



Feeding Chickens

Livestock Production Guide

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An important part of raising chickens is feeding—feeding makes up the major cost of production and good nutrition is reflected in the bird's performance and its products. This publication discusses feeding traditional rations as well as mixing your own rations, organic diets, and special concerns for feeding chickens in some of the pasture-based models discussed in the companion ATTRA publication [*Sustainable Chicken Production*](#).

Feeding Options

The most convenient way of feeding chickens is with a balanced pelleted ration, whether the birds are confined indoors or allowed to range outdoors. Most diets contain corn for energy, soybean meal for protein, and vitamin and mineral supplements. Commercial rations often contain antibiotics and arsenicals to promote health and improve growth, coccidiostats for combating coccidiosis, and sometimes mold inhibitors. However, it is possible to obtain unmedicated feed-check feed labels to see if they contain feed additives.

In the industry, the feed is pelleted so the bird can eat more at one time. Chickens are nibblers and make frequent trips to the feed trough for small meals, which requires energy. Pelletting reduces the amount of energy required for a bird to feed. However, many producers of pasture-based, "natural" poultry believe that the meat is better when the bird receives more exercise.

If the bird is eating a fibrous diet, grit such as oyster shells is supplied to aid in grinding up coarse feed in the gizzard. Industry birds usually don't use grit because the diet is low in fiber. Outdoor birds also pick up small stones.

Different rations are often used, depending on the production stage of the bird. Starter rations are high in protein-an expensive feed ingredient. However, grower and finisher rations can be lower in protein since older birds require less. A starter diet is about 24% protein, grower diet 20% protein, and finisher diet 18% protein (1). Layer diets generally have about 16% protein. Special diets are available for broilers, pullets, layers, and breeders. Whole grains can also be provided as scratch grains.

Access to clean water is important. Levels of total dissolved solids above 3000 ppm in the water can interfere with poultry health and production.

Home-mixed Rations

Some producers decide to mix their own rations in order to be assured that only "natural" ingredients are used.

Poultry feed ingredients include energy concentrates such as corn, oats, wheat, barley, sorghum, and milling by-products. Protein concentrates include soybean meal and other oilseed meals (peanut, sesame, safflower, sunflower, etc.), cottonseed meal, animal protein sources (meat and bone meal, dried whey, fish meal, etc.), grain legumes such as dry beans and field peas, and alfalfa. Grains are usually ground to improve digestibility. Soybeans need to be heated-usually by extruding or roasting-before feeding in order to deactivate a protein inhibitor. Soybeans are usually fed in the form of soybean meal, not in

"full-fat" form, because the valuable oil is extracted first. Whole, roasted soybeans are high in fat which provides energy to the birds.

Chicken feed usually contains soybean meal which is a by-product of the oilseed industry. In the industry, soybeans are dehulled and cut into thin pieces (flaked) to improve the action of the solvent (usually hexane) which is passed through the soybean to extract the valuable oil. Vegetable oils such as soybean oil are used for edible and industrial purposes. Then the soybean is then toasted as a method of heat treatment to deactivate an inhibitor which would otherwise interfere with protein digestion in the animal.

However, chickens can also be fed unextracted (full-fat) soybeans. An advantage of feeding unextracted soybeans is that they still contain the oil which provides high energy fat to the bird. Unextracted soybeans need to be heat-treated-roasted with dry heat and then ground, rolled, or flaked before mixing into a diet. Another method of heat treatment is extruding. Extrusion involves forcing the beans through die holes in an expander-extruder which creates friction which heats the beans sufficiently (sometimes steam is also applied). The result is a powdery material which does not require further grinding. Roasted and extruded soybeans should not be stored for long periods of time, especially in hot weather, because the oil turns rancid.

Since protein is generally one of the most expensive feed ingredients, the industry uses targeted rations and reduce the amount of protein in the diet as the birds grow (chickens require less and less protein as they age); however, it may not be cost-effective for small-scale producers to have different diets for starters, growers, and finishers.

Vitamin pre-mix is usually added but may be reduced by using vitamin-rich plant sources such as alfalfa. Other plants also provide vitamins in their leaves, hulls, and brans. Fish oil can provide vitamins A and D. Yeast provides some of the B vitamins. Sunlight is a good source of vitamin D for ranging chickens (converting a precursor to vitamin D). Poultry in cattle pastures may obtain vitamin B12 when picking through dung pats for insect larva.

Sprouting grains, although a labor-intensive process, is used by some producers for vitamins when access to range is not possible. Sprouting can increase the amounts of carotene (vitamin A precursor) in the grain and as a source of year-round forage, could be an advantage for certified organic poultry production to reduce the amount of synthetic vitamins required in the diet. Eating plants may provide a yellow color to the skin of slaughtered chickens and a deeper yellow color to egg yolks.

Trace mineralized salt is usually added to poultry diets, but other sources can provide minerals. Minerals, although not present in high levels in plants, are provided in fish meal and kelp (seaweed). Meat and bone meal is an excellent source of minerals, particularly calcium and phosphorus, as well as being a good protein source. However, if a producer

does not want to use meat and bone meal, then dicalcium phosphate can be substituted.

Access to pasture can reduce the vitamins and minerals needed in the diet since the birds get vitamins from plants and both vitamins and minerals from insects. An example of an all-grain diet is enclosed.

Probiotics are sometimes provided to chicks during placement and before shipping. However, preparing a balanced diet can be a complex, possibly costly process, especially for producers with little background in nutrition. Specialized knowledge is required about the nutrient requirements of chickens and the nutrients contained in feedstuffs. Feed ingredients need to be sourced, milled, mixed together according to a formulation, and the mix is usually pelleted.

Ration-balancing of home-made diets is important, especially on a commercial scale, to achieve the right amounts of nutrients. If diets are not properly balanced, then birds will suffer from nutritional diseases. The National Research Council's Nutrient Requirements for Poultry [\(2\)](#) specifies the amounts of protein, energy (carbohydrates and fats), minerals, and vitamins. The quality of the protein is important since it is made up of individual amino acids, some amino acids being essential to bird health.

The proper amount of these nutrients needed in diets depend on breed, age, and type of production. The reference issue of Feedstuffs magazine [\(3\)](#) has a charts of feed composition which lists the amount of nutrients provided by various feedstuffs. Feeding textbooks such as Applied Animal Nutrition: Feeds and Feeding [\(1\)](#) also have such charts. Feedstuffs can also be analyzed in a laboratory for nutrient make-up. Poultry nutritionists or Extension agents can provide help in ration-balancing. In preparing your own diet, formulation is important. Sample diets are enclosed. Some diets do not include meat and bone meal--call ATTRA for more information.

If you are mixing a large volume, you may be able to get a local feedmill to mill, mix, and possibly pelleted (requires different machinery) for you. Feedmills also have access to feed ingredients and staff with nutritional expertise who can formulate diets.

Ellie MacDougal, a Maine farmer who keeps 50 layers primarily for composted litter for an herb operation, is an example of a producer who mills and mixes her own ingredients on-farm. She purchases whole grains and mills them as needed to retain nutrients. She says that milled grains should be fed within 30 days or else they begin to lose nutrients. She suggests a hand-mill for small quantities or a motorized mill for larger amounts. Another option is to buy already milled grains and just do your own mixing.

Some producers feed whole grains. An "old-fashioned" way of feeding chickens is the "mash and grain" method which is a two-feed system of providing whole grains along

with a high-protein ration in order to reduce costs. The whole grains cost less than the high-protein ration and can even be grown on-farm [\(4\)](#). Contact ATTRA for more information on mash and grain feeding.

Certified Organic Diets

Home-mixed diets are particularly useful to certified organic poultry producers. Although pre-mixed organic poultry rations are available for purchase, they can be expensive and may need to be shipped from long distances. Call ATTRA for a list of organic poultry feed suppliers.

Many producers look for local sources of organic feed ingredients. If you have difficulty in finding sources of organic feedstuffs locally, the Organic Crop Improvement Association (OCIA) [\(5\)](#) may be able to provide you with the names of organic producers in your area. Some producers raise their own organic feedstuffs.

A useful contact is Craig Kovacik [\(6\)](#), an organic poultry producer in Michigan. He raises an average of 50 broilers per week in a pasture-based model. He mixes and sells organic poultry rations and is familiar with organic standards for processing feed.

At present, the USDA does not permit "organic" labels for livestock products, because the federal standards are not yet set for organic livestock production. However, private and state certifying agencies provide certification if an operation meets their criteria. Most programs' standards for certified livestock production require that 100% of the feed be certified organic and that no antibiotics, wormers, growth promotants or insecticides which are not on the program's list of approved natural products be used.

Feeding Concerns for Chickens in Pasture-based Models

When raising birds in a pasture-based model, it is important to keep in mind that the digestive system of the chicken is geared towards the digestion of insects, seeds, and grain rather than the digestion of forage, and they will still need concentrate feed rations to produce well. However, chickens can make some use of high-quality forages, particularly legumes. Ladino clover was a recommended forage in the 30's and 40's when grazing poultry was more common. Sudan grass was used for summer grazing, oats and wheat were used in the winter, and alfalfa provided perennial legume pasture.

Joel Salatin [\(7\)](#) developed the popular "pastured poultry" model in which broilers are pastured in floorless pens which are moved daily to fresh pasture. Feed concentrate is provided in the pen, along with water. In this system, allowing the birds to forage on

plants, seeds, insects, and worms which reduces concentrate feed costs by 30%. (See the ATTRA publication [Sustainable Chicken Production](#) for more information.) Salatin does not believe that forage species is important for poultry range. He believes that a diverse, perennial mix of forages is key to providing nutrients. He says the forage height is important and keeps his pasture sward at about 2 inches.

If the grass is tall, chickens in the confined field pens ("pastured poultry") tend to mat the grass down and it becomes unsanitary. Fresh, vegetative pasture provides more nutrients to poultry than fibrous, stemmy pasture, and a good sod pasture prevents muddy, unsanitary conditions. Some producers use mangles, kale and even tree forage, such as mulberry or persimmon, as poultry feed.

Salatin also developed a free-range model called the "eggmobile." This is a portable layer house which is moved every few days to a new pasture location. Birds range freely during the day (see the ATTRA publication [Sustainable Egg Production](#) for more information). If chickens (particularly the more aggressive layer breeds) are raised in a "free-range" model such as the eggmobile, it may be possible to feed whole grains cafeteria-style instead of milled, mixed rations. Salatin feeds whole grains to his layers in the "eggmobile". Corn, wheat, oystershell, and meat scraps are fed cafeteria-style, so the birds can choose what they need.

If, for example, the birds have been eating a lot of grasshoppers on pasture, they may consume less of the expensive meat scraps. This style of feeding may make costly organic feeding more feasible, since whole organic grains could be purchased and fed without the additional processing costs of milling and mixing into rations. However, birds in the confined field pens of the pastured poultry model may not be able to forage sufficient insects.

Although feed requirements can be reduced by allowing access to range and the accompanying insects, benefits of ranging poultry may lie more in marketing and animal welfare rather than in the feeding.

Summary

Chicken nutrition and feeding is an important part of production. If you are going to mix your own diet, great effort may be required to produce well-balanced diets, especially certified organic diets. Chickens are able to obtain some of their nutrients from insects, worms, and plants when on pasture, thus reducing costs.

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2) National Research Council. 1994. Nutrient Requirements for Poultry. No. 1, 9th Edition. National Academy of Science, Washington, DC. 155 p.

3) Feedstuffs

P.O. Box 2400

Minnetonka, MN 55343

1-800-888-7580

Reference issues: \$35.00

4) Plamondon, Robert. 1997. Feeding chickens the old-fashioned way. May-June. p. 51-52.

5) Organic Crop Improvement Association

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