



Raising Your Home Chicken Flock

A successful backyard flock requires sound animal care and management, which includes proper planning, careful management, a biosecurity plan to prevent diseases, and a complete and balanced feeding program. The U.S. Department of Agriculture (USDA) reported that 7% of all U.S. households owned a small flock, with an average size of approximately 49 birds. There are more than 138,000 small backyard flocks in the United States.

Raising a home chicken flock can be a good experience and a source of enjoyment. As a family project, it teaches about living beings and responsibility. The home chicken flock also can be an excellent source of low-cost, high-quality poultry

products. This publication provides the basic tools to start a successful flock.

Why Have a Small Flock?

A small flock offers the convenience of having layers for fresh eggs or broilers for poultry meat right at home. Often, backyard flocks are a hobby or a learning experience for 4-H or Future Farmers of America (FFA) projects. Poultry can be exhibited at county and state fairs and poultry shows. There is also the pleasure of observing different shapes and colors in a backyard flock. Poultry may include chickens, bantams (small chickens), geese, ducks, turkeys, game birds and guineas.

Before You Plan to Raise a Flock

Always begin with the end goal in mind. What is your goal--to have fresh eggs, pets, or meat; teach your child the responsibilities of caring for animals; show birds; or just enjoy watching and caring for poultry? Check with local, county, state and even federal zoning and environmental regulations as some may prohibit poultry flocks in your area. Zoning regulations are usually specific about animals and environmental considerations, such as flies, odor and noise. Check with your county Extension office or representatives of government agencies for information before planning a flock. Also consider the proximity of your neighbors and their opinions. Good neighbor relations are very important. Home flocks, no matter what the size, require water, food and daily care, including weekends, vacations and holidays. The time and effort required should be considered in weighing your desire for a home flock against other possible uses of your time and labor. **Caring for a flock is a 24-hour, seven-days-a-week commitment that begins with your first bird.**

What Kind of Chickens Should You Raise?

There are three basic types of poultry; breeds used primarily for egg production, breeds used for showing or exhibiting, or those that are bred for meat production. Care and feed requirements will vary for each type of breed. Purchase your chicks or chickens from a reputable hatchery or breeder. It is recommended that you purchase chicks from hatcheries or breeders that participate in the National Poultry Improvement Plan (NPIP). A list of certified hatcheries and breeders can be found at <http://extension.umd.edu/poultry>.

Egg production – White Leghorns are a very popular breed for laying white eggs. Rhode Island Red, Barred Rock, Sex-links (cross-bred chickens whose color at hatching is differentiated by sex, thus making chick sexing easier) and Buff Orpingtons are popular breeds that lay brown eggs. Pure breeds can lay approximately 150 eggs per year per hen, while commercial leghorns and brown Sex-links can lay up to 260 eggs per hen per year. A rooster is not needed for the hen to produce eggs. Most of the time, chicken breeds with white ear lobes lay white eggs and chickens with red ear lobes lay brown eggs. These breeds of birds can be purchased as day old chicks or 18-22 weeks old pullets that are ready to lay eggs.

Meat production – Cornish Cross is a fast-growing breed for meat. They can reach 4-5 pounds as a broiler in 6 weeks or 6-10 pounds in 8 to 12 weeks as a roaster size.

Exhibition/Showing – Chickens are judged depending on the characteristics of the particular breed. The American Poultry Association (APA) publishes *The American Standard of Perfection*, which is the official breed standard for fancy (hobby) poultry in North America. The book provides illustrations and descriptions of all accepted breeds of domestic poultry. Bantams are a small breed chicken, about ¼ the size of large poultry, often exhibited by young 4-H members.



Because they are small, Bantams eat less and require minimal space.

Urban Poultry

Urban poultry is a relatively new term used to describe small flocks that are reared inside city limits. The practice is becoming more prevalent because many cities are changing laws to allow homeowners to maintain small flocks. The exact number and sex that can be maintained varies by city so it is important to check your local municipality ordinances before you begin. There are also other restrictions placed on how close to the neighbors the birds can be, as well as what can be done with the manure and dead birds. Make sure that you find out as much information as possible before starting. Also, if you are a member of a homeowners association, check to determine if poultry are allowed.



Housing Requirements

Housing should provide protection from all kinds of weather, predators, injury, and theft, as well as

adequate space for moving, nesting and roosting (see table 1). Consider the location of your poultry house on your property. Locate the building in a well-drained area, with access to water and electricity. Your job is to keep the birds comfortable at all times. The house should be weather tight, well ventilated and insulated. It is important to provide adjustable ventilation for adequate air movement in cold and hot weather.

Permanent or temporary housing are options to consider. A permanent house will remain in the same location on the property. Temporary or portable housing can be moved as needed around the property and is typically used when birds are raised on pasture. The birds usually are raised in bottomless pens directly on pasture and are provided feed and water daily.

Depending on the poultry breed, you may want to consider outside run areas with temporary or permanent fencing and overhead netting to protect the birds from predators. The floor can be concrete, wood, or dirt, but litter, such as shavings or sawdust, should be spread on the chicken house floor. Use a (½-inch) mesh hardware cloth over windows to keep out birds, rodents and varmints.

Predators

Growers must do everything possible to protect their birds from predators (see table 2). Restrict birds (particularly young ones) to locations that protect them when predators are most active. Most predators are active at night, in the early morning and late in the evening. Keeping the birds in their

Table 1. Birds Need Adequate Space for Moving, Nesting and Roosting so Space Requirements Vary with the Type of Bird¹

<u>Type of bird</u>	<u>Sq ft/bird inside</u>	<u>Sq ft/bird outside runs</u>
Bantam Chickens	1	4
Laying Hens	1.5	8
Large Chickens	2	10
Quail	1	4
Pheasant	5	25
Ducks	3	15
Geese	6	18

Source: ¹Clauer, 2009

coop or another protected area during the night and letting them out only during the day is one of the best methods to lower predation losses. Many growers surround birds' area with electric fencing to keep predators out. However, this does not protect the birds from hawks and owls. Other growers protect birds by completely fencing the outdoor area with a wire roof to prevent predators from entering. The amount of protection necessary depends on the farm's location. Typically, farms near forest or wooded areas or those in rural areas require greater protection than those in more populated areas.

Rearing Poultry

Brooding

Newly hatched chicks need heat during the first few weeks. There are many types of chick brooders that can be adapted to a small flock. You can use standard hover brooders for starting a flock of up to 1,000 chicks. The common infrared lamp is an inexpensive way to brood flocks of 25 to 100 chicks. The heat lamp should be at least 18 inches above the litter. In winter, make sure that the room

Table 2. The Most Common Predators and the Signs They Often Leave

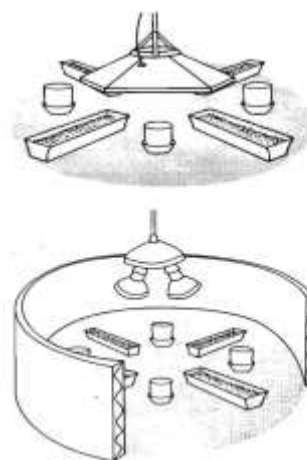
Predator	Signs
Coyote	Whole bird missing, sometimes with scattered feathers
Cat	Chicks or young birds missing
Dog	Birds usually mauled but not eaten; birds missing
Fox	Whole bird missing, with scattered feathers
Hawk	Bird eaten on site, lots of feathers (look nearby under areas where the birds can perch to eat)
Mink/Weasel	Dead birds neatly piled; back of head and neck eaten
Owl	Head and neck eaten, lots of feathers, sometimes whole birds missing; happens at night
Opossum	Whole birds consumed, feathers and all; sometimes leave only the wings or feet
Rat	Chicks or young birds missing; partially eaten chicks
Raccoon	Breasts and entrails eaten, backs bitten, scattered feathers
Skunk	Entrails eaten but not muscles or skin; lingering odor

temperature is warm enough to allow the heat lamps to be effective. A two-lamp unit provides safety in case one burns out during cold weather (see figure 1).

Start brooding chicks at 90°-95° during the first week, reduce the temperature gradually by 5° each week until the chicks are 5 weeks old and the chicken house temperature is 70°-75°. Hang a thermometer at chick level to monitor brood temperature. However, the behavior of the chicks is a better indicator of their comfort. If the chicks have loud, sharp chirps and bunch near the heat source, they are cold. If they are panting and bunched in the corner away from the heat source, they are too warm.

A circular barrier called a brooder guard, usually 15- to 16-inches high and made of cardboard or other solid material, can be used to help confine the chicks. This guard can also help reduce drafts of cold air, and keeps chicks near the heat source during the first week to 10 days.

Figure 1. Suggested Arrangement Includes Two Heat Lamps in Case One Burns Out in Cold Weather



Feeders

Manufactured chick feeder designs vary from commercially used cardboard or plastic feeder lids to metal troughs. Homemade boxes, egg flats and similar low, open designs are acceptable as long as the chicks have easy access to the feed, and feed waste is controlled. Provide enough space so that avoid feed waste, gradually change chicks to regular tube or trough feeders so that open feeders can be removed when the chicks are 10 days old.

Farm supply dealers carry hanging tube and trough feeders for all ages. Hanging tube feeders are adjustable and can be used for chickens from one week through adulthood. Trough feeders have a limited capacity for adjustment, which makes it necessary to use at least three different sizes of feeders during the birds' growing cycle.

A feeder can be built from scrap lumber, but must be designed to avoid feed waste. The feeder must have a grill or other device to keep chickens from roosting on it or scratching in it and a lip to keep the feed from being spilled out. It is also essential that the feeder be the correct height (the back height of the chickens). Allow 2 to 3 inches of feeder space per bird for a laying hen or a meat bird.

Nests

Chickens kept for egg production should have access to nests at 19 to 20 weeks of age. Giving young pullets the opportunity to find nests one to two weeks before they start laying helps prevent them from developing the habit of laying in the litter. Nest boxes and roost areas should be placed 24 inches above the floor. At least one 12" x 12" nest box per four to five chickens is adequate. A 14" x 14" nest box is better for larger breeds. Keep 1 to 2 inches of clean, dry straw or pine shavings in the nest. Make sure nesting areas are separate from the roosting area so birds don't roost in the nesting boxes. Nesting boxes will become very dirty if hens are roost there.

Roosts/Perches

Roosts or perches provide comfortable sleeping for hens. Roosts can be rods or tree branches at least 2 inches in diameter. Allow at least 6 to 7 inches of roost space per bird. Keep roosts higher than the nesting boxes. Hens will roost on the highest point in the house.

Waterers (Drinkers)

Manufactured chick waterers (also called drinkers) are usually gallon or quart jars that screw onto special bases. Once filled, the waterers are inverted and the chicks drink out of the base. A poultry fountain is another type of waterer. The poultry fountain maintains a constant water level in the pan by a vacuum and the top is designed to prevent roosting. A 5-gallon waterer can accommodate up to 75 hens. The height of waterers should be two inches shorter than the height of the chickens' backs. Allow 2 to 3 inches of drinker space per bird. Clean the waterers and replenish with fresh water daily so chickens have access to clean water at all times.

Waste/Litter Management

Dropping pits help with litter management; they catch a good portion of the bird's feces as well as water spillage. The dropping pit should be wire covered and at least 12 to 16 inches off the floor. Clean the dropping pit regularly, particularly if wet conditions develop and ensure a modest flow of air over litter and manure to suppress the growth of bacteria such as *E. coli* and *Salmonella*.

Lighting

Artificial light benefits all types of poultry. Adequate lighting will maximize egg or meat production. One 25-watt incandescent bulb lights 40 square feet. A 40-watt incandescent bulb provides adequate light for 200 square feet of floor space. If the ceiling is painted white or a light reflector is used, the quality of light is enhanced. Proper artificial light during the fall and winter months will stimulate and maintain egg production. A combination of natural and artificial light for 14 hours per day is effective at maintaining egg production throughout the year.

Usually broilers and roasters will grow well with 24-hour light, but can grow with only 8 to 10 hours,

such as that provided by natural light. Installing an automatic timer is an inexpensive and easy way to adjust the amount of artificial light. Always add the artificial light with a time clock in the morning and let the birds go to roost when the sun sets.

Economics of Small Poultry Flocks

Whether you view your small poultry flock as a hobby or a significant contribution to the family diet, it is useful to estimate the acquisition and maintenance costs. The budgets for layer and broiler flocks in tables 3, 4 and 5 were developed by

Dale Johnson, Farm Management Specialist for University of Maryland Extension. They are based on his personal experience in raising layer and broiler flocks and in consultation with other producers. Small flock production is highly variable and good management is important for efficiency. Following each budget are the assumptions on which the budgets are based. These explanations will assist you in calculating your own budget estimates based on the number of laying hens or broilers you are planning to raise. You also should consider your level of experience and the availability of inputs.

Table 3. Estimated Backyard Layer Flock Budget for Four Hens, 3 years of Production (1)

Dozen eggs produced (2)				179
Item	Unit	Amount	Price	Total
Costs				
Housing (3)				\$ 200.00
Heat lamp and bulb, feeders & waterers (4)				\$ 50.00
Chicks (5)	per chick	4	\$ 2.50	\$ 10.00
Chick starter (6)	50 lb bag	1	\$16.00	\$ 16.00
Early bird grower (6)	50 lb bag	1	\$15.00	\$ 15.00
Layer feed (6)	50 lb bag	18	\$14.00	\$ 252.00
Total costs				\$ 543.00
Total cost per dozen eggs				\$ 3.03
Labor hours (7)		0.25 hrs/day	1,095 days	273.75
Assumptions:				

1. Budget is based on a 3-year lifespan. Some producers will keep hens longer, but egg production diminishes in the third year and beyond that, tapers off even more dramatically.
2. About 200 days are needed for raising chicks and molting. Egg production is calculated as 895 days x 4 hens x 60% egg yield per day, assuming supplemental lighting in winter.
3. Housing expenses are highly variable. The budget includes a simple "chicken tractor-" type coop and run. Some producers spend much more while others build their own for much less.
4. Heat lamp for chicks, feeders and waters for both chicks and adult birds. Note: The entire cost of housing, heat lamp and bulb,

feeders and waterers is included in the three years production. These items will last several years so if layers are kept for more than 3 years, i.e. additional flocks, costs per dozen eggs will dramatically decrease. But, many people tire of layers after three years.

5. Chick prices are highly variable. Most backyard producers buy chicks at the local agricultural supply stores. Estimated costs are for a good layer breed.
6. Bagged feed from reputable feed company. The feed conversion ratio in this budget is 4.5 pounds per dozen eggs. This can be reduced somewhat by letting the hens graze in the chicken tractor or by feeding garden and table refuse. But hens should always have access to good quality layer feed.
7. Fifteen minutes a day to take care of flock. This includes moving chicken tractor, feeding and watering, collecting and cleaning eggs. Valuing labor would discourage most backyard producers.

Table 4. Estimated Small Flock Layer Budget for 25 hens, 2 years of production (1)

Dozen eggs produced (2)				800
Stewing hens				23
Item	Unit	Amount	Price	Total
Cash expenses				
Chicks (3)	per chick	25	\$ 2.00	\$ 50.00
Chick starter (4)	50 lb. bag	3	\$17.00	\$ 51.00
Early bird grower (4)	50 lb. bag	5	\$15.00	\$ 75.00
Layer feed (4)	50 lb. bag	64	\$14.00	\$ 896.00
Heat bulb (5)	bulb	1	\$ 7.00	\$ 7.00
Mileage to slaughter facility (6)	miles	40	\$ 0.50	\$ 20.00
Slaughter fee (7)	per bird	23	\$ 2.50	\$ 57.50
Cartons (8)	carton	200	\$ 0.25	\$ 50.00
Miscellaneous expenses				\$ 50.00
Total expenses				\$ 1,256.50
Total cash expense per dozen				\$ 1.57
Other required resources				
Housing startup costs (9)				\$ 1,000.00
Feeder & waterer startup costs (10)				\$ 150.00
Labor hours (11)		0.25	730 days	182.5
Assumptions				

- Budget is based on a two-year lifespan. Some producers keep hens 3-4 years but egg production will diminish dramatically.
- Out of two years, 180 days are required for raising chicks and molting. Production is calculated as 550 days x 25 hens x 70 % yield. A 8% mortality over the life of the flock is factored into the egg yield. The egg yield also supplemental lighting in the winter.
- Chick prices are variable among national mail order hatcheries, local hatcheries, and agricultural supply stores. Estimated costs are for a good layer breed.
- Bagged feed from reputable feed company. The feed conversion is four pounds of feed to one dozen eggs. The ratio assumes the layers have access to pasture where they can get some nutrition.
- Heat bulbs generally last one flock. Careful handling may extend life.
- Some small flock producers prefer to have birds slaughtered by someone else.
- 23 stewing hens based on 8% mortality over life of flock.
- Assumes cartons reused an average of 4 times.
- Housing expenses are highly variable. This budget includes a chicken coop (\$750) and polywire netting fence (\$250) which will last many years.
- Feeders and waterers at estimated cost of \$150 will last many years. In this budget,

housing and equipment costs are not included in the cost calculations. It is difficult to estimate how many years they will last. These costs per dozen eggs are small.

11. Fifteen minutes a day to feed, water, collect & clean eggs. Valuing labor would keep most small flock producers from keeping layers for economic reasons.

Table 5. Estimated Small Flock Cornish Cross Broiler Budget for 25 Birds, 12% mortality (1)

Dressed pounds produced (2)		6 lbs./bird	22 birds	126
Item	Unit	Quantity	Price	Total
Cash expenses				
Chicks (3)	per chick	25	\$ 2.00	\$ 50.00
Chick starter feed (4)	50 lb. bag	2	\$17.00	\$ 34.00
Early bird grower (4)	50 lb. bag	2	\$15.00	\$ 30.00
Bird finisher feed (4)	50 lb. bag	3.5	\$14.00	\$ 49.00
Heat bulb (5)	bulb	1	\$ 7.00	\$ 7.00
Mileage to slaughter facility (6)	miles	20	\$ 0.50	\$ 10.00
Slaughter fee (7)	per bird	22	\$ 2.50	\$ 55.00
Miscellaneous expenses				\$ 25.00
Total expenses				\$ 260.00
Total cash expense per pound				\$ 2.06
Other required resources				
Housing startup costs (8)				\$ 200.00
Feeder & waterer startup costs (9)				\$ 75.00
Labor hours (10)		0.25 hrs/day	56 days	28.00
Assumptions				

1. Many producers experience more than 10% mortality. Good management may reduce this rate.
2. Assumes it takes 8 weeks to grow straight-run birds to an average of 6 lbs. dressed weight. It is better to produce birds in spring and fall when cool temperatures encourage eating.
3. Chick prices are variable among national mail order hatcheries, local hatcheries, and agricultural supply stores. Chick costs are based on Cornish cross broilers.
4. Bagged feed from reputable feed company. The feed conversion is 3 pounds of feed to

1-pound dressed weight with the birds in a pasture coop getting a small amount of nutrition from pasture.

5. Heat bulbs generally last one flock. Careful handling will extend life.
6. Some small flock producers prefer to have birds custom slaughtered. If you choose this option, make sure there is a facility within reasonable distance.
7. 22 birds bagged in vacuum bags based on 12% mortality.
8. Housing expenses are highly variable. This budget includes one pasture coop which

costs \$200 to build and will last several years and many flocks.

9. Feeders and waterers estimated cost of \$75 will last several years and many flocks. In this budget, housing and equipment costs

are not included in the cost calculations. It is difficult to estimate how many flocks they will last. These costs per flock are small.

10. Fifteen minutes a day includes moving pasture coop daily, feeding, and watering.

Feeding the Flock

Feed represents about 70 percent of the cost of raising chickens. Commercial poultry farms use bulk feed programs in which a single delivery of 12 to 30 tons of commercial poultry feed is common. Such high volume results in relatively low per-pound feed costs and explains why supermarket prices for poultry products also are relatively low. The small flock owner deals in lower quantities of feed – typically 50 to 100 pounds– and thus pays a higher cost per unit for feed.

Chickens must be fed an adequate diet for maximum productivity. There are six categories of nutrients that are required in a diet to maintain and promote a healthy flock-- water, carbohydrates, fat, protein, vitamins and minerals.

The age and function of birds determines the specific nutrient requirements, which are met by mixing together different feed ingredients (see table 6). Formulating and mixing poultry feed is a complex process which ensures that feed contains all of the required nutrients. Specialized software programs usually are necessary to formulate poultry rations. High-quality commercial feed can be purchased from most local farm stores. According to veterinarians in poultry diagnostic laboratories, nutritional deficiency diseases such as curly toe paralysis, nutritional coryza and rickets are ordinarily seen only in poultry being fed homemade (non-commercial) rations.

Several types of commercial poultry feeds are available (for example: starter, grower, finisher, and layer rations). The correct ration depends on the type (pullet, layer, or broiler) and age of the birds (see table 7). Do not feed layer rations to younger birds or starter/grower rations to birds producing eggs. If a young chicken is fed a layer diet, the high calcium levels will result in improper bone formation, kidney failure, and possibly death. In contrast, feeding a broiler starter diet to a laying hen will result in poor egg shell quality. Problems associated with inadequate nutrition can occur quickly in growing birds and often these problems are irreversible. What you think you may be saving in feed may cost you in bird performance.

Feeding scratch grains to chickens is not necessary when they are receiving a complete diet. Scratch grains typically are cracked, rolled or whole grains such as corn, barley, oats or wheat which are low in protein and high in energy or fiber, depending on the grain. When scratch grains are fed in conjunction with a complete diet, they dilute the nutrient content of the prepared diet. If you decide to feed your birds scratch grains, provide them sparingly. Generally scratch grain should be 10% or less of the total daily food consumption. If you feed scratch grains, provide an insoluble grit so the birds can properly grind and digest the grains. If the birds have access to the ground, they usually can find enough grit in the form of small rocks and stones.



Jon Moyle

Birds grazing on pasture can attain a portion of their nutrient requirement from grasses and insects. Nutrient intake depends on the pasture forage quality and the breed of chicken.

Laying hens require large

amounts of calcium for egg shell development. Diets formulated for layers should contain all of the calcium required by the hen. An extra source of calcium can be offered free choice in the form of ground oyster shell, calcite, or limestone.

Commercial poultry feed is available in mash, crumble and pellet forms. Processing feed into pellet or crumble form increases the cost over the mash form. However, there are some advantages to feeding pellets or crumbles. Since feed is packaged in pellet form, the bird is able to consume and metabolize a greater amount of feed. Feed in pellet form is a complete unit of feed and birds cannot

pick out individual feed ingredients. Pelleting feed can also improve handling quality and reduce feed waste.

Regardless of the form of feed you decide to feed your birds, handle it properly to maintain its nutritive value. Nutrients in feed break down during extended holding times. Store feed in a clean, dry, rodent-free area. Do not store feed bags on a concrete floor because feed picks up moisture from the concrete. It is recommended that you store feed bags in covered plastic trash cans or on wooden pallets so air can circulate under the bags.

Typically, feed is available as medicated and non-medicated. Medicated feed usually contains a coccidiosis preventive drug. Birds can become infected with an intestinal parasite called coccidia. A coccidiostat is typically added to diets of chickens raised on the ground. Many coccidiostats need to be withdrawn from the feed for several days before the birds can be marketed so it is important to provide unmedicated feed during this time. Always read the feed label to ensure the proper withdrawal time.

In most cases, birds should have continued access to feed so that they always receive the proper level of nutrients.

Table 6. Typical Feeding Programs for Chickens of Different Ages and Functions¹

Layer	Layer Replacement ²	Broiler ²	Roaster ²
<p>20 weeks-production cycle, <i>Laying mash</i></p> <p>May be fed all mash or mash-grain method</p> <p>Free choice: Calcium (oyster shell or limestone) may be fed for good egg shell quality. Soluble grit may be fed if whole grain is used.</p>	<p>0-6 weeks, <i>Starter</i> (mash form)</p> <p>6-13 weeks, <i>Grower or Pullet developer</i> (15% protein)</p> <p>13-20 weeks, <i>Developer</i></p>	<p>0-3 weeks, <i>Starter</i> (mash form)</p> <p>3-6 weeks, <i>Finisher</i> (mash or crumbles)</p> <p>6 weeks-market, <i>Withdrawal</i> (mash or crumbles)</p>	<p>Same as broiler to 7 weeks of age.</p> <p>Broiler finisher and corn or whole grains until 2 weeks prior to market.</p> <p>Insoluble grit may be fed if whole grain is used.</p>

¹This schedule should be used as a guide only.

²A suitable chemical agent (coccidiostat) must be added to feed to retard the life cycle or reduce the population of pathogenic coccidia to the point that disease is minimized and the host develops immunity must be included in feed for young chickens (see poultry disease section). Read the feed tag or make sure your feed store provides Starter or Grower feed with a coccidiostat.

Table 7. Feed Requirements for Layers and Meat Birds Depend on the Production Phase

Layers (Brown egg type)		
Age	Total amount of feed (lbs)	Ration type
Day old to 6 weeks	4	Starter
7 weeks to 18 weeks	46	Grower
19 weeks to 70 weeks (onset of lay to termination)	104	Layer

Layers (White egg type)		
Age	Total amount of feed (lbs)	Ration type
Day old to 6 weeks	3	Starter
7 weeks to 18 weeks	12	Grower
19 weeks to 70 weeks (onset of lay to termination)	80	Layer

Meat Birds		
Age	Total amount of feed (lbs)	Ration type
Day old to 3 weeks	2	Starter
4 weeks to 7 weeks	7	Finisher

Vest and Dale, 2002

Biosecurity

Biosecurity includes management practices that prevent disease-producing germs (pathogens) from entering the flock and neighboring flocks. The following biosecurity measures must be taken:

1. Purchase healthy stock;
2. Keep your birds confined using pasture coops or fencing;
3. Keep dirty equipment and materials from other flocks away from yours;
4. Do not mix species of birds;
5. Medicate properly and follow directions;
6. Keep unfamiliar people and others who might be carriers of disease away from your birds;
7. Control vermin, such as rats and mice;
8. Practice an insect-control program;
9. Keep pen areas weed- and debris-free and keep buildings in good repair;
10. Keep new birds, sick birds, and birds returning from shows and swap meets isolated from the rest of the flock for at least 3 weeks;
11. Only wear dedicated clothing and footwear around your birds. Do not wear the dedicated clothing off your property; and

12. Wash hands before and after handling birds.

Rely on professionals such as veterinarians, Extension educators, animal health suppliers (those who sell vaccines and medicines) and universities for educational materials and advice.

Pathogens have many hiding places and numerous ways of spreading from flock to flock (see table 8). Management strategies that block pathogens include: isolation from other types of wild or domestic mammals or birds, confinement in secure houses, and enforcement of the rules you developed to keep potentially contaminated items from other flocks away from your birds. Footwear and clothing, farm equipment, or anything that may have been in contact with someone else's birds can be considered "potentially contaminated." Good biosecurity not only protects your own birds, it also helps to protect the birds---and in some cases the income---of others.

Disease Management

It is important to consider several factors that relate to the quality and health of the flock once you've chosen the type or breed. Purchase stock only from reputable breeders or hatcheries. Stock purchased from magazine advertisements, especially bargain offers, can mean serious problems later. Purchase from Pullorum-Typhoid clean flocks under the National Poultry Improvement Plan (NPIP).

Pullorum and Typhoid are highly contagious diseases caused by *Salmonella*. NPIP breeders, hatcheries and facilities have been checked for proper management and sanitation, and the presence of seriously diseased birds. "Sources of Poultry and Supplies for Small Flocks," published by the University of Maryland Extension, provides a partial listing of poultry, eggs, and chicks for sale and can be obtained free from your county Extension office or online at <http://extension.umd.edu/poultry/small-flock-production/basic-flock-management>



Table 8. Examples of Places Pathogens Hide and Ways They Spread to Your Flock

<u>Hiding places/Ways of spread</u>	<u>Diseases produced</u>
Free-flying migratory birds and waterfowl	Avian influenza (bird flu) Chlamydiosis (ornithosis)
Wild or domestic mammals (e.g., raccoons, cattle, etc.)	Pasteurellosis (fowl cholera)
Soil and pasture land	Avian tuberculosis
Rodent droppings	Salmonellosis
Mosquitoes	Encephalitis in pheasants and other game birds
Puddles or pools of muddy water	Botulism, especially in waterfowl and game birds
Earthworms	Gapeworm, cecal worm infestations and histomoniasis
Crates and boxes previously holding poultry	Laryngotracheitis, Newcastle disease and most other avian respiratory infections

Diseases

Many poultry diseases have similar symptoms so rely on a veterinarian for an accurate diagnosis in order for the flock to receive proper treatment. M D A's Animal Health Diagnostic laboratories (see table 9) offer free diagnostic services for poultry. When there is an outbreak in the flock, take one or two birds showing typical signs to the lab. Following diagnosis, treat the disease under the direction of a veterinarian or with the advice of your county Extension educator.



Table 9. Maryland Department of Agriculture Animal Health Diagnostic Laboratories

Laboratory	Address	Phone Number
Frederick County	1840 Rosemont Avenue Frederick, MD 21702 AHFrederick.mda@maryland.gov	(301) 600-1548
Wicomico County	27722 Nanticoke Road Salisbury, MD 21801 AHSalisbury.mda@maryland.gov	(410) 543-6610

Respiratory diseases are the most common diseases in chickens (table 10). Most respiratory diseases can be prevented by good biosecurity and vaccinations.

Marek's Disease is one of the most common killers of chickens of all ages. Marek's Disease is caused by a Herpes virus that often accumulates in the feather follicles and spreads by aerosol through infected dander (sloughed skin and feather cells).

Another similar tumor-causing chicken disease is Lymphoid Leukosis which is caused by a Retrovirus. Common poultry publications often use the terms Marek's and Leukosis interchangeably but they are actually different diseases that cause similar signs and lesions. Birds with Marek's show various forms of the disease.

Visceral Marek's results in tumors on the liver and other organs; the bird becomes thin and eventually dies. The neural (nervous system) form of Marek's results in progressive paralysis of the wings, legs and neck. An enlarged sciatic nerve (a nerve found in the inner part of the thigh) is a common cause of paralysis, with the bird eventually lying on its side unable to move.

Gray eye is another form of Marek's, in which the iris shrinks, the eye turns gray, and the bird goes blind. Fortunately, a vaccine for Marek's Disease is available and most poultry suppliers sell chickens that are already vaccinated for the disease.

Figure 2. A chicken infected with Mycoplasma



Table 10. Respiratory Illnesses are the Most Common Poultry Diseases

Disease ^{1/}	Symptoms
Infectious bronchitis	Rapid spread, gasping, wet eyes, coughing, swollen sinuses, drop in egg production, misshapen eggs, rough- or soft-shelled eggs, watery egg whites, death
Newcastle disease	Rapid spread, gasping, rattling, loss of appetite, coughing, huddling, paralysis of legs, twisted neck (stargazer), walking backward, drop in egg production, soft or misshapen eggs, death
Laryngotracheitis	Slow spread (can spread quickly in a flock if strain is virulent), conjunctivitis (eye inflammation), coughing, sneezing, sitting hunched on floor, emitting a cawing sound, coughing bloody mucus, nasal discharge, swollen head and wattles, drop in egg production, death
Fowl pox	Skin – white to yellow bumps on comb, face or wattles, turning to scabs Internal – cankers in membranes of mouth, throat and windpipe; difficult breathing; nasal or eye discharge
Coryza	Thick nasal discharge with odor, swollen sinuses, ruffled feathers, difficult breathing
Mycoplasma	Difficult breathing, ruffled feathers, nasal discharge, rattling, facial and nasal swelling, weakness, drop in egg production, swollen joints, yellowish feces (figure 2)
Cholera	Droopiness; difficult breathing; loss of flesh; drop in egg production; purplish swollen head, comb and wattles; paralysis

^{1/}Highly pathogenic transmissible diseases, such as Exotic Newcastle and Avian Influenza, can be avoided with proper management and biosecurity measures.

Coccidiosis is the single most common cause of death in young birds. It is caused by single-celled protozoan parasite that attacks different parts of the intestinal tract, causing an irritation of the lining that prevents the absorption of food. In minor outbreaks, the birds are droopy, have ruffled feathers and lose weight. Egg production in older birds declines. Severe cases result in hemorrhage and death. Practically all poultry house litter contains coccidia so it is important to keep litter dry and to purchase feed that contains a coccidiostat for young birds.

External parasites can cause production and mortality losses if proper prevention and treatment procedures are not followed. Chickens should be

checked once a week for symptoms (table 11). Consult your county Extension agent for procedures and chemicals (follow use directions carefully) for prevention and control.

Internal parasites are worms found in the digestive and respiratory tracts (table 11). Often insects, such as beetles, act as the intermediate host. Insects carry the worm eggs, which are deposited in the chicken after it eats the insect. Administer chemicals for the prevention and treatment of internal parasites only under the direction of a competent authority.

Table11. Chickens Should Be Checked Weekly for Symptoms of Common External and Internal Parasites

Common parasites	external	Symptoms
Chiggers		Red, pimple-like irritations
Lice		Large, yellowish, transparent insects on the skin; low weight; blackish discoloration (dirty) in the vent and tail area; drop in egg production
Mites		
Red (roost)		Loss of weight, red specks, death
Northern fowl		Red or black specks around vent, unthrifty, drop in egg production
Feather		Loss of feathers, web irregular with only shafts left in some cases
Scaly leg		Enlarged shanks and toes with raised, crusty scales

Common parasites	internal	Symptoms
Large roundworm		Long, yellow-white worms in intestine; droopiness; weight loss; diarrhea; death
Capillary worm		Hair-like worms in crop and upper intestine, droopiness, weight loss, death
Cecal worm		Short worms in the ceca, unthrifty, weak, loss of flesh
Tapeworm		Long, white, flat, segmented worms in intestine; unthrifty; slow growth; weakness
Gapeworm		Red, forked worms in trachea; gasping; coughing

Other diseases are not as common and require a professional diagnosis. Moldy feed causes mycotoxins which may result in production losses and flock mortality. Chickens develop nutritional deficiencies if they are not given a well-balanced diet.

Sanitation

Lack of cleanliness is often a precursor to poultry disease. You should implement several sanitation measures in a home flock:

- 1) cleaning and disinfecting of house and equipment before starting chicks or housing layers;
- 2) cleaning waterers daily;
- 3) screening manure pits under roosts, feeders and waterers;
- 4) managing litter to keep it dry and clean;
- 5) burying or composting all dead chickens;
- 6) raising young stock away from adult chickens;
- 7) isolating the flock from chickens raised off the farm, neighbors, wild birds, dogs, cats, and other outside traffic;
- 8) practicing good housekeeping and rodent control; and
- 9) disposing of litter and manure by spreading and plowing or spading the manure under soil. Manure and litter should be spread and stored away from areas used by poultry.

Poultry manure is an excellent source of plant nutrients for your garden. However, the danger of infection means that poultry manure should always be well composted before adding it to your garden. Never add any type of raw manure to your vegetable garden. **Please refer to the on-farm composting publication listed in the reference section of this bulletin for complete details.**

Properly managing any mortality from your chicken flock will prevent the spread of disease. There are several available options for disposing of dead chickens. Composting animal carcasses, for example, is identical to composting of any other organic material. However, composting may not be a viable option when there is very little mortality. University of Maryland Extension Fact Sheet 717 by Brodie and Carr provides complete details about composting animal mortalities. Burial may be another option of dead bird disposal; however, it may not be permitted in certain locations due to groundwater levels. Check with your county before burying any dead birds. There are also dead animal removal services that will dispose of dead birds for a fee.

Home Processing

The quality of ready-to-cook chicken is only as good as the live bird. When choosing chickens for processing, look for healthy and well-finished birds. Consider the bird's weight and age for your particular need. Withhold feed for 9-12 hours before processing.

For good flavor, it is essential that the chicken be well bled. Cutting the jugular vein (on each side of the neck) is one of the best methods of killing and bleeding. Hang the chicken by the feet so it will not bump other objects and bruise the meat or be soiled.

Scalding involves immersing the chicken in hot water so that the feathers are easily removed. With the water temperature between 130° and 160° F, approximately 1 ½ minutes of scalding should be adequate to remove feathers easily. A large pot with a propane burner works well for scalding.

Remove the head, feet and viscera. Wash the chicken thoroughly in clean water and chill promptly to below 40°F.

Egg Laying and Handling

Many people consider eggs as perfect nutrition in a perfect package. Traditional egg laying breeds like Leghorns and Rhode Island Reds typically start laying around 20 weeks of age. Some breeds may not start laying until 8 to 12 months. Commercial-type hens can produce an average of about one egg a day.

A hen will lay eggs even if you do not you have a rooster. Fertilized or unfertilized eggs are both excellent for table use. Sometimes, a small blood spot may appear in the yolk. The spot is due to a rupture during ovulation and makes no difference in the taste of the egg and can occur in both fertile and infertile eggs. Occasionally, a hen may lay a double-yolk egg. Although most eggs in the grocery store are white, egg color is determined by breed and diet. Eggs may be white, brown, blue or many other colors. The color of the egg has no effect on its taste or nutritional value.

Provide clean nesting boxes to encourage hens to lay. Nesting boxes should be approximately 12 x 12 x 12 inches and located off the floor. Wood shavings and/or straw make good nesting material. You can train hens that do not use the laying boxes to do so by gently placing them in a nesting box and promptly picking up any eggs that they lay elsewhere.

The egg shell is semi-permeable. Air enters the egg and moisture evaporates. Eggs should be cleaned gently with a clean damp cloth (always use water that is warmer than the egg), and refrigerated. Since water can enter through the egg shell, do not immerse an egg in water to clean. The risk of infection from eating eggs is low, but susceptible individuals should only eat hard cooked eggs.

Maryland Regulations for Poultry Product Sales

Poultry Meat

(Meat requirements provided are for fewer than 20,000 birds.)

You must register all poultry premises with the Maryland Department of Agriculture (MDA) as part of their avian influenza control efforts. There are no fees unless you have more than 3,000 laying hens. State or federal inspection of poultry meat is not required if you are producing and processing less than 20,000 birds for meat annually and do not sell other than directly from the farm.

Producers can participate in MDA's voluntary Rabbit and Poultry On-Farm Slaughter/Processing Program. Participating producers are certified to sell parts and whole poultry and rabbits but not ground meat anywhere intrastate (restaurants, retailers, farmer's markets). For complete details on this program, go to http://mda.maryland.gov/foodfeedquality/Pages/poultry_rabbit_program.aspx or call the MDA at 410-841-5769.

You will need to process the birds in a clean environment and in a manner so that no feces or contaminants are visible on the final product. USDA's, Food Safety Inspection Service, or the MDA, will inspect your farm if poultry meat is

found to be adulterated with feces or other contaminants. Packaging can be as simple as a clear plastic freezer bag. If you process less than 1,000 birds annually, the packaging must contain a label with the name and address of the seller, contents, and net weight. If you process more than 1,000 but less than 20,000 annually, you must also put the statement "Exempt-P.L.-492." In Maryland, you may sell your products from your property, but you **may not** sell at a farmer's market or any other off-farm location unless you have MDA's Rabbit and Poultry On-Farm Slaughter/Processing Program certification.

Once processed, you must refrigerate the carcasses at less than 40°F until sold. Be sure your clientele commit to purchasing your poultry before you begin raising birds (this is where a down payment and contract comes in handy). Since you will be raising, slaughtering, and processing less than 20,000 birds, you will be unable to sell to restaurants, retail locations, and industrial foodservice institutions unless you complete the MDA Rabbit and Poultry On-Farm Slaughter/Processing Program certification.

Eggs

(Egg requirements provided are for less than 3,000 laying hens.)

In Maryland, all eggs for sale must be graded and sized. Selling unclassified eggs is not permitted. If you package your eggs in used cartons collected from friends and neighbors, you must use a large permanent black marker to **completely mark out**:

1. The USDA grade shield.
2. Logos such as PA certified, UEP certified, MEQAP, PEQAP, etc.
3. The packer or distributor's information.

4. The sell-by date.
5. Any claims made by the original producer, unless you can substantiate your eggs meet the claims (ex. Omega Three).

Be sure to label the egg carton with your name, address, and telephone number. You will also need to label your carton with the Lot # which corresponds to your flock number. For most small flocks, this is the same flock they have always had and therefore should be labeled as Lot #1. Additionally, you will need to write the egg registration number on the carton (you will get this number when you register with the MDA to sell eggs). Remember, it is free to get an egg registration number if you have fewer than 3,000 birds. If you have more than 3,000 birds, you will pay a \$30.00 per year registration fee and a \$.08 per 30 dozen sold assessment fee.

If you plan on transporting and storing your eggs, they must be kept at or below 45°F until sold to the customer. That means you should hold your eggs in a refrigerator or cooler with ice packs. Use of ice cubes is prohibited by the MDA because the ice will melt and cause regular cardboard egg cartons to become soggy and the water can also contaminate the eggs. Keep a small thermometer in the cooler with your eggs as proof that the correct temperature is being maintained. You must contact the MDA to register to sell eggs. By registering a layer flock to sell eggs, you are also automatically registered in MDA's mandatory poultry premise registration.

Grading and Sizing of Eggs

Be sure to put your label on each carton of eggs with both the grade and size. [Egg sizes](#) are based on the weight (ounces) of a dozen. It is recommended to weigh your eggs using a simple kitchen scale or egg scale before placing into the carton. This

provides the true weight of the dozen without adding the weight of the carton. The grades of eggs, AA, A, and B (from best to worst), are based on compliance with quality tolerances. Eggs labeled Grade A must be fresh, clean, without bloodspots, and unbroken. At retail sale, at least 82% of the eggs in a carton labeled Grade A must meet the A quality standard or better. The sale of restricted eggs (cracks and dirties), unclassified eggs, and eggs labeled Grade B to consumers in Maryland is prohibited. To determine the quality of eggs, they must be examined for both external and internal defects.



External Defects

You will need to downgrade eggs that have slight stains, localized moderate stains less than 1/32 of the shell or scattered moderate stains that are less than 1/16 of the shell to a B quality. Eggs with localized moderate stains covering more than 1/32 of the shell, scattered moderate stains covering more than 1/16 of the shell, prominent stains, and any kind of adhering dirt (yolk, manure, etc.) are considered dirty. You should also consider thin spots in the shell or irregular texture, ridges, and shape before deciding the quality of an egg. In general, if the shell defect weakens the egg or it doesn't fit into the carton cell, it should be downgraded to a B quality. Eggs labeled Grade A cannot have more than 18% B-quality shells (if they have other defects, the amount of B-quality shells allowed would be reduced because they still have to be a minimum of 82% A quality or better).

Be sure to lightly wash your eggs before packaging to remove any adhering dirt, feathers, or shavings. Stains may be buffed out under running hot water that is at least as warm as the

egg (perhaps with a little food grade soap in the sponge - see www.nsf.org/usda for soaps and sanitizers approved for use on food). Dirty eggs that have been cleaned should be sanitized by spraying with hot water containing 100 part per million of chlorine. The size and intensity of any remaining stains should be considered before packaging.

At the time of publication of this bulleting, these regulations were current. For updated or revised regulations, visit MDA's website (<http://mda.maryland.gov/Pages/homepage.aspx>).

Exhibiting Poultry

Many small flock owners like to exhibit their birds at county fairs or in poultry shows. Purebred birds are shown by breed or class as identified in the American Poultry Association (APA) Standards of Perfection which lists the classes and descriptions for each breed and variety. Before your poultry can be exhibited, you will need to obtain a Poultry

Premises Registration number, an avian influenza test, and a pullorum-typhoid test. Contact MDA for more information on poultry testing. For complete details of Maryland poultry exhibition requirements, go to MDA's website (<http://mda.maryland.gov/animalHealth/Pages/poultry.aspx>) or contact MDA directly at 410-841-5810.

Maryland Regulations for Registering Poultry

In conjunction with biosecurity, registering your birds with MDA's Mandatory Poultry Registration <http://mda.maryland.gov/animalHealth/Pages/poultry-reg-faq.aspx> is an excellent way to protect your small flock. Not only are you notified of any disease concerns along with any poultry regulation updates within the state, you are issued a premises ID number that you can use as a marketing tool with your customers. Your concern of the health of your birds will be conveyed to the buyer by registering with MDA. If you have any questions on the Poultry Registration Program please call 410-742-6023.

References

Brodie, H.L., and L.E. Carr. 1997. *Composting Animal Mortalities on the Farm*. Maryland Cooperative Extension, Fact Sheet 717.

Christian, A.H., G.K. Evanylo and J.W. Pearse, 2009. *On-Farm Composting A Guide to Principles, Planning and Operation*, Virginia Cooperative Extension Publication 452-232.

Clauer, P, 2009. *Small Scale Poultry Housing*, Virginia Cooperative Extension, 2902-1092.

LaCross, C. and R.E. Graves, 1992. *On-Farm Composting*, Pennsylvania State University Cooperative Extension, Fact Sheet C 3.

Vest, L. and N. Dale. 2002. *Nutrition for the Backyard Flock*, The University of Georgia Cooperative Extension Service, Leaflet 396.

Suggested Reading

For copies of the following publications, contact their publishers. Those publications without a price listed are free.

A Guide to Better Hatching. 1975. Stromberg Publishing Company; Pine River, MN 56474. \$9.95

Avoiding Residues in Small Poultry and Game Bird Flocks 2003. PNE Publication 564. Washington State Cooperative Extension; Pullman, WA 99164.

Backyard Biosecurity Practices To Keep Your Birds Healthy (USDA/APHIS)
http://www.ces.ncsu.edu/depts/poulsci/tech_manuals/backyard_biosecurity.pdf

Bantam Standard. 2006. American Bantam Association; P.O. Box 127, Augusta, NJ 07822. \$35.00

Bantams. North Central Extension Publication 209,. Cooperative Extension Service, University of Wisconsin; Madison, WI 53706.

Biosecurity for Poultry. 2001. VME Factsheet. Teresa Y. Morishita,. Ohio State University Extension. Columbus, OH 43210.

Biosecurity for Poultry at Community Farms. 2008. Publication 8280, McCrea, and F. Bradley. . University of California Division of Agriculture and Natural Resources. <http://ucanr.org/freepubs/docs/8280.pdf>.

Common Lice and Mites of Poultry: Identification and Treatment. 2005. Publication 8162, McCrea, J. Jeffrey, R. Ernst and A.Gerry. University of California Division of Agriculture and Natural Resources.
<http://anrcatalog.ucdavis.edu/items/8162.aspx>.

Considerations in Raising Small Backyard Flocks of Poultry in Population-Dense Communities. 2009. 02pr Publication. David Frame. Utah State University Cooperative Extension. Logan, UT 84322.

Capons. 2000. Fact Sheet 54. University of Florida Extension. Gainesville, FL 32611.

Exhibiting Poultry for Pleasure and Profit. 1978. Stromberg Publishing Company; Pine River, MN 56474. \$10.95

Factors Affecting Egg Quality. K-State Research and Extension,
<http://www.ksre.ksu.edu/bookstore/Item.aspx?catId=578&pubId=228>

Home Processing of Poultry. 2004, ANSI-8400. Oklahoma State Cooperative Extension. Stillwater, OK 74078.

Homemade Comfort Cages for Small Poultry Flocks. Fact Sheet 429. University of Maryland Extension. College Park, MD 20742.

Incubating and Hatching Eggs. 2000. B-6092. Texas Agricultural Extension Service. College Station, TX 77863.

Poultry-A Guide to Anatomy and Selected Species. Wilson, D. University of Illinois.
<http://im.itcs.illinois.edu/ak17supp.pdf>

Poultry in Urban Areas, Adam A. Hady, and Ron Kean. UW Extension,
<http://learningstore.uwex.edu/Assets/pdfs/A3908-03.pdf>

Poultry Showmanship. 1980. 4-H 2060. Ralph Ernst. University of California Davis, CA 95616.

Prevention – A Young Person’s Guide to Keeping Animals Safe and Healthy. Available at <http://www.vet.ohio-state.edu/1985.htm>. Colorful, 20-page booklet appropriate for all ages keeping poultry. Can be reproduced locally.

Principles of Feeding Small Flocks of Chicken at Home. 2008. David Frame. Utah State University Cooperative Extension. Logan, UT 84322.

Salsbury Manual of Poultry Diseases. 7th ed. Salsbury Laboratories, Inc.; Charles City, IA 50616

Selecting and Preparing Poultry for Exhibition, K-State Research and Extension
<http://www.ksre.ksu.edu/bookstore/pubs/L771.pdf>

Sexing All Fowl, Baby Chicks, Gamebirds, Cage Birds. 1977. Stromberg Publishing Company; Pine River, MN 56474. \$9.95

Small Meat Processors. <https://www.extension.org/small%20meat%20processors>

Sources of Poultry and Supplies for Small Flocks. Yearly. University of Maryland Extension, College Park, MD 20742.

The Standard of Perfection. 2010. American Poultry Association. Burggettstown, PA 15021. \$59.00.

USDA Egg-Grading Manual. <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELDEV3004502>

1984 Yearbook of Agriculture, Animal Health, Livestock and Pets. Section II. Backyard Poultry and Pet Birds. Twelve chapters, pages 11 to 110. Available nationwide in many county libraries or Extension offices.

Publications on Other Species

Agriculture Alternative – Rhea Production. 1994. Penn State Cooperative Extension Service; State College, PA 16801.

Brooding and Rearing Ducklings and Goslings. 1993. G8920. University of Missouri Extension. St. Louis, MO 63180.

Emu Production. 1996. Joan Jeffery. Texas Cooperative Extension. College Station, TX 77843.

Hatching Ostrich Chicks. 2009. ANSI-9013. Oklahoma Cooperative Extension Service. Stillwater, OK 74078. \$0.20.

Ostrich Production. 2007. ANSI 3988. Oklahoma Cooperative Extension Service; Stillwater, OK 74078. \$0.20.

Raising Bobwhite Quail for Commercial Use. 1990. Circular 514. Cooperative Extension Service, Clemson University, Clemson, SC 29631.

Raising Ducks. 2008. WW01189. University of Minnesota Extension. Minneapolis, MN 55455.

Raising Ducks in Small Flocks. 2000. 2980. University of California Cooperative Extension. Davis, CA 95616.

Raising Geese. 1983. Farmers Bulletin 2251.. United States Department of Agriculture. Washington, DC 20250. \$0.25 (Minimum order of \$1).

Raising Guinea Fowl. 1976. Leaflet 519. United States Department of Agriculture; Washington, DC 20250. \$0.25 (Minimum order of \$1).

Raising Waterfowl. 1985. A3311. Cooperative Extension Service, University of Wisconsin; Madison, WI 53706.

Small Turkey Flock Management. 1981. North Central Regional Extension Publication No. 60.. Cooperative Extension Service, University of Wisconsin, Madison, WI 53706.

4-H Pigeon and Dove Project. 2008. 4-H 154. Oregon State University Extension Service. Portland, OR 97209. \$2.50.

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