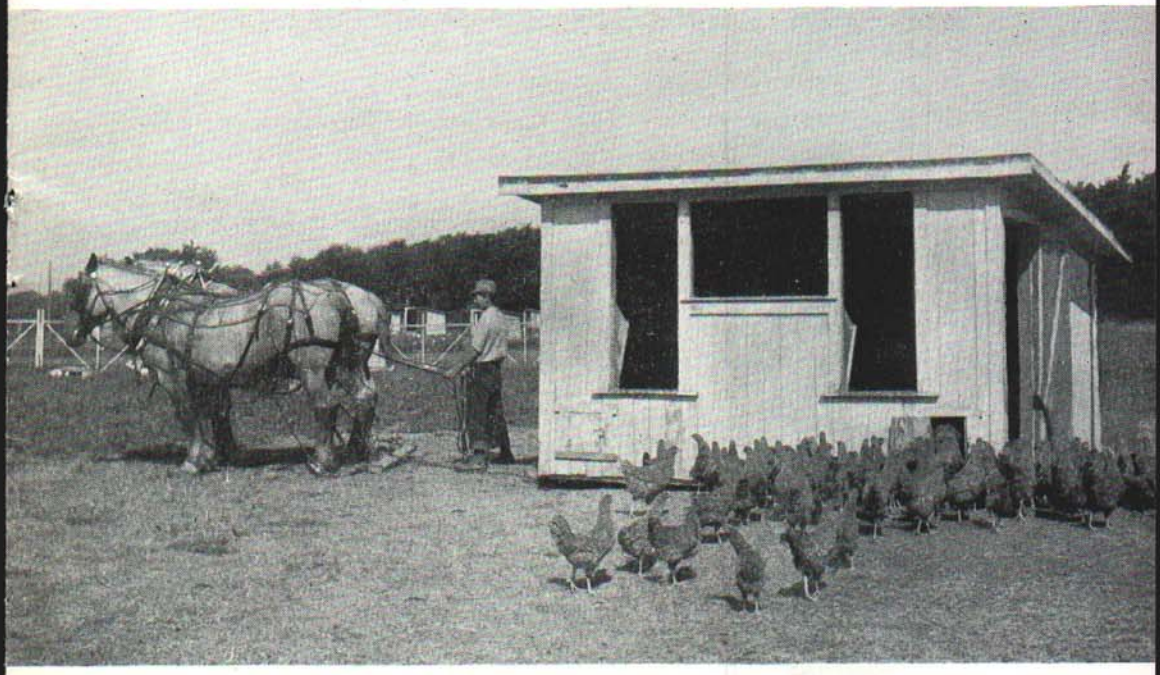
EXTENSION BULLETIN 52

Growing
HEALTHY CHICKS

By J. A. Davidson and C. G. Card



MICHIGAN STATE COLLEGE :: EXTENSION SERVICE
EAST LANSING

GROWING HEALTHY CHICKS

PREPARATION FOR CHICKS

1. *Clean range.*
2. *Clean and disinfected house.*
3. *Clean and disinfected equipment.*
4. *Adequate equipment.*

BROODER STOVE

1. *Large smoke outlet.*
2. *Coal capacity for 25 pounds or more.*
3. *Damper in stove pipe.*
4. *Electric brooder of ample size for number of chicks.*

FEEDERS

1. *Provide 100 inches feeding space per 100 chicks to start with.*

SELECTION OF CHICKS

1. *Egg breeding most important.*
2. *Cheap chicks poor investment.*
3. *Hatchery chicks are desirable.*
4. *Good hatcheries produce better chicks than do most farmers.*

FEEDS AND FEEDING

1. *Feed a good commercial starter or well mixed and adequate home mixed formula.*
2. *Feed chicks as soon as they will eat.*
3. *Include scratch grain at proper time for mash being used.*
4. *Keep mash before birds constantly.*

SUMMER RANGE

1. *Clean range covered with alfalfa or good grass sod.*
2. *Adequate shade.*

Clean range
Clean house
Well bred chicks
Good feed
Freedom from disease
Good management

result in

Well grown pullets

Profitable laying flocks

GROWING HEALTHY CHICKS

By J. A. DAVIDSON* and C. G. CARD*

Probably no farm practice has changed more during the last few years than has the method of brooding chickens. At least 80 percent of the chickens reared annually in Michigan are now artificially brooded.

Artificial brooding, with the grouping together of large numbers of chickens on limited range, has brought about new management problems. The shipping of chicks, breeding stock and hatching eggs on a large scale throughout the nation has resulted in the dissemination of poultry diseases to the extent that we now have poultry diseases on virtually every farm. The presence of disease on the farm makes new practices necessary.

During the past few years, a flock of good hens on the average Michigan farm has returned a greater farm profit than most other farm enterprises, when the amount of money invested and the amount of labor required is considered. Egg prices have continuously remained at a level above the cost of production. A poultry flock to be profitable must be well-bred, well-fed, well-housed, kept free from disease, and the layers must be replaced with well-grown pullets.

More poultrymen become discouraged over their inability to raise healthy chickens than from any other cause. The production of excellent pullets requires some information, common sense, and much hard work.

PREPARATION FOR CHICKS

Clean Range

A clean range is required for successful brooding. This range must be one on which no chickens, turkeys, or other poultry have ranged for at least two immediately preceding seasons. Poultry disease organisms live in the soil from one season to the next and it is virtually impossible to rid infected soil of these organisms. Plowing, the application of lime or other disinfectants, or cropping and cultivating may kill part of the disease organisms, but only time will kill them all.

A clean range is very important on farms where coccidiosis, range

*Department of Poultry Husbandry.

paralysis, pullorum disease, intestinal worms, tuberculosis, or other disease has been present. The organisms which cause these diseases live over in the soil, and diseases are almost certain to infect chicks which are raised on contaminated range. Select a clean range that is well-drained and is growing a good grass sod or alfalfa.

Clean Brooder House

Disease organisms also frequently live in the brooder houses from one season to the next. It must be remembered that these organisms are microscopic, and millions of them may be harbored in a single crack or under a single bit of dirt.

The brooder house should be moved to a clean range each season and must be so constructed that it can be easily cleaned. The house should be cleaned before moving to the new range, so that any refuse from the house is left at the old site. Few people know how to clean a brooder or poultry building. The word clean has only one meaning—*100-percent clean.*

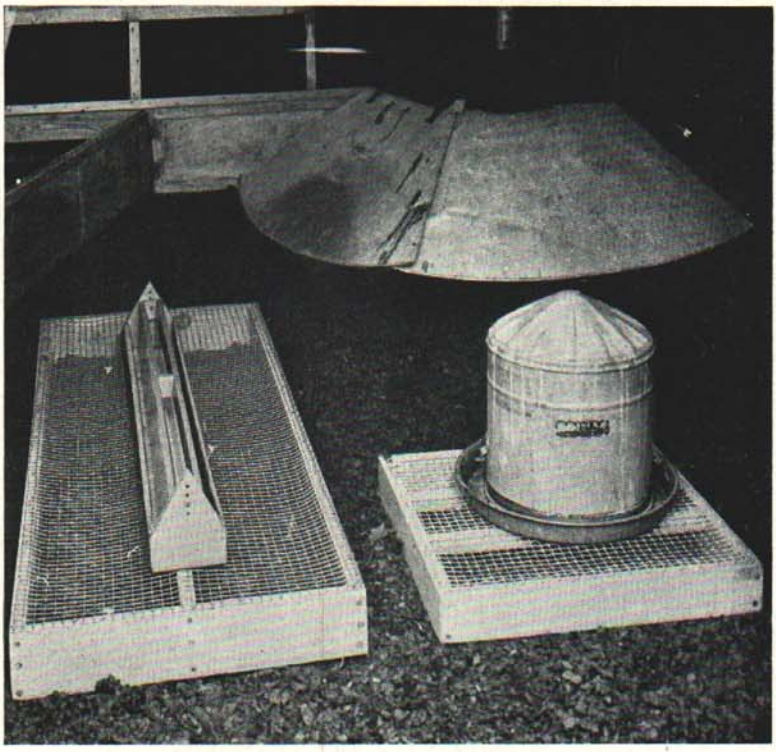


Fig. 1. Clean equipment ready for chicks.

The use of a broom and a small amount of disinfectant does not clean a brooder house. The building must be swept clean, then scrubbed, using plenty of soap and much water, and thoroughly disinfected with a good disinfectant. Scrubbing is more important than the use of a disinfectant. If the scrubbing is sufficiently thorough, a disinfectant solution may not be necessary. Obtain a disinfectant that will kill all disease organisms. Many of the common commercial disinfectants on the market will not kill coccidial organisms. Iodine suspensoid is one of the most efficient disinfectants obtainable. If properly applied, it will kill all disease organisms present in the brooder house.

When using a disinfectant for any purpose, it is very important to use it as recommended by the manufacturer. Disinfecting solutions used at a greater strength than recommended do not insure a better disinfection. Many disinfectants are most efficient at only one dilution and are less efficient when used at a greater strength than the one recommended.

In old buildings which have poor floors with cracks which collect dirt, it may be necessary to use heavy building paper or other heavy paper to cover the floor. The paper should be laid, starting from the door and lapping as it is laid toward the rear to assist in cleaning without tearing the paper or getting litter under the edge of the paper. A few tacks should be used to hold the paper in place.

CLEAN EQUIPMENT

The feeders, mash hoppers, watering equipment and roosts should be thoroughly washed with hot water and soap before being placed in the house. If extra watering equipment is available, thorough washing each week is simplified; otherwise the washing will have to be done at night.

BROODER STOVES

Portable brooder houses must necessarily be small, and they are usually one-room buildings. Stoves to be used in one-room houses should be equipped with hovers or canopies. Stoves without hovers operate very well in two-room brooder houses but do not prove satisfactory in one-room buildings, except during the season when the chicks can be turned outside at a very early age. It is never desirable to place more than 300-350 chicks about one stove. The average portable colony house 10 x 12 or 12 x 14 feet requires a brooder stove with a hover or a canopy 50 to 52 inches in diameter.

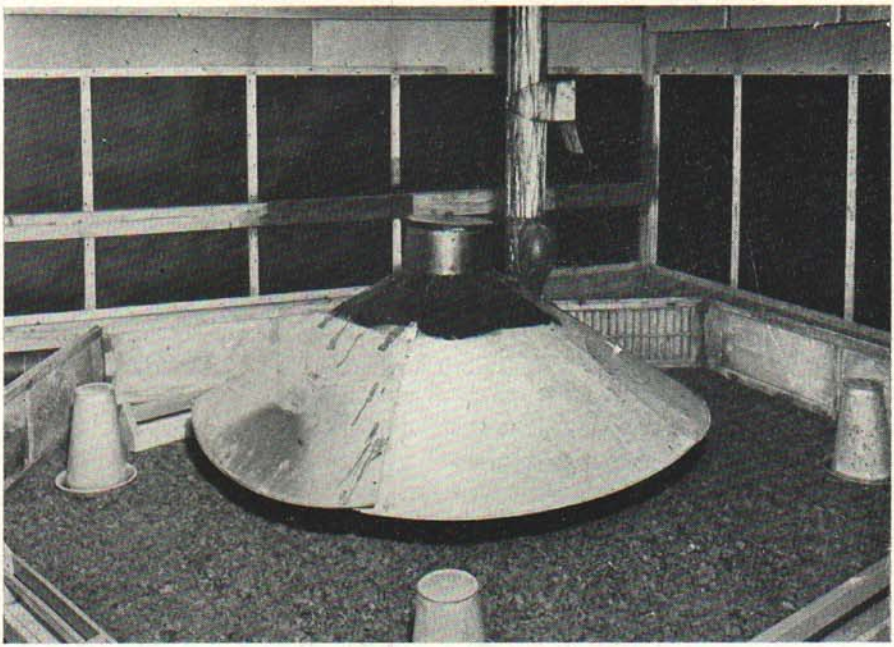


Fig. 2. Hard coal brooder, which shows guard to limit chick's activities during first few days.

COAL STOVES

Coal stoves are usually recommended because there is less of a fire hazard associated with them than is the case with oil burners. Select a coal stove that is substantially built, that has an ample-sized chimney or smoke outlet, and that will hold considerable coal. Many makes of coal burning stoves give satisfactory results.

OIL-BURNING STOVES

Some makes of oil-burning stoves give satisfactory results. In selecting a stove of this type, it must be remembered that there is a greater danger from fire than with coal burners and every precaution should be taken to minimize the fire hazard. Oil stoves have the advantage over coal burners that, in warm weather the fire can be turned out in the morning and started again in the evening, using fuel only when heat is necessary. With a coal burner, it is necessary to keep the fire going through the day since it takes several hours to get a coal fire burning properly.

ELECTRIC BROODERS

The use of electric brooders has become more prevalent with the increase of rural electrification. Many improvements have been made on electric brooders the past few years. They are very satisfactory under proper conditions and management.

The electric hover offers more uniform temperature under the brooder than can be obtained with coal or oil. However, the chick is more dependent on the attention of the operator in respect to the establishing of a temperature which will permit proper distribution. When outside temperatures are low the capacity of the brooder is decreased because of the necessity of using space for feeders and waterers. In most cases, the rated capacity is too high except under ideal conditions.

The electric hover should be operated, at first, as directed by the manufacturer. If the chicks "bunch" at certain points, the brooder is being operated at too high or too low a temperature. Necessary changes should then be made to remedy the situation. An acurate thermometer is absolutely essential in starting and regulating an electric brooder. After the chicks are placed under it, the behavior of the chicks should be observed rather than the thermometer for temperature regulation.

Usually the brooder should be made warmer during the day to drive the chicks out to cooler areas to feed and thus reduce crowding. The temperature should be reduced for the night. The temperature should be high as the birds grow older so that they will be driven to the outside and taught to roost. This will also reduce excessive dampness under the hover.

A piece of insulation board sufficiently large to place under the brooder should be used on the floor to prevent loss of heat and to reduce condensation of moisture.

An electric brooder should not be operated for the purpose of saving fuel costs, although it may do so. The primary objectives are reduction of labor and fire hazard.

Over-crowding to reduce brooding costs is false economy, because the greater part of the cost of raising chicks lies in the cost of feed and cost of chicks.

SETTING UP THE STOVE

In setting up the brooder stove, do not overlook fire precautions. Have an asbestos pad or a sand box underneath the stove. Place the stove so the ashes can be easily removed and so that the ash door under the hover can be easily seen.

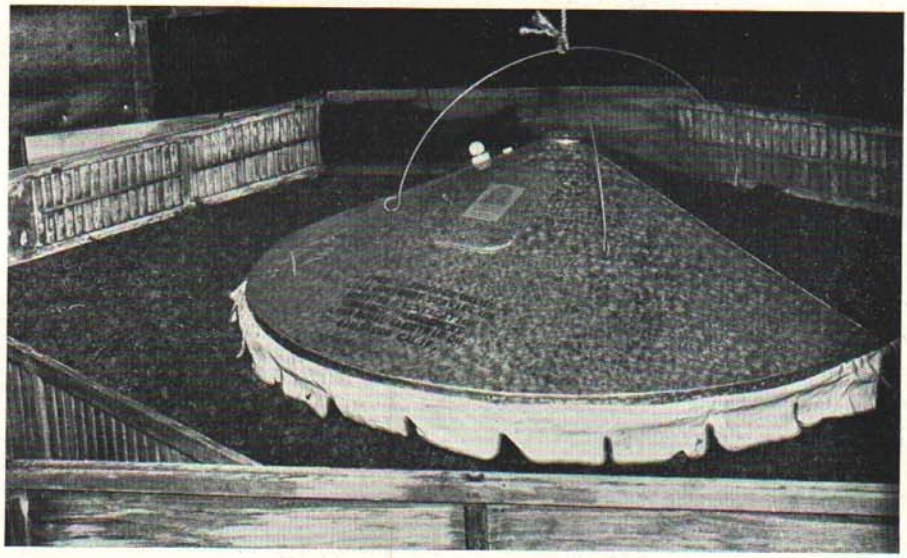


Fig. 3. Electric hover suspended from ceiling. Height easily adjusted.

Regulate the stove to a temperature of approximately 90° F. at a level of one inch above the floor under the outside rim of the hover. Proper chick brooding requires sufficient heat under the hover and a cool brooding room. More chicks are injured by too much heat than are hurt by too little. Keep the brooder room as cool as possible, with the temperature under the hover high enough so the chicks can get warm if they wish. Ideal conditions require a temperature of 85°-90° F. under the outside edge of the hover and a room temperature of not more than 70° F. (on the wall, 4 feet from the floor). These temperatures may be reduced gradually as the chicks get older. It is important that the chicks be kept cool and that all feeders and waterers be placed away from the stove so that the chicks are encouraged to stay in the cool part of the brooding room. In brooding chicks, a good rule is to keep them just as cool as possible and yet comfortable. If the young chicks crowd around the stove, the temperature is too low and if they settle down at night at a considerable distance beyond the edge of the canopy, the temperature probably is too high. Observe the behavior of the chicks.

CHICKS

About 75 percent of all Michigan chicks are purchased from hatcheries. Better chicks can be obtained from the hatchery than are produced on the average farm. The commercial hatcheries are able to produce good quality chicks through the use of such factors as purchase of good males, proper selection of eggs, proper incubation.

In selecting chicks or in selecting sources of chicks, price should not be the first consideration. If the chicks are to be raised for laying purposes, it must be remembered that ability to lay is an inherited characteristic. A profitable flock must lay 150 or more eggs per bird, and it is possible for well-bred farm flocks to average 200 or more eggs per bird. To make such a record, it is necessary that the parent stock be bred for high-egg production. High-record hens and high-record flocks are invariably the progeny of high-record parents. Chicks coming from ordinary flocks that lack production characteristics are unlikely to lay more eggs than their ancestors.

The importance of this egg breeding factor cannot be over-emphasized. Profit or loss depends almost entirely upon the egg breeding of the chicks purchased. A difference of only a few cents per chick may mean the difference between profit and loss. The poorly bred chick and the well-bred one look alike when they are hatched and they may look much alike when they are matured; but the well-bred pullet may lay 200 or more eggs per year, and the poorly bred one (receiving the same care and the same attention) may lay only 100. There may be a difference of 10 dozen or more eggs in the annual production of the two pullets. At an average sale price of 25 cents per dozen, this means a difference of $2.50 per bird in gross income; *the original difference was only a few cents in the original cost of the chicks.*

Farmers should remember that hatchery operators are primarily business men and are producing chicks for the purpose of making a profit. Chicks that are sold at cheap prices are invariably cheap chicks. A hatcheryman cannot invest much in breeding males, blood-testing, selection of eggs, and in the other expensive operations that are necessary to produce good chicks and then sell these chicks at a low price. Carefully kept cost records on hatchery production indicate that a good hatchery operator spends at least 9 cents or more per chick to produce good quality chicks.

In determining the number of chicks to be purchased or hatched, it is best to figure on starting at least three chicks, male and female, for every good pullet desired.

Pullorum disease is probably the only disease of any practical importance that may be contracted by the chick through the egg from which it hatches. Pullorum disease is a new name for a disease formerly known as bacillary white diarrhea. Continued testing and the removal of carriers of this disease from the laying flock reduce the likelihood of a serious outbreak in the chicks. In selecting chicks, inquire about the disease history of the flock from which the chicks come, particularly with reference to pullorum disease.

GOOD CHICKS COME FROM GOOD ENVIRONMENT

When purchasing baby chicks, adequate inquiry should be made not only into the quality of the parentage of the chicks being purchased but some attention should be made to the integrity of the seller. It is unfortunate that there are some dealers in chicks who are not entirely reliable, and annually many thousands of dollars are spent for chicks that are not of the quality they are represented to be. Chicks, hatching eggs, or poultry breeding stock which are approved or certified or which are produced under Record of Performance supervision, are usually dependable. When purchasing from a poultryman who has had his flock, hatchery, and advertising program inspected and approved by some recognized unbiased state agency, one has an added assurance of the quality of the stock and of the reliability of the seller.

NATIONAL POULTRY IMPROVEMENT PLAN

The National Poultry Improvement Plan was approved by the cooperating states in 1935. The plan is administered by the Bureau of Animal Industry of the United States Department of Agriculture. The work of the organization has been a distinct aid in promoting activities which will improve the quality of our poultry stock.

Fig. 4. 10 x 12 portable colony house.

The Michigan State Poultry Improvement Association was organized in 1925. This state association is now the official state agency for the National Poultry Improvement Plan. Membership in the state as well as the national organization is voluntary. Hatcheries cooperating under the National Poultry Improvement Plan have their hatchery, eggs and breeding stock inspected during the hatchery season by the official state agent representing the association.

For further information as to grade of chicks offered, breeding and health requirements, and other pertinent information desired, one may write to the Field Manager, Michigan Poultry Improvement Association, East Lansing, Mich.

Chicks that are poorly incubated are difficult to raise, and all chicks—whether hatched at home or purchased—should be closely and rigorously culled before being placed in the brooder house. Deformed, small, and weak chicks should be killed. Poor chicks are a continual liability and they probably will never return a penny of profit if they live.

RATIONS

Commercial poultry feeds, as manufactured and sold by reliable concerns, are dependable. These firms usually are careful about the quality of the feeds manufactured and sold. If one decides to feed a commercial ration, a feed sold by some reliable concern should be selected and given a fair trial by using it for a considerable period of time. The feeding routine or instructions recommended should be followed. The business of manufacturing and selling feeds is extremely competitive and competition requires that commercial concerns market good feeds.

Open Formula Feeding

Much time and money have been spent by the agricultural experiment stations and the United States Department of Agriculture in developing rations for growing chicks.

The argument shifts back and forth as advocates of all-mash starters and those for mash and grain combinations do additional work. The formulas change as new discoveries are made and new products become available. There is much good to be gained by this competition. With the information available today, it is possible to make a great many combinations that are satisfactory. Therefore, the feed to use will depend on the price of ingredients and the purpose for which the feed is intended.

The level or amount of protein and quality or source of it is important. The day-old chicks requirement for protein is high, gradually decreasing as the birds become older. Therefore, if the protein con-

tent of the mash is lower than required, the rate of growth is slower and the amount of feed consumed is greater for a unit of gain in weight. For that reason, many poultrymen prefer a starter fairly high in protein and use grains to reduce the crude protein intake as the birds grow older.

The "Spartan Chick Starter" developed at the Michigan Agricultural Experiment Station several years ago has proved satisfactory as an all-mash starter under a variety of conditions. It may also be used as a growing mash by feeding grain after the chicks are 6 to 8 weeks of age. It is composed of as follows:

36 pounds yellow corn meal (med.-coarse ground)
20 pounds wheat bran
20 pounds ground oat groats or ground oatmeal
10 pounds dried milk
5 pounds meat scrap (50% protein)
5 pounds alfalfa leaf meal
1 pound salt
2 pounds steamed bone meal
1 pound cod liver oil (85 D or equivalent from higher potency oils)
4 ounces manganese sulfate per ton

This starter apparently is satisfactory as regards the necessary vitamins. The mineral content is sufficiently high if no grain is fed and the chicks are allowed range at an early age. The rate of growth is reduced somewhat by the low-protein content (16 to 17%) for the first few weeks. Where liquid milk is available, the amount of dried milk may be reduced accordingly. One gallon liquid milk is equal to 0.9 pound dried milk.

Mash and Grain Ration

For those who wish to feed grain starting from 10 days to 3 or 4 weeks of age, depending on the date of hatch and whether batteries or brooder houses are used to start the chicks, the following formula has proved satisfactory:

33 pounds yellow ground corn (med. to coarse ground)
20 pounds wheat bran (reground)
20 pounds ground oat groats or ground oatmeal
10 pounds dried milk
5 pounds meat scraps (50% protein)
5 pounds vacuum-dried white fish meal (60% protein)
5 pounds dehydrated alfalfa meal
1 pound salt

1 pound cod liver oil (85D, or equivalent Vit. D. from other sources)
4 ounces manganese sulfate per ton

Using grain with this type of formula will reduce the amount of mash consumed during the early life of the chick. The amount of feed necessary to produce the first pound of gain will be less with this formula than with the Spartan Starter.

BROILERS

If chicks are to be raised for broilers, they should be so bred that by nature they will produce good marketable broilers at an early age. Broiler producers usually prefer Barred Rocks, White Rocks, Wyandottes, New Hampshires or crosses of the above-mentioned varieties.

Broiler Mash

In the formulas mentioned dried milk is one of the principal ingredients as a source of protein and vitamins. At times, when dried milk is not available or when the price is unusually high because of scarcity, the following mash which has been used as a broiler mash, will prove satisfactory:

Ground yellow corn	28 pounds
Ground oats (heavy)	14 pounds
Wheat bran	14 pounds
Flour middlings	14 pounds
Dehydrated alfalfa meal	5 pounds
Meat scraps (50%)	6 pounds
White fish meal (60%)	6 pounds
Soybean oil meal	6 pounds
Dried whey powder	2½ pounds
Steamed bone meal	1 pound
Ground oystershell flour	2 pounds
Salt	½ pound
Cod liver oil (85 units D)	1 pound
Manganese sulfate	4 ounces per ton

In this formula, dried milk is deleted and dried whey powder is used to supply the essential vitamins and vitamin-like materials found in milk. There are other products which could be used to meet those requirements. When used, they should be added in amounts that will provide the same nutrients which are supplied by the dried whey or dried milk.

Grain, principally cracked corn should be supplied when the birds are 5 or 6 weeks old. If broilers are being fed not more than 5 pounds of cracked corn per 100 birds should be fed until they are 10 weeks of age. This may be increased as they become older.

Other Formulas

Many other feed formulas will give satisfactory results. Virtually every agricultural experiment station has its own formula that proves satisfactory. Many poultrymen have variations from these formulas that they prefer for one reason or another. The rations that are included in this bulletin give satisfactory results in Michigan. They have been tried at the Michigan Agricultural Experiment Station at East Lansing, and Michigan poultrymen have used these rations with satisfactory results. There is probably no single ration that is perfect. These formulas are believed to be superior to many others and are recommended.

Management for the First Few Weeks

The brooder house floor should be covered with sand, peat litter, straw, alfalfa hay cut in short lengths, or with good clean chaff that is free from mold. Fill water dishes with water or liquid milk and feed hoppers with mash. Mash should be kept before the chickens continuously from the first feeding until they reach the laying house. During the first days or until the chicks learn to eat, the mash can be fed in shallow pans, on newspapers, or in inverted chick box covers. The regular box cover turned bottom side up and lined with paper is a satisfactory feed container for the first few days. These covers should be cleaned two or three times each day, relined with paper, and filled with fresh mash.

Most poultrymen make the mistake of not providing an adequate number of hoppers and water dishes for their chicks. Seventy-five to one hundred square inches of feeding space should be provided for each 100 chicks at the start, and, as they become older, much more space is necessary. Sufficient hopper feeding space should always be available so that virtually all of the chicks can eat at one time. Insufficient feeding space contributes to uneven growth as the less vigorous chicks are crowded away from the feeders and do not eat as they should.

Milk Feeding

Ten percent of dried milk is included in the Spartan Starter and Growing ration. Where liquid milk is available and is kept before the chicks continuously, the amount of dried milk can be reduced from 10 percent to 5 percent of the ration. When liquid milk is being fed, every possible effort should be made to discourage flies. Milk is an excellent feed, fed either sour or sweet or as buttermilk, but the flies that congregate about the milk dishes may be intermediary hosts for tapeworms. The elimination of house flies may prevent a very large percentage of the tapeworm infestations.

Growing Mashes

The starting mashes listed may be used as a growing mash if grain is fed in hoppers after the chicks are 6 weeks old. The cost will not be greatly more than when a lower protein growing mash is used because the growing birds will eat less of them than they would of the lower protein growing mash.

However, the amount of milk in some rations is higher than necessary for birds on range. Therefore, a mash with less milk may be used. Ground whole oats may be used instead of more expensive oat products.

The growing mash that has proved satisfactory at Michigan State College when grain is kept before the birds at all times, is:

600 pounds ground yellow corn
460 pounds ground oats
400 pounds wheat bran
100 pounds alfalfa meal (dehydrated)
100 pounds meat scrap
100 pounds white fish meal
100 pounds dried skimmilk
80 pounds soybean oil meal
30 pounds oystershell flour
20 pounds salt
10 pounds cod liver oil (85 units D)

On this mash the birds will consume about twice as much grain as mash. The grain may consist of equal parts cracked corn and whole wheat. Whole corn may be used to replace gradually the cracked corn after the birds are 10 to 12 weeks old. Whole oats in a separate feeder may be advisable.

Where the plan of feeding the grain continuously in feeders is practical the use of the starting mash until the chicks are 10 to 12 weeks of age may be desirable, after which time the laying mash may be fed as a growing mash. This eliminates having one more feed mixture and also eliminates a change of feed when the pullets are housed.

Green Feed

Succulent green feed is desirable. Chicks should be raised on good pasture. Alfalfa, June grass, or other well established grass pastures are very satisfactory. If the chickens are not ranging where they can secure succulent green feed at will, it should be provided for them daily. Cut green alfalfa, lettuce, cabbage, Swiss chard, or other similar green feeds give satisfactory results.

Cod Liver Oil

It is a good practice to incorporate 1 percent of cod liver oil, 85 D, in the starting and growing ration. Early in the season, if the chicks are not being exposed to sunshine, they need cod liver oil. Later, if the chicks are getting direct sunshine, they may get along without it but it is relatively inexpensive and 1 percent of cod liver oil should be used in the starting mash. Higher potency oils may be used at an equivalent rate.

Perches

It is important that chicks be taught to perch as early as possible, unless there is a tendency of the strain to develop crooked breast bones from too early perching. It is desirable to provide low perches as soon as the chicks show any perching inclination. Leghorns will start to perch when two weeks old. Rocks and Reds will usually not take to perches until four to six weeks old. As soon as all chicks have learned to perch at night, the brooder stove can be removed. If the stove is removed before the chicks are perching, they are likely to crowd into the corners and to smother those on the bottom of the pile.

*Feed Consumption (Including Milk Solids) and Weight of Birds by Week**

Weeks of Age	White Leghorns		Rhode Island Reds	
	Feed Per Bird Lb.	Weight Per Bird Lb.	Feed Per Bird Lb.	Weight Per Bird Lb.
0	.....	.08	.....	.08
1	.09	.11	.10	.11
2	.28	.18	.29	.16
3	.57	.26	.56	.26
4	.94	.38	.95	.36
5	1.42	.50	1.48	.53
6	1.96	.69	2.18	.73
7	2.71	.90	2.96	.96
8	3.51	1.09†	3.94	1.22
9	4.41	1.22	4.95	1.52
10	5.40	1.41	6.02	1.80
11	6.45	1.56	7.15	2.01
12	7.53	1.80	8.39	2.29‡
13	8.64	1.93	9.62	2.39
14	9.74	2.06	10.83	2.56
15	10.93	2.20	12.14	2.76
16	12.11	2.36	12.58	2.90
17	13.54	2.49	15.17	3.13
18	14.93	2.63	16.82	3.26
19	16.38	2.72	18.38	3.43
20	17.91	2.90	20.12	3.68
21	19.39	3.05	21.89	3.85
22	20.83	3.12	23.68	4.00
23	22.29	3.22	25.41	4.16
24	23.84	3.28	27.24	4.29

*The data were compiled from Storrs Agricultural Experiment Station Bulletin No. 96, being the averages of three experiments with a total of 1,028 White Leghorns and 865 Rhode Island Red chicks. Birds had skimmilk to drink and no water during the first 10 weeks, after which both milk and water were supplied. An outdoor range was provided.

†Leghorn cockerels were removed at the end of the eighth week.

‡Rhode Island Red cockerels were removed at the end of the twelfth week.

Night Lights

Many poultrymen are successfully using all-night lights on their chicks. A 25-watt bulb is placed in the brooder house and kept burning at night, except during the first week or two when electric brooders are used. This practice virtually eliminates mortality from crowding. A dim light through the night not only keeps the chicks from crowding but seems to stimulate growth slightly. A few chicks will be found at the feed hoppers at all times. Chicks eat, return to the hover, and eat again in a few hours. Where electricity is available, the use of lights the first few weeks is desirable.

A question often asked by poultry keepers is, "How much feed is required for a chick of a certain age, and what should the chick weigh?" The preceding table is of interest in that connection.

SUMMER RANGE

The summer range is very important. As previously mentioned, the chick range and the growing range should be good green pastures of alfalfa or grass. Summer ranges should not be over-crowded, and the brooder houses or summer shelters should be scattered so that the growing chickens do not congregate in large numbers. Best results are obtained when not more than 200 birds are grown in a group. The cockerels and pullets should be separated early. One should dispose of the males as soon as they are marketable and one's time and facilities can then be devoted to the pullets that are to be retained as layers.

Where permanent brooder houses are being used or where inadequate portable houses are available, summer shelters, as shown in the

Fig. 5. Summer shelter located on good grass range.

illustration, prove very practical and satisfactory. These shelters are inexpensive and are preferable to brooder houses during hot weather. Plans and specifications for this type of shelter may be obtained without cost from the Michigan State College Poultry Department.

SHADE

Ample shade is essential, and, if the brooder house or colony houses or summer shelters can be moved near a clump of trees, the trees not only provide shade but also make excellent roosting quarters for growing pullets. If natural shade is not available, artificial shade may be made for the birds. Adequate hopper space and waterers must be provided outside of the shelters. Growing pullets or cockerels require about the same amount of hopper space as do adult birds, or about 10 feet of feeding space for 100 birds.

HOUSING

When Leghorn pullets are five months old, they can be placed in winter quarters. Rocks, Reds, or other heavy varieties should be housed by the time they are six months of age. As soon as the birds are placed in the laying house, they should be fed a regular laying ration.

CONFINEMENT REARING

Chickens can be successfully raised in confinement. It is important where chickens are being raised in restricted quarters, that they have plenty of room and that adequate feeding facilities be available. The feeding rations must include everything necessary to insure good growth. By using the Spartan Starter and when cod liver oil is incorporated in the mash, one can grow chickens satisfactorily in confinement. It is desirable to have small outside pens large enough so that the birds can go outside for sunshine. These pens may be of concrete, wire screen, or board floors. Wire screen, usually one-half inch gravel screen, above concrete floors is very practical. This arrangement prevents the birds from walking in their droppings, and the concrete under the wire can be easily cleaned.

BATTERY BROODING

Batteries, to be used just for starting chicks, for a week or 10 days, are not economical unless they can be used frequently. If the batteries are properly regulated under suitable surroundings and not crowded, chicks can be so started satisfactorily. When removed from the batteries, however, and placed on the floor the birds require more attention and training than if originally started on the floor.

Battery brooders have been used for a great many years, in some cases, by using larger cages without heat for the purpose of producing broilers. This generally is a highly specialized phase of poultry production, so that for the average farmer and poultryman the investment is too great.

SEXED CHICKS

The purchasing of day-old sexed pullet chicks is a practice rather generally followed by those rearing Leghorns. If the chicks are properly handled while being sexed, there is no injury to them as chicks or as laying pullets. The purchaser of day-old sexed pullet chicks usually pays a price twice that of straight-run chicks. He thus pays the price of the cockerel and the sexing charge.

Because it is usually difficult to make a profit on Leghorn broilers, benefit arises in that there is less congestion, due to the fact that one is only rearing pullets. However, some seem to believe that they can rear as many pullets as straight-run chicks, thus they have an overcrowded condition and probably produce lower grade pullets.

The authors urge that when sexed pullet chicks are purchased that one purchase only one-half the number of the straight-run chicks, thus not crowding the pullet flock. The fewer birds reared may make it possible to avoid disease, and consequently, have a lower overhead or total cost.

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