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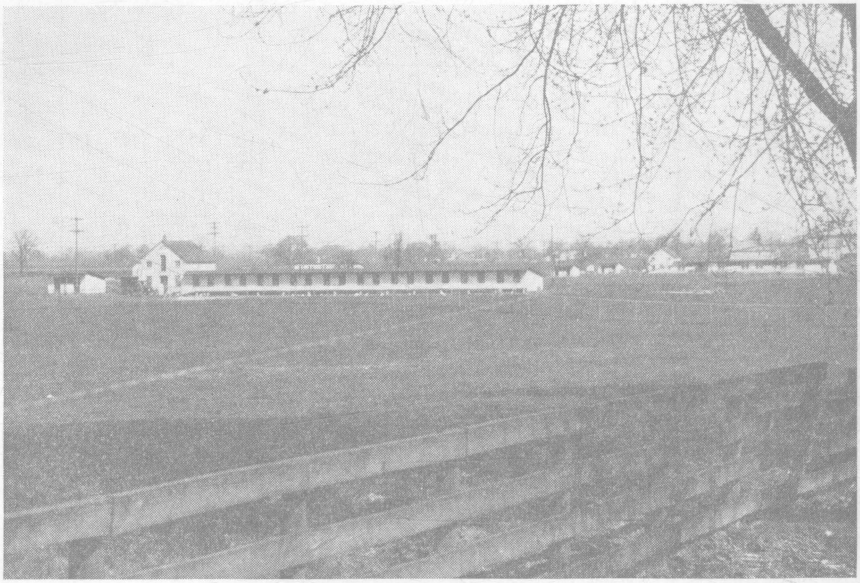
H. C. RAMSOWER, Director

Poultry Feeding Stuffs and Rations



A portion of the Ohio State University poultry plant, where feeding experiments are conducted.

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CONTENTS

PART I.—FEEDING STUFFS

PART II—POULTRY RATIONS

Poultry Feeding Stuffs and Rations

The feed nutrients to be considered in feeding stuffs are proteins, carbohydrates, fats, minerals, and vitamins. The amount and quality of nutrients in different feeding stuffs are subject to wide variations and are dependent on source, soil conditions, climate, method of preparation, storage, age, etc. The feeding value of feeding stuffs depends on the combinations fed and the purpose of feeding; such as growth, maintenance, fattening, or egg production.

The many variables prevent a statement of the nutritive value of a feeding stuff that holds good in all cases. Feeding experiments involving consideration of many of the variables and combinations have not been tried. Much valuable information concerning feeding practices is being found out each year. In addition, many new products and by-products of several industries are being placed on the market for feeding purposes.

The purpose of this bulletin is to summarize what seems to be the most reliable information known at present concerning the principal feeding stuffs suitable for Ohio poultrymen, and their use in poultry rations.

PART I—FEEDING STUFFS

PROTEIN FEEDS

Protein is necessary for growth of flesh, internal organs, feathers, etc. It also furnishes about 50 percent of the solids found in the edible part of the egg. Among the feeding stuffs fed for this purpose are milk, packing house by-products, and vegetable protein concentrates. Milk probably furnishes the best protein material for poultry, but the high price makes it an uneconomical feed to buy except when fed in limited amounts. The packing house by-products, such as meat scraps and tankage, find extensive use. If of good quality, they make economical and satisfactory feeding stuffs.

Vegetable protein feeds, such as cottonseed meal, soybean meal, and corn gluten meal may be used instead of the more expensive animal protein feeds, but do not give quite as good results. These products will give very poor results unless fed with a mineral mixture. For economy in feeding practices, combinations of the above groups of proteins sometimes give better results than when fed alone. For instance, the average producer may make a better profit by feeding both milk and packing house by-products, or a vegetable protein feed with either milk or packing house by-products, than when he feeds any one of these alone.

Liquid Milk.—Sweet and sour milk are considered of equal feeding value for both young chicks and laying hens. Skimmilk and buttermilk are also considered of equal value provided no additional water has been added. A gallon of liquid milk may be considered equal in feeding value to about 3 pounds of semi-solid milk, 1 pound of dried milk, or 1 pound of meat scraps or tankage. When liquid milk is available on the farm at 4 cents a gallon or less, it is much cheaper than semi-solid milk or dried milk or tankage. Where both water and milk are given to drink it is hard to secure sufficient protein intake from the milk, and additional protein concentrate should be fed in the mash. A hundred hens will drink from 3 to 4 gallons of milk a day.

Dry Milk.—Dry skimmilk and dry buttermilk are considered of equal value for feeding purposes. The procedure used in preparation may alter the quality of the products. Choose a white or creamy white product in prefer-

ence to one that is brown. About 13 parts of all the feed consumed would have to be dry milk if one wished to feed as much milk in the dry form as the birds would eat if given liquid milk to drink.

Semi-solid Milk.—Semi-solid skimmilk and semi-solid buttermilk are considered of equal feeding value. It is believed that cod liver oil keeps its original vitamin content when mixed in semi-solid milk. It would require about 10 pounds of semi-solid milk per 100 hens per day to furnish the same amount of milk as would be consumed if given in the liquid form. If semi-solid milk is fed as a liquid with the same strength as liquid milk, it requires about 3 pounds to a gallon of water.

Meat Scraps.—This product is sometimes called meat meal. It consists of the dried and ground residue, after partially extracting the fats and oils from animal tissues, exclusive of hoof, horn, manure, and stomach contents. The larger the amount of bone material in the product the lower will be the protein content. The material may vary from around 40 percent ash and 35 percent protein in the case of meat and bone meal to 10 percent ash and 75 percent protein in the case of meat crisps. Most of the meat scraps on the market carries about 50 percent protein and 20 to 25 percent ash. Therefore, with each 5 pounds of meat scraps fed there is about 1 pound of bone meal included.

Good quality meat scraps contains less than 10 percent fat, is light brown in color, comparatively free from brownish-black particles, and has the odor of scorched, fresh meat when warmed.

Tankage.—Tankage is the residue from animal tissues, exclusive of hoof, horn, manure, and stomach contents, especially prepared for feeding purposes by cooking under live steam for many hours to remove fats and for sterilization. The material is then dried at a high temperature and ground. In the natural condition there is little difference between tankage and meat scraps, except that a little more care is used in selecting the material that goes into meat scraps, and it is usually kept cleaner.

Blood meal is often added to tankage to increase its protein content. This is objectionable, for the blood meal lowers the feeding value of the product. Tankage carrying 50 percent protein has greater feeding value than tankage carrying 60 percent protein which contains blood meal to increase the protein content. The sooner the feeder recognizes that the quality of protein plays a more important part than quantity, the better he will be able to select his protein feeds.

Tankage and meat scraps coming from the small packing plant may be of very good or poor quality. The small packer usually does not pay as much attention to the recovery of the by-products as the large packer. As a result one often finds considerable variation in appearance and quality of the meat scraps and tankage obtained from the small packing house.

Fish Meal.—This product is the clean, dried, ground tissues of undecomposed fish with or without the extraction of part of the oil. The meal may be made from whole fish or from waste coming from fish canneries. Fish meal made from whole fish has greater nutritive value than meal made largely from the heads, tails, and fins. Fish meal is not as palatable as meat scraps but resembles it very much in protein and ash content. When good fish meal can be purchased for less than meat scraps, it can be used economically to furnish at least half of the animal protein in the ration.

Cottonseed Meal.—This is a product of the cotton seed, composed principally of the kernel, with such portion of the hull as is necessary in the manufacture of oil. Good cottonseed meal contains at least 36 percent protein and should be finely ground, of sweet odor, reasonably bright in color, yellowish, not brown or reddish, and free from excessive lint. It appears that cottonseed meal, when properly fortified with minerals, can be used most economically to replace part of the animal protein in the ration for baby chicks and laying hens. Apparently the fresher the meal the better its feeding value.

Linseed Meal.—This is made from flaxseed from which the oil has been extracted. It may be used in small quantities to replace a part of the meat scraps in the ration.

Soybeans or Soybean Oil Meal.—Crushed soybeans fed in the raw state are not very palatable. Soybean oil meal which has been cooked and pressed to remove the oil is more palatable. Soybeans have been raised principally for forage in the past. The feeding value of the beans or the oil meal is about the same and compares favorably with the other vegetable protein feeds.

Corn Gluten Meal.—This by-product of corn is that which remains after the separation of the larger part of the starch, the germ, and the bran by the process employed in the manufacture of cornstarch and glucose. It may be used to replace part of the animal protein feed in the ration.

THE CEREAL GRAINS AND BY-PRODUCTS

The cereal grains—corn, wheat, oats, barley, etc.—do not vary much in composition and feeding value. They are classed as the carbohydrate or energy and fat producing feeds. The cereal grains vary in vitamin content. Vitamin B is found in the germ and outer coating of the grains. Yellow corn carries an appreciable amount of vitamin A. Many by-products of the cereal grains are on the market. They vary widely in chemical composition, vitamin content, and feeding value.

Corn.—Corn, whole, cracked, or meal, is a good feed and well liked by poultry. Yellow corn and white corn are of equal feeding value except that the former contains vitamin A, while the latter does not. Some corn is degerminated when sold as cracked corn or meal. Such products are deficient in vitamin B. Corn should usually constitute the biggest percentage of any constituent in both the scratch grain and mash in Ohio rations. It is advisable to feed cracked corn in preference to whole corn in the scratch grain.

In buying corn meal, distinguish between Corn Feed Meal and Corn Meal. The difference is as follows:

Corn Meal is the clean, sound, ground product of the entire grain.

Corn Feed Meal is the by-product obtained in the manufacture of cracked corn, with or without aspiration products added to the siftings.

Wheat.—This grain is well liked by poultry. It is more expensive than corn because of its use for making flour. The usual wheat by-products from the flour milling industry are more valuable for feeding purposes than whole wheat. Some of the smaller mills make flour and only one by-product which is commonly known as Mill Run Feed. This makes a more desirable feed than comes from mills that further divide the by-product into several fractions. The by-products contain the germ and outer coating of the grains, which carry nearly all the vitamin and mineral content of the grain as well as considerable protein.

It is likely that the standard middlings carry greater nutritive value than the other by-products listed herewith with the possible exception of wheat mixed feed. Combinations of these products may be fed. There is probably very little difference in the feeding value of winter and spring wheat by-products.

Some of the principal by-products of wheat are: wheat bran, standard middlings, flour middlings, shorts, and wheat mixed feed or mill run.

Wheat Bran is the coarse outer covering of the wheat kernel as separated from cleaned and scoured wheat in the usual process of commercial milling.

Standard Middlings consist mostly of fine particles of bran, germ, and very little of the fibrous offal obtained from the "tail of the mill." This product is obtained in the usual commercial process of milling and should not contain more than 9.5 percent crude fiber.

Flour Middlings consists of standard middlings and red dog flour combined in the proportions obtained in the usual process of milling. It should not contain more than 6 percent crude fiber.

Shorts consists of fine particles of bran, the germ, and the fibrous offal obtained from the "tail of the mill." The crude fiber content may vary from 3.5 to 7.5 percent.

Wheat Mixed Feed (Mill Run Wheat Feed) consists of pure wheat bran and the gray or total shorts of flour middlings combined in the proportions obtained in the usual process of commercial millings.

Oats.—This cereal grain is valuable for poultry if properly selected and prepared for feeding. Heavy oats (40 lbs. per bushel) are more desirable than lighter oats, because they contain less hulls. Oats can be fed most satisfactorily when finely ground and fed in the mash. The feeding value is increased when the hulls are removed, but one should not have to pay more than 20 to 25 percent more for hulled oats than for good quality whole oats. There is very little difference in the feeding value of hulled oats and rolled oats. Some oat products are: clipped oats, hulled oats or oat groats, oat middlings, oat shorts, and rolled oats.

Clipped Oats have the hulls clipped at the pointed end.

Hulled Oats or *Oat Groats* are the kernels of the oat.

Oat Middlings are the floury portions of the oat groat obtained in the milling of rolled oats.

Oat Shorts are the covering of the oat grain lying immediately inside the hull, being a fuzzy material carrying with it considerable portions of the fine floury part of the groat obtained in the milling of rolled oats.

Rolled Oats consist of nearly the whole oat kernel with only a portion of the skin and sometimes the tip removed.

Barley.—This is a very good feed for poultry. It may be used profitably to replace a part of one of the other cereal grains in the ration.

Buckwheat.—Buckwheat is well liked by poultry and makes a good feed.

Rye.—Rye has a hard kernel and is not very well liked by poultry.

MINERAL FEEDS

Minerals are as essential as any other nutrients that enter into poultry feeds. They are used to make bone, to aid in digestion and use of food, for making eggshell, part of egg contents, etc.

During growth we are principally concerned in bone development. For best results, minerals in addition to the cereal grains and animal protein feed

should usually be fed. Among the mineral substances commonly fed for this purpose are different forms of bone, rock phosphate, and limestone.

For egg production, we are chiefly concerned with minerals for making the shell and ash of the contents of the egg. The grains and protein feeds will generally supply sufficient minerals for body functions and for the contents of the egg. Mineral material for making eggshells should be supplied. Materials commonly used for this purpose are oyster shell and limestone grit.

Salt (sodium chloride) should be fed at the rate of about ½ to 1 percent of the total food consumed. It increases palatability and aids digestion. Future work will likely show that it will be beneficial to feed iron and sulfur in some form in the ration, but there is not sufficient evidence to warrant this recommendation at the present time.

The use of too much minerals, or an improper balance, may easily lead to trouble. The feeder in most cases will do well to use a simple home-mixed mineral mixture as recommended by the Experiment Station or University.

Some mineral substances used for growth and eggshell formation are:

Poultry Bone.—This material, sometimes called raw bone or steamed bone, consists of bones from packing houses that are picked out from refuse material, kept free from dirt, ground, cooked, and dried. The material carries from 20 to 25 percent protein and some fat.

Special Steamed Bone.—This consists of bones that have been thoroughly cooked and extracted. The process removes the protein fat and some of the more soluble bone material. The product is not nearly as good for feeding purposes as poultry bone.

Fertilizer Bone.—Fertilizer bone is unpalatable, not free from dirt, and has undergone a severe treatment as Special Steamed Bone.

Rock Phosphate.—This is not as readily used as Poultry Bone, probably because it contains a number of other mineral elements as impurities.

Oyster Shell.—Mineral matter in readily available form for eggshell formation is supplied by oyster shell. It is doubtful if clam or other sea shells will give as good results as oyster shell.

Limestone.—Where there is sufficient phosphorus supplied in the ration, limestone may be used for growth of bone and for eggshell formation. Only limestone of high purity should be used for poultry.

Grit.—The question of grit has received considerable attention during recent times. It is now known that the benefit derived from grit is due to the mineral matter dissolved from it and used by the chicken, and not from its aid in the grinding of food in the gizzard.

In choosing a grit, try to secure the material that furnishes the largest amount of easily soluble lime. As to size, better results will probably be obtained by the use of chick size or intermediate size as now placed on the market.

VITAMINS AND OTHER NECESSARY NUTRITIVE FACTORS

Vitamins are substances of unknown chemical composition occurring in very small quantities in certain feeding stuffs. So far it has been shown that poultry need three of these substances, Vitamins A, B, and D.

Vitamin A.—This vitamin is necessary for growth. Where there is a deficiency of it, the vitality of the bird is lowered and it is more susceptible to disease. Among the vitamin A carrying feeds recommended for Ohio poultrymen are yellow corn, the legume hays, grass from the outside range, some of the succulent feeds as carrots, and cod-liver oil of good quality. Where

the feeder is using 40 percent or more yellow corn in the ration and feeds alfalfa meal, or has legume hays such as alfalfa, clover, or soybean hay available, there will be sufficient vitamin A in the ration.

Vitamin B.—Vitamin B is also necessary for growth. A deficiency is shown by a poor appetite, loss of weight, and loss of muscular control. This vitamin is found in the germ of the cereal grains as corn, wheat, and oats. In wheat by-products it is most abundant in middlings, and then in bran and shorts. Some is found in all forms of milk. It occurs in legume hays and succulent feeds such as fruits, vegetables, roots, and tubers. Yeast is a very rich source of vitamin B. The addition of yeast to poultry rations for both baby chicks and laying hens improves them, but it is very doubtful if the increase is sufficient to pay for the yeast used. If cereal grains or their by-products which contain the germ are fed, sufficient vitamin B will be supplied.

Vitamin D.—This vitamin is necessary for poultry to make use of minerals in the ration. A deficiency of this vitamin in the ration causes leg weakness in chicks, and lowered production, thin shelled eggs, and a loss of minerals from the skeleton in laying hens. The factors which prevent these troubles may be supplied by cod liver oil, sunshine, or ultraviolet light.

Cod Liver Oil.—This oil, if properly prepared and handled, is the richest source of vitamins A and D. Cod liver oil that is exposed to the air oxidizes and gradually loses its vitamin A. For this reason it is not advisable to mix cod liver oil with more than enough feed to last one or two weeks. The red oils contains little if any vitamin A because of oxidation. The vitamin D is variable in amount in both the light and red cod liver oils. It is more stable than vitamin A but may undergo some oxidation.

The feeder can only be sure of a cod liver oil being rich in vitamins by using an oil that has been tested by a reliable firm and its strength guaranteed. When birds are not outdoors much of the time, feed 2 pounds of oil or a quart, with each 100 pounds of feed. The oil can be mixed satisfactorily by pulling to one side a few pounds of the feed, and mixing the small pile in with the remainder of the feed. If feeding yellow corn and alfalfa, both of which contain vitamin A, then the less expensive red oil can be fed if it contains vitamin D. The vitamins found in cod liver meal and in semi-solid buttermilk containing cod liver oil do not meet the requirements, and additional oil should be fed where these feeding stuffs are used.

Glass Substitutes.—The various glass substitutes are supposed to let the beneficial light rays from the sun pass through, while window glass will not. Some of the products on the market have been tested and found satisfactory, but there are doubtless some on the market that are not satisfactory. Some of the products are not durable and will not last long. Others hold dust easily and prevent the passage of beneficial rays. It is of little value to replace window glass by glass substitutes in our present type of poultry houses, for there is not much sun that gets through the windows and on the birds in the house. For much success with glass substitutes, even if the material proves durable and is kept free from dust, will necessitate having more windows extending nearly from the ceiling to the floor, or the construction of sheds with the roofs covered with the glass substitute.

Ultraviolet light machines have been used to take the place of sunshine. They are expensive and require electricity to operate them. They are not practical for the average poultryman. For fattening stations and commercial poultrymen, they may prove worth while.

PART II—POULTRY RATIONS

Benefits of a Complete Ration.—Any ration to give satisfactory results must be balanced and complete, which means that it should contain the proper amount of cereal grains or their by-products, protein feeds, minerals, and vitamins. The amount of each will vary, depending on whether the feed is to be used for growing chicks, for commercial egg production, for breeding stock, or for fattening birds for market. The choice of ingredients will depend on the purpose for which they are to be used, the price, what one has on the farm to feed, and what can be purchased when wanted on the local market.

The All-Mash Feed.—The newer idea of poultry feeding favors the feeding of all the ingredients ground, mixed, and fed as a mash. The method is simpler, more sanitary, and more economical use is made of the feed than where the ration is fed partly as scratch grain and partly as mash. Since birds prefer a granular mash to one finely ground, it is advisable not to grind the ingredients any finer than is necessary to prevent the chickens from picking over the material and taking out what they like best.

Suggested Rations.—It would be impossible to list all the rations that might be made from the many feeding stuffs. A few of the best rations for the different purposes that are suitable for the greatest number of Ohio poultrymen are listed on the following pages. The rations are not perfect and may be improved. They are flexible enough to make some modifications without changing the feeding value of them to any great extent.

STARTING AND GROWING RATION

RATION NO. 1—ALL-MASH

	Pounds
Ground yellow corn	72
Wheat middlings	20
Meat scraps (50 percent protein)	5
Poultry bone meal	2
Salt	1

Skimmilk instead of water is given to drink during the first eight or ten weeks. Other forms of milk may be substituted. See page 3.

RATION NO. 2—ALL-MASH

	Pounds
Ground yellow corn	46
Wheat bran	14
Wheat middlings	14
Meat scraps	14
Dried buttermilk	6
Fine alfalfa meal	3
Poultry bone meal	2
Salt	1

Water is given to drink with this ration.

With either ration I or II it is necessary to feed about a quart of cod liver oil with each 100 pounds of mash, if the chickens are raised indoors or get little direct sunshine. It is also advisable to supply green feed when possible.

Directions for Feeding.—It is desirable to leave the chicks in the incubator or chick boxes until old enough to feed (48 hours). They are then placed in the brooder and the ration fed in pie pans, egg case flats, or other shallow containers. Plenty of feed should be available at all times. Be sure to supply sufficient drinking fountains and feeding space.

After two or three days replace the shallow feeders by small wooden troughs (30 inches long, 6 inches wide, and 3 inches deep). Use one trough for each 40 to 50 chicks. It is advisable to place a loosely fitting strip of heavy inch mesh screen on the feed to prevent scratching (see Fig. 1). Keep the troughs well filled and stir up the feed three or four times a day.

After four weeks it is advisable to do away with the wire mesh cover and replace the troughs by larger ones or use reel feeders (see Figs. 2 and 3).

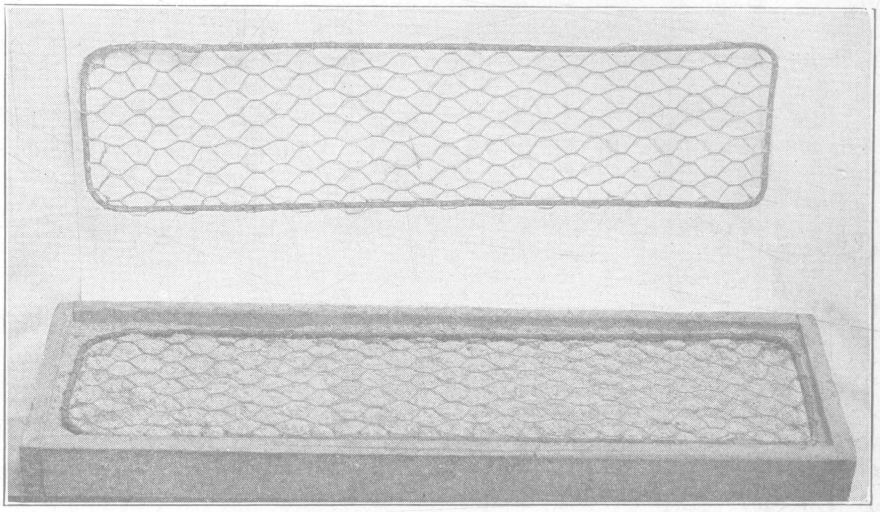


Fig. 1—Open trough for feeding mash to chicks. The grid shown above and in place permits chicks to have easy access to mash but prevents waste from scratching. *(Courtesy of D. C. Kennard, Ohio Agricultural Experiment Station.)*

A reel feeder is more sanitary and permits more chicks to eat at one time than an open box of the same size. The reel feeder will serve until the birds are large enough to use the reel mash feeder commonly used for hens (see Fig. 4).

Sufficient drinking space and cleanliness of utensils are essential. The first week or so, the 2-quart size fountains are very satisfactory (Fig. 5). The reel drinking trough (Fig. 3) designed at the Ohio Experiment Station works well after the first week. The reel is arranged so that it can easily be adjusted in height according to the age of the chicks. The trough is 2½ or 3 feet long, 4 or 5 inches wide, and 2 or 2½ inches deep, inside measurement.

These troughs have advantages over fountains and some other drinking utensils in that they are easily filled, have a greater capacity, and a larger number of chicks can drink at one time. After birds are placed on range, watering equipment commonly used for the laying flock may be provided.

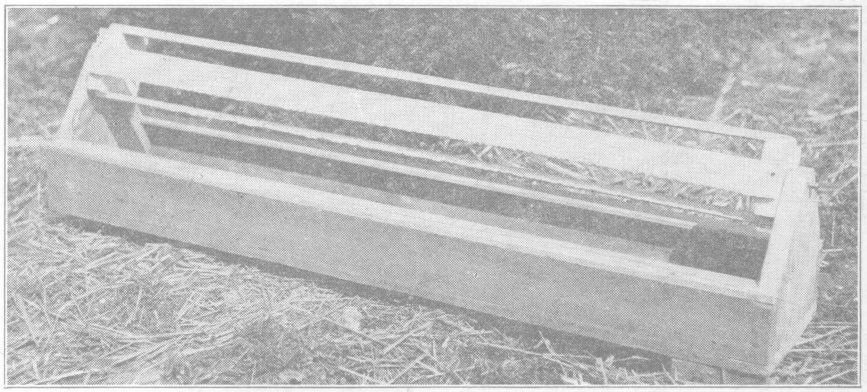


Fig. 2—Reel mash feeder for chicks. Built on same plan as reel milk feeder, Fig. 3, but is 7 inches wide, 2½ inches deep inside. Instead of beveled edge, Fig. 3, a plaster lath is nailed on top of sides of trough so as to project one inch inside to prevent waste of mash. *(Courtesy of D. C. Kennard, Ohio Agricultural Experiment Station.)*

After the first eight or ten weeks, the milk is discontinued with ration No. 1. With ration No. 2, 50 to 100 pounds of cornmeal is mixed with each 100 pounds of mash before feeding. In fact, from this stage on, it is up to the feeder to judge how much protein to include in the ration. Conditions will vary greatly, depending on stock, time of hatching, etc. To hasten maturity feed more meat scraps. To hold back maturity reduce the amount of meat scraps or feed more corn. There is a growing tendency among poultry raisers, to feed the regular ration and make no attempt to hold back pullets.

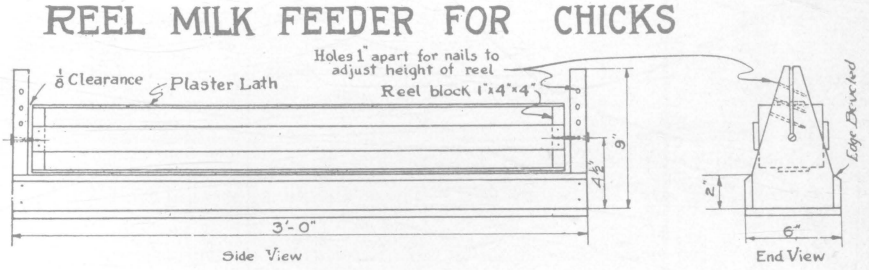


Fig. 3—Plan of reel drinking trough and reel mash feeder for chicks. *(Courtesy of D. C. Kennard, Ohio Agricultural Experiment Station.)*

RATIONS FOR LAYING HENS

RATION NO. 3—ALL-MASH

	Pounds
Ground yellow corn	65
Middlings or ground wheat	20
Meat scraps	10
Bone meal	4
Salt	1

Water is given to drink. If milk is available, the meat scraps may be reduced to 5 pounds.

RATION NO. 4—ALL-MASH

	Pounds
Ground yellow corn	59
Middlings or ground wheat	20
Fine ground oats	10
Meat scraps (50% protein)	10
Salt	1

RATION NO. 5—ALL-MASH

	Pounds
Ground yellow corn	56
Middlings	20
Fine ground oats	10
Meat scraps	5
Cottonseed meal	7
Salt mixture	2

Salt Mixture.—A satisfactory salt mixture for feeding with vegetable proteins consists of bone meal 40 parts, limestone 40 parts, salt 20 parts.

RATION NO. 6—SCRATCH GRAIN AND MASH

Scratch Grain	*Pounds*	*Mash*	*Pounds*
Cracked yellow corn	300	Yellow cornmeal	100
Whole wheat	100	Bran	100
		Middlings	100
		Ground oats	100
		Meat scraps	100
		Bone meal	25
		Salt	5

The rations for laying hens are incomplete as they stand, and the following should be considered:

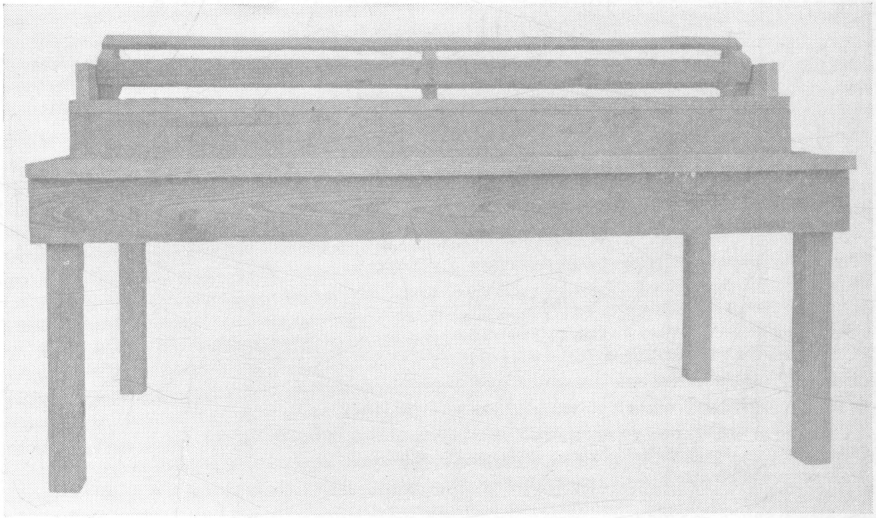
Oyster Shell and Limestone Grit.—These should be available at all times in hoppers.

Green Feed.—Keep good quality alfalfa, clover, or soybean hay before the birds at all times in wire baskets, or to all-mash ration add 5 pounds of alfalfa leaf meal in the mash; and 25 to 50 pounds to the scratch grain and mash ration.

Sunshine.—Get the birds out in the sunshine as much as possible, or feed a quart of cod liver oil (rich in vitamins A and D) in each 100 pounds of feed.

Condition of Birds.—If birds are slow coming into production or are laying poorly, increase the meat scraps in the all-mash rations to 15 pounds. If using Ration No. 6, feed more mash feed and less scratch grain. If the birds lay too rapidly and get too thin, reduce the meat scraps in the all-mash rations to 5 pounds. If using Ration No. 6, feed more scratch grain and less mash.

System of Feeding.—Make changes in ration gradually. Fill up hoppers each evening. Birds prefer granular mash.



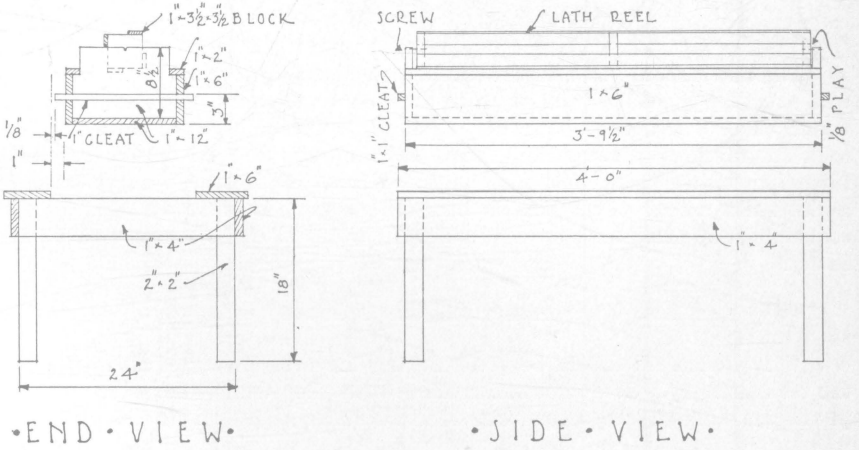


Fig. 4—A dry mash feeder for laying hens.

RATIONS FOR FATTENING POULTRY

The purposes of fattening poultry are to improve the quality of the meat and to add weight. The two main classes of chickens marketed are hens that have passed their time of profitable production, and the surplus of cockerels that are raised with the pullets. The raising of broilers during odd seasons of the year is also becoming a business of considerable importance.

Birds should be shut up in a pen, or better still placed in fattening crates, and fed all the fattening feed they will eat for a few days before being sent to market.

FATTENING RATION FOR HENS

The gains made by hens are small and rather erratic. The fattening period for this class of birds should be short—6 to 8 days. The gain during the period should be about 7 per cent and the loss in dressing 8 to 10 per cent. A very satisfactory ration for fattening hens consists of:

Corn meal, 40 parts by weight.
Liquid milk, 60 parts by weight.

FATTENING RATION FOR YOUNG BIRDS

Broilers, fryers, springs, and the like, which are still growing, need some additional protein feed in the ration. Also, better consumption and results may be expected where a variety of the grain products are used. It is profitable to fatten fryers for about 10 days, and broilers up to two weeks. The gains during the period may reach 40 per cent in case of broilers. The loss in dressing will amount to 10 to 14 per cent. A satisfactory ration is:

Ground corn	59 parts
Wheat flour middlings	25 parts
Finely ground oats	10 parts
Meat scrap	5 parts
Salt	1 part

The mash should be mixed with enough liquid milk to make a batter that will pour fairly easily from the vessel. Semi-solid milk may be mixed with water (2 to 3 pounds to a gallon) and the solution used in place of liquid milk for mixing up the feed. Dried milk appears to give better results in fattening rations than semi-solid milk. Where dried milk is substituted for liquid milk, use about 13 pounds in each 100 pounds of feed. Mix the feed containing the dried milk up with sufficient water to make a batter that pours easily.

DIRECTIONS FOR FEEDING

Very little feed should be given during the first day of confinement. Get the birds hungry. Give about as much feed as they will clean up in 5 minutes in the morning of the second day, and as much as they will clean up in 10 minutes in the evening. On the third day, feed morning, noon, and evening all the birds will clean up in from 10 to 15 minutes. Continue the procedure throughout the period. Do not give water to drink, as they will get enough from the wet feed.

FEED CONSUMPTION AND GROWTH

A question often asked by poultry keepers is, how much feed is required for a chick to a certain age and what should the chick weigh? The table which follows is of interest in this connection.

FEED CONSUMPTION (INCLUDING MILK SOLIDS) AND WEIGHT OF CHICKS AND PULLETS BY WEEKS.*

Week	White Leghorns		Rhode Island Reds	
	Feed per bird	Weight per bird	Feed per bird	Weight per bird
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*
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	13.58	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 1028 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.

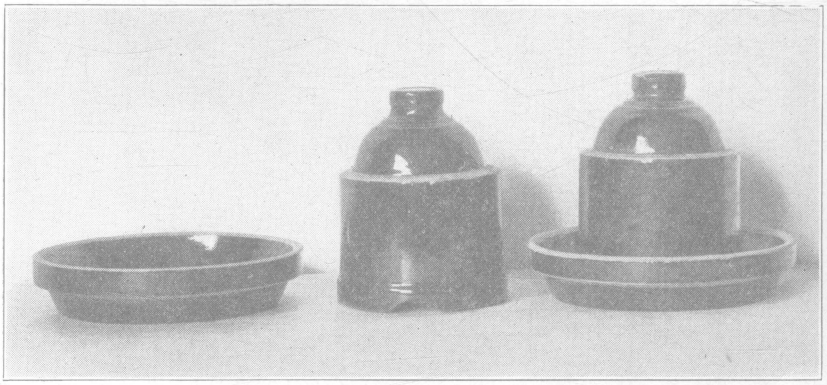


Fig. 5—A suitable drinking fountain for small chicks.

POUNDS OF NUTRIENTS IN 100 POUNDS OF SOME OF THE FEEDING STUFFS USED FOR POULTRY*

Feeding Stuff	Water	Ash	Crude Protein	Carbohydrates		Fat
				Fiber	N-Free Extract	
Barley	9.3	2.7	11.5	4.6	69.8	2.1
Buckwheat	12.1	2.1	10.8	10.3	62.2	2.5
Corn, well dried	10.5	1.5	10.1	2.0	70.9	5.0
Corn meal, bolted	13.3	1.23	10.1	1.79	68.10	5.65
Corn gluten meal	9.1	1.1	35.5	2.1	47.5	4.7
Oats	9.2	3.5	12.4	10.9	59.6	4.4
Oats, hulled	8.2	3.1	13.9	1.9	64.2	8.7
Oats, rolled	7.9	2.0	16.0	1.5	66.1	6.5
Wheat	10.2	1.9	12.4	2.2	71.2	2.1
Wheat bran	10.1	6.3	16.0	9.5	53.7	4.4
Wheat middlings	10.1	5.2	16.8	7.6	55.7	4.6
Cottonseed meal	7.5	6.2	44.1	8.1	25.0	9.1
Linseed meal	9.1	5.4	33.9	8.4	35.7	7.5
Buttermilk	90.6	.7	3.6	...	5.0	.1
Buttermilk, dried	4.5	8.1	34.6	...	50.9	1.9
Skimmilk	90.1	.7	3.8	...	5.2	.2
Fish meal	10.5	28.1	51.4	...	...	8.3
Meat scraps, 50 to 60 per cent protein	9.0	18.4	51.7	6.6	3.9	10.4
Poultry bone	7.3	61.7	24.3	...	3.6	3.1
Tankage, 60 per cent protein	7.9	15.3	60.4	5.3	3.7	7.4
Alfalfa meal	8.8	9.0	14.3	30.1	35.8	2.0
Alfalfa leaves	6.6	13.6	22.5	12.7	41.2	3.4

*Calculated from Henry & Morrison's Feeds and Feeding and Kaupp-Ivey tables.

For general information in regard to profitable poultry raising, for poultry home reading course, and other poultry bulletins, write to the Agricultural College Extension Service, Ohio State University, Columbus, Ohio.