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12-1933

# Better Rations, More Eggs, Greater Profits

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*South Dakota State University*

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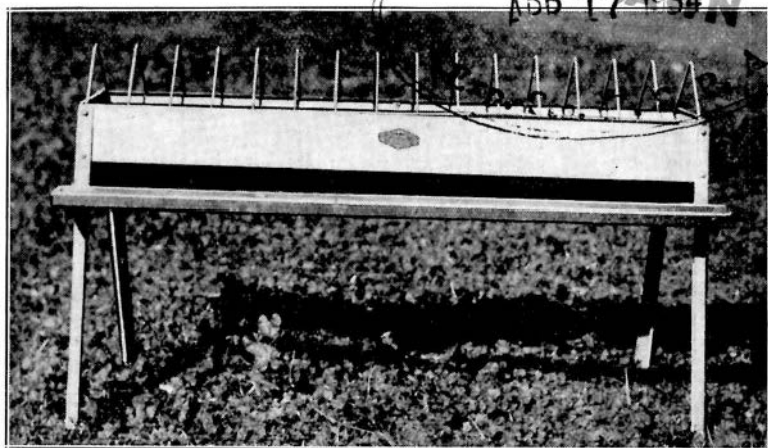
## Recommended Citation

Tully, W. C., "Better Rations, More Eggs, Greater Profits" (1933). *Agricultural Experiment Station Circulars*. Paper 13.  
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# BETTER RATIONS MORE EGGS GREATER PROFITS

By W. C. Tully



● One satisfactory type of mash hopper—needed in many South Dakota poultry raising houses.

**Hens Bred for Egg Production, Proper Feeding,  
Good Housing, Sanitation and Management are the  
Four Essentials of Profitable Poultry Production.**

Poultry Husbandry Department  
South Dakota State College of Agriculture  
and Mechanic Arts, Brookings, S. D.

If given a chance a laying hen will use about 8 pounds of meat and bone scrap in a year. By supplying this in an otherwise properly balanced mash and grain ration, egg returns can at least be doubled.

\* \* \*

Liquid milk contains 91 per cent water; condensed milk 71; and dried milk 5. Use whichever is cheapest on a dry matter basis except that liquid milk is not advised in summer as it attracts flies, the secondary host of one species of poultry tape-worm.

\* \* \*

Empty mash hoppers do not help egg production.

\* \* \*

In winter warm water should be provided. If no water heater is available, supply hot water two or three times daily, depending on the weather, so that a supply is always available.

\* \* \*

The value of a wet mash, preferably moistened with milk, is debatable, when dry mash and the milk would be fed anyway. Feeding some of the dry mash moistened may increase consumption of this necessity when fed to pullets starting production, or to hens finishing the moult.

\* \* \*

Money is worth saving. The lowest difference in cost per year between home-mixed and purchased laying mashes, where the farm flock averages 100 hens, and where a proper mash is fed the year around amounts to a considerable sum.

\* \* \*

Money spent on tonics, conditioners, mineral mixtures, and cure-alls for poultry is wasted.

# Better Rations, More Eggs Greater Profits

## Feeding Hens for Egg Production

The chief interest of poultry raisers is to receive a reasonable return from their investment over the costs of stock, housing, feeding, and labor. Proper feeding alone will not do this, as successful poultry production depends on four major essentials, together with many minor ones. These major essentials are:

- (1) birds bred for egg production, or good breeding
- (2) good housing
- (3) proper feeding
- (4) sanitation and management

To illustrate this better one may take any average flock of hens in South Dakota and follow the last three points in the greatest detail, and the profit over investment will be negligible. Why? Simply because one essential, good breeding, has been overlooked. Or a poultry raiser spends much more than average on breeding stock, and as often happens, does not feed it properly or gets into trouble with some disease, with the result a net loss. All four points must be followed for profits with poultry.

### Reasons for Feeding

Laying hens are fed for three reasons:

1. Maintenance, repair of body tissues, storing of fat.
2. To supply heat and energy.
3. For reproduction, or egg production.

Eighty per cent or more of the entire feed consumed by laying hens goes for body maintenance and to supply heat and energy. Only when the necessary feeds to properly care for these essentials are provided is it possible for the hen to use the remaining small part of her feed, about 20 per cent, for reproduction, the first phase of which in birds is egg production.

A hen has often been called an egg machine. Supply the machine the proper raw materials, and if the machine is the right kind and it is properly managed, the manufacturing process can go on unhampered.

In order to gain some idea of what should be fed to laying hens, one must keep in mind the "why" of feeding, and here of course the composition of the hen's body, and of the egg, is of great importance. Analyses show that the hen's body consists of the following substances:

water	55.8%	animal protein	21.6%
fat	17.0	mineral or ash	3.8

Egg analyses show the same substances, but in somewhat different proportions as follows:

water 65.9%	animal protein 12.83%
fat 10.59	mineral or ash 10.68 (mostly in the shell)

From these analyses it is easily seen that hens must be provided with the right feeds in order to maintain their bodies and to lay eggs. Hens are not creators and cannot lay profitably, especially in those seasons other than spring, when egg production is more or less unnatural, unless the proper nutrients or feed ingredients are supplied in the correct proportions.

### Feed Nutrients

All feeds are composed of six important groups of nutrients, each of which has a definite function in the fowl and in the formation of the egg. Table I shows these in a brief way.

TABLE 1.—Relation of Nutrients in Feed to the Fowl and the Egg.

Nutrient	Use in Fowl	Use in Egg
Water	Body fluids Transporting food Body temperature regulation	Water in yolk and albumen
Mineral	Bones, body tissues, blood	Shell, yolk
Proteins	Muscles, blood, nerves, feathers, tissues	Egg albumen, yolk proteins
Carbohydrates (fibre, starch, sugar and fats)	Energy, heat, body fat	Yolk fat
Vitamins	Disease prevention; normal growth, hatchability	Albumen, but principally yolk

#### Water

A constant supply of fresh clean water, warmed in winter, and uncontaminated by pills and tablets, is essential. Water performs many functions in the hen's body, as well as making up more than half of the egg. Animals and birds can do without food a great deal longer than without water, but in the case of laying hens or growing chicks neglect of either is poor management.

#### Minerals

Minerals are known also as ash or inorganic matter and many of them cannot be destroyed by heating at a high temperature (red heat) for a long time. About 12 or more minerals are essential for the hen's body but where a properly compounded mash and grain ration is fed calcium as

## The Hen is the Most Efficient Transformer of Raw Material Into the Finished Product

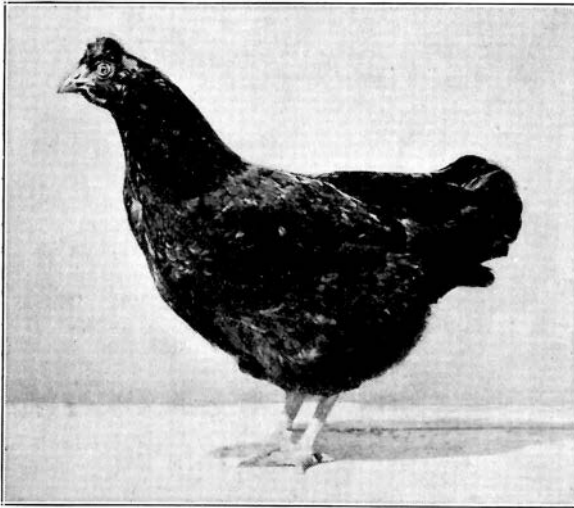


Fig. 1.—The Hen  
—S.D.A. 705. 268 eggs  
in one year, aver-  
aging 24 ounces  
to the dozen.

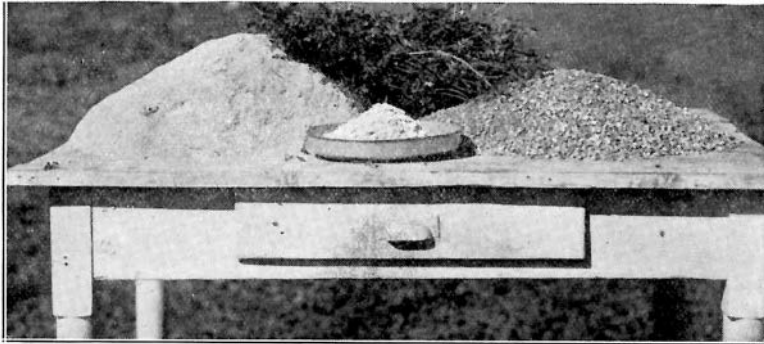


Fig. 2.—The Feed—40 pounds of laying mash, 38 pounds of scratch grain, 4 pounds of oyster shell, 10 pounds of green feed, and 60 quarts of water.

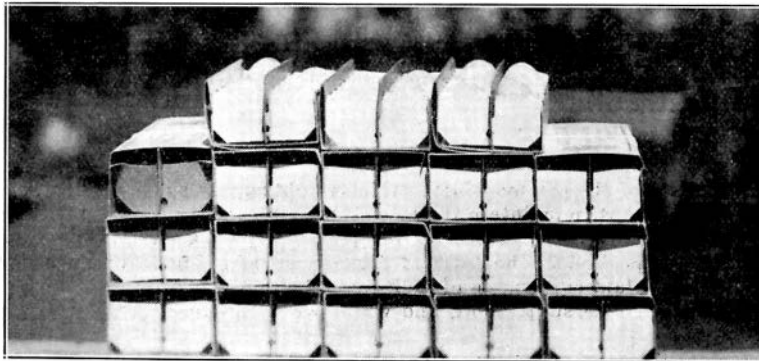


Fig. 3.—The Product—268 eggs, average weight 24 ounces to the dozen, total weight 33.5 pounds.

supplied by oyster shell and different limestones, and granite or mica grit are the only ones that need be added to the ration.

### Proteins

Proteins are divided under practical conditions into two classes, proteins of vegetable source, and proteins of animal origin. Both classes are made of substances known as amino acids, but with few exceptions single proteins do not have all the necessary amino acids or are not what is known as "complete" proteins. What is still more important, individual proteins have widely varying amounts of the different amino acids, of which about 20 are known. While all farm grains contain vegetable proteins, these as a rule are less "complete" than proteins of animal origin, which is the chief reason why meat and bone scraps, milk in some form, and in some sections fish meal, are found in all good laying rations. Vegetable proteins are also deficient in mineral matter.

Egg albumen is almost entirely animal protein and water. If both of these are not supplied egg production is greatly reduced, as neither can be economically "manufactured" from vegetable protein or from other nutrients in the ration.

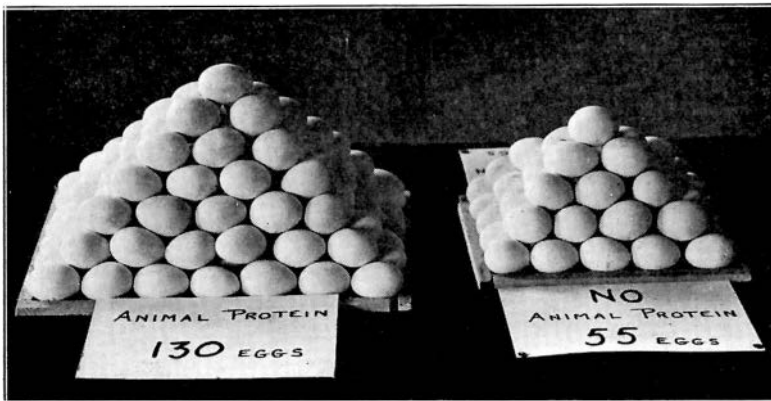


Fig. 4.—The Result of Feeding Animal Protein

High and continuous egg production cannot be expected unless the birds get part of their protein from animal source. The above figures represent a general average taken from the results of experiments from several stations. (Courtesy Cornell Extension Bulletin 222, February 1932.)

### Carbohydrates and Fats

A mixture of the common farm grains would supply sufficient heat, energy, and body fat to maintain the hen. When an excess of these nutrients is given, as when the farm flock is fed principally on grains, surplus nutrients are deposited in the form of fat instead of going to produce egg yolks. If hens laid eggs made of yolks and shell only, a ration of common farm grains, a lime supplement, and water would produce plenty of eggs.

While hens often lay eggs with albumen or "white" of a decidedly inferior quality, because of improper rations, they seldom produce eggs without any of this material.

### Vitamins

Vitamins are food substances, impossible to determine in the feed by ordinary analyses, but the presence of which is shown by feeding tests. Vitamins are essential for normal growth, health, egg production, egg shell formation, and hatchability. The importance of these substances cannot be neglected in a proper ration. Six vitamins have been established to date. Their uses in poultry feeding, and the most common sources follow:

**Vitamin A.**—Found in yellow corn, in green leafy feed, green grass, cod liver oil, and to some extent in milk. This vitamin prevents a disease known as nutritional roup, shown up by the formation of white spots or cankers in the roof of the mouth and throat. Nutritional roup can be distinguished from ordinary roup by the absence of the usual vile odor. Continued absence of this vitamin from the ration results in blindness. Vitamin A is essential to normal growth.

**Vitamin B.**—Found in the germ of grains commonly fed to poultry. In a complete ration no deficiency of this vitamin need be necessary. A lack of vitamin B causes a partial paralysis, known as polyneuritis. This disease is not common in farm raised poultry.

**Vitamin C.**—Prevents scurvy to which hens are not subject.

**Vitamin D.**—The cheapest and best source of this vitamin is direct sunlight, which acts on the skin in such a manner as to form vitamin D in the body. Sunlight which has passed through window glass is useless as a source of this vitamin and sunlight which has passed through any of the numerous glass substitutes on the market, with one or two exceptions, is almost useless. From November to March the amount of vitamin D effect from the sun is much less than in spring and summer, and for this reason, in winter, cod liver oil as the next most practical source of this vitamin for poultry use is recommended, and essential for best results.

A lack of this vitamin in the ration of young chicks causes a form of "leg-weakness," more correctly known as rickets. This disease is common in chicks, as well as in dogs, other animals, and young children. Rickets is caused by a lack of either a sufficient supply of vitamin D or by an insufficient supply of, or improper balance between two minerals in the ration, calcium and phosphorus. In hens, vitamin D is necessary for growth, particularly bone growth, egg production, egg shell formation, and hatchability. It is one of the most important vitamins in poultry feeding, and the one most commonly neglected, principally in winter.

**Vitamin E.**—Has not as yet been shown essential to poultry.

**Vitamin G.**—Found in milk, alfalfa, green leafy feeds, and in yeast, is a growth promoting factor and is essential for normal growth. In a complete mash and grain ration it is taken care of satisfactorily without any additions to the feed. This vitamin is probably associated with another which prevents pellagra, a disease not common in chickens unless the ration is decidedly deficient in certain animal protein.



### Balanced Rations for Hens

A study of the preceding information will show the complex nature of proper feed for a laying hen. Yet these requirements are easily met if a properly formulated, completely mixed ration is used. A balanced ration for layers is simply one that supplies all the nutrients, water, minerals, carbohydrates and fats, proteins, and vitamins in the correct amounts. Despite the fact that in 1930 the poultry industry in South Dakota was valued at almost \$20,000,000, farmers of this state have not profited from their poultry as they could. One of the important reasons for this is a lack of care in feeding, not only the laying stock, but the growing birds as well. The value of a balanced mash was first shown more than 30 years ago, yet not more than ten per cent of farmers in this state feed this to their layers, while countless experiments show the value of this part of the ration. One hundred pounds of one of the mash formula given later costs only 25 cents more than an equal amount of a good grain mixture. When properly fed, a hen eats about 40 pounds of mash and 40 pounds of grain in a year; or about 80 pounds of grain if no mash is fed. In other words the extra cost of properly feeding a hen one year is only the difference in price between 40 pounds of mash and 40 pounds of grain. This amount varies with feed price changes, but in the fall of 1933 was only about ten cents per bird per year.



Fig. 5.—Mixing Dry Mash Ingredients

The dry mash ingredients can be well mixed by turning them over on the floor about four times. Whether to buy prepared feeds or mix rations at home is a question of cost, quality, and convenience. Figure the cost of the ingredients in the ration, add a reasonable charge for mixing, and then compare the price of home mixed feeds with commercial feeds. (Courtesy Nebraska Extension Circular 1420 Revised.)

Feeding a balanced mash the year round to well-bred hens will result in an increased egg production of from 75 to 100 eggs per bird. Hundreds of definite experiments have proven this. Even at the lower figure of an increase of 75 or 6¼ dozen eggs per year, with eggs at an average price of 16 cents for the year, as they were in 1932, this would mean one dollar more from every well-bred laying hen each year. This indicates a profit of 1000 per cent on the investment for mash.

### Feeding Methods and Rations

While there are different methods of feeding laying hens, the most common and best plan is to use a properly formulated dry mash which is fed in a self-feeding hopper, as illustrated, and a mixture of grains which are fed usually in deep straw litter. The so-called all mash method of feeding is not recommended, as no experiments show the value of grinding all the feed for layers, which if done increases the cost of the ration somewhat. In addition mash is digested too quickly to allow the birds a supply of feed in their crops during the night, especially in winter.

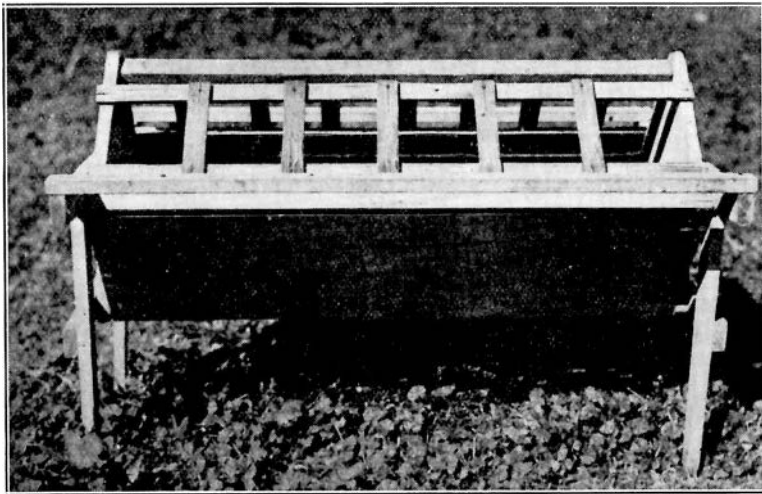


Fig. 6.—Another good mash hopper. Satisfactory poultry house equipment can often be made at home.

The reasons for feeding a part of the ration in ground form are as follows:

1. It saves the gizzard some grinding, as all the feed a bird eats must be ground in this organ, and thus enables the hen to consume more feed. This partly explains why more eggs can be obtained when part of the ration is fed ground. A two-year test at the New York State Agricultural Experiment Station showed that to produce the same number of eggs, it required 20 per cent more feed when all the grain was fed whole, than when only one-half was fed whole and the rest ground.

2. Mash supplies the best method known at present of feeding meat and bone scraps, dried milk, and other necessary ingredients in the ration, thus offsetting the deficiencies of the vegetable proteins in the grains and grain by-products.

Formulae for mash rations are as numerous as the varieties of chickens, and too many of each are available. However, the following mash is the one used and recommended by the Poultry Department of the Agricultural Experiment Station of South Dakota State College, and if mixed thoroughly, using the correct amount of each ingredient, will give exceptionally good results. The formula is very similar to that formerly recommended, but has been changed to put the ingredients on a percentage basis.

### South Dakota State College Laying Ration for Pullets and Hens

**Mash:**

% or lbs.

33 ground yellow corn  
 15 wheat bran  
 15 wheat middlings  
 10 pulverized oats (34 pounds or more per bushel)  
 15 meat and bone scrap, not less than 50 % protein  
 5 dried buttermilk or dried skim milk  
 5 alfalfa leaf meal, not more than 20 % fibre  
 1 common fine salt.  
 1 cod liver oil (Nov. 1 to March 31, or all year if birds are confined to  
 the house)

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100

**Grain:**

% or lbs.

50 whole or cracked yellow corn  
 50 wheat (durum)

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100 Total

1. Ground barley, may be used to replace one half or all of the ground yellow corn if alfalfa leaf meal and cod liver oil are also used in the mash as given, or if plenty of green range and direct sunlight is available in summer.

2. Thirty per cent of ground wheat or mill-run may be used to replace the 15 per cent each of bran and middlings if cheaper or more readily available. This change is true for the above mash formula only.

3. If some liquid milk, skim milk or buttermilk is available, the dried milk may be omitted from the mash. If sufficient liquid milk is obtainable so that it can be left in front of birds at all times, the meat and bone scrap can be reduced to 10 per cent of the mash, but under no condition feed less than 10 per cent of this valuable animal protein supplement.

4. Alfalfa leaf meal is much more valuable than alfalfa meal which contains stems finely ground as well as leaves. A good test of alfalfa leaf meal is the fibre content, which should be about 15 per cent in a high qual-

ity product. Alfalfa meal on the other hand may run as high as 30 per cent fibre. Poultry can use only a very limited amount of fibre and if a ration contains much, the high fibre content is replacing other feed that would be much more useful to the bird.

5. Cod liver oil, next to direct sunshine is the most practical source of vitamin D, which is necessary for normal growth, production, egg shell formation, and hatchability. It should be fed at least from November 1 to March 31 whether birds are outside on fine days or not, and the entire year if birds are confined. Experiments too numerous to mention show the value of this addition to the ration.

Cod liver oil should be biologically tested for vitamins and stored in a tightly closed container. After being mixed with feed this product will retain sufficient potency, particularly vitamin D, for six months.

There is a tremendous amount of poor quality cod liver oil on the market. One should be sure to buy a tested product. This station does not recommend the use of mixtures made of minerals, or other products, and cod liver oil. They are too expensive and often have lost their vitamin D potency because of the peculiar reaction of some minerals and this vitamin. Furthermore, no added mineral mixture need be added to the mash described above if mixed according to directions. Far too many "mineral mixtures" are sold, usually at several times their value, for the good of the poultry business and particularly for the pocket book of the poultry raiser.

6. The dry mash, properly mixed, should be kept before the birds constantly. Use hoppers or troughs that are up off the floor at least a foot so that they can be kept clean from litter, droppings, or other filth. Provide sufficient mash hopper space so that half the birds can eat at one time.

The following mash formula, while not as complete as that previously shown, will give good results. It is not recommended for use during the winter or hatching season.

Mash:

% or lbs.

20 ground yellow corn  
20 wheat bran  
20 wheat middlings  
20 ground heavy oats  
20 meat and bone scraps

The grain part of the ration is also given. This is best fed in the litter, one-quarter of the total grain allowance in the morning, the rest half an hour before birds go to roost in the evening.

As the grain ration may be varied somewhat according to those on hand, and should be varied according to costs, several grain mixtures are given:

1. yellow corn—either whole or cracked
2. 50 per cent yellow corn and 50 of wheat
3. 40 per cent yellow corn, 40 wheat, 10 barley and 10 heavy oats.
4. 50 per cent yellow corn, 30 wheat, 10 barley or speltz, 10 heavy oats.

Grain mixtures 1 and 2 are best as hens frequently refuse oats and sometimes barley and speltz, if yellow corn and wheat are in the mixture. Do not omit the yellow corn unless alfalfa leaf meal or green range in summer, or the alfalfa as well as cod liver oil are fed in winter. Light oats

should never be used, and never more than a total of twenty per cent of heavy oats, speltz, or barley, in the grain mixture, as these grains are high in fibre of which a bird can use but little.

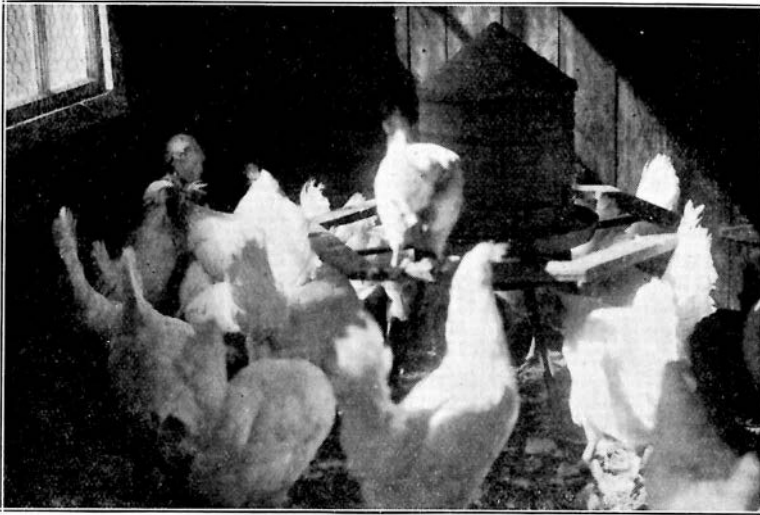


Fig. 7.—A very satisfactory type of water fountain. A less expensive waterer can be made of a simple stand to hold a pail up off the floor.

### Feeding Methods

The method of feeding mash in open hoppers and scratch grain in the litter has been previously described. With this method the poultry feeder must exercise his powers of observation to get the proportions of mash to grain about right. As the dry mash is self-fed, feeding the right amounts of mash and grain depends entirely on the amount of grain fed. In other words, to get greater mash consumption cut down on the grain fed, and to reduce mash consumption increase the amount of grain. Layers usually prefer grain to mash. Ordinarily hens use about equal amounts of mash and grain. However, with pullets just starting production more than fifty per cent of the ration should be grain in order to develop additional body weight. In winter additional feed is needed to heat the body and as the grain mixture serves this function more than the mash, additional grain must be fed in cold weather.

A good poultry raiser whose birds are laying and in proper condition as to body weight feeds very little grain in the morning, to encourage mash consumption during the day. For the evening feeding, all the grain that the birds will clean up should be given. If grain is found on the floor early the next morning it indicates too heavy feeding the previous evening. Good poultrymen always handle a few of their birds once or twice a week to determine their body condition. If birds are in heavy production and ap-

parently losing weight, the amounts of grain fed should be increased. If birds are too fat and not laying as they should, reduce the grain fed to increase mash consumption.

### Hopper Feeding of Grain

This system of feeding where the grain mixture, as well as the mash, is hopper fed, is becoming more popular and saves considerable work. Several experiments where well-bred birds were used show that this feeding method gives just as good results as does the older system of feeding grain in the litter. With hens of poor breeding it is not altogether satisfactory because the grain consumption is increased and the birds may get too fat. This can be avoided by covering the grain hoppers after dark and leaving them covered till about half an hour before sundown the next afternoon. In this way mash is available at all times but the grain only for a short time in late afternoon. Hopper feeding of both grain and mash is much more sanitary than feeding the grain on the floor. Its only disadvantage is that more hoppers are required and many poultrymen who feed mash supply only half the hopper space that should be available for mash alone. Occasionally it may be found difficult to get pullets to eat sufficient mash in order to get production started. This will be more true with pullets raised without a growing mash. It is quite possible that hopper feeding of grain will entirely supersede the litter feeding method.

### Feed Requirements

A Leghorn will use approximately 80 pounds of mash and grain feed per year. Dual purpose birds, such as Plymouth Rocks, Rhode Island Reds, etc., about 85 pounds each. These figures do not include the three or four pounds of lime supplement used by each bird in a year. One hundred Leghorns in production will use approximately 22.5 pounds of feed daily, which should be made up of about equal parts of mash and grain, with slight variations of this ratio as explained previously. Because only a relatively small part of the total feed consumed is used for egg production, mature birds not in production will use almost as much feed as those laying. This is important to remember in culling work, as it costs almost as much to feed a cull as a layer.

### Mineral Requirements

Oyster shell, or limestone in some form other than the dolomitic or high magnesium type, should be available in separate hoppers at all times. A good granite grit should also be hopper fed. Most of the so-called grits on the market in this section of the country are not true grits at all, but only limestone. The latter will replace oyster shell but have little effect of a true grit which it to aid the gizzard in grain grinding. Some farmers leave gravel before birds, which is better than no grit, but it has no value for egg shell formation.

### Green Feed

Green feed, or more correctly speaking, green leafy feed, is an important part of the ration. So-called green feeds are divided into two distinct classes: those that supply some of the vitamins as green alfalfa, alfalfa hay or leaf meal, grass range, grain pasture, sprouted oats, and possibly

cabbage; and those that supply only succulence as mangels, sugarbeets, and cabbage. The great importance of vitamins has been discussed. Succulent feeds aid digestion and are relished by the birds.

For several months of the year undoubtedly the best form of both green leafy feed and succulence is a fenced-in alfalfa pasture, allowing about one-third of an acre for each hundred hens in order to maintain permanent green range in normal years. Laying hens should never be allowed to range over the barnyard including the manure pile, because undoubtedly the time is soon coming when eggs from such hens will not be saleable. When layers are confined however, alfalfa hay in addition to the alfalfa leaf meal in the mash should be fed in wall racks. Sprouted oats, and other green feeds may be fed as second choice.

The importance of plenty of green leafy feed cannot be overestimated as recent work tends to show that second year production of layers is often materially reduced through a lack of sufficient vitamin A in the ration during the first year's production.



Fig. 8.—Cull cabbage makes an excellent succulent feed but is low in vitamin value.

### Artificial Lights for Layers

Laying hens and pullets are artificially lighted from about October 1 to the end of March primarily to increase the length of their working way which in turn allows greater feed consumption and higher winter egg production. Artificial lighting does not greatly increase the total number of eggs laid in a year, but it does materially increase the production during fall and early winter when egg prices always have been highest.

Three systems of lighting are in use, of which either the use of morning lights, starting about 5 a. m. in October and November or evening lights from shortly after sunset till about 8 p. m., are the best. While some experiments have been completed to show the value of all night lighting, at present we do not recommend this method. Morning lights have a big advantage in that no dimming system is necessary, which must be used with evening lights to allow the birds to get to roost after the bright lights have been turned off. On the other hand during winter it is usually colder in the early morning than in early evening.

Electric lights are best and the bulbs should be suspended from the ceiling, allowing one 40-watt bulb for each 200 square feet of floor space. The bulbs should be placed not more than ten feet apart and in the approximate center of the house lengthwise. Large reflectors, four inches in depth and sixteen inches in diameter, are necessary to save waste of light and to properly light the floor, mash hoppers, water fountains, and other feed. It is essential that some light reach the roosts or the birds will stay there rather than go to work. The proper height for the lights depends on the depth of the house and the height of the roosts.

As electricity is as yet not available on many farms, gas lanterns and such lights may be used with good results. However, every precaution must be taken to avoid fire.

With any system of lighting, feed and water must be available when the lights are turned on, otherwise lights are wasted. If morning lights are used the small morning grain feeding can be scattered in the litter the previous evening after dark. All layers must be accustomed to lights gradually. That is, in using morning lights increase the amount of time the lights are turned on as the days get shorter, never increasing this time more than fifteen minutes any week. Starting lights suddenly for example at 5 a. m. on December first, may result in a moult or slump in production, and for some time at least, do more harm than good. Similarly in reducing the time lights are used, which is usually about February first, all changes must be made gradually.



Eggs should be the chief product of the poultry farmer, with chicken meat production secondary. How much does the South Dakota Farmer make from eggs each year? From poultry meat? The following free information will help. When writing for information on poultry write to the Poultry Department at State College, but when writing for bulletins only, please write directly to the College Mailing Room.

Number	Extension Circulars
142	How to Show Poultry.
145	Feeding Poultry for Market.
189	Killing Poultry for Market.
225	Useful Homemade Equipment.
265	Circulars and Blue Print Plans.
270	Grow Healthy Chicks.
292	Turkey Production in South Dakota.
295	South Dakota Type Poultry House.
333	Selecting Hens for Egg Production. (Culling.)

**Extension Leaflets**

- 18 Efficient Marketing of Eggs and Poultry.

**Special Circulars**

- 1 Are Your Hens Spreading Tuberculosis?  
 13 Poultry Sanitation.  
 14 Caponising and Capons.  
 15 Poultry Management. A Manual for 4H Club Members Only.  
 26 4H Club Farm Marketing. A Manual for 4H Club Members Only.

**Experiment Station Bulletins**

- 242 Results of Poultry Feeding Experiments.  
 243 Marketing of Poultry Products.

**Farmers' Bulletins, U. S. Department of Agriculture**

- 697 Duck Raising.  
 767 Goose Raising.  
 801 Mites and Lice on Poultry.  
 849 Capons and Caponising.  
 1200 Tuberculosis of Fowls.  
 1377 Marketing Poultry.  
 1378 Marketing Eggs.  
 1391 The Guinea Fowl.  
 1409 Turkey Raising.  
 1506 Breeds of Chickens. I. American Class.  
 1507 Breeds of Chickens. II. Continental Class.  
 1508 Poultry Keeping in Backyards.  
 1524 Farm Poultry Raising.  
 1533 Rat Control.  
 1538 Incubation and Brooding of Chickens.  
 1541 Feeding Chickens.  
 1652 Poultry Diseases.  
 1694 Dressing and Packing Turkeys for Market.