for the entire shelter, including the panel which is built to close the back end of the shelter after the brooding unit is detached.

The plan for building the feeders attached to the sides of the range shelter is shown in Figure 9 (upper). A baby chick feeder, as shown in Figure 9 (lower) is more satisfactory for feeding the first two or three weeks. The chicks will then have enough size to use the

feeders built on the sides of the shelter. A range feeder, as shown in Figure 10, should be provided from 8 weeks to maturity, to supplement the feeders on shelter.

Materials for Brooder

First are listed the number of lengths of lumber you will have to buy from lumber yard or sawmill, and then the pieces into which the lumber will have to be cut before starting to assemble the materials in the finished structure.

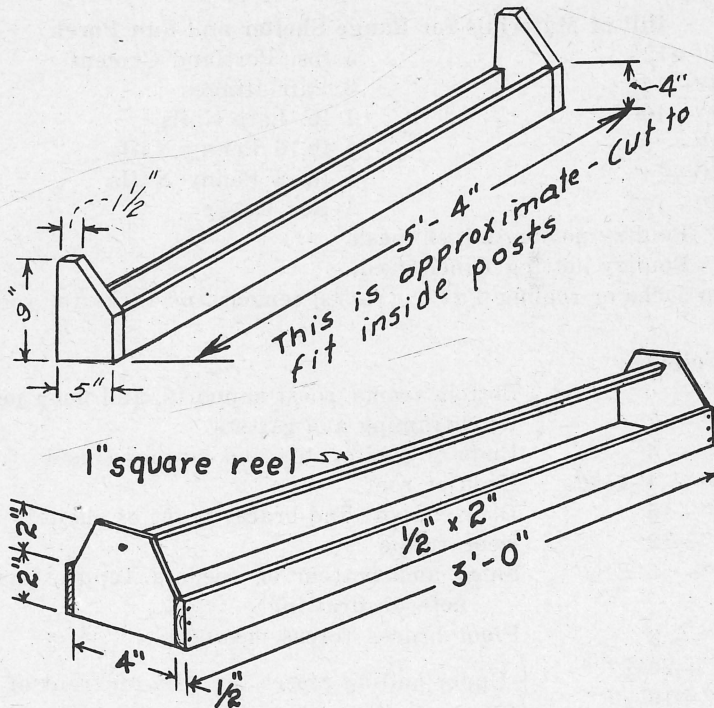


Fig. 9. (upper) Feeder for sides of shelter.
(lower) Small feeder for use first 3 weeks.

Bill of Materials for Brooder

1—1"x12"—12' (ft.) long	1—1"x 4"— 8'	1—1"x 4"— 8'
1—1"x12"—14'	1—1"x 4"—10'	1 piece tin 34"x48"
1—1"x12"— 8'	1—1"x 6"— 4'	Roll roofing 42"x54"
1—1"x10"— 4'	1—1"x 8"— 4'	Two kerosene lamps
2—8"x10" panes of glass cut to form 4—8"x5" pieces		

Cut as Follows:

2—1"x12"—32"	Ends of base
2—1"x12"—4'	Sides of base
2—1"x12"—32"	Ends of middle section
1—1"x10"—4'	Back of middle section
1—1"x6"—4'	Front of middle section
4—1"x12"—42"	Lid or roof
1—1"x8"—42"	Lid or roof
2—1"x4"—45"	Lid cleats
2—1"x4"—4'	Floor
4—1"x4"—2'—2 ³ / ₄ "	Floor

For the front of brooder, also provide an old piece of canvas 5 inches wide by 4 feet long.

Bill of Materials for Range Shelter and Sun Porch

4—1"x4"—12'	5 lbs. Portland Cement
5—1"x4"—14'	3 Pair Hinges
2—1"x4"—10'	1 lb. Lath Nails
2—1"x4"—8'	1 lb. 6 Penny Nails
1—1"x6"—14'	1 lb. 8 Penny Nails
1—2"x4"—16'	1 Box Tacks
12'—24" Poultry netting 1-inch mesh	
4'—12" Poultry netting 1-inch mesh	
3 Burlap sacks or roofing 4'x7'.	(Sacks, cement and tacks for roof.)

Cut as Follows:

5—1"x4"—6'	Bottom frame, roost supports, and floor joists
5—1"x4"—7'	Roof framing and rafters
4—1"x4"—4'	Ends of shelter, top and bottom (inside framing)
2—1"x4"—4'-1 ¹ / ₂ "	Ends of roof
1—1"x4"—5'	Door support and brace (front of shelter)
1—1"x4"—12'	Door frame
6—1"x4"—5'-2 ¹ / ₂ "	Sides and bottom of feeders (approximate, see note on drawing)
2—1"x4"—2'	Floor braces (cross members)
1—1"x4"—20 ¹ / ₄ "	} Upper nailing pieces for wire on front of shelter
1—1"x4"—16 ¹ / ₂ "	
2—1"x6"—5'-4"	Lids of feeders (approximate, see note on drawing)
4—1"x6"—9"	Ends of feeders
2—2"x4"—5'	} Legs of shelter
2—2"x4"—3'	

Bill of Materials for Chick Feeder

1 pc. 1/2"x4"—3'	Bottom	1 pc. 1"x4"—8"	Ends
1 pc. 1/2"x2"—6'	Sides	1 pc. 1"x1"—3'	Reel

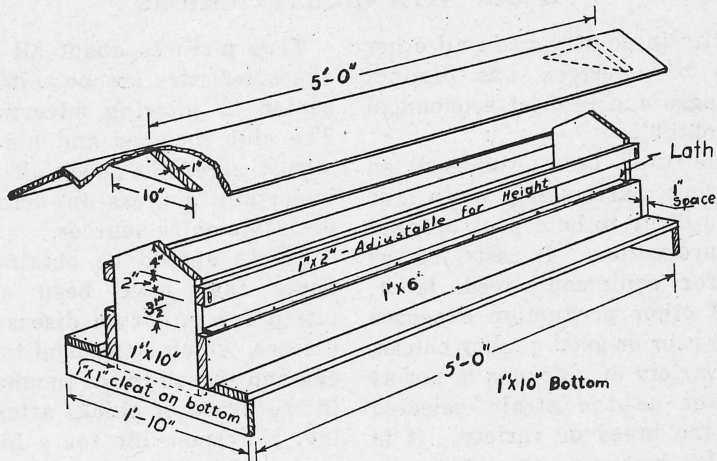


Fig. 10.—A good type of range feeder.

For Larger Broods

Where club members and their parents have worked out arrangements whereby the club member will produce all the chicks on the farm and it is to be a more sizeable unit than that just described, other brooding and rearing equipment would probably be more desirable. A 10 x 12 ft. Missouri colony brooder house will accommodate 250 to 300 chicks. A summer range shelter would also be needed in the brooding and rearing operations. This shelter is 9 x 12 feet in size and can be used for a dual purpose. It can be moved up beside the colony brooder house and used as a sun porch until the pullets are ready to go out on the range. This permits the carrying out of a good sanitation program, as the chicks can be kept off of contaminated ground during the brooding period.

When the pullets are 8 or 10 weeks of age they can then be moved out to clean range and the

range shelter used for housing them until fall. Circular 404, which you can get from your county agent, gives plans for the construction of the Missouri summer range shelter. If a new brooder house is needed you can secure a copy of Circular 453 which gives plans for construction of the 10 x 12 colony brooder house.

The range shelter provides ideal roosting quarters for the pullets during the summer. It is just as important however that proper feeders and waterers be provided. The range shelter will accommodate from 100 to 125 pullets through the summer. To provide adequate feeding space three to four 5-foot range feeders should be provided for this many pullets. Plans for building suitable range feeders are available in Circular 419. A barrel waterer with float valve control should also be provided to make possible the supplying of adequate water with a minimum of labor.

BEGIN WITH QUALITY CHICKS

Quality in poultry as in all other classes of livestock has distinct advantages and is most economical and profitable.

Chicks that are purchased on price alone, particularly when it is low, are likely to be a poor bargain as mature pullets. It costs just as much for equipment, feed, labor, and all other production expenses to raise poor or good quality chicks.

The variety of chickens is not as important as the strain selected within the breed or variety. It is desirable, however, to select the more common breeds of chickens such as White Leghorn, White or Barred Rock, White Wyandotte, New Hampshire Red or Rhode Island Red. It is more difficult to get hatching eggs, breeding stock or baby chicks of good breeding from the less common varieties that have no superior money making qualities. From one-half to two-thirds or more of the total poultry income is derived from eggs. The importance of getting chicks that will develop into high producing pullets cannot be overemphasized. Missouri farm flock records over a period of years show that the net income above all expenses is two and one-fourth times greater in flocks that lay an average of 150 eggs as compared to those that lay slightly less than 100 eggs.

The number of eggs laid is only one of several important considerations. Large egg size (24 ounces or more per dozen), freedom from disease, and the vigor and vitality of the parent stock are also important.

True pictures about all of these characteristics are not always presented in glowing advertisements. The club member and his parents should carefully check all of these important matters in determining desirable chick sources.

Chicks should be obtained from flocks that have been carefully tested for pullorum disease. This disease, which is transmitted in the egg and spread in the incubator and in the brood of chicks after hatching, is responsible for a high percentage of chick losses up to three weeks of age. Testing the parent stock to remove infected hens, and strict sanitation in the hatchery and in the incubator reduces loss to a practical minimum when properly done.

Quality chicks cost more and reliable producers cannot be expected to sell this superior stock at prevailing competitive prices. However, the additional cost of \$5 or even \$10 per hundred chicks is actually the best investment that any one desiring success in poultry raising can make. Mortality throughout the life of the birds is likely to be much smaller, and net returns with proper care and management are almost sure to be much greater.

Securing chicks that feather rapidly is another important consideration in the purchase of chicks particularly to those producing broilers and friers. Such producers are also interested in chicks that will develop into birds with full plump breasts and compact bodies.

Fortunately, the chick buyers can tell whether or not the chicks are

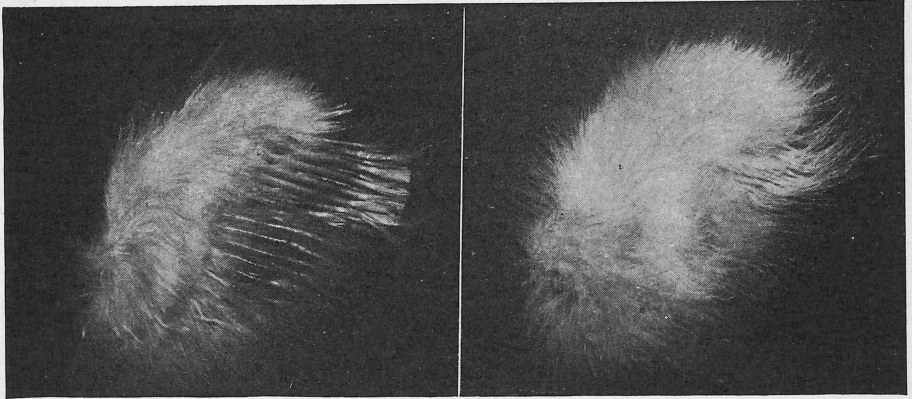


Fig. 11.—Fast feathering wing (left) and slow feathering wing (right) at hatching time. Both of same breed.—Courtesy Maryland Agricultural Extension Service.

fast feathering by observing the development of the wing feathers. In fast feathering chicks there will be several (usually 6 to 8) long spike-like primary feathers that are readily seen. Also, there will be about as many well developed secondaries. However, they will not have as much length as the primaries. In slow feathering chicks the primaries and secondaries will have made very little development and will be obscured by the down.

Rapid feathering chicks will also have well developed tails at ten days of age and will be well feathered over the back and rest of the body at 8 weeks of age.

A program known as the National Poultry Improvement Plan has been developed to promote improvement in breeding and production qualities in poultry and to reduce losses in chicks caused by pullorum. Hatcheries and flock owners in Missouri, participating in this improvement plan, operate under the supervision of the Missouri Poultry

Improvement Committee. The plan includes definite breeding stages and pullorum control and eradication classes. Hatcherymen cooperating with the plan use uniform terminology in advertising the chicks they have for sale. Such uniformity in advertising makes it easy for the purchaser to know something about the quality of the chicks.

Club members will want to be familiar with the major differences represented in the terminology used. The meaning of these terms needs to be understood so that club members can make their purchases intelligently, if securing chicks from one of these member hatcheries.

There are three breeding stages that the club member will particularly want to know about in making chick purchases.

1. U. S. Approved—These chicks are from flocks where both males and females are selected for constitutional vigor and for standard bred and production qual-

ities. The hatching eggs must have weighed one and eleven-twelfth ounces each.

2. U. S. Certified—These chicks are from flocks where the females are selected as in the Approved flocks and mated to U. S. Record of Performance males. U. S. R. O. P. males are produced from U. S. R. O. P. hens that laid 200 or more eggs averaging 24 ounces or more per dozen. Also, these males have passed inspection of an official state inspector. Hatching eggs in the certified breeding stage must weigh one and eleven-twelfth ounces each and average 24 ounces per dozen.
3. U. S. R.O.P.—These chicks are from R.O.P. hens in individual male matings headed by R.O.P. males. The females must have laid 200 or more eggs during the year's production, to qualify as R.O.P. hens. Also, the males come from hens that have laid 200 or more eggs. The average egg weight requirement of R.O.P. hatching eggs in 25 ounces per dozen.

The pullorum control and eradication classes and the differences they represent should be understood. They are:

1. U. S. Pullorum-Tested—This means that the chicks are from flocks that have been tested by a person approved for this purpose and that the reactors have been removed from the premises. These flocks must contain fewer than 6% of reactors in 1944-45 and fewer than 5% reactors in 1945-46 and the following years.

2. U. S. Pullorum-Controlled—In this class the tolerance is fewer than 2% of reactors in the flock.
3. U. S. Pullorum-Passed—These flocks must contain no reactors on the last test made.
4. U. S. Pullorum-Clean—These flocks must contain no reactors in the last two consecutive tests.

No attempt has been made in this discussion of breeding stages and pullorum control and eradication classes to give full and detailed requirements for the flocks, or the requirements of the hatchery producing the chicks. Only the basic flock requirements are given, which should be understood by every club member. Those wishing complete information should secure the official publication on the plan.

Time of Hatching

Nature provides an object lesson as to the best hatching time. Many persons have observed that the earliest broods of robins and other wild birds seem to develop best. The same result is usually observed in comparison of the rate of growth in early and late hatched chicks.

Chickens of the heavy breeds should be hatched in February or early March. Leghorns should be hatched in March or early April. Weather conditions are more favorable and faster growth results. Chickens grow most rapidly to twelve weeks of age.

Early hatched pullets develop into larger, heavier birds at maturity and start laying in the late summer or early fall when egg prices are higher. Cockerels reach broiler weights when prices are normally

higher than those to be obtained from later hatches.

Early hatched chicks are less likely to become infected with coccidiosis because the parasite causing this disease requires warm soil and moisture to become actively infective. This is also true of worm

infestation which does more harm to infested chicks under twelve weeks of age than to older ones.

Chicks use feed for growth to better advantage during cool weather. Consequently, early hatched chicks gain in weight and size at a lower cost.

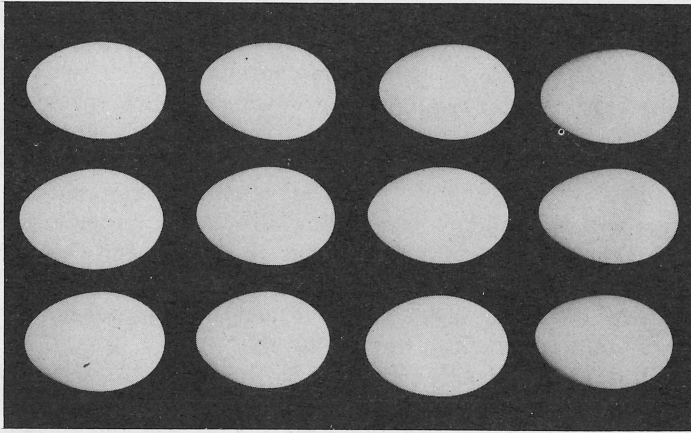


Fig. 12.—Eggs of normal (and desirable) shape for hatching.

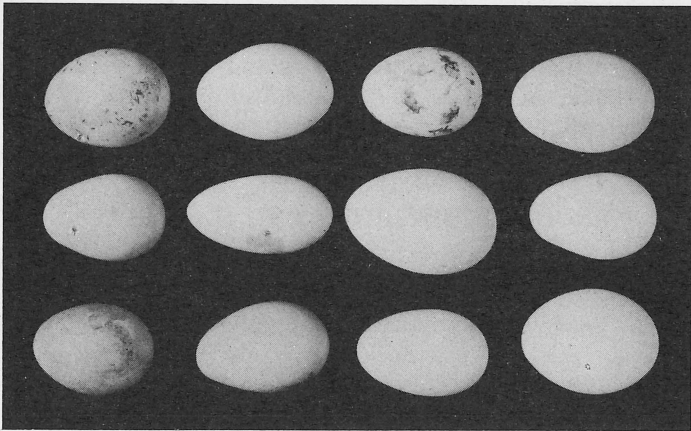


Fig. 13.—Eggs of undesirable shape for hatching.

Selection of Hatching Eggs

Desirable hatching eggs are normal in shape, clean, and have sound shells. Eggs that have rough,

porous shells, or ones that are ridged or unusual or irregular in shape should not be used for hatching purposes. Such eggs hatch

poorly. In addition these characters in eggs are inherited. Pullets that are secured from the few eggs of this appearance that hatch are likely to produce similar eggs which have lowered market value.

Since the size, shape and color of eggs are inherited characters, uniformity of these characteristics should be used in selection. White eggs should be free from creamy tints and be chalk white in color. Brown shelled eggs may vary slightly in color, but a uniform shade is desired. It can be obtained by careful selection.

Small eggs will not produce large vigorous chicks and should never be used because the pullets from such eggs are likely to lay the kind of eggs from which they were hatched. Hatching eggs should each weigh two ounces or slightly more.

Incubation

Chicks of different ages, even though no more than three or four days apart, should not be brooded together. This slight difference in age is important because chicks

grow rapidly and the smaller chicks die in large numbers if forced to compete with the older chicks for feed, water and warmth. The number of chicks desired for one brooder house should be secured at the same time. This means artificial incubation is almost essential.

It is usually less expensive and more satisfactory to purchase chicks or have the eggs hatched in modern incubators which normally produce more vigorous chicks.

If a small farm incubator is to be used the operating instructions of the manufacturer should be followed. It is important, however, that the incubator thermometer be checked in warm water with a fever thermometer to be sure of its accuracy.

If the hatch in these small machines is early and the chicks are small it is probable that the temperature of the incubator was too high or that the amount of moisture was too small. If the chicks hatch late and are slow to fluff out these conditions indicate too much moisture, too little ventilation and possibly too low a temperature.

BROODING METHODS AND MATERIALS

Sanitation

Clean range for baby chicks and growing stock is the foundation for all the future health of the flock. If developing chickens are heavily infested with worms and other parasites at an early age they fail, despite treatments, to develop into healthy, profitable adult birds.

Clean ground must fill these requirements:

1. Where chicks have not been

raised during the past two years.

2. Away from contaminated ground about the old poultry yards or runs on ground that does not receive water drainage from such areas.

3. On ground where poultry litter and droppings have not been spread for at least two years.

4. Whenever possible green feed such as bluegrass or legume hay crops, including alfalfa, sweet clov-

er, red clover and Korean lespedeza should be provided.

Club members should select three clean ground locations for use in three successive years. At the end of this period the chicks can be returned to the first area and the rotation repeated. These areas need not be separately fenced if locations for the brooder house or range shelter are 150 yards apart.

Before chicks are placed in any kind of brooder house, it must be thoroughly cleaned and disinfected. All the old litter and droppings must be removed. The floor should be scraped and the walls as well as the floor swept clean. After all filth has been removed the house should be disinfected with lye water. A lye solution may be made by dissolving one can of ordinary lye in twelve gallons of cold water. This is the cheapest and best disinfectant that can be used.

If movable brooder quarters are to be used the building should be thoroughly cleaned and disinfected before moving to prevent any possible spreading of diseases and parasites to the clean location.

If permanent brooding equipment is used the litter should be removed to a safe distance to avoid any possibility of infecting the brood from this source.

When brooding in confinement is practiced, it is best to keep a pan of disinfectant just outside the brooder house door to permit the caretaker to disinfect his overshoes before entering the house.

Equipment

Chicks must be brooded under sanitary conditions. Equipment

that will make this possible has already been discussed. If more than 50 to 75 chicks are brooded it will be necessary, of course, to use a regular colony brooder house. In this case a good brooder stove is very necessary. A brood of chicks that becomes over-heated is seriously injured. Chilled chicks also become poor property. Stoves that are hard to regulate should be avoided. Any good wood, coal, oil, gas or electric brooder will give satisfactory results. A homemade electric brooder, if properly made, will work very satisfactorily. Circular 486, which you can secure from your County Agent, has plans for the construction of an electric brooder.

A sufficient number of feeders and waterers should be provided. Two 3-foot chick feeders, feeding from both sides, is sufficient for each 100 chicks for the first 2 to 3 weeks. From the time the chicks reach 3 weeks of age until they are 8 weeks old an intermediate type of feeder should be used that is larger than the chick feeder. During this period, three of the 3-foot intermediate feeders should be provided for each 100 chicks. If 50 chicks are being raised in the combination brooder and range shelter the feeders built on the side of the shelter will provide sufficient feeder space during this period.

Feeding

It is important that chicks receive unlimited amounts of proper feed. They should be started on feed when not more than 24 to 36 hours old. Further delay in feeding is harmful. As an aid in getting chicks started on feed, cardboards

with a little feed on them can be placed under the edges of the hover. An all mash ration is recommended for the first 8 weeks. Formulas for two different chick starters recommended by the College of Agriculture are listed.

Chick Starters Nos. 1 and 2

Ground yellow corn	270#	230#
Shorts	75#	75#
Bran	50#	25#
Alfalfa leaf meal	25#	50#
Meat scraps	50#	35#
Dried milk	25#	—
Soybean oilmeal	—	75#
Salt	5#	5#
*Codliver oil or feeding oil	5#	5#
TOTAL	505#	500#

*This is on the basis of a vitamin D potency of 85 AOAC chick units per gram. Fortified oils carrying 400 AOAC units per gram may be used. In this case, it would take only one pint in the above formulas.

The chick starter, without grain, is kept before the chicks until they are 8 weeks of age. If the pullets are to be kept for replacement purposes, they should then be changed to a grower mash, with grain. They, of course, should be moved to their summer quarters. The cockerels could be sold at this time as broilers.

Some club members may wish to sell all of their chicks as friers or roasters. In this case, a simple method of feeding would be to continue with the chick starter even after the chicks reach 8 weeks of age but also feed grain.

For Growing Pullets

Growing mashes for pullets which have been found satisfactory and

have been recommended by the College of Agriculture are:

Ground yellow corn	100#	100#
Shorts	100#	100#
Bran	100#	100#
Alfalfa leaf meal	16#	16#
Meat scraps	40#	30#
Soybean oil meal	—	30#
Dried milk	20#	—
Salt	4#	4#

TOTAL 380# 380#

Whole or cracked yellow corn or one-half yellow corn and one-half wheat, barley, or kafir may be fed. Both mash and grain should be constantly supplied in open hoppers. This results in faster growth and heavier pullets that will lay more winter eggs and return a greater profit.

If sufficient supplies of wheat and oats are available on the farm there is no need in purchasing shorts or bran. Wheat can be ground and replace the shorts and good oats can be ground to replace the bran.

Each light breed pullet, if fed from 24 hours of age to maturity at 20 weeks, will eat about 8 pounds of all-mash starter, 6 pounds of growing mash and 6 pounds of grain.

Heavy breed pullets will consume 9 pounds of starter, 10 pounds of growing mash and 10 pounds of grain to 24 weeks of age.

Management to 8-12 Weeks

Crowding chicks results in slower growth, higher feed costs and greater death losses and the pullets raised are of poorer quality. For these reasons the greatest number to be raised in a 10x12 ft. brooder

house is 250 to 300, and 50 chicks is the largest number to be brooded in the combination brooder and shelter unit.

Brooding temperature is important. Chicks should be brooded at the lowest temperature that will keep them comfortable. This means starting the first day at a temperature of not more than 95° F. at the edge of the hover. This temperature should be reduced 5-8 degrees at the end of the first week and a like amount at the end of the second and third weeks. When a temperature of 70°-75° F. is reached, this temperature should be maintained until artificial heat is no longer needed.

Chicks should be taught to roost as early as possible. Low roosts should be placed in the house when the chicks are three weeks old. These may be 1x1 or 1x2 inch boards and the corners of these pieces should be rounded. The roost may be located at the rear of the building. In the beginning they should be from 2 to 3 inches above the floor. After the chicks learn to roost they may be raised to 18 or 24 inches above the floor. Inch poultry netting should be tacked to the lower side of the roosts and extended to the floor in front of them. This will prevent the chicks from picking the droppings, improve sanitation and reduce labor in caring for them.

The litter used will determine how often it must be replaced. However, it is important to change it frequently. Chaffy straw, very coarsely crushed corn cobs, or coarse sand are some of the types of litter used satisfactorily. If

sanitary conditions are not maintained disease organisms that may be introduced by the caretaker will develop rapidly at brooder house temperatures.

Where the combination brooder and shelter unit is used in brooding it will require the use of two kerosene burners to supply enough heat for early brooding. Setting the unit in a protected location is also desirable in early brooding. In this unit, sand is used as the litter in the brooder. No roosts, of course, are placed in the brooder part of this unit. It is desirable, however, to install roosts in the shelter part of the unit when the chicks are 3 to 4 weeks of age. Roosts are installed by attaching them to the side braces of the shelter.

Coccidiosis Control

Sanitation is the best prevention for coccidiosis. However, even after all precautions have been taken it is possible to have an outbreak of coccidiosis in the chicks. The common symptoms of coccidiosis include loss of appetite, ruffled feathers and a droopy, ragged appearance. Blood is frequently found in the droppings, but chicks may have the disease without this symptom. Bloody droppings, however, are a sure indication of the disease.

In the event that an outbreak of this disease occurs the litter should be removed and the floor and litter kept dry and clean. Particular attention should also be given during an outbreak to the providing of plenty of heat for the birds. A little higher temperature than normal would be desirable.

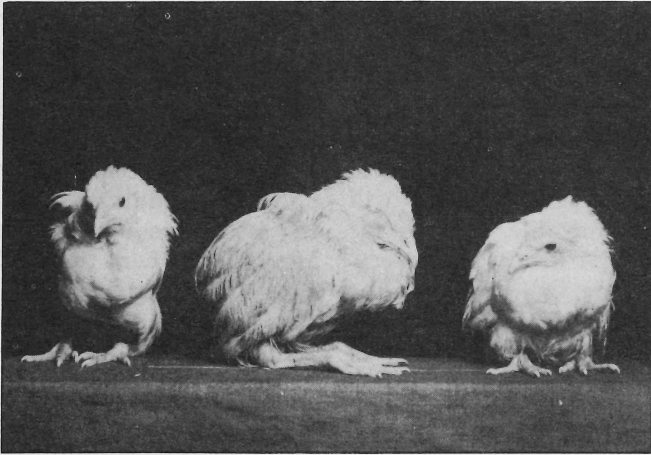


Fig. 14.—A group of chicks affected with coccidiosis.

The chicks should be changed from their regular ration to a mash composed of 20 pounds each of yellow cornmeal, bran, and shorts, 40 pounds of dried skimmed milk or dried buttermilk, 3 pounds of bone-meal and 1 pound of salt. This mash should be kept before the birds constantly until improvement is noticed. Usually this is in from 5 to 10 days. Provide plenty of good fresh water and green feed. No grain would be fed.

If liquid milk—either sweet or sour—is available it may be used instead of the dried milk if it is fed constantly with both the mash and water removed.

It is important to supply green feed. Grain should be fed with this liquid milk treatment. A small amount should be fed in the morning and a larger amount at night. The chicks should go to roost with full crops. At the end of 5 or 10 days or when recovery is noted the chicks should be returned to the regular starter ration.

If the chicks have access to the soil it will, of course, become con-

taminated during such a period. It is important therefore that they be moved to a new location.

For more complete information on coccidiosis secure Bulletin 411.

Management of Young Stock

After pullets reach the age of 8-12 weeks the task of raising a healthy pullet flock is only well begun.

The need for sanitation is just as important during the remainder of the growing period. Clean range is still important to avoid round worm infestation and coccidiosis infection.

Pullets that become infested with worms make slower growth and consume more feed to maturity because they do not start to lay as early and seldom have the vitality to continue in production during the winter months.

Money spent for worm treatments is poorly invested because the trouble can be avoided and the cost of raising better pullets reduced.

The range should provide green feed and shade. An alfalfa, clover,

4-H RECORD

(To be used with 4-H Circular 75)

POULTRY PRODUCTION

Name _____ Age _____

Address _____ County _____

Date Project Started _____

Name of 4-H Club _____

Project Leader _____

Junior Project Chairman _____

Club Activities

Club meetings attended during year _____

Project meetings attended _____

Number of demonstrations given at project meetings _____
club meetings _____, county meetings _____, state or district
meetings _____.

Number of times judging was done in local club _____ county _____
district _____, state _____.

Number of exhibits made in community _____, county _____
state _____, Interstate _____.

Work done or supplementary activities: _____

Poultry Project Requirements

Young Stock - Secure not less than 50 baby chicks and develop them to market weight or to maturity.

Flock Management - Own and care for or manage in partnership with parents a laying flock from October 1 to September 30 of the following year. Members enrolling in this project for the first time may start the project any time between October 1 and January 1.

Project Goals

Young Stock - My goal for 194__ is to make my pullets weigh _____ pounds by October 1 of the year they were hatched and to make broilers weigh _____ at eight weeks, fryers _____ pounds at twelve weeks or roasters _____ pounds at four months.

Flock Management - Secure an average production of _____ eggs per hen for the year.

Practices to be Followed

A check mark (✓) in the left hand column shows that I plan to carry out the practice checked. A check in the right hand column shows that I carried out the practice checked.

Section I - Young Stock*

Plans for Growing Young Stock

I Expect To

I Did

_____ Secure _____ baby chicks of U. S. approved or better grade
for meat and U. S. certified or better for production
_____ Sell cockerels as broilers and develop the pullets to maturity _____

*Project members enrolled in the Young Stock project will use only Section I of this Record. Those enrolled in Poultry Flock Management will start with Section II but will refer back to Section I for that part of Poultry Management that has to do with growing pullet stock.

I Expect To

I Did

- _____ Sell all birds as broilers
- _____ Sell all birds as fryers
- _____ Sell all birds as roasters
- _____ Brood chicks in a combination brooder and range shelter
- _____ Brood chicks in a 10'X 12' brooder house or house of similar capacity
- _____ Use a _____ (wood, coal, oil, or electric) brooder stove
- _____ Keep my project birds separate from other birds handled on the home farm

Brooding

- _____ Scrub brooder with lye water if it has been used before.
- _____ Put heat in the brooder twenty-four hours in advance of the arrival of the chicks.
- _____ Put clean litter on the floor
- _____ Handle chicks carefully when they are placed in the brooder.
- _____ Put a guard around the brooder stove (if a stove is used) to confine the chicks to the heated area
- _____ Hold the temperature at 95° for the first week and lower 5° a week until the temperature is down to 70°
- _____ Provide roosts for chicks when they are three to four weeks old
- _____ Keep birds confined or move to clean range

Feeding Chicks

- _____ Feed starting mash as soon as chicks are placed in brooder
- _____ Prepare a starting mash using a formula recommended by the Missouri College of Agriculture
- _____ Buy a good commercial starting mash
- _____ Feed mash in feeders allowing one three foot chick feeder for each 50 chicks to three weeks
- _____ Increase feeder space 50% and use larger feeders from 3 to 8 weeks.
- _____ Continue broilers or fryers on starting mash until marketed, adding grain at 8 weeks
- _____ Change pullets to growing mash and grain at 8 weeks.
- _____ Keep plenty of fresh water before birds at all times.

Summer Management of Young Stock

- _____ Use clean range
- _____ Provide range shelter at the rate of one square foot for each bird.
- _____ Provide ample feeders for both grain and mash and place in limited shade
- _____ Locate a water fountain in a shady place
- _____ Separate cockerels from pullets when the brood is 8 to 10 weeks old.
- _____ Vaccinate the pullets with chicken pox vaccine at 8 to 12 weeks of age
- _____ Cull out pullets that are undesirable for layers and market them for meat

Completing the Record on Young Stock

- _____ Estimate the value of pullets on hand
- _____ Total value of birds sold
- _____ Calculate feed, equipment, brooding and other costs and transfer same to the financial summary in this Record Book

Section II*

Planning Flock Management Project

I Expect To

I Did

- _____ Continue with pullets developed in the Young Stock project and handle them as a separate enterprise on the farm _____
- _____ Take over by purchase a flock of hens _____
- _____ Enter into a partnership with my parents whereby I manage the home flock and share in the income according to a definite agreement entered into between me and my parents _____

Housing

- _____ Provide comfortable house, 20 feet of depth, straw loft and open front. _____
- _____ Allow three square feet of floor space for light weight birds and four square feet for heavy weights. _____
- _____ Provide one clean nest for every 4 to 5 birds in the flock . . . _____
- _____ Provide 8 inches of roosting space for every bird and arrange roosts over a dropping board or dropping pit _____
- _____ Put down a thin section concrete floor in the laying house . . . _____
- _____ Use built up litter. _____

Winter Management

- _____ Hopper feed laying mash and feed grain in hoppers or troughs _____
- _____ Keep green alfalfa hay before the birds at all times _____
- _____ Keep oyster shell before the birds at all times _____
- _____ Provide plenty of water and keep the temperature of the water above 50° _____
- _____ Keep the birds free of lice _____
- _____ Keep the house free of mites _____
- _____ Use electric lights _____

Care of Eggs

- _____ Keep nests clean _____
- _____ Gather eggs 3 times a day in the summer. _____
- _____ Cool the eggs before placing them in a egg case _____
- _____ Store eggs in a cool humid place. _____
- _____ Produce infertile eggs when not producing eggs for hatching . . . _____
- _____ Market eggs once a week in winter and twice a week in summer . . . _____

Summer Management

- _____ Yard laying flock _____
- _____ Cull out low producers regularly every month or at least twice during summer and early fall _____
- _____ Keep feed, water and oyster shell before birds at all times . . . _____
- _____ Control lice and mites _____
- _____ Keep egg and feed records on forms provided by the Poultry Department of the Missouri College of Agriculture _____
- _____ Sell eggs on a graded basis _____

*For Poultry Flock Management Project members.

Note: Please refer to Section I for treatment of the subjects of Brooding, Feeding Baby Chicks and Summer Management of Young Stock.

Financial Summary

Young Stock

Cost of baby chicks. _____
Cost of feed _____
Cost of brooding _____
Other costs _____
Total Costs _____

Value of stock on hand October 1 _____
Received from sale of market birds _____
Total Receipts _____

Poultry Flock Management

Gross income from flock for the year _____
Cash expense _____
Income less expense _____
Average production per bird _____
Labor income per bird _____

Signed _____

Date Record is submitted _____



Fig. 15.—In early weeks of brooding, the range shelter is used as a sun porch near the farmstead.

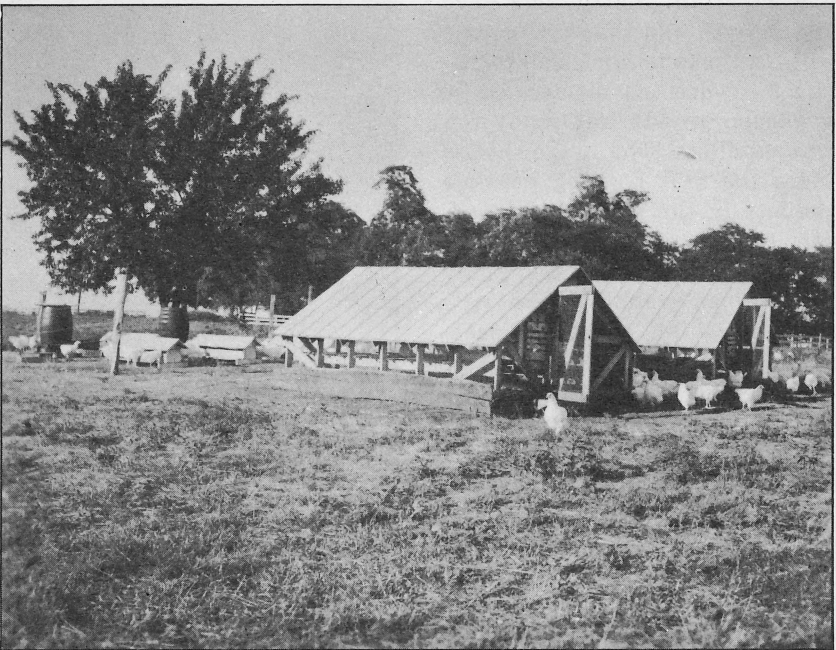


Fig. 16.—Pullets on range to which the range shelters and other equipment have been moved.

lespedeza or bluegrass field or the edge of a corn field provide excellent locations for the portable brooder house or range shelter.

A continuous supply of tender green feed is desirable. The seeding of pure sudan grass, rape or other forage plants is recommended when necessary to supply ample green feed.

The range should provide limited shade. Dense, heavy shade which is not reached by sunshine some time during the day is not desirable. Sunlight has a disinfecting effect which is needed. However, some shade, particularly during the hottest part of the day, is essential. If natural shade is lacking a brush arbor can be built to provide protection.

It is important that pullets have plenty of room and that their quarters be comfortable and well ventilated. Crowded conditions cause slow uneven growth and many undesirable pullets. The range shelter provides the best housing possible for pullets in the summer. In addition to providing comfortable rooming quarters it is very easily moved to clean ground.

Liberal feeding must be practiced. Growing mash, grain, oyster shell, and plenty of clean, fresh water should be available for the pullets at all times. Water and feed should be placed in a shady place to encourage consumption. Improved sanitation can be obtained by placing the feeding and watering equipment on wire platforms. Water and feed that is wasted falls through the wire netting and cannot be reached.

Club members should be on the watch throughout the summer for lice and mites. Numbers frequently build up rapidly during hot weather and reach large numbers before they are recognized. By observing the pullets and the roosting quarters occasionally, proper control methods can be applied if lice and mites are found.

Chicken Pox

Chicken pox may be controlled by vaccinating pullet flocks between the ages of eight and twelve weeks. This produces immunity for life provided the recommended chicken pox virus vaccine is used. Pigeon pox virus is not recommended.



Fig. 17.—Hen affected with fowl pox.

Chicken pox usually breaks out in the fall or early winter. It appears as raised brown wart-like scabs on the comb, wattles and bare parts of the head. In cases of light infection these scabs are often mistaken for scratches resulting from peck-

ing, fighting and other minor injuries.

Vaccination is simply done by removing a few feathers from the thigh of the young pullet and applying a very small amount of the vaccine to two or three follicles where the feathers have been removed.

Vaccination is recommended on only those farms where pox infection has caused trouble in previous years or in communities where infected flocks are quite common. There is no need to vaccinate for the disease if it has not caused trouble in the community because the process of vaccination would introduce the infection on farms where it has not been present. The introduction of the infection whether from other flocks or by vaccination, requires an annual vaccination

of pullet flocks to prevent future outbreaks of the disease.

Change Ration

After the pullets are housed, the change from a growing mash to laying mash should be gradually made by mixing increasing amounts of laying mash with the grower feed. In ten days the change should be completed.

The onset of laying should occur naturally. The age at which pullets start to lay is an inherited characteristic. It is a mistake to attempt to force heavy egg production or to try to delay the onset of laying. Healthy pullets that have been properly fed will start laying when they mature, and until they are ready to lay they should not be unduly stimulated to start production.

LAYING HOUSE AND EQUIPMENT

A comfortable poultry house is necessary to secure profitable egg production during the summer months as well as during the winter. It is also essential to maintain a healthy flock.

A comfortable poultry house need not be expensive, but it should have certain important characteristics which can be obtained on any farm.

A good poultry house should be dry, well lighted and ventilated, and reasonably warm. The walls must be tightly constructed to prevent drafts that cause colds and roup to develop. Old houses may be repaired to provide tight walls by a number of different methods. Straw or similar material may be packed between the studs and held in place by old fencing. Card board cartons

or roofing paper may be used. Any of these temporary methods are successful since the most important thing is that of keeping the hens comfortable at low cost. New houses or ones that have good material in them should, of course, be built or repaired with the comfort of the hens in mind.

A damp house is always uncomfortable. Moisture may come from the floor, or collect on the roof and sides of the building due to improper roof construction or poor ventilation.

Floors for the Laying House

Concrete floors are best in laying houses. A new type thin section floor is now being used which costs less than a board floor. It

also costs less than a dirt floor when the expense of more frequent changing of litter and greater losses from disease are considered. Perhaps your club leader or some other successful poultry raiser in your community will show you how they are built.

Dirt floors are unsanitary, usually draw moisture, and cannot be disinfected. Some dirt floors may be improved by spreading a six inch layer of crushed rock, cinders or gravel in the house. This prevents the ground moisture from coming up in the house. Water rises just like oil rises in the wick of a lamp.

Insulation in the Laying House

Metal roofs are satisfactory for poultry houses if properly insulated. Unless this is done, however, moisture collects on the inside surface and causes a damp, as well as a cold, uncomfortable house.

The ceiling should be no higher than is necessary to provide head room for caretaker (usually 6½ to 7 feet). Houses with high ceilings are cold. A large part of the heat loss during winter months occurs through the roof and the largest amount of heat penetrates through the roof in summer. For these reasons a straw loft is desirable to reduce ceiling height. It aids in keeping the house dry and makes it warmer in winter and cooler in summer. If the height of the roof permits the loft should consist of 10 to 12 inches of settled straw which may be supported by poultry netting or old woven wire fencing or by some other simple method. If part or all of the roof is too low for such a loft, straw should be

packed between the rafters as a means of securing insulation in the lower portions and the loft installed where height permits.

Ventilation

Improper ventilation is usually the result of too small an amount of fresh air. This causes the air in the house to become damp. The moisture collects on the walls of the building and on the floor. This dampness combined with the need for more fresh air produces an unhealthy condition that lowers egg production and makes disease outbreaks almost certain.

The best means of ventilation is accomplished through an open front which is usually 24 to 30 inches in width. During cold weather the size of the opening may be regulated with a curtain or series of them made from feed sacks. This opening is seldom completely closed. More flocks disappoint their owners because of too little fresh air than because of too much of it.

The most comfortable poultry houses are at least 18 and preferably 20 feet deep. Narrow houses are difficult to ventilate because they are drafty and cold when an adequate supply of fresh air is provided and are stuffy and unhealthy without the necessary exchange of air. Houses of proper depth when equipped with an open front are easily managed, require little attention and produce excellent results. The rule of 1 square foot of open front for every 15 square feet of floor space is used in determining the size of the open front. The open front should begin eighteen to twenty-four inches

above the inside floor level of the house and extend upward twenty-four to thirty inches. Ventilation flues or stacks, and baffle ventilators usually prove unsatisfactory. These require much attention, often fail to work, and sometimes work directly opposite to the intended way.

Light, Cheerful House Desired

A comfortable house should be light and cheerful. Small windows should be arranged on all sides of the house to light all of the floor space and enable the hens to use all of it. Removal of these windows during the summer also makes the house cooler. The windows must be tightly fitted, however, to pre-

vent drafts in winter. Special laying, scratching and roosting rooms in a house make it dark, reduce the number of birds that can be kept and serve no good purpose.

Equipment for the Laying House

Eight to ten inches of roosting space is required per bird. Either droppings pit or roosts and droppings boards may be used. In either case the use of wire netting to keep the birds out of the droppings is very important. Not only does it add to the sanitation in the house but it also helps in the production of clean eggs. Ordinarily inch and one-half poultry netting is used for this purpose. Roosts are usually

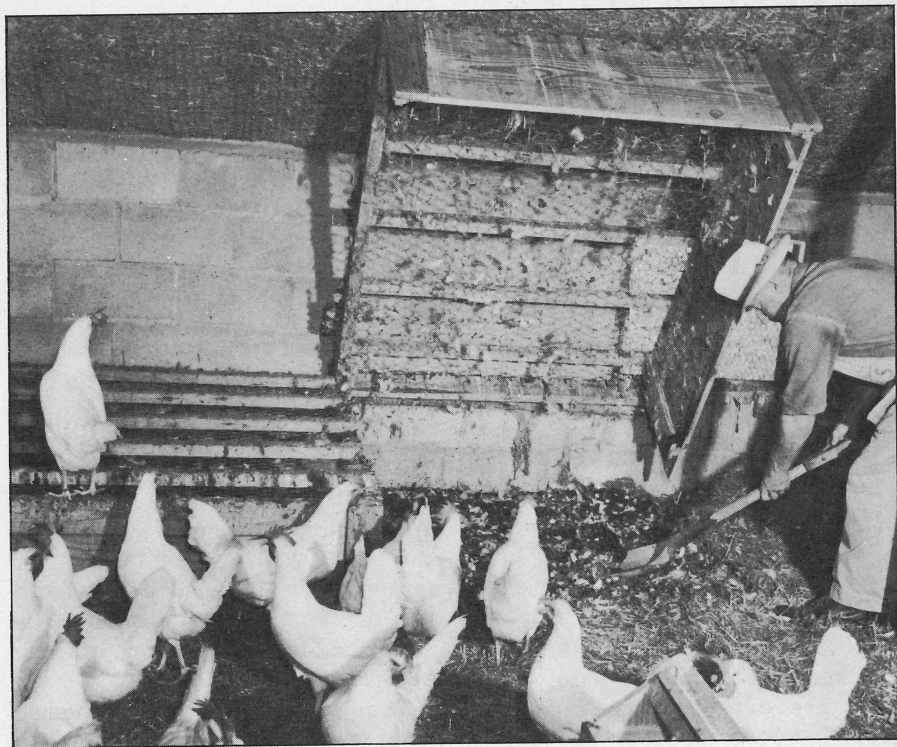


Fig. 18.—This type of droppings pit is easy to clean.

made from 2x2 inch material with the upper corners rounded off.

The droppings pit has been gaining rapidly in popularity in the past few years. Many poultry raisers who now have droppings boards in their laying houses are changing them to the droppings pit. The use of the droppings pit makes it easy to see all birds as one enters the house. They do not leave any dark corners in which sick birds may hide. They require less frequent cleaning than the droppings boards and are thereby labor savers.

One nest should be provided for every 4 to 5 hens. Where droppings boards are used in the house the nests are frequently hung at the front edge and just under the droppings boards. When the pit type of roosts are used the nests are hung on the walls of the house.

Two mash feeders 4 to 5 feet long are necessary to provide adequate feeder space for 100 hens. If grain is also fed in feeders additional feeder space would need to be pro-

vided for it. Some poultry raisers prefer to feed their grain night and morning in regular v-shaped troughs.

At least one 5 to 8 gallon automatic waterer should be provided in each 20x20 ft. house. The waterer should have a heating element so that the chill may be taken off the water during the winter. Both feeders and waterers should be raised above the floor enough to prevent the litter from being scratched into them. As a rule 12 to 16 inches is a desirable height. The waterer in particular should be placed on a sanitary platform so that any water that is spilled will not get into the litter and be worked over by the birds.

A rack for the feeding of legume hay to the laying flock through the winter is a most desirable piece of equipment.

Plans for the construction of poultry equipment are available in Circular 419 entitled, "Homemade Poultry Equipment."

WINTER FEEDING AND MANAGEMENT

Pullet flocks should be comfortably housed in permanent laying quarters by the last of September. If housing is delayed beyond this date, weather conditions are generally less favorable. If the onset of laying has occurred, the changes in surroundings when moved at a later date is very likely to disrupt laying and a partial molt may result. Early hatched pullets should be housed at an earlier date by the time five eggs are received daily from 100 birds or when production reaches five per cent.

Before the pullets are housed the building should be thoroughly cleaned and disinfected. All movable equipment should be removed, cleaned, scraped, and sprayed. All litter, droppings, dust and other filth should be completely removed and the house and equipment sprayed and scrubbed with a solution made of 1 can of ordinary lye dissolved in 12 gallons of cold water.

The pullets should be housed separately from older birds. This may be accomplished in one house

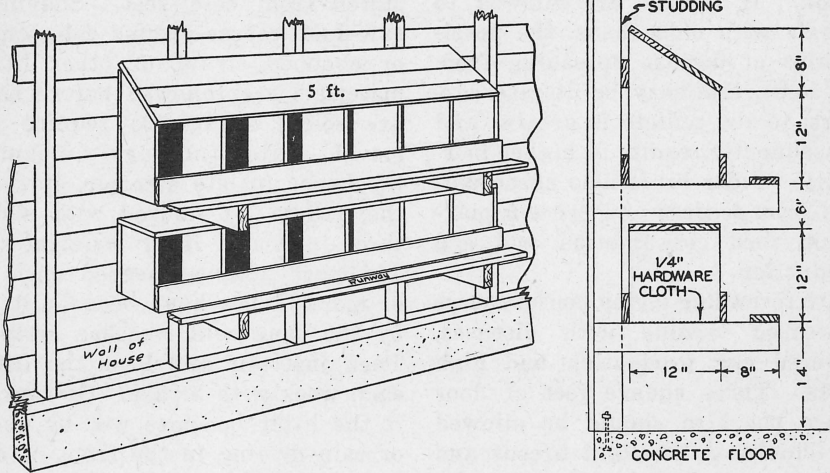


Fig. 19.—Double tier of wall nests. At right is end view showing details of construction.

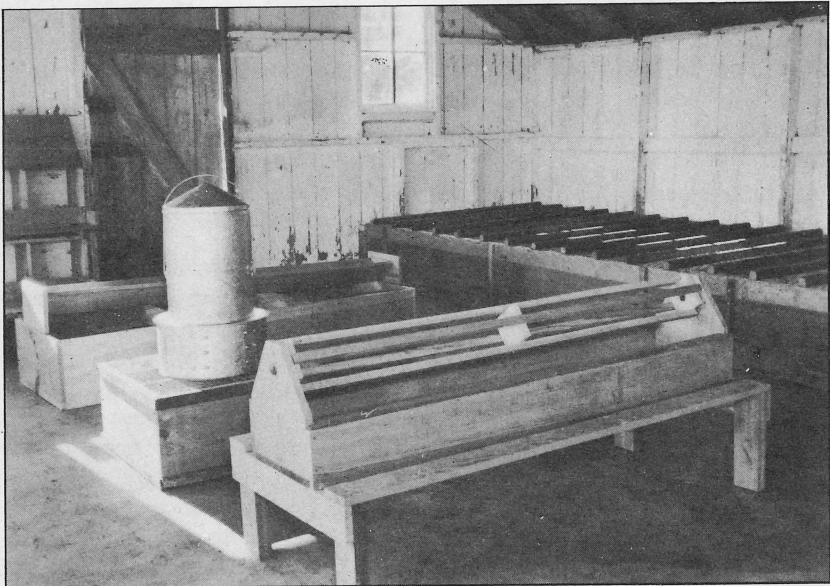


Fig. 20.—The right kind of equipment in the laying house is important.

by means of a temporary wire partition. If pullets are allowed to mingle with older hens, the possibilities of disease spreading from old hens, that may be disease carriers, to the pullets is greater and consequently results in higher mortality. Older birds also chase pullets from feeders and prevent maximum feed consumption and egg production.

Overcrowding laying houses causes increased trouble with diseases, lowered egg production and high costs. Three square feet of floor space per bird should be allowed for chicks of the light breeds and four square feet for those of the heavy breeds. Thus a house 20 feet square will accommodate 125 or 130 Leghorns or 100 White Rocks or other heavy breed varieties.

Hens in molt should have constant access to good laying mash and should receive the same care which is normally given during heavy production.

Pullets frequently molt after laying profitably for two or three months. This may be due to a loss in body weight which sometimes results from heavy production and improper feeding. Every effort should be made to increase body weight of pullet flocks after housing by allowing the onset of laying to occur naturally and by providing liberal quantities of grain.

The practice of building up litter is becoming popular with flock owners. Built-up litter simply means that the litter is renewed rather than removed. Its many advantages are that it saves labor, lowers the litter cost, helps to keep

the house dry, and the layers do not suffer from cold feet. Shavings, saw-dust, coarse ground cobs, chaff or chopped straw, or other litter materials are renewed before they are soiled enough to require removal. After thoroughly cleaning the house in late summer, start as the pullets are housed with about three inches of litter material and add more litter as needed until 10 or more inches have been built up by the time cold weather arrives. Then just stir and level the litter each week with a rake. Of course, if the litter becomes wet by snow or rain driving in the front of the house, it is desirable to remove the wet portion immediately.

The built-up litter is left in the house until early summer. Some producers leave the built-up litter in the house until August when they get the quarters ready for the pullet crop. When this is done only one cleaning is required in a year's time. The manure under the droppings pits, of course, will need to be removed more frequently than this.

Principles of Feeding

Club members cannot expect poultry to return a profit unless ample amounts of the proper kind of feed are provided. Laying hens which receive all of the proper kinds of feed needed for profitable egg production use approximately two-thirds of this total amount to maintain their bodies. The remaining one-third of the feed is used in the production of eggs. The hen maintains her body first from the feed she receives. Consequently, liberal feeding of a complete ration must be practiced before economical egg

production can be secured. If lesser amounts of feed are provided fewer eggs will be received because a smaller amount of raw materials will be available from which the hen may manufacture eggs.

Types of Feed

There are five general types of feed which must be included in the ration, in addition to plentiful supplies of clean, fresh water. These are listed as:

1. Energy producing feeds which include: corn, wheat, grain sorghums, and barley.

2. Protein feeds which include: meat and bone meal, super-meat scrap, dried skim milk, dried butter milk, liquid skim milk, and soybean oil meal. Twenty per cent of the laying mash ration, by weight and chemical analysis, should be composed of these feeds.

3. Vitamins have become increasingly important as more knowledge of the effect upon feeding results has become available.

(a). Vitamin A is found in yellow corn, alfalfa meal, bright green legume hays, fresh cod liver oil and in green feed. It is necessary for the health of the flock and for a high rate of laying and good hatchability of eggs.

(b). Vitamin D is found in direct sunlight which has not been filtered through ordinary window glass or through most glass substitutes. It is also present in fish oils. Vitamin D is necessary for the health of the flock, for high egg production, bone and egg shell formation and hatchability.

(c). Vitamin G is necessary for high hatchability and maximum egg

production. Two common sources of this vitamin are milk and green feed.

4. Minerals are quite generally and generously supplied in other feeds. Expensive mixtures of numerous types of chemicals to supply minerals are not necessary and represent useless expense. It is necessary, however, to supply ordinary salt in the feed and to provide oyster shell or finely ground limestone.

5. Green feed is desirable in producing hatching eggs but when other substitutes are provided containing vitamins A and G there is little to be gained by its use in the production of market eggs.

A good laying mash is a necessary part of a good feeding program throughout the year. Mash is fed in a finely ground form so the hen can eat larger quantities and digest it more easily. Mash also serves as a means of including protein, and vitamin carrying ingredients in the ration in proper amounts.

The laying mash and the entire ration must not contain too much bulky feed. Chickens digest concentrated feeds readily. While some bulk is desirable, too much material of this nature prevents the hen from consuming enough of the other feeds to produce at the most profitable rate. Wheat bran or ground oats are used to provide necessary bulk and certain other valuable nutrients. The amounts to be used are limited.

The grain ration should be one-half to two-thirds of the total ration. It should be composed of the grains

listed as energy producing feeds. A mixture of these grains or a single grain may be fed. At least one-third yellow corn is desirable in the grain mixture. Without yellow corn, it is necessary to provide green feed or alfalfa meal in the mash, or legume hays. It is possible to provide a complete ration without yellow corn when it is more economical or necessary to do so. Oats may be included in the grain ration in an amount which does not exceed one-third the total grain supply.

Any changes in laying mash rations, grain feeds, or methods of feeding should be made gradually over a period of a week or ten days. Sudden changes of any kind result in reduced feed consumption causing lowered production or temporarily retarded growth.

It is not necessary to buy mill feeds if home-grown grain such as oats and wheat are available. Good heavy oats can be ground and substituted in place of the bran. Wheat can be coarsely ground and substituted in place of the shorts. If yellow

corn is not available it is possible to substitute such feeds as ground barley or kaffir. If such a substitute is made, however, it is necessary to add an additional 5% of alfalfa leaf meal to provide vitamin A. When the alfalfa meal is increased the bran or ground oats in the ration should be correspondingly reduced.

Feeding Grain

Pullets of the light breeds should receive a constant supply of grain fed in open hoppers. They will consume no more than is needed, lay equally well and each pullet will have an opportunity to consume the amount of grain needed to maintain body weight. When grain is fed in this manner additional hopper space, equal to that recommended for laying mash, should be provided.

Heavy breed pullets frequently consume too much if grain is self fed. It is best to feed grain to the heavier breeds twice daily. One-third of the total amount should be

RECOMMENDED LAYING RATIONS—Laying rations recommended by the Missouri College of Agriculture are:

	No. 1	No. 2	No. 3
Yellow corn meal	200 lbs.	200 lbs.	200 lbs.
Bran	165 lbs.	165 lbs.	165 lbs.
Alfalfa leaf meal	35 lbs.	35 lbs.	35 lbs.
Shorts	200 lbs.	195 lbs.	200 lbs.
Meat scraps	150 lbs.	75 lbs.	115 lbs.
Dried milk	—	—	35 lbs.
Soybean oilmeal	—	80 lbs.	—
Salt	7 lbs.	7 lbs.	7 lbs.
Codliver oil or feeding oil	7 lbs.	7 lbs.	7 lbs.

Ration No. 3 is suggested for breeding hens.

Codliver oil or feeding oil is necessary only during the winter months beginning in November and ending April 1.

fed in the morning and two-thirds at night before roosting time. One hundred pullets will consume about 15 pounds of grain and $7\frac{1}{2}$ pounds of mash each day during the winter months. High producing flocks consume slightly more of both feeds.

In any event grain should never be fed on the bare ground or scattered in the litter. It may be fed in long V-shaped troughs or hoppers and additional feeding space supplied by spreading it upon the mash in the hoppers. As many diseases are spread through poultry droppings, scattering grain increases disease hazards from this source and is decidedly unsanitary.

Feeding Wet Mash

In heavy producing flocks, particularly of the light breeds, it is frequently desirable to feed a wet fattening mash at noon each day in order to insure maintenance of adequate body weight.

Noon feeding of any wet mash is recommended because the purpose of this special preparation of feed is to secure increased feed consumption of a particular kind. If fed earlier in the day it tends to merely replace other types of feed which would otherwise be eaten.

Fattening mash may be composed of 6 parts ground yellow corn, 3 parts of shorts, and 1 part dried milk. In feeding it should be moistened with water to form a crumbly mash. Liquid milk may be substituted for dried milk and water eliminated in mixing. The mash should not be sloppy but just enough milk or water added to cause the particles to cling together like bread crumbs.

Temporary and sometimes permanent drops in egg production that usually accompany extremely cold weather may be partly explained by lowered consumption of laying mash and water. Additional attention to the flock during these periods is desirable. The drinking water should be warmed frequently to maintain normal consumption. Warm wet laying mash may be fed at noon as a means of holding up the amount of mash consumed. This additional attention pays by keeping the hens comfortable and the supply of eggs more constant.

The feeding of wet laying mash should be held as a reserve practice for use when cold weather arrives. It may be continued during the winter months, but should also be gradually reduced and discontinued by late March or early April. At that season production naturally reaches its peak and continued use of this forcing practice is unnecessary and may prove harmful.

Tonics and Conditioners

The practice of providing tonics, conditioners for the laying flock during the winter months or at any other time is expensive and valueless. Healthy chickens properly fed require none of these and treatment of sick chickens is seldom profitable.

Periodic worm treatments and laxatives are to be avoided. If pullets are actually infested with worms they should be treated for the type of worms with which they are infested and not for all types of worms. This should be done before they are placed in permanent laying quarters. Hens should be treated during the period of most

general molt. The practice of indiscriminate worming of all birds, without knowledge of the type of worm infestation, is to be discouraged.

A good ration, including a complete laying mash made according to the principles and formulas given in this bulletin, plus grain, oyster shell and a plentiful supply of clean fresh water are the best assurances for satisfactory production. This type of feeding program combined with comfortable housing and attention to the management details outlined here may be depended upon to produce satisfactory and profitable results.

Colds and Roup

The best insurance against colds and roup consists of early housing in comfortable quarters that are

free from drafts, dampness, and overcrowding.

Should an outbreak of colds occur it is most important that the cause of the trouble be determined and corrected. The infected birds should be removed from the flock as a means of reducing the spread of infection. Potassium permanganate may be used in the drinking water as a disinfectant to reduce the spread by this method. It is used at the rate of one-fourth teaspoon in one gallon of drinking water. Also, it is important that it be kept free from organic matter as this causes it to lose its strength rapidly. It is necessary that the solution be renewed as soon as it turns brown if it is to be effective. The color indicates that the solution no longer has the power to kill germs.

FEEDING AND MANAGEMENT FOR SUMMER EGG PRODUCTION

Any well developed hen or pullet that is healthy will lay well during the spring months of March, April and May. During the summer months that follow the problem of securing good egg production depends upon good management.

The hens should be kept in comfortable quarters that are cool during the day and well ventilated. Roosting space should be ample to avoid excessive heat during the night.

Ample supplies of clean fresh water, laying mash and oyster shell must be available.

Grain should be limited to an evening feeding in the case of heavy breed birds or light breeds that are hand fed grain.

Every effort should be made to get the hens to eat large amounts of laying mash. A wet laying mash should be fed at noon each day.

The hens should be confined within the house until after the wet mash feeding each day. This keeps the layers near the kind of feed and water necessary for high egg production.

Close culling should also be done to remove the early molting, broody and unthrifty hens as they appear. This practice reduces feed costs, and increases net income.

Lice and mites may seriously reduce egg production and since they multiply rapidly in hot weather the flock should be examined every two or three weeks for the presence of

lice. The roosts and other equipment in the house should also be examined for mites.

Club members that follow these recommendations can obtain satisfactory egg production until late October or early November from the mature flock.

Other management considerations are the same as those discussed under Winter Management.

Lice and Mites

Lice live on the body of the bird and lay their eggs on the feathers. They multiply rapidly, particularly in warm weather. The nicotine sulfate treatment to rid poultry of these pests is very effective and easily carried out. "Black Leaf 40" (nicotine sulfate) is spread upon the roosts in a narrow, thin line about an hour before roosting time. As the hens perch on the roosts during the night, the heat from their bodies causes a nicotine gas to form. This kills the lice but does not kill the eggs on the birds' feathers. For this reason it is necessary to repeat this treatment in 7-10 days to kill the lice that hatch before they mature to lay more eggs.

Sodium fluoride as a dust and in suspension as a dip are also used to control lice. Sodium fluoride powder is dusted on the bird and worked into the feathers.

Dipping in a solution of sodium fluoride is a very effective method of keeping the flock free from lice. If all the birds on the farm are dipped twice a year, the flock can be kept comparatively free of body lice. The dip method is useful for pullets under range conditions when housed in buildings which permit

too free a circulation of air for successful use of the nicotine sulfate method.

Since dipping must be done on warm bright days, the flock should be treated in advance of cold weather in the fall if infested. If the old birds are dipped in the fall before the pullets are placed in the house, it is often unnecessary to treat the pullet flock. It may be necessary to dip a second time as soon as warm weather permits in the spring.

The dip is prepared by adding one ounce of sodium fluoride powder to each gallon of water. The birds should be held by the wings and the entire body placed under water. The free hand should be used to ruffle the feathers to be sure the solution reaches the skin. Finally the head can be pushed under once or twice and excess material allowed to drain back into the container for a few seconds before releasing the bird.

Sparrows and other birds should not be permitted in the house with poultry, because they frequently bring in both mites and lice.

Mites do not live on the chickens but live in the cracks and crevices about the roosts and nests where they can crawl on to the birds. They may be eliminated by thoroughly cleaning the house, disinfecting it with lye solution and painting the roosts and droppings platform with waste crank case oil.

A clean, comfortable house, and sanitation in feeding and watering, combined with healthy stock, is the greatest insurance against parasites and disease losses. It is much easier and less costly than "doctoring".

Worm Control and Treatment

Control of round worms depends upon sanitation in the use of clean range. When clean range is used there should be no necessity for worming the pullet stock before housing in permanent quarters. Adult birds may require a worm treatment at the end of the first year's production. Treatment should be given each individual bird at the time the flock is in a general molt.

Tape worms cannot be effectively controlled or eliminated by treatment. Success in preventing a serious infestation depends upon sanitation. The tape worm completes a part of its life cycle in the chicken and a portion in insects such as slugs, flies, etc., upon which the chickens may feed. Clean quarters which reduce the fly hazard will also reduce tape worm infestation.

Before any worm treatment is given the club member should know the kind of worm with which the chickens are infested. Then treatment may be expected to be somewhat effective. Double duty worm pills, combining treatment for both round worms and tape worms are not recommended.

Round worms are white or yellowish white in color and from 2-4 inches in length. They are round or cylindrical while the tape worm is flat, ribbon-like and made up of sections or segments.

Chickens may be affected with both types of worms at the same time. Treatment, however, should be made for one type of worm and followed with a treatment for the other kind in a week or ten days.

Chickens that are heavily infested

with worms of either type become thin, light in weight, and have ruffled feathers and a general unthrifty appearance. Paleness of the head, comb and shanks is also characteristic.

Nicotine in some form is recommended for the elimination of round worms. There are a number of commercially prepared round worm pills on the market for this purpose.

Common household lye is valuable in holding down tape worm damages. To use this treatment mix $\frac{1}{2}$ gallon of wheat and $\frac{1}{2}$ gallon of oats and add 1 rounding tablespoon of household lye that has been previously dissolved in 1 pint of warm water. Cover this mixture with water and boil slowly for two hours. Scorching of the grain should be avoided by adding a little water from time to time and by stirring the mixture frequently. Excess water should be drained off.

The birds should be starved for 24 hours before feeding this mixture and water should not be given for the last 12 hours of this fast. The grain that has been boiled in lye solution should then be placed before the birds for about two hours. Water should also be provided. Two hours before roosting time is an ideal time to feed this mixture. In this way most of the worm segments will be deposited under the roosts and can be collected and destroyed early the next morning. A second treatment must be given in a week.

Any worm treatment to be effective is somewhat severe. Hens that are laying well do not need treatment and sanitation in preventing infestation is far more important.

CULLING AND PRODUCTION JUDGING

Culling begins with the removal of unthrifty young stock. Pullets placed in the laying house should be selected for size, rate of maturity, health and vigor.

In the laying flock poor individuals should be removed as they appear during all months of the year. However, the greater part of culling is done toward the end of the laying season from July to November.

Proper treatment and good feeding of a flock ahead of the time it is to be culled is necessary. Good hens will appear to be culls if they have not had good feed and care.

One of the first points in culling is to learn the proper way to hold the birds.

The hen should be held in the left hand with the palm upward and the fingers extended. Allow the breast bone of the hen to rest on the palm with head pointing toward the elbow. The extended fingers should grip the legs in such a manner as to allow the hen to be comfortable. This grip involves placing the thumb and first finger on the outside of the right leg and the second finger between the legs.

A good producing hen has vigorous, strong, healthy appearance and is gentle and friendly. A poor layer is wild or cross.

The eye of a good hen has a bright, alert appearance. The head is broad, and fairly short, with a short, well-curved beak. The entire head has a clean, clear cut appearance in contrast with a dull eye, long narrow, beefy type head found in poor producers. This is shown in Figure 21.

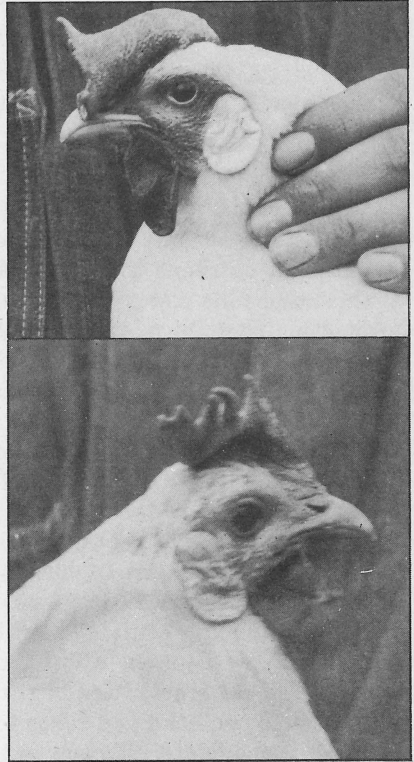


Fig. 21.—Heads of good and poor producers. The good above, the poor below.

Birds that have poor heads usually will be found lacking in other body characteristics. A good hen has a broad back, deep body, and is wide between the legs. Such a bird gives a clean cut appearance, has a full broad chest and possesses constitutional vigor and ability to turn large amounts of feed into eggs. When handled these good hens have a square, angular feeling to the

touch. Hens that lack these good qualities have small rounded bodies that lack depth and width. They are narrow between the legs and have shallow chests that indicate a lack of vigor. Figure 22 shows a good producer. Notice the full breast, deep, long body, clean cut square head and frayed worn feathers.

Judging Past Production

The amount of yellow color in the skin, legs and beak of the breed and varieties of chickens that have skin of this color tells a story of past egg production. A bird takes yellow color into her body from yellow corn and green feeds. This color when it does not go into egg yolks is deposited in the skin. It is most noticeable in the area around the vent and in the beak and shanks. If a hen is laying regularly this color fades away until a bleached or white appearance develops in steadily producing birds. The color first fades in the skin around the vent. The beak starts to fade at the base next to the head and takes 4 to 6 weeks to completely bleach to the tip. The legs bleach more slowly because of thick scales and 4 to 6 months of steady laying is necessary before all the color disappears.

This fading of color makes it possible to judge past production rather accurately since this color returns during the summer months when the poorer hens slow down or stop laying completely. This information does not apply to chickens of the white skinned varieties such as Orphingtons.

A good producing hen has a soft, loose, velvet-like skin. Her breast

bone is fine and the pin bones are thin and flexible. A poor producer has coarse pin bones; is thick skinned and the flesh of the abdomen will feel hard and tight.

The breast bone of a hen which is not in laying condition will be drawn up so there is little distance between the rear end of it and the pin bones which will also be close together. A hen in laying condition will show a depth of three to four finger widths between the end of the breast bone and the pin bones, which will also be expanded two or three fingers in width.

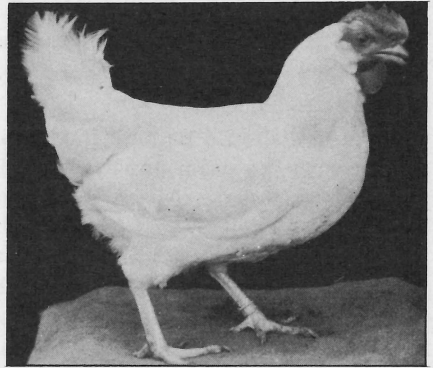


Fig. 22.—A good producer at the end of laying year. The bare head is quite characteristic of heavy layers.

The Molt

The hen uses the same feed to make eggs and feathers. If she starts changing feathers, she slows up or completely stops egg production. Poor producers start molting in the early summer and usually stop laying completely or lay very few eggs. In contrast, the hen that molts in September or October or later completes the task of growing new feathers in about 60 to 90 days. She starts laying again almost as soon as the inferior hen that starts molting during the late

June or July months. Early molting hens usually lay at a slower rate than the fast molters and require more time to complete the growth of new feathers. Consequently they are unprofitable.

The way in which a hen sheds her primary wing feathers makes it possible to estimate how long the molt has been in progress and approximately how much vacation the hen has taken. Figure 23 shows a diagram of a chicken wing divided between primary and secondary feathers. There are from 9 to 11 primary wing feathers which are separated from the secondary feathers by a wide feather called the axial feather. This feather is easily distinguished from the primary and secondary (inner half of wing) feathers because the shaft of

the feather divides it into two equal parts. The shaft in the primary feathers is off center and causes the web of the feather to be wider on one side than the other.

Hens that stop laying in July or later usually lose the primary wing feathers closest to the axial feather. For each loss of a primary wing feather it is safe to estimate that a two weeks vacation was taken. It takes about six weeks for a new feather to grow completely. A new feather of this type has a bright pink quill as compared to a white quill in the old ones. These facts make it possible to estimate when the vacation started and by adding two weeks additional vacation for each new feather found, the approximate length of vacation can be determined.

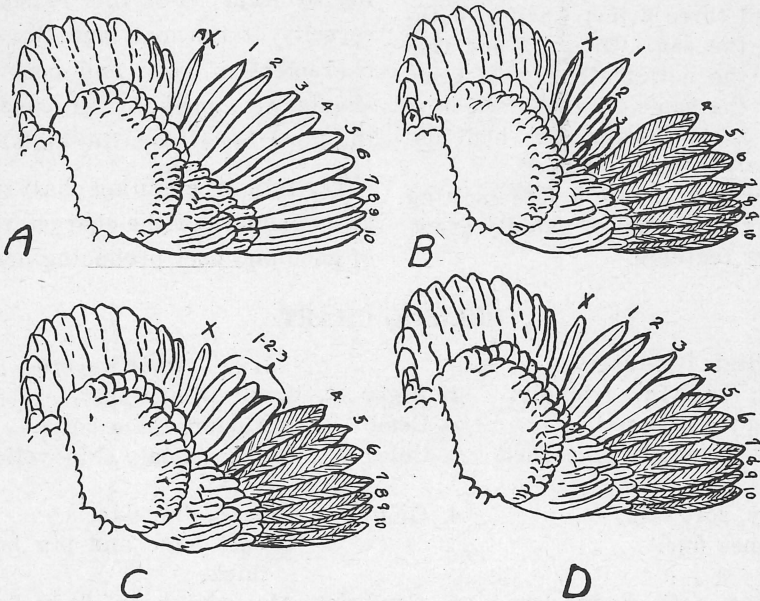


Fig. 23.—(A) Wing with feathers fully renewed. (B) Normal wing molt showing first three primaries in process of replacement. (C) First three primaries molted in a clip. (D) Wing with first four primaries renewed. B Molt has been in progress about six weeks. C Three feathers molted at one time, indicating a two or three weeks vacation which started about four weeks previous. D Probably molted in succession in which case vacation started over eight weeks earlier and extended over a period of approximately four weeks. This hen has probably resumed laying.

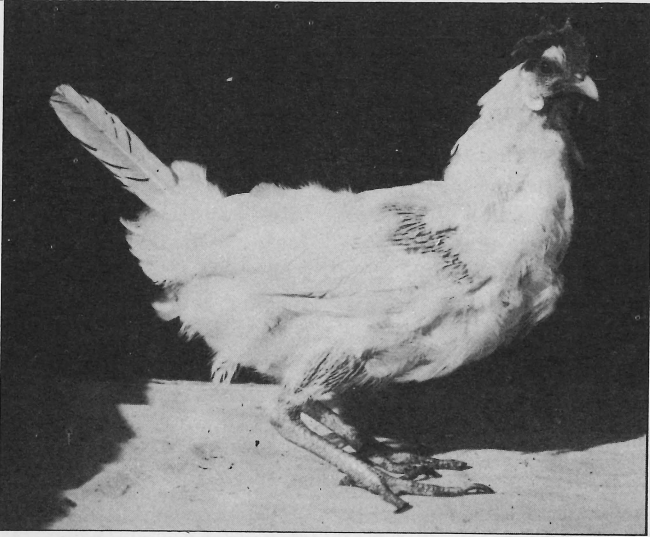


Fig. 24.—Heavy layer in full molt. Picture taken November 1.

In late molting hens the exception to this general rule is found. These good hens frequently molt two and three primary wing feathers at the same time. When this occurs the new feathers will grow out at the same rate and the rest period is no greater than had just one feather been dropped.

Figure 24 shows a late molting hen in the process of rapidly growing new feathers.

A temporary upset or a sudden change in feeding can cause molting to occur. For this reason the severity of the molt and the other characters of good and poor hens should be considered in selecting the good hens from the culls.

The following culling chart serves as a summary of the characteristics of good and poor producing hens:

CULLING CHART

High Producers.		Poor Layers
Strong, healthy, friendly.	1. Vigor	Lazy, wild, weak.
Full and waxy; red.	2. Comb	Shrunken, pale color.
Shanks, beak, skin bleached out.	3. Color	Shanks, beak, skin yellow.
Velvety, soft skin.	4. Quality	Coarse, dry skin.
Pin bones fine.		Breast bone and pin bones thick.
Abdomen soft, body deep, pin bones spread.	5. Condition	Abdomen hard, body bones closed up, pin bones close together.
Late, fast molter.	6. Molt	Slow, early molter.

PRODUCTION AND CARE OF GOOD MARKET EGGS

Eggs are best when freshly laid. They require the same care that is necessary to prevent milk from spoiling. They should be cooled rapidly, stored in a cool cellar or basement and should be marketed at least twice a week during the summer months.

Unless they receive care that protects and preserves their original good quality consumers quickly become discouraged and use fewer eggs. This, of course, lowers the price that the producer of good and poor eggs is able to secure.

Produce Clean Eggs

Eggs are clean when laid and should be kept clean. This may be done by providing one nest for every four or five hens in which clean nesting material is always kept. The eggs should also be gathered three or more times each day before the hens have a chance to get them dirty. Dry litter helps reduce the number of dirty eggs.

Protect Eggs From Heat

Frequent gathering is also important because the heat from the hens sitting on the eggs causes the egg whites to become thin and watery. For the same reason broody hens should be confined in coops. Heat damage lowers the quality and price that can be received.

Since heat damage is serious, it is important to gather the eggs in wire baskets which permit a free circulation of air for more rapid cooling. The eggs should be left in these baskets over night in a cool

basement or cellar to allow all the animal heat in the egg to escape as quickly as possible. If eggs are cased immediately, the animal heat stays in them for a much longer time and their quality declines.

At the time an egg is laid, it has no air cell, but as the body heat of the hen leaves it the contents inside the shell contract, leaving a small air cell which is normally located in the large end of the egg. The older it becomes, the more moisture evaporates from it and the larger it becomes. For this reason the size of the air cell is used by market men to tell the age of the eggs. Consumers do not want to buy stale eggs and consequently the price for eggs with large air cells is much lower than that to be obtained for a fresh egg. This is another reason for frequent marketing.

Storage Place Should Be Moist

Since the size of the air cell is used to estimate the quality of an egg and since eggs lose market value more rapidly in dry places, eggs should be kept in a place having a high percentage of moisture in the air.

This may be accomplished by building a sand box in the corner of the basement or cellar. Three or four inches of sand should be placed in the box and a bucket of water should be added to the sand each morning during the summer months. The eggs may be cooled out in wire baskets, placed on a rack directly above the sand box. The

evaporation of moisture from the sand cools the eggs more rapidly and prevents the air cell from becoming too large.

Since eggs absorb flavors and odors, the cellar or basement should be free of spoiled fruit, onions, or kerosene which would give the eggs an objectionable flavor.

Produce Infertile Eggs

After the hatching season, infertile eggs should be produced. The old male birds and young cockerels should be sold or securely penned away from the laying flock. A fertile egg during the summer months will start to develop a chick within a few hours after it has been laid. Such eggs are unfit for human food and mean an absolute loss to the egg producer. The average rooster eats about 85-90 pounds of feed per year and aside from producing fertile eggs for hatching they are of no value.

Case Properly and Handle With Care

The eggs should be cased with the small end down—if the large end

is placed down the air cell in this end is likely to be broken and a fresh egg would be classed as old if damaged in this way. Avoid rough handling in taking the eggs to market. During the summer months they should be protected from the sun to prevent heat damage.

Good cases and clean flats and fillers should be used in packing eggs for market. The flats and fillers should be dusted off because the dust and moisture on the shell will result in a soiled egg.

Eggs should be handled and prepared for market in this manner to preserve their original value and secure their increased use at better prices.

They should be sold on a graded basis that will reward the producer for his care in delivery of a quality product to market.

It is just as unfair to sell all eggs or chickens at the same flat price as it is to sell all hogs, cattle or sheep at a flat price regardless of the size, age, weight and finish.

For additional information on the production and marketing of quality eggs, secure Extension Circular 428.