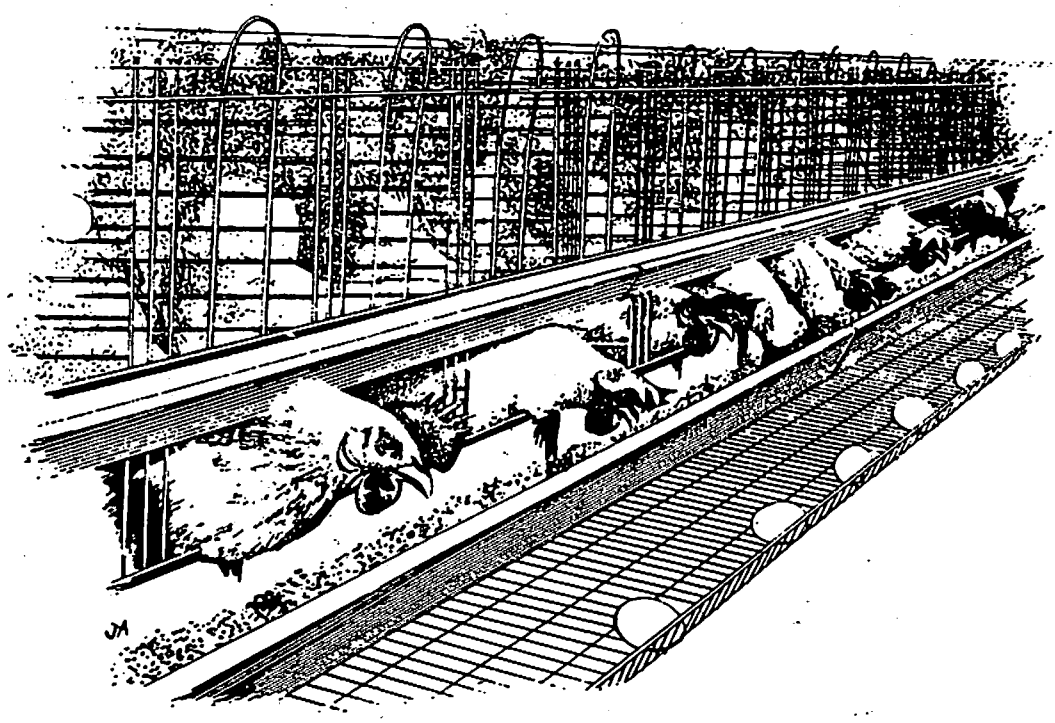
Anderson

Feeding Chickens



Cooperative Extension Service
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The primary function of feeding egg production chickens is to transform unpalatable plant, animal, and mineral matter into highly palatable and nutritious eggs and meat for a profit.

A successful enterprise depends on many things such as good breeding, management, housing, disease prevention, nutrition, and marketing. Of these, nutrition is very important since feed expense amounts to 60 or 70% of the total cost of producing eggs.

Feeding poultry is more exacting than for other farm animals. Chickens have a higher rate of metabolism and therefore require a more exact ration. They have no teeth and therefore require a concentrated ration. Because they have a simple stomach, there is little opportunity for synthesis of essential nutrients such as B-complex vitamins and amino acids.

Nutrients

For maximum efficiency, the nutrients that chickens need must be supplied in a sufficient quantity and at economical prices. These nutrients are carbohydrates and fats (which supply mainly energy), protein, minerals, vitamins, and water.

The types and proportions of the various ingredients supplying these nutrients will depend on their quality and cost, and variations in age, breed, and strain of birds receiving the rations. These variables make it impossible to formulate a ration that will be best for all conditions and purposes.

Feed Ingredients

Energy

Energy is required for body maintenance, locomotion, heat production, and body and egg fat.

Grains and grain by-products are the foundation of all poultry rations. They supply primarily carbohydrates which are a major source of energy. Corn and grain sorghum (milo) are the most important grains in Kansas poultry rations.

Yellow corn differs from sorghum grain and white corn in that it contains carotenoid pigments such as carotene and xanthophyll. Carotene can be converted by the fowl to vitamin A. Xanthophyll is important because it is laid down in the egg yolk and skin to give them the desired yellow color. Grain sorghum has approximately 93 to 98 percent of the feeding value of yellow corn. (Suggested corn-sorghum grain ratios are shown in Table 1.)

Table 1. Suggested Corn-Sorghum Grain Ratios

Corn	Sorghum Grain[1]
50%	50%
25	75[2]
75	25
10	90[2]

1. Substitution varied with price of corn and sorghum grain for most economical formulation.
2. When more sorghum grain is used, one needs to add additional dehydrated alfalfa meal to maintain desirable egg yolk color.

Oats are relatively low in energy and high in fiber. They are particularly suitable for rations that require low to medium energy levels, such as pullet growing rations.

Wheat is a highly acceptable grain for use in poultry feeds particularly when used in combination with other grains. Except for its lack of pigmentation value, it has about 92 to 95 percent of the feeding value of yellow corn; however, it is seldom economical to use.

Animal fats are concentrated sources of energy which are used to increase the energy content of rations such as high energy laying feeds. Fats also contribute valuable physical qualities to feeds.

Protein

Protein ingredients serve as sources of amino acids, the building blocks of protein. A balanced ration will contain proper amounts of the 11 essential amin acids required by the chicken. Two o more different protein sources are usually used because of economics, and the fact

that no one source contains the correct proportions of all the essential amino acids required by the chicken.

Soybean meal, meat scraps, and fish meal are the main protein ingredients used in Kansas poultry rations. Although soybean meal is the major protein that is used, it has one limitation in that it is low in methionine, one of the essential amino acids. Synthetic DL methionine or methionine hydroxy analogue can be economically added to rations.

Fish meal and meat scraps, in addition to being good protein sources, supply certain minerals and "unidentified factors."

Minerals

Minerals are essential for chickens because they are needed for the formation of bone, egg shells, blood cells, and for numerous metabolic reactions. There are some minerals present in the grains, protein supplements, and other ingredients; but in most cases supplemental sources of the following five minerals are added.

Calcium—ground limestone is an efficient and economical source. Calcium requirements vary with the strain of bird, rate of egg production and age of the laying hen. Calcium is particularly important for layers. To maintain good egg shell quality the complete ration should contain 3.25 to 3.5 percent calcium. During the stress of warm summer months one may need to increase the level of calcium in the complete ration to 3.75 to 4.0 percent or else supplement the feed with oyster shell. This can be offered free-choice in floor pens or fed at the rate of 2 pounds per 100 hens per week with caged birds.

Recent studies have shown it is beneficial, when using the complete feeding system, to supply at least half of the calcium in a large particle size, e.g. flake oyster shell or granular limestone.

Phosphorus—dicalcium phosphate is a good source of both calcium and phosphorus. Consideration should be given to the source since the availability of the phosphorus varies among different sources.

Salt (NaCl)—Iodized salt or finel verized salt is usually added at the r 0.5 percent of the total ration.

Trace minerals—a trace mineral usually added to satisfy the mang zinc, iodine, copper and selenium re ments.

Oyster shell—a soluble form o cium carbonate that can be used t plement the calcium needs for layer may be fed free-choice or as a top ing.

Grit—a nonsoluble mineral subs such as sand or granite that serv assist the muscle contractions of th zard in crushing and grinding food cles. Grit is not essential when pulv complete mash feeds are fed.

Vitamins

Vitamins are involved in many bolic processes of the chicken—e metabolism, ionic balance, bone f tion, and blood clotting. The mas duction of synthetic sources of vit makes it possible to add the nec vitamins at a very small cost.

Vitamins A, D_3, E, K, B_{12}, ribof pantothenic acid, niacin, and choli usually added to rations. They are u provided in excess amounts since th relatively inexpensive.

Water

Water is the cheapest, yet in cases the most neglected nutrient. will suffer loss of production or die water starvation sooner than from starvation.

Water that appears clean can trouble along with its life-giving p ties. For maximum production, should be cool, free of pathogenic n organisms and toxic levels of mi and chemicals. Water with a salt co of over 3,000 ppm is poor water for try. Have your water supply tested i suspect it is unsafe for poultry.

Table 2. Recommended Rations for Chickens (Amt./100 lb)

Ingredients	Layers				Meat-Type	
	Starter (0-8 wks.)	Grower (8-12 wks.)	Grower (12-20 wks.)	Layer 17%	Starter (0-4 wks.)	Finisher (5-8 wks.)
Corn, yellow, ground	30.0 lb	25.0 lb	30.0 lb	32.0 lb	22.5 lb	27.5 lb
Sorghum grain, ground	30.0 lb	25.0 lb	35.0 lb	32.0 lb	22.0 lb	27.0 lb
Soybean meal, 44% prot., solv. extr.	27.0 lb	15.0 lb	20.0 lb	25.0 lb	44.5 lb	34.5 lb
Oats, ground	.....	10.0 lb	5.0 lb	.....	.....	.....
Wheat standard middlings (shorts)	.....	10.0 lb	.....	.....	.....	.....
Alfalfa meal, dehy., 17% prot.	5.0 lb	5.0 lb	7.5 lb	2.5 lb	2.5 lb.	2.5 lb.
Meat and bone scraps, 50% prot.	.....	5.0 lb	.....	.....	.....	.....
Fish meal, 60% prot.	3.0 lb	.....	.....	.....	.....	.....
Fermentation solubles	2.0 lb	....	.....	.....	.....	.....
Fish solubles	.....	2.0 lb	.....	.....	.....	.....
Ground limestone (Calcium carbonate)+	1.5 lb	1.0 lb	1.0 lb	6.5 lb	1.0 lb	1.0 lb
Dicalcium phosphate+	1.0 lb	1.0 lb	1.0 lb	1.5 lb	1.0 lb	1.0 lb
Salt (Sodium chloride)+	0.5 lb	0.5 lb	0.5 lb	0.5 lb	.5 lb	.5 lb
Animal Fat	.....	.....	.....	.....	5.0 lb	.....
Added per 100 Lbs. of Feed						
Trace mineral mix+,[1]	23 g	23 g	23 g	23 g	23 g	23 g
Vitamin A (10,000 USP units/$_2$gm)[2]	15 g	10 g	10 g	15 g	20 g	20 g
Vitamin D_3 (15,000 ICU/gm)[2]	8 g	7 g	5 g	6 g	8 g	8 g
B-complex vitamin mix[2,3]	46 g	23 g	23 g	46 g	45 g	45 g
Vitamin B_{12} (20 mg/lb)[2]	15 g	15 g	10 g	15 g	10 g	10 g
Choline chloride, 25% mix[2]	80 g	80 g	....	40 g	40 g	40 g
Methionine[2]	23 g	23 g	23 g	23 g	23 g	23 g
Coccidiostat[2,4]	23 g	23 g	Optional	.....	.....	.....
Antibiotic supplement of choice[2]	Recommendation of Manufacturer			.....	.....	.....
Calculated protein (%)	20	18	16	17	24	20

*Alternatives of some animal protein and 18% protein level for cage layers and certain strains of birds may be desired.

+ Mineral premix

1. Example—Trace mineral mix supplying by %: Mn 10; Fe 10; Ca, Max. 14, min. 12; Cu 1; Zn 5; I, 0.3; Co 0.1.
2. Vitamin and amino acid premix.
3. Example—B-complex vitamin mix supplying in mg/lb: riboflavin 2000; pantothenic (2,680; niacin (; choline chloride 20,000.
4. Example—Amprol-25% (R) at rate of 1 lb/T or an equivalent coccidiostat.

(R)= Registered trademark.

Feed Addi

Feed additives such as antibiotics, antioxidants and other drugs are not essential for life, but are put in rations for purposes not directly concerned with nutrient requirements, such as stimulation of production and treatment of disease.

The use of feed additives in poultry feeds is closely regulated by the Food and Drug Administration. Consult the supplier of the additives for current Food and Drug regulations pertaining to their usage.

Miscellaneous Ingredients

Various other ingredients are added to poultry feeds for specific purposes such as to supply unidentified factors and pigmentation. Examples of these ingredients are dried distillers grains, corn gluten meal, and alfalfa meal. Except for alfalfa meal, the use of these ingredients depends primarily on their availability and cost in relationship to other ingredients.

Leg Disorders

There is a common problem in rapid growing strains of broilers. Perosis-like symptoms, such as swelling of the hock joints, slipped tendons, and severe shortening of the long bones can be due to deficiencies of the trace minerals maganese and zinc and the vitamins choline, niacin, folic acid, biotin and pyridoxine. Extra fortification with these nutrients via either the water or feed is recommended when nutritionally related leg disorders are a problem.

Feeding Systems

The most common feeding system is the complete ration (mash, granules or pellets). It is recommended for meat-type birds, where bulk feed handling and automatic feeders are used and where uniform egg yolk color is important.

The mash and controlled grain and free-choice systems are satisfactory for layers. The "mash and controlled grain" system involves feeding a 20% protein mash free-choice and limited amounts of grain.

The "free-choice" system involves placing a high protein concentrate (26 to 32%) and grain in separate feeders and allowing the birds to balance their own ration. All birds cannot do this satisfactorily.

The latter two systems are used primarily for feeding growing pullets and laying hens. They require more labor and supervision and result in variable egg yolk color; however, homegrown grains can be utilized. The proportions of mash to grain will depend on the desired level of protein intake.

Controlled and restricted feeding systems are used in rearing egg production-type replacement pullets. The purpose of either system is to restrict the energy intake of the bird resulting in delayed sexual maturity and leaner, more muscular birds. Controlled feeding involves feeding a ration containing high fiber and bulk. Restricted feeding, as the name implies, involves restricting the pullet's feed intake, such as feeding the amount of feed that will be consumed within a specified period each day.

Physical Form of Feed

Pelleting increases the density of the feed. Crumbles are pellets which have been run through a grinder or roller. Both have certain advantages, namely less feed wastage particularly on range, increased acceptability (palatability) and reduced sorting over of ingredients. However, pellets and crumbles tend to increase cannibalism.

Pellets or crumbles are usually recommended only for broilers and growing pullets, but not for layers because of the extra cost of pelleted rations.

Formulation and Mixing

Formulas for complete feed starting, growing, and laying rations are presented in Table 2. (on the preceding two pages) These rations are designed to make maximum use of those ingredients readily available in Kansas. A number of feed firms will custom mix a ration according to your formula.

The decision whether to purchase your feed or to do some form of "on-the-farm mixing" depends on many factors. Availability and costs of ingredients, size of enterprise, labor supply, available capital, and services are some of the factors that should be considered.

There are several degrees of on-the-farm mixing of feed. Table 3 (on the next page) shows the supplies required for various degrees of on-the-farm mixing. An understanding of this is very helpful in considering this question. These systems are shown on the following page.

Complete Feed

This system requires a minimum amount of capital investment, and managerial ability and time. The number of services supplied by the feed manufacturers varies among companies, but usually includes financing technical assistance, service, and in some cases, marketing assistance.

Concentrate [Balancer]

This program involves mixing either homegrown or purchased grains with a commercial concentrate. Storage, grinding, mixing, and handling facilities are required. Quality of the grain is your responsibility, while that of the concentrate is the supplier's. The quality of the concentrate is important.

Super-Concentrate

The concentrate is mixed with a protein supplement (usually soybean meal), limestone, and grain. The advantage of this system is that the soybean meal may be purchased in bulk at considerable savings. Few services are supplied by the concentrate supplier. Quality of concentrate and type of mixing equipment is very important.

Premix

This system is used by producers who mix from the ground up, but who do not have the facilities and volume for mixing microingredients such as vitamins, drugs, and trace minerals, which are the usual ingredients in premixes. Usually the supplier furnishes information on formulation and mixing. As the package containing the vitamins, drugs, and trace minerals becomes smaller per ton, premix quality and proper mixing procedures become extremely important.

It is evident from the preceding discussion of mixing systems that when you become involved in on-the-farm mixing, the responsibilities involved in producing a quality feed shift from the supplier to you.

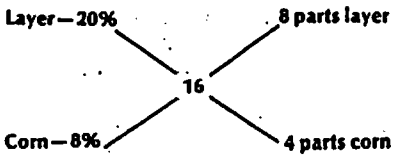
Remember, whatever aspect of poultry feeding you may be considering, the most important thing is the feed cost per unit of product.

Square Method of Formulating Feed

This method is a simple way to compute the ratios at which two separate feed ingredients should be combined to arrive at a certain level of one nutrient.

For example, lets's assume you desire to feed a 16% protein ratio using corn (8% protein) and a 20% protein layer mash. Follow these steps to determine the percentages of corn and layer mash that should be combined:

1. Draw a square and place the desired protein level (16%) in the center.



2. Put the layer and its protein content at upper left; put corn and its protein content (8%) at lower left.

3. Subtract diagonally across and record the differences at the opposite corners. The number at the upper right gives the parts of layer mash by weight and the number at the lower right gives the parts of corn by weight.

4. Divide the parts of corn by total parts (4 + 12 = 33%) to determine what percent of the ratio should be corn. The remainder (67%) would be layer mash.

Table 3. Supplies for Mixing*

Complete Feed lbs.	Concentrate	lbs.	Super	lbs.	Premix	lbs.
2,000	Conc.	800	Super	300	Vitamin Premix	5
	Corn	1,200	Limestone	100	Salt	6
			Soybean Meal	400	UGF Source	20
			Corn	1,200	Phosphorus	20
					Alfalfa	50
					Poultry By-Products	100
					Limestone	120
					Soybean Meal	400
					Corn	1,279

*"Shall I Mix Poultry Feed on the Farm?" Prepared by Marion L. Jones. North Carolina Agricultural Extension Service. February, 1965.

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