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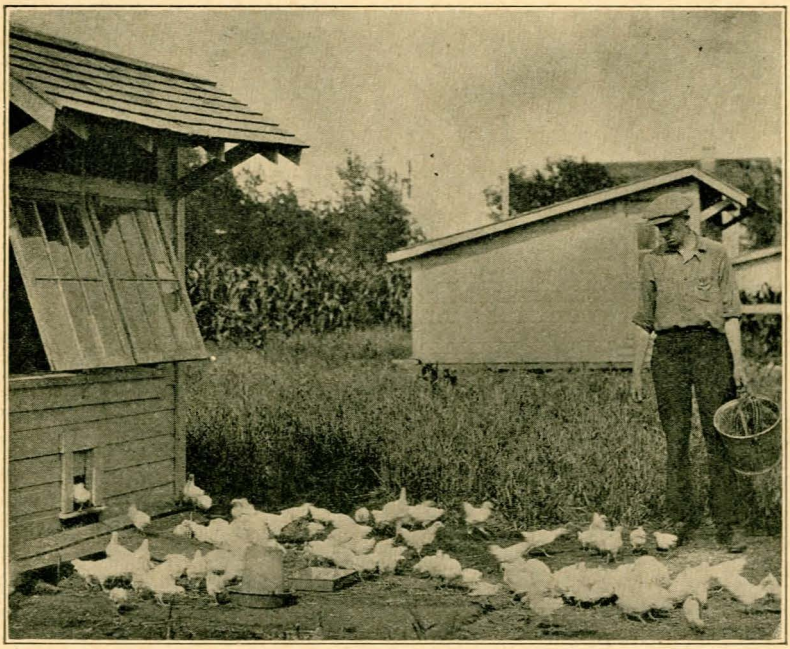
Extension Circular 1401, Revised January, 1929

Care and Feeding of Baby Chicks



The University of Nebraska Agricultural College Extension Service
and United States Department of Agriculture Cooperating
W. H. Brokaw, Director, Lincoln

Care and Feeding of Baby Chicks

F. E. MUSSEHL

The growing of vigorous, well developed chicks is in many respects the most important job before the poultryman. Brooding skill during the first ten weeks especially, affects not only the immedite growth rate of our chicks, but also the health, vigor, and egg production of the pullets reared and used for laying stock later. Poultry producers should take as their goal the rearing of 85 per cent of the chicks put into the brooder house. Many will exceed this goal, but no poultry producer should feel satisfied until he has attained this proficiency in brooding skill.

TEMPERATURE REQUIREMENTS

First of all baby chicks must be kept warm. During the incubation period the chicks have been living in an environment averaging 100 degrees Fahrenheit, and the adjustment to lower temperatures must be made gradually. The source of the heat for brooding is not so significant, it may be produced from coal, kerosene, or electricity, but the volume and dependability of supply is very important.

The entire brooder house or room need not be heated, in fact it is desirable to have part of the environment cooler than the hover section because of the stimulating effect of occasional low temperatures. The ideal situation is to have only a part of the environment, that part known as the hover, heated so that the chicks can become warmed in a few minutes when they come in from the cooler parts of the house. The following temperatures are suggested as most desirable when the common type of canopy equipped brooders are used, —first week,—100 degrees Fahrenheit on floor at edge of the canopy; second week, —95 degrees Fahrenheit; third and fourth weeks,—90 degrees Fahrenheit; and fifth and sixth weeks,—85 degrees Fahrenheit. After this period the behavior of the chicks will be the best guide to brooder stove operation. As a matter of fact a very skilled brooder operator can successfully brood chicks without reference to a thermometer at any time, using the behavior of the chicks as the guide to proper stove management. When the chicks circle about the stove in a satisfied manner, at or near the edge of the canopy, temperature requirements are satisfactory.

BROODER STOVES

Coal and certain types of kerosene or distillate burning brooder stoves are giving good service under Nebraska conditions. Buckwheat or pea size anthracite coal is usually used

for fuel in coal burning brooder stoves. From 10 to 30 pounds of fuel per stove per day is required, varying with weather conditions, size of unit to be heated, construction of brooder house and similar conditions. When anthracite coal is not available nut size soft coal or mixtures of soft coal and stove coke are sometimes used, but these fuels are never as satisfactory as is anthracite.

Stovepipes for brooder stoves should be at least four inches in diameter and the first section should be equipped with a damper for use in windy weather. The pipe should extend at least three feet above the high point of the roof and the top of the pipe be protected with a cone-shaped cap to keep out rain and snow.

Coal burning brooder stoves will require attention at least twice daily, and in severe weather three times daily for best results, especially with newly hatched chicks.

Kerosene burning brooder stoves of the type which carry off the by-products of fuel combustion are also proving very satisfactory. Kerosene is the most satisfactory fuel for use in these brooders, but the relatively high cost of this fuel has led many poultry producers to try distillate as a fuel. The best grades of distillate are giving satisfactory results. The smaller types of kerosene burning brooders without flues for carrying off the by-products of combustion are less satisfactory. The smaller, non-drum type kerosene brooders produce much less heat than the other types, and are for that reason also limited to use late in the season.

From 1½ to 5 gallons of kerosene or distillate are required per day for the oil burning stoves depending again on weather conditions and size of unit to be heated. With all types of kerosene and distillate burning brooder stoves careful installation and skillful operation are essential to prevent unnecessary fire hazards.

When dependable electric service is available at prices not to exceed three or four cents per kilowatt-hour electric brooders are practical. From the standpoint of convenience electric brooders are perfect. The heating units used in these brooders have been improved so that most of them are now very dependable.

Since electric heat is relatively expensive it is suggested that brooder houses in which electric brooders are used should be well insulated so that no unnecessary heat leakage results. Moses and Wood * report a power requirement of from 1½ to 2 kilowatt-hours per chick for an average eight weeks brooding period. Heating units of the " black heat " type are recommended.

* California Agricultural Experiment Station Bulletin Number 441.

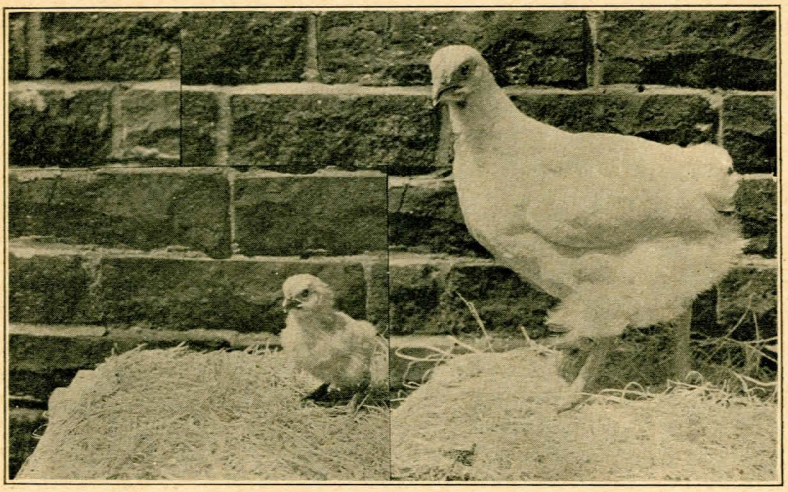


FIG. 1.—A chick that makes normal growth multiplies his initial weight 16 times by the time he is 8 weeks old, which means that he is a high speed animal.

HOT WATER BROODING SYSTEM

For poultry producers who understand the principles of sanitation, and who wish to brood 2000 or more chicks at one time, permanent brooder houses with hot water heating heating systems can be recommended. Cheaper fuels can be used in hot water systems and labor costs of caring for chicks can be materially reduced. Equipment costs are somewhat higher per 1000 chick capacity when hot water systems are installed, but permanent buildings, such as are practical for these systems, can be built more substantially and insulated better so that a saving in fuel costs is also effected in that way.

A permanent brooder house can be used efficiently by specialized poultry producers for from eight to nine months each year. It may be used starting February 1st or thereabouts for brooding chicks to be sold as broilers when ten weeks old. After a thorough cleaning of the house and equipment, it can be used for brooding the replacement flock, that is the flock from which pullets will be reared for egg production the following winter. After these chicks are past the age when they require heat, they can be moved to outside roosting sheds, and the house used again for growing a crop of broilers. Used in this way the overhead cost of equipment per chick brooded is much reduced.

Several commercial manufacturers are now offering hot water brooding systems which are giving good service. The

systems are not especially complex and any competent heating engineer can, as a matter of fact, plan a hot water installation that will prove satisfactory.

When permanent brooder houses are used, small concrete or gravel covered yards which can be thoroughly cleaned after each brooding period will be an important part of the equipment. Let us emphasize again that no one should consider the building of a permanent brooder house unless he understands the importance of sanitation and has a permanent enthusiasm for carrying out the program.

BATTERY BROODERS

Another type of brooding equipment which is being adapted to certain conditions is the battery brooder. This equipment is made up of a number of units decked one above the other, each deck provided with electric heating units. Hardware cloth floors are placed above removable pans to catch the droppings. Feed and water troughs placed just outside each compartment complete the equipment. Each unit is about 36″ x 36″ in size and six units placed one above the other make up a battery. Capacities for each deck are stated at from 100 to 125 chicks, but it is suggested that if this equipment is used to hold chicks until they are over two weeks of age that 50 chicks per unit of this size be considered maximum capacity. The feeding of complete rations, especially with reference to vitamin D, is of course absolutely imperative when battery brooders are used. A combination of battery brooding equipment to be used for four or five weeks, and a permanent hot water heated brooding system available later holds possibilities for broiler and eight weeks old pullet production.

NUMBER OF CHICKS TO BE BROODED TOGETHER

The number of chicks brooded in each unit materially influences the labor, fuel and overhead equipment costs and for that reason poultry producers want to keep as many chicks in each unit as is consistent with good results. One must remember that the type of chicks being brooded first of all affects the number which can safely be put together. With proper equipment and with skilled management 1000 Leghorn chicks can be brooded together quite satisfactorily. The brooding of 1000 heavy breed chicks together however is extremely difficult if not impossible. The heavy breed chicks do not take to the roosts so readily, and the crowding problem after the chicks are three or four weeks old is one to give concern. Even with Leghorns there is considerable evidence that 500 chicks per unit will grow with more uniformity and

less mortality than when brooded in larger units. It is suggested that 500 chick units of Leghorns and 400 chick units of heavy breeds be considered the maximum for best results except in the hands of very skilled operators.

AMOUNT OF FLOOR SPACE

Here is another problem in which the economic law of diminishing returns is known to operate. Lippincott (1) presents the data of Buster and Newlon on the correlation between floor space and brooder mortality. This data presumably applies to Leghorn chicks brooded under commercial conditions.

TABLE I.—*Showing Relation of Floor Space to Brooder Mortality.*

Floor space per 100 chicks	Number of chicks brooded	Actual Mortality	Per Cent Mortality
Less than 35 sq. ft. per 100 chicks	73,007	19,254	26.3
35 to 49.9 sq. ft.	25,371	4,122	16.2
50 sq ft or over	25,044	3,484	13.1

From this data it would seem that an allowance of one-half square foot of floor space per chick is not wasteful, but is rather most economical. On this basis brooding units of the following sizes will satisfactorily accomodate the following number of chicks:

8 x 12= 96 sq. ft.—192 chicks
10 x 12=120 sq. ft.—240 chicks
10 x 14=140 sq. ft.—280 chicks
10 x 20=200 sq. ft.—400 chicks
20 x 20=400 sq. ft.—800 chicks (Leghorns only)

VENTILATION

Ventilation is less often a limiting factor in brooding than are the other essentials mentioned because in the average heated brooder house, there is sufficient leakage of air around windows, doors and through the roof, walls, and chimney to keep the house in a satisfactory condition. As the season advances however ventilation becomes more of a problem, and for that reason windows in the brooder house should be arranged for easy opening. Back ventilation openings under the eaves across a good portion of the brooder house should also be provided for summer use.

RADIANT ENERGY REQUIREMENTS

The energy which is released from the burning coal or distillate in brooder stoves is one form of radiant energy, and it is indeed very important, but recent research work

(1) Poultry Production, Fourth Edition, Page 353.

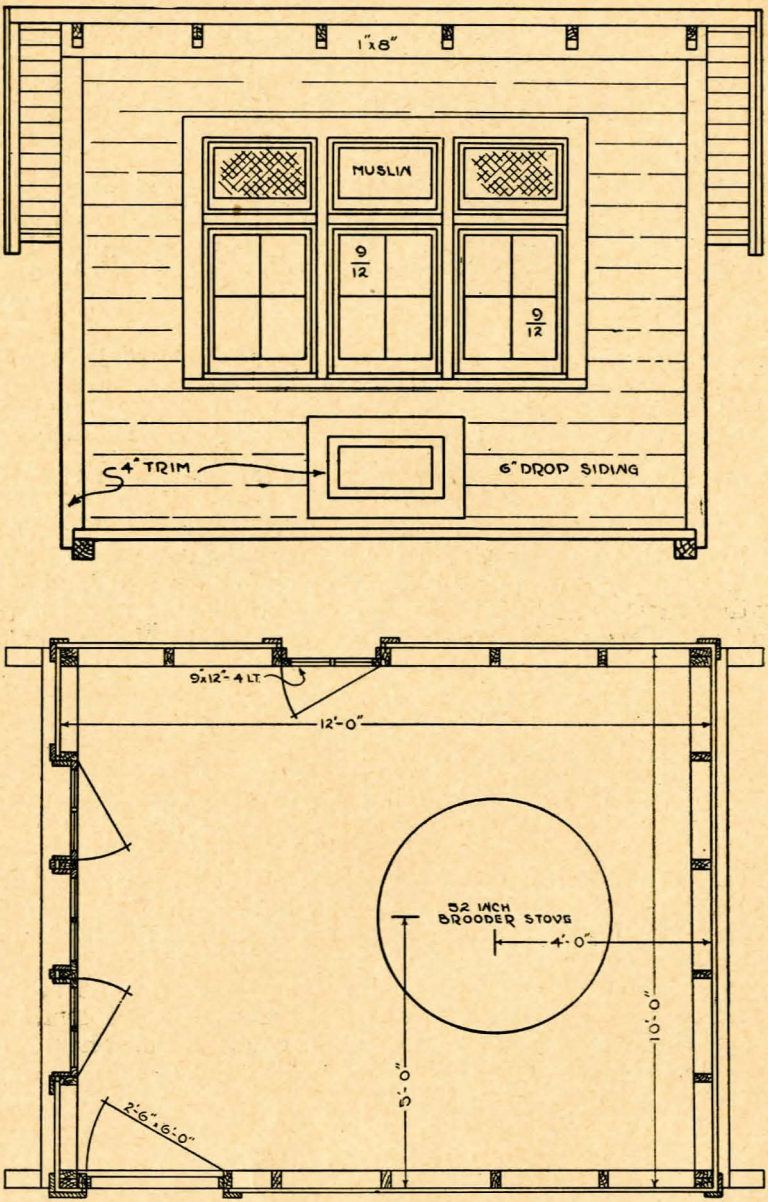


FIG. 2.—This illustrates the front elevation and the floor plan of a 10′ x 12′ broder house, the most practical size and type for Nebraska farm conditions.

has shown that another type of non-visible radiant energy is well nigh indispensable. For many years poultry producers who have attempted to grow chicks at other than the natural seasons have had trouble with a trouble which they called "leg weakness" for want of a more suitable term. Recent research work has demonstrated that this leg weakness was fundamentally a disorder similar to rickets in other animals. Rickets is a disease of the bones caused by faulty calcium and phosphorus fixation. Most cases of chick rickets can be prevented and cured by exposure to direct sunshine for a few minutes each day or by providing the vitamin factor (vitamin D) which has the same effect on calcium and phosphorus fixation. The effective radiation in sunshine is known as ultra violet, and constitutes only about one per cent of the total energy in the sun's radiations.

Sunlight which has passed through glass has had most of its ultra violet radiation reflected or absorbed by the glass, and is not effective in protecting against rickets. A number of glass substitutes are being manufactured which transmit a considerable part of the ultra violet radiation, and the use of the sun parlor with a muslin or cheesecloth covered top offers a method of exposing young chicks to direct sunshine without unduly chilling them.

SANITATION AND HYGIENE

Experienced poultry producers now generally agree that the most important subdivision of the brooding problem is that of maintaining a sanitary environment. Courageous departure from the old beaten paths is being taken by many poultry raisers with some degree of success in solving the very perplexing problems of health maintenance.

There are many parasites which prey upon the growing chick and the mature hen. Baby chicks do not have the natural resistance which older stock acquires to a degree at

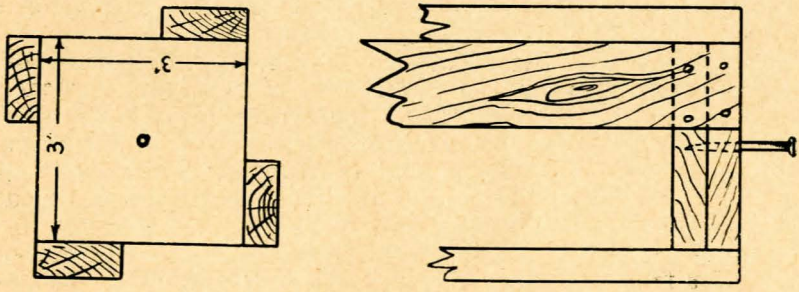


FIG. 3.—End view of reel with no dead center.

least, and so the following of a rigid sanitation program is of especial importance with chicks during the first ten weeks. Expressed in a few words the high points of a sanitation program are (1) clean feed; (2) clean water; (3) clean houses; (4) clean yards.

Plans for reel-protected feeders for feeding dry mash and green feed, aids in the clean feeding program, are illustrated here and discussed in more detail in Extension Circular Number 1441. These devices are not expensive, and will conserve their cost in feed saved in one year.

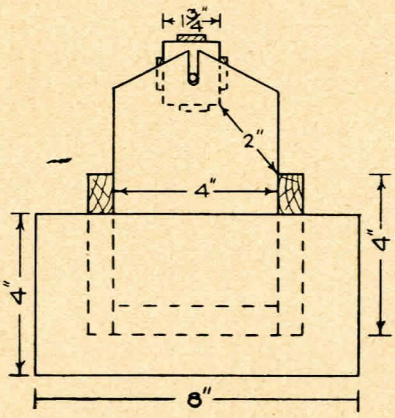


FIG. 4.—End view of reel-protected feed water trough for growing chicks. By raising the reel, more head space is allowed the growing chicks.

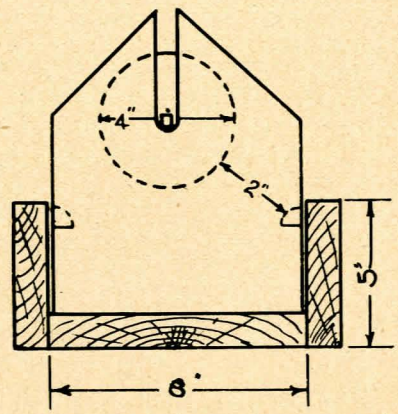


FIG. 5.—End view of large trough where a 4" brooder stove pipe or a gutter pipe is used for a reel. A lip for the edge of the trough is made by nailing quarter round to the inside of trough.

For water and milk the common earthenware crocks are quite satisfactory, although not strictly sanitary. Both feed and water utensils should be placed on a stand or platform covered with half inch mesh hardware cloth.

Just how often the brooder house should be cleaned will depend somewhat on the number of chicks being brooded together, size of the chicks and the prevalence of any infectious trouble. If an outbreak of coccidiosis occurs, for instance, it is very desirable that the brooder house be thoroughly cleaned every four days until the disease is controlled. In general it is better to err by cleaning too often than by cleaning too seldom. The writer has never known of chicks to suffer from too much sanitation, but has known of thousands of chicks to suffer from a very evident lack of it

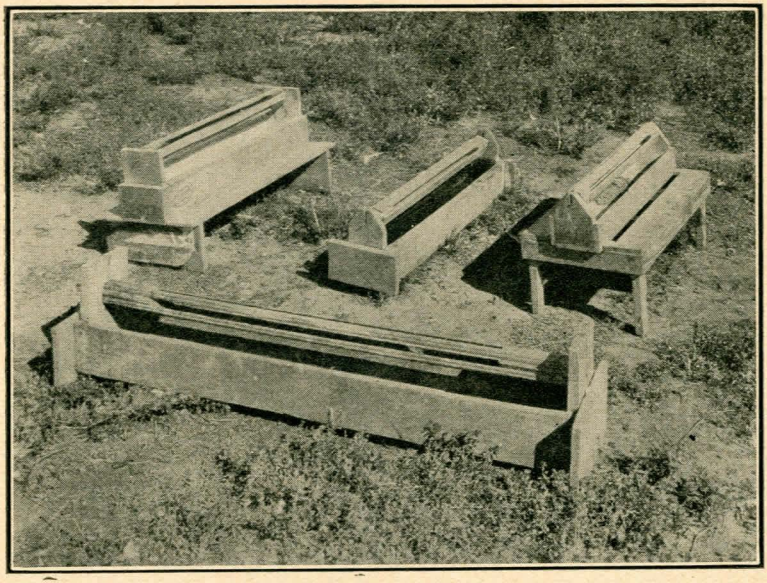


FIG. 6.—Four types of protected feed and water troughs.

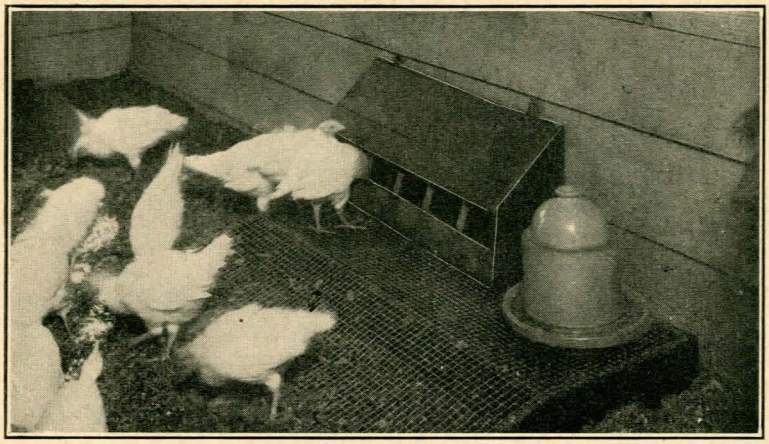


FIG. 7.—Feed and water stand made with top of hardware cloth.

Clean yards or a clean range are also an important factor in sanitation. The poultryman has in this connection three options,—(1) movable brooder houses to be put on clean ground each spring; (2) permanent brooder houses of the small type with a rotation system as is illustrated in Figure

8; (3) permanent brooder houses with board, cement or graveled covered yards which can be regularly and thoroughly cleaned. One thing is definitely established,—that heavy fertile soils, such as abound in all the most important poultry raising counties of Nebraska, soon become contaminated with

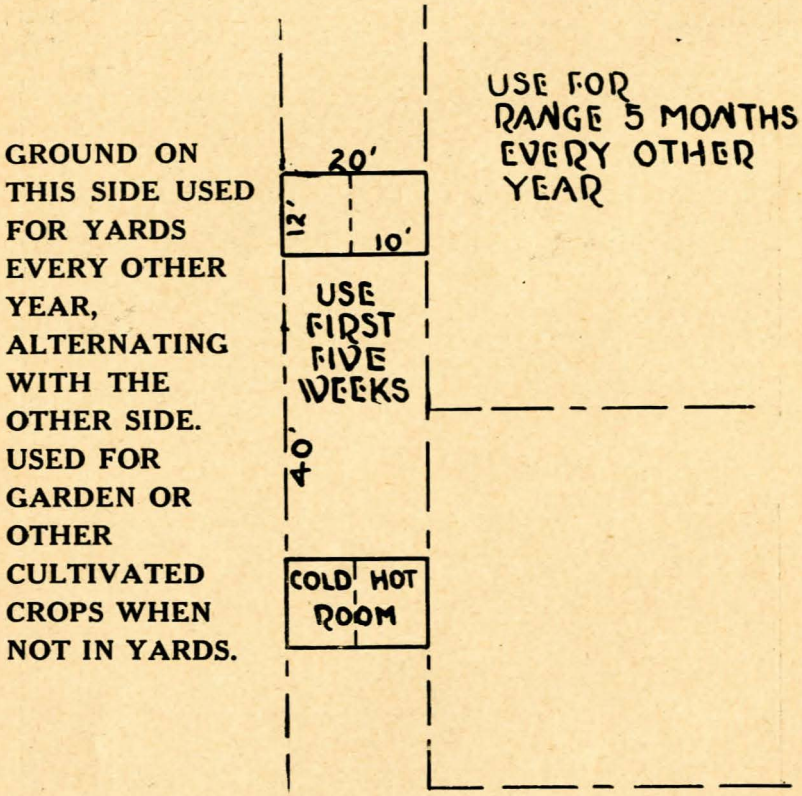


FIG. 8.—Plan for rotation of chick yards where permanent brooder houses are used.

harmful parasites of several types and some practical way must be found to keep them under control, otherwise poultry health will suffer.

The most practical program is to prevent them from becoming established in the bodies of our birds rather than to try and oust them later by using vermifuges, vermicides and other chemical agents which, after all are of doubtful value.

There is shown herewith a plan for the rotation of chick

yards where a permanent brooder house is used. This plan is being used on numerous poultry farms with success.

Another program which is being successfully followed is the use of permanent brooder houses with small cement or gravel covered yards for use until the chicks are well feathered so that they no longer require heat. At this time the cockerels are separated from the pullets and the latter are moved to inexpensive roosting sheds placed on the edge of a cornfield, orchard, or similar location where shade and green stuff are available. Hopper feeding with dry mash under these conditions reduces labor costs and equipment costs are not greatly increased, since the roosting sheds are relatively inexpensive.

CHICK RATIONS AND FEEDING METHODS

The essential requirements for growth and egg production are fundamentally the same, and the nutritional principles on which poultry rations should be planned are discussed in Extension Circular 1420. The reader is therefore referred to this circular for a more extensive discussion of these principles.

There are of course hundreds of chick rations which will give satisfactory results if used with reasonable discretion. Expressed in a few words, a practical chick ration must be palatable, high in the essential vitamins, contain good proteins in proper combination and be reasonable in cost.

In Nebraska the basic poultry feed is yellow corn. Yellow corn is however deficient in mineral elements and vitamins, and its proteins are not complete. The chick feeding problem therefore consists essentially of making good these deficiencies in the most economical way by combining other feeds with corn. Feeds which can be used for this purpose are wheat and wheat milling by-products, oats, barley, skim milk, meat meal, tankage, linseed meal, gluten meal, cottonseed meal, and alfalfa meal.

FEEDING METHODS

Chick feeding methods have been much simplified during recent years by the use of the all mash method. This consists simply of mixing all elements except the liquids, grit and succulent feeds, and keeping the mixture before the chicks at all times. This method, known as the "all mash" method of feeding, has advantages in the saving of labor and in promoting sanitation. When the all mash method of feeding is used one should provide at least 4 feet of feeder space for 100 chicks. This allowance should be doubled after the chicks are 3 weeks old. The practicability of all mash feeding for the production of broilers and for the feeding of all

chicks until they are ten weeks of age has been well established. Many poultrymen however feel that when pullets are being reared for winter egg production that a modification of all the mash program from the 10th week until the pullets start laying is desirable. This modification consists of the feeding of part of the ration in the form of cracked or whole grains.

A simple all mash mixture which has been found satisfactory at the Agricultural College Poultry Farm when supplemented with green cut alfalfa or similar feed is made of the following ingredients:

Chick Mash No. 1

Yellow cornmeal	**4 parts by weight**
Shorts	**2 parts**
Bran	**2 parts**
Meat and bone scraps (20 to 23 per cent ash)	**1 part**

Another all mash mixture which has given excellent results, and which has the advantages of greater variety of proteins and higher vitamin content is made of the following elements:

Chick Mash No. 2

Yellow cornmeal	**44.0 per cent**
Shorts	**25.0 per cent**
Bran	**10.0 per cent**
Linseed oil meal	**2.5**
Meat and bone scraps (20 to 23 per cent ash)	**10.0**
Dried buttermilk	**2.5**
Alfalfa meal (leaf meal preferred)	**5.0**
Salt	**1.0**
Total	100.0

Mixture Number 2 will give better results than Number 1 when a plentiful supply of good palatable green stuff is not available. When skim milk or buttermilk are available on the farm, these feeds should by all means be used for chick feeding. When a sufficient supply of milk is available to keep before the flock at all times, the following mixture can be used:

Mixture No. 3 (with skim milk or buttermilk)

2 parts yellow cornmeal
1 part shorts
1 part bran
3 pounds raw bone meal and 1 pound salt per 100 pounds other ingredients.

HOW SOON SHOULD CHICKS BE FED?

This again is a question that has been vigorously debated for years. There is experimental evidence that good vigorous, healthy chicks can adapt themselves to either a starvation period of 48 hours after hatching or the taking of feed immediately after hatching. The growth rate is not seriously affected by withholding feed for 48 hours, and we recommend this practice. The first feed may consist of dry mash given in a small protected feeder, or, if infertile eggs are available, a crumbly mixture of hard boiled eggs and dry mash.

WHEN IS COD LIVER OIL NECESSARY?

For real early chicks and during long periods of cloudy weather the addition of a small amount of cod liver oil will be helpful in preventing leg weakness. One per cent of a good grade of cod liver oil, which is about one pint per 100 pounds of feed, will be sufficient.

One of the best methods of mixing cod liver oil with the mash is to use bran as the absorbent. Weigh out four pounds of bran and add one pint of cod liver oil. Work the oil into the bran with the hands and when this has been thoroughly done, add the bran — oil mixture to 95 pounds of other ingredients. The mixture will retain most of its rickets preventing value for at least eight weeks after mixing.

When battery brooders are used the feeding of cod liver oil or some other contributor of Vitamin D is very essential. Egg yolk also contains a high concentration of Vitamin D. Hard boiled infertile eggs can be fed at the rate of two eggs per 100 chicks, for chicks less than two weeks old. For chicks over two weeks old, four eggs per 100 chicks may be fed.

Another product which has been offered for its Vitamin D content is cod liver meal. This is a by-product of the making of cod liver oil, and consists of dried and pulverized cod liver tissue. Research work at the Nebraska Agricultural Experiment Station showed this product to have some rickets preventing properties, but five per cent of cod liver meal was not as effective as two per cent of oil made from the same raw material. Cod liver oil is a much more economical source of this vitamin essential under present conditions than is cod liver meal.

These rickets preventing supplements to the chick ration are indeed a great boon, but we must remember that they are only a substitute for the best anti-rachitic agent which is direct sunshine. Nebraska poultry raisers are fortunately favored with a very good supply of this essential during the natural chick rearing season. Through the use of an inex-

pensive sun parlor attached to the front of the brooder house, the services of direct sunshine can be obtained even when February and March chicks are being brooded.

MINERAL REQUIREMENTS

Baby chicks grow rapidly when the ration and other environmental factors are favorable and so rapid development of skeletal structure is essential. The chief mineral needs are for calcium and phosphorus and the rations listed in this circular contain enough of these and the other essential mineral elements to meet all needs if conditions required for proper assimilation are satisfied. These are provided by the ultra violet radiation of sunshine or its Vitamin D equivalents.

Research work at the Nebraska Agricultural Experiment Station shows conclusively that there is a harmful effect when too much mineral matter is included in the ration. The addition of more than two or three per cent of ground limestone or raw bone meal and indiscriminate additions of so-called complete mineral mixtures to the chick mash mixture are not to be recommended.

GREEN FEEDS

Even when the chick mash mixture is complete in all the theoretical essentials we advise the feeding of plenty of good succulent green feed at least twice daily. Early in the season sprouted oat tops can be used, later green alfalfa, blue grass, clover and similar feeds are very suitable. These succulent feeds contribute Vitamins A and B, minerals, and a certain physical factor that has not yet been expressed in scientific terms, but which is nevertheless important. The feeding of some form of succulent feed in sanitary feeders twice daily is good chick feeding practice.

FEEDING GROWING PULLETS

From the time the pullets are twelve weeks of age until they start laying the protein in the ration should be lowered slightly. The simplest way to do this is to increase the amount of yellow corn in the ration or to lower the animal protein supplement. Mixture Number 2, for instance, can be modified for use as a growing mash by lowering the meat and bone scraps from 10 to 5 per cent, and increasing the yellow cornmeal to 49 per cent. The principle to be observed is that as pullets grow older their relative growth rate decreases and consequently the protein plane should be lowered. Too early maturity at the expense of size results from the feeding of too much protein during the last part of the growth period.

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