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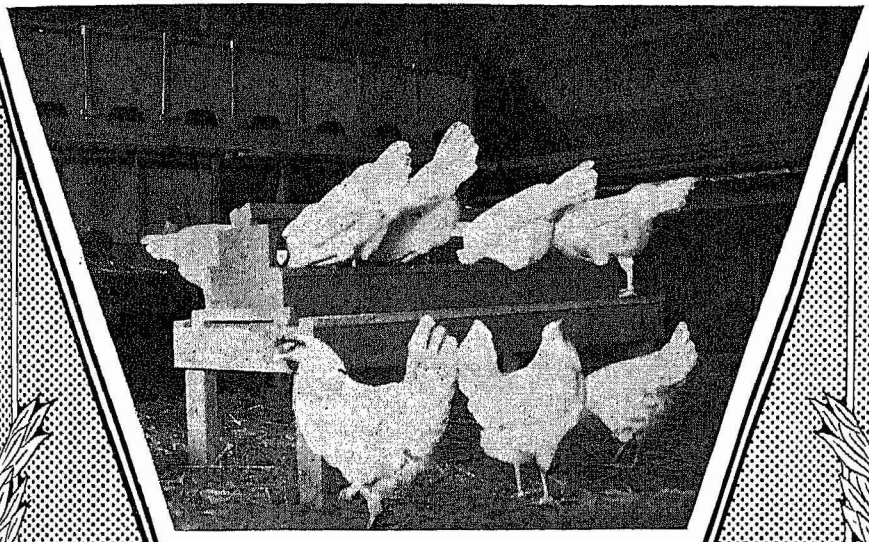
FEEDING LAYING HENS



By H.E. Cushman

MONTANA STATE COLLEGE
Extension Service
BOZEMAN

RULES FOR FEEDING:

Keep birds active

Do not over-feed

Send birds to roost with full crops

Make changes in feed gradually

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Feeding Laying Hens

By

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Extension Poultry Specialist

A hen eats because she is hungry. If she is forced to satisfy her hunger with what she can pick up she is likely to get only a "maintenance ration," except during the spring of the year when bugs and green things are plentiful. Then, because she is getting a "balanced ration," she lays eggs and reproduces herself.

All that is needed to maintain life is enough nutrients and protective feeds to keep up body heat and energy and supply materials to rebuild cells and tissues that are torn down in the process of living. To lay eggs, however, additional substance from which eggs are built must be supplied. Since poultry profits are primarily derived from eggs it is the poultryman's business to duplicate spring conditions and supply feeds that will keep the flock in maximum health and production at all seasons.

Either a commercial mash or a home mixed mash may be fed to supply egg-building materials. There are a great many reliable commercial feeds on the market which have the advantage of uniformity of composition and thoroughness of mix. Further, they contain all the requirements for production in the proper condition and proportion. On the other hand many poultrymen find it advantageous to market home grown grains through their poultry and, therefore, prefer the home-made mashes. In either case, the efficient poultryman should know a hen's egg laying requirements and understand how to compound and how to feed an economical ration.

But before a poultryman starts to formulate a ration he should recognize that:

1. A hen cannot convert simple elements such as carbon, hydrogen, oxygen and mineral into living tissue.

2. She must obtain the elements for her body and body products from complex compounds derived from plants and other animals. These complex compounds are classed as nutrients: proteins, carbohydrates (starches and sugars), fats and water and protective feeds (vitamins and mineral salts).

3. The hen cannot digest and absorb all of any of the nutrients taken into her system. For example, cellulose is wholly indigestible. Its only function is to act as bulk in aiding other materials to move along the digestive tract. Therefore the digestibility of common poultry feeds must be worked out experimentally.

In order to further understand the birds' requirements the poultryman

should understand the approximate composition of both the hen and the egg, so that he may understand the reasons for including certain nutrients in the ration.

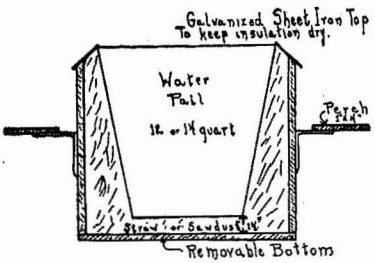
	Water	Protein	Fat	Mineral
Hen	55.8	21.6	17.0	3.8
Egg	65.9	12.8	10.6	10.7

With these facts in mind the nutrient requirements can be considered.

NUTRIENT REQUIREMENTS

Water

Since 65% of the egg and 55% of the hen is water, an abundance of fresh, pure water must always be available for poultry. If there is a lack of water a decrease of eggs occurs immediately. In winter some arrangements for keeping the water warm should be made (see Fig. 1). Water also helps in the process of digestion and regulation of body temperature. In summer it helps to keep birds cool. Since 10 dozen eggs contain 1 gallon of water, there is no greater return for money expended than to supply plenty of fresh water.



INSULATED WATER PAIL AND CONTAINER.

Fig. 1—Insulated water pail and container (Ohio Exp. Sta.)

Carbohydrates and Fats

Carbohydrates and fats both supply body heat and energy as well as produce fatty tissues and yolk fats. Since animal fats are not easily utilized by poultry and since carbohydrates can be converted into fats during digestion, it is safer to depend on carbohydrates for the fat requirements of the ration.

The principal source of carbohydrates is from grains which, as whole grains make up 100% of the "scratch" and, as ground grains, form from 75% to 80% of the "mash" portion of the ration.

Although there is no set rule as to which grains shall be used in the ration, it is wise to remember that grains high in crude fiber have low digestibility and that excess fiber is actually harmful to poultry. Availability and cost usually determine the choice of grains. In making this choice

the table (below) prepared by the late Dr. W. F. Holst, of California, is very helpful in figuring the comparative food value of the different feedstuffs.

The figures in table I may be used to determine which of the various available feeds are most economical in any district.

TABLE I

Comparative Food Value of Poultry Feedstuffs Using Indian Corn as a Basis

Feed	Food values	Number Pounds necessary to replace 100 pounds Indian corn
Indian corn	100	100
Wheat	93	107
Barley	82	122
Wheat flour middlings	78	128
Oats	75	133
Wheat bran	57	175
Potatoes (fresh)	24	417

For example, the table shows that 100 pounds of barley contains only 82 per cent as much food value as 100 pounds of Indian corn. To express this in another way, and as the table shows, it takes 122 pounds of barley, and 107 pounds of wheat, to equal 100 pounds of Indian corn in terms of feeding value. With this information and knowing the cost of various local feedstuffs the poultryman can ascertain the most economical feeds by the following method:

Divide the price of one footstuff by its "comparative food value" (as given in the table).

Multiply this result by the "comparative food value" of the other feed.

The final answer equals what you can afford to pay for the second feed, as compared with the first.

Examples showing the method of computation:

When barley is selling at $2.00 per cwt. what can you afford to pay for wheat?

$2.00 ÷ .82=$2.44

$2.44 × .93=$2.27

$2.27=the price you can afford to pay for wheat when barley is selling at $2.00.

When wheat is selling at $2.27 per cwt. what can you afford to pay for barley?

$2.27 ÷ .93=$2.44

$2.44 × .82=$2.00

$2.00=the price you can afford to pay for the barley when wheat is selling at $2.27.

Protein

Muscle growth, cell replacement and the albumen of the egg are derived from the protein part of the ration. Experiments prove that ordinary grains are deficient in protein. Further, the grain by-products that are rich in protein such as cottonseed and soy bean meal are not satisfactory in supplying the protein requirements. Consequently, an animal source of protein must be used to satisfy body and laying requirements. The most common sources of animal protein are commercial meat scrap, fish meal, milk and milk products.

Again turning to Dr. Holst, the poultryman can learn the comparative value of these protein supplements:

Kind of Supplement	Meat Scraps	Fish Scraps	Dried Milk
% Protein (Average)	53	63	33
% Digestibility (Average)	75	90	100
Lbs. necessary to balance 100 lbs. of mash (Average)	20	14.3	24

Since liquid milk contains only three per cent protein it would take about three and a half to four gallons of liquid milk to supplement meat scrap for 100 hens daily. However, Dr. Martin, of Kentucky, states that, because of other factors in the liquid milk, one gallon replaces one pound meat scrap and, therefore, only two and a half gallons of liquid milk per 100 hens daily are required.

It is a very common error for poultrymen to economize on animal protein. In a number of experiments the Kentucky Experiment station shows that 20 per cent meat scrap gives the greatest return over feed cost. This agrees with Dr. Holst's findings.

Also on Montana's demonstration farms, cooperators using about 20 per cent meat scrap or its equivalent in liquid milk have obtained the greatest return of money over and above the cost of feed.

Dried milk, although out of the question in many sections of the state, because of cost, is more digestible and produces a greater number of eggs when used.

An oversupply of protein is as serious as too little protein, as kidney disorders and broken health are the results.

Vitamins

Vitamins are food elements of unknown composition. They occur in slight amounts in grains and more abundantly in leafy vegetables and cod liver oil. There are six that have been fully studied to date: A, B, C, D, E, and G. All of them except C play an important part in protecting health and promoting growth of poultry. Their lack results in serious poultry disorders.

Value of Eggs, Feed Cost, and Returns Over Feed Per Hen When Varying Percentages of Meat Scrap are Fed In the Mash (White Wyandottes)

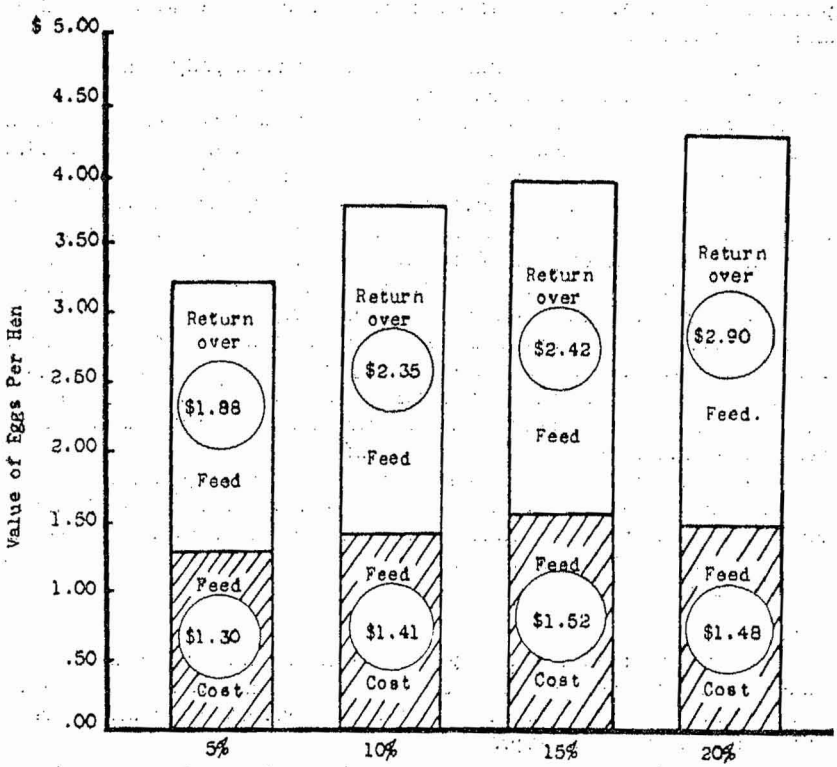


Fig. 2—Percentage of Meat Scrap in Mash. (Kentucky Exp. Sta.)

Vitamin A—is found in most kinds of green feed, yellow corn, dried alfalfa products, and cod liver oil. It is destroyed by exposure to air. It promotes growth and prevents nutritional roup, sore eyes or opthalmia, certain types of leg weakness and crooked bones.

Vitamin B—is found in green feed, grain coatings and germs, in yeast and milk. It aids growth and disease resistance. It prevents nerve disorders, such as polyneuritis and certain forms of paralysis.

Vitamin C—is found in vegetables; prevents scurvy in human beings but is not required by poultry.

Vitamin D—is commonly spoken of as the sunlight vitamin because it has the same effect as the ultraviolet rays of the sun. It is found in small amounts in most green feeds and in large amounts in cod liver oil and the

yolk of eggs. It prevents rickets and leg weakness and assists in calcium, phosphorus assimilation.

Vitamin E—is known as the antisterility vitamin, since without it reproduction is hindered. It is found in rolled oats, whole wheat and dried alfalfa and lettuce.

Vitamin G—is a growth vitamin. It is found principally in milk. Without it chicks or poults do not make proper growth gains.

Generally speaking the vitamin requirements will be met if the grain germs are left in the mash to supply Vitamin B and plenty of alfalfa, milk and sunlight is provided for Vitamins A, D, E and G.

Some experiments are reported from New Jersey* on the vitamin content of alfalfa. It was found that alfalfa that is sun dried and gets brown in its curing process loses part of its Vitamin A content, but is richer in D. On the other hand when alfalfa is cut and rapidly dried by artificial means it is seven times as rich in Vitamin A but has very little D.

Whenever there is any doubt about the amount of Vitamin A or D present it is wise to add about one to two per cent cod liver oil. In buying cod liver oil the poultryman should demand a tested oil and one of known purity. If it is then stored in a tightly stoppered dark bottle at 70° F. or below, the Vitamin A content will not be affected.

The use of green feeds is an excellent way of lowering feed costs without affecting the efficiency of the ration. With an abundance of alfalfa, birds will not eat nearly as much "scratch" or "mash" nor will they need as much mineral. In the presence of Vitamin D the bird can make better use of the minerals in feeds.

Minerals

Laying hens need minerals principally to maintain bones and supply materials for egg shells. If there is a deficiency of minerals the first result is a decrease in egg production. If the lack becomes more acute rickets and nutritional disorders appear.

For these primary needs calcium and phosphorus are the most necessary. However, there are certain other elements that appear in minute quantities that are quite as necessary to the life and health of the bird. These rarer elements usually occur in sufficient quantities in the normal diet, but additional calcium and phosphorus must be provided. The common sources for these materials are bone meal, meat scrap and rock phosphates for phosphorus, and oyster shell, lime and calcite for calcium.

Recent experiments indicate that the ratio of calcium to phosphorus in the ration is even more important than the amounts of each substance used in the ration. The total calcium phosphorus balance of a ration should be somewhat between 2:1 and 3:1. In many parts of Montana, Colorado and Texas, where there is a phosphate deficiency in the soil, and where there is "bone chewing" among livestock, more than the normal amount of bone meal must be supplied.

*Journal Bio. Chem.—December, 1929.

AVERAGE PERCENTAGE COMPOSITION OF POULTRY FEEDS*

Feed	Moisture	Ash or Mineral Matter	Crude Protein	Carbohydrates		Fat
				Indigestible	Digestible	
Grain and seeds:						
Barley	9.6	2.9	12.8	5.5	66.9	2.3
Corn or cornmeal	12.9	1.3	9.3	1.9	70.3	4.3
Flour middlings	10.7	3.7	17.8	4.7	58.1	5.0
"Red Dog" flour	10.1	2.9	17.2	3.1	61.9	4.8
Garden peas	11.8	3.0	25.6	4.4	53.6	1.6
Linseed meal	8.9	5.4	34.5	7.7	36.7	6.8
Oats or ground oats	7.7	3.5	12.5	11.2	60.7	4.4
Rye	9.5	1.9	11.1	2.1	73.7	1.7
Wheat	10.6	1.8	12.3	2.4	71.1	1.8
Wheat bran	9.6	5.9	16.2	8.5	55.6	4.2
Wheat flour	12.3	0.5	10.9	0.4	74.6	1.8
Wheat middlings (shorts)	10.1	3.5	16.3	4.3	61.6	4.2
Wheat screenings	10.2	3.9	13.3	7.4	61.1	4.1
Animal origin:						
Bone meal	7.2	61.5	23.1	3.3	—	4.9
Bone meal (steamed)	4.1	70.0	4.9	—	—	0.5
Buttermilk	91.0	0.7	3.0	—	4.8	0.5
Buttermilk (condensed)	71.5	3.3	11.5	—	10.4	3.3
Buttermilk (dried)	4.5	8.1	34.6	—	48.3	4.5
Fish meal	6.6	21.0	56.1	0.7	2.6	10.5
Fresh bone	30.4	21.1	19.7	—	3.8	25.0
Meat scrap (50 to 55% protein)	7.1	21.1	53.9	2.2	5.0	10.7
Skim milk	90.6	0.7	3.2	—	5.2	0.3
Skim milk (dried)	4.7	7.3	37.0	—	50.0	1.0
Whey	93.8	0.4	0.6	—	5.1	0.1
Green feeds, etc.:						
Alfalfa (green)	72.9	2.6	4.7	8.0	11.0	0.8
Alfalfa leaf meal	5.6	14.2	20.5	15.2	41.1	3.2
Alfalfa meal or dried hay	8.3	8.9	16.0	27.1	37.1	2.6
Beet pulp (dried)	8.4	3.5	9.3	18.7	59.3	0.8
Cabbage	91.1	0.8	2.2	0.9	4.7	0.3
Carrots	88.6	1.0	1.1	1.3	7.6	0.4
Mangels	91.2	1.0	1.4	0.8	5.4	0.2
Potatoes	78.9	1.0	2.1	0.6	16.3	0.1
Rutabagas	88.6	1.2	1.2	1.3	7.5	0.2
Turnips	90.6	0.8	1.3	1.2	5.9	0.2

*From Poultry Husbandry by M. A. Jull, except as noted.

AVERAGE PERCENTAGE COMPOSITION OF POULTRY FEEDS
(Continued)

	Calcium**	Phosphorus**
Corn or cornmeal	0.012	0.260
"Red Dog" flour	0.120	0.830
Oats or ground oats	0.102	0.395
Wheat	0.050	0.373
Wheat bran	0.125	1.110
Wheat middlings (shorts)	0.096	0.876
Bone meal (steamed)	30.045	13.959
Oyster shell	37.951	
Buttermilk (dried)	1.349	0.169
Meat scrap (50 to 55% protein)	8.683	4.270
Skim milk (dried)	1.336	0.979
Alfalfa meal or dried hay	1.046	0.221

**From L. C. Norris and H. S. Wilgus, Jr., Cornell.

NUTRITIVE RATIO

The above table is included since many poultrymen with a mathematical turn of mind enjoy working out the Nutritive Ratio or the ratio between protein and carbohydrates, plus fats. A good laying ration has a ratio of about 1:4.6. In arriving at this ratio the nutrients of each feed stuff are added together (before the fats are added to carbohydrates their value is multiplied by 2.25 because of the greater fuel value of fats), then the sum of total carbohydrates and fats is divided by total protein.

Numerically the Nutritive Ratio is expressed as:

$$\text{N. R.} = \frac{\text{Carbohydrates plus (fats} \times 2.25)}{\text{Protein}} = \frac{4.6}{1}$$

COEFFICIENT OF DIGESTION

In accurately working out a feeding formula the poultryman should also bear in mind, as was previously mentioned, that the hen does not digest all of any nutrient; therefore using table 3 by Fraps, the actual amount of the nutrient digested and absorbed by the hen's body can be determined.

OTHER FEED FACTORS

However, it is unwise to depend entirely upon the nutritive ratio in compounding a poultry feed. Though balanced, it may still prove inadequate since there are other factors that determine its effectiveness.

Condition

Whether the mash part of the ration is fed dry, wet, finely or coarsely ground, all have bearing on its digestibility. A coarsely ground feed permits the birds to pick out particular particles which unbalances the remainder. Too finely ground mashes are apt to clog in the birds' mouths and prove harmful. Careful research workers have found that cooking vegetable feeds lowers their digestibility

TABLE 3
Average Digestion Coefficients of Poultry Feeds
(Fraps, 1928)

Feed	Protein	Carbohydrates		Fats
		Crude Fiber	Nitrogen Free Extract	
Alfalfa leaf meal	99.7	3.5	0	0
Barley	72.0	10.4	82.1	58.1
Buttermilk (dried)	81.6	—	81.1	78.6
Corn meal	71.8	15.2	91.9	91.6
Fish scrap	90.7	—	15.4	95.7
Meat meal	86.7	24.0	34.0	93.1
Oats (whole)	74.1	7.1	69.3	81.7
Rye	65.3	12.2	86.0	31.4
Wheat middlings—6.25% crude fiber	50.0	9.0	49.7	52.6
Wheat gray shorts	69.2	13.0	71.0	85.2
Wheat bran	59.9	7.9	54.1	50.0
Wheat	74.0	8.7	88.9	47.1
Wheat middlings—8.5% crude fiber	76.2	8.2	59.6	52.6

Palatability

Whether the taste of the mixture appeals to the bird's appetite also has much to do with its effectiveness. This is one of the reasons for using a variety of grains, although one grain might give a proper balance. Further, certain feeds prove unsatisfactory because they are unpalatable. Rye, for instance, is highly digestible and rich in carbohydrates but is not a satisfactory poultry feed because birds generally do not relish it.

Wholesomeness

It is a very poor practice to allow hens to turn scavengers since unwholesome feeds quickly affect both egg and meat flavor, as well as the bird's health. No animal is more susceptible than poultry to tainted feeds which result in botulism, limberneck and paralysis. In considering wholesome feeds, the drinking water must not be overlooked since fowls are not only injured by stagnant, filthy water but water also may be the carrying agent of many diseases.

Availability and Cost

Feeds on hand or that can be purchased locally and their cost are probably the chief determining factors in compounding feeds. So many of the mashes that are quoted in various bulletins are formulated for states

where corn is available. Corn is an excellent feed because it not only provides easily digested nutrients but it is also rich in vitamines. However, corn is not available in most parts of Montana. Consequently, for this state it is wise to supplement at least part of the corn with wheat and wheat by-products, using alfalfa as a vitamin source.

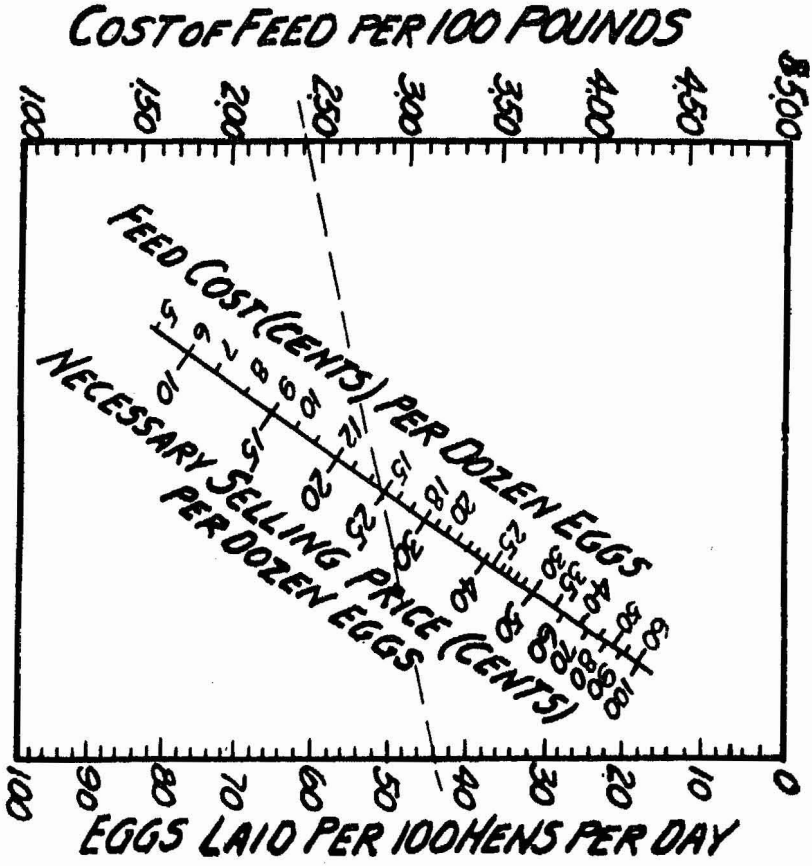


Fig. 3—Quick method for determining feed cost per dozen eggs and necessary selling price per dozen eggs. (Illinois Exp. Sta.)

A quick method for determining feed cost per dozen eggs and the necessary selling price per dozen (Fig. 3) has been worked out by the University of Illinois. In other words, when the selling price goes down the poultryman must cut his feed cost so that he can still make a profit if possible.

TABLE 4

New England Conference Ration

MASH

200 Lbs. Yellow corn meal
100 Lbs. Wheat bran
100 Lbs. Wheat flour middlings
100 Lbs. Ground oats (38 - 40 Lbs. per Bu.)
50 Lbs. Meat scrap, not less than 50% protein
25 Lbs. Fish scrap, not less than 50% protein
25 Lbs. Afalfa leaf meal, not more than 20% fiber.
25 Lbs. Dried skim milk, or dried buttermilk
15 Lbs. Ground oyster shell or limestone
5 Lbs. Salt
645 Lbs.

GRAIN

200 Lbs. Yellow corn, whole or cracked.
100 Lbs. Wheat.

Add to this mixture 7 quarts tested cod liver oil, sardine oil, (100 U. S. P. vitamin D units per gram) or their equivalent of cod liver oil vitamins A and D concentrates (all of high biological rating) or use as directed by manufacturer.

OREGON

Mill run	320 Lbs.
Ground wheat	400 Lbs.
Ground yellow corn	400 Lbs.
Ground oats	200 Lbs.
Ground barley	100 Lbs.
Meat meal	200 Lbs.
Fish meal	100 Lbs.
Dried milk	100 Lbs.
Alfalfa leaf meal	80 Lbs.
Bone meal	50 Lbs.
O. P. Linseed oil meal	20 Lbs.
Oyster shell flour	20 Lbs.
Dairy salt	10 Lbs.
	2000 Lbs.

Feed with scratch grain.

WASHINGTON

740 Lbs. Mill run or bran
300 Lbs. Low grade flour or midlings
300 Lbs. Ground yellow corn
100 Lbs. Ground barley
150 Lbs. Meat scrap
150 Lbs. Fish Meal
100 Lbs. Skim milk powder
100 Lbs. Alfalfa leaf meal
40 Lbs. Ground oyster shell
20 Lbs. Salt
20 Lbs. Biologically tested cod liver oil
2020 Lbs.

SCRATCH

100 Lbs. to 200 Lbs. Wheat
100 Lbs. Corn (whole or cracked)
100 Lbs. Barley
50 Lbs. Heavy oats

MONTANA RATION
(Making Use of Available Wheat and Usually Scarce Corn)

MASH

800 Lbs. Ground wheat
or
400 Lbs. Wheat
400 Lbs. Mill run
300 Lbs. Ground heavy oats
200 Lbs. Ground barley
200 Lbs. Ground yellow corn
150 Lbs. Meat scrap (50% protein or better)
100 Lbs. Fish scrap (56% protein or better)
100 Lbs. Dried skim or dried buttermilk
100 Lbs. Alfalfa leaf meal
30 Lbs. Bone meal
40 Lbs. Ground oyster shell
20 Lbs. Common salt
2040 Lbs.

To this add 20 to 30 Lbs. of Tested Cod Liver Oil or its equivalent.

Note: In home mixing the oil have it nearly up to 70° F. and mix with the corn meal, then mix with the rest of the ingredients.

Note 2: To stop cannibalism or feather picking the ground oats may be increased.

SCRATCH

Wheat

SUGGESTED RATIONS

Because there is no one ration that meets the requirements of all poultrymen, a number of rations that do fulfill the requisites discussed in the foregoing pages are given in table 4.

FEEDING SCHEDULES

Having chosen the ration that best fits the needs of the poultryman, the question that then confronts him is: how to feed?

Three Feeding Systems

There are several systems: all-mash, mash-scratch and grain-milk. The all-mash method is supposed to be the easiest to feed since everything that is needed is put into one mixture. In practice it is not that easy. The poultryman using the all-mash method must constantly check the weight of the birds and the feed consumed. In case of loss in weight, the carbohydrate content of the mash must be increased. For example, more corn meal may be added, (just as more grain is fed in proportion to mash in event of weight loss in the mash-scratch system); or, a wet mash at noon containing sprouted oats or steamed alfalfa leaves, which increases feed consumption because of increasing palatability, serves the same purpose.

In the grain-milk system the main points to be remembered are: 1. The ration is incomplete; therefore minerals, vitamins and succulent materials must supplement the ration. 2. Care must be observed that surplus grain does not accumulate in the litter. 3. Caution must be observed to keep hens from getting too fat.

Artificial Lights

With any of these systems artificial lights may be used in order to shorten hours on the roost and keep hens from drawing on their own bodies for energy requirements during long winter nights. A separate bulletin could be written on artificial lighting. However, in connection with feeding it is enough to state, that when using lights: 1. The lights must sufficiently illuminate the floor so that hens awakened by them will get down and eat. 2. There must be an adequate supply of mash in the hoppers and grain in the litter when the hens get up. 3. There must be a plentiful amount of warm water for the early morning hours.

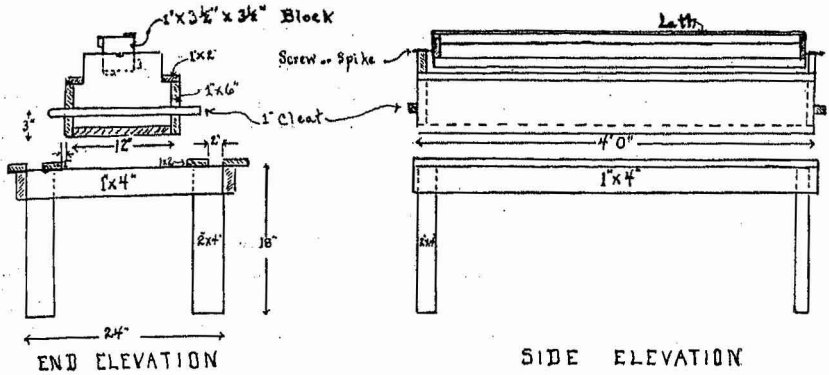
In using artificial light, because hens spend more hours in activity, the scratch grain should be increased 2 pounds per 100 birds daily.

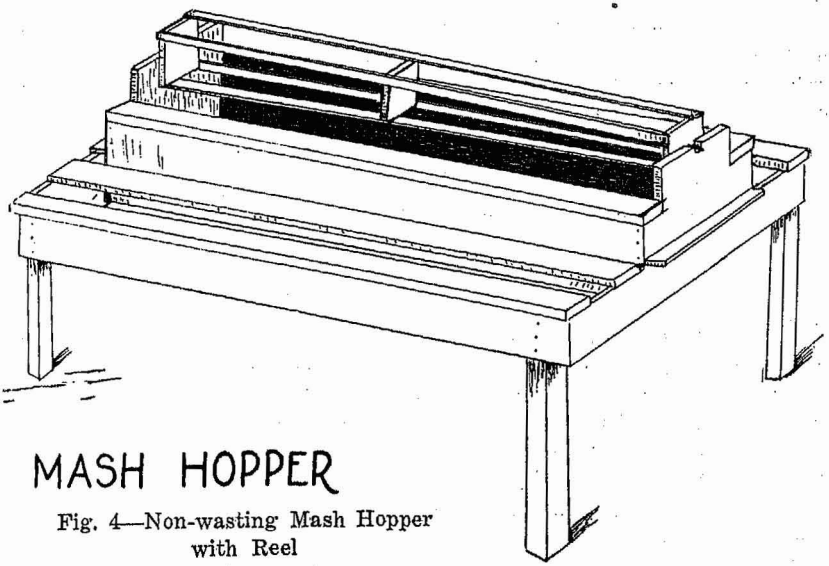
While there are various methods of using lights; namely, evening, night-lunch and morning, the morning light has been the most popular method in this state.

In actual practice, caution must be used whenever the length of day is increased or decreased by lights in order to prevent an untimely molt.

For Montana Conditions

Taking all three feeding systems into consideration the results of experiments at different stations indicate that where sub-zero weather occurs, as it does in this state, it is best to feed the mash in a non-wasting hopper (Fig. 4), and the scratch in the litter.





MASH HOPPER

Fig. 4—Non-wasting Mash Hopper with Reel

Bill of Materials for Dry Mash Feeder

4 pieces 2x4—18″ long
2 pieces 1x4—24″ long
2 pieces 1x4—4′ 2″ long
4 pieces 1x2—4′ 2″ long
2 pieces 1x2—4′ long
2 pieces 1x6—4′ long
1 piece 1x12—4′ long
2 pieces 1x10—12″ long
2 pieces 1x1—18″ long
3 pieces 2x3½x3½
4 plaster laths
2—2½ No. 10 screws
½ lb. 6d nails

WINTER SCHEDULE FOR 100 PULLETS

Time	Kind of Feed	How Fed	Amount
Early morning	Scratch	In litter	4 pounds*
All during day	Mash	In non-wasting hopper	What will be used during the day, or about 10 pounds
9 A. M. or 10 A M.	Milk—(when supplementing meat scrap)	In wooden trough or stone or glass jars	3 gallons
1:30 P. M.	Green feed	In rack or trough	What birds will eat in one hour
3 P. M. or 4 P. M.	Scratch	In litter	8 pounds*

*As warm weather advances and the birds mature a reduction should be made in the amount of carbohydrates. This is most easily accomplished by reducing the amount of scratch which in turn increases mash consumption and narrows the ration. Example:

12 pounds scratch per 100 hens daily during winter
10 pounds scratch per 100 hens daily during spring.
8.5–9 pounds scratch per 100 hens daily during summer.

FEED PLUS COMMON SENSE

Althought the foremost poultry nutrition authorities have been quoted and rations and feeding schedules have been given for poultrymen to use in feeding hens for profit, the whole success of feeding operations falls on the poultryman's shoulders. As one prominent poultryman aptly expressed it, "Take two buckets, one filled with feed, the other with common sense and give a liberal amount of each."

Also the good poultryman must keep two steps ahead of his birds. He must keep some practice in reserve to prevent pullets from going into a molt and declining in production. As previously mentioned the weight of the birds must be watched. At the first indication of loss in weight some poultrymen introduce artificial lights. This gives opportunity for increased feed consumption. At the next danger signal the fat content of the mash is increased by adding corn meal. If another change is needed, a more palatable mash moistened with milk may whet jaded appetites. A more succulent green feed may help mash and grain consumption. Often cleaning the house, providing fluffy, clean litter, may renew interest of the birds. The successful poultryman watches his birds, anticipates their needs, keeps records, cuts out leaks and realizes that by keeping cost of production at a minimum the return over feed cost increases.