Bobwhite Quail Production and Management Guide

Cooperative Extension Service/The University of Georgia College of Agricultural and Environmental Sciences

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Introduction

Each year in Georgia, approximately five million Bobwhite quail are produced and marketed for use at hunting preserves and plantations. In Georgia, it is required that public use hunting preserves obtain annual permits through the Department of Natural Resources. Approximately 175 hunting preserves are permitted annually through the Department of Natural Resources. In addition to the large number of hunting preserves in Georgia, there are many other plantations in the adjoining southern states. The total number of hunting preserves and plantations in the southern region provides an excellent market for Bobwhite quail producers.

With the associated problems of agronomic crops such as droughts and volatile market prices, Bobwhite quail production has received attention as an alternative enterprise for many farming operations. Most successful producers typically raise breeders with the intent to market the resultant chicks at one day of age to growout producers, or they specialize in the growout of day-old chicks until approximately 17 weeks of age to sell as flight-ready birds to game preserve owners. Breeder producers typically sell day-old chicks at $0.25-0.30/bird, whereas flight-ready bird producers market 17 week-old birds at approximately $2.80-3.00/bird. The quality of bird produced and the time of year they are available may greatly influence the price received for flight-ready Bobwhite quail.

Breeder and Hatchery Management

Lighting

Housing needs, feeding schedule, lighting program and vaccination schedule are all calculated in reverse from the time the birds are about 22 weeks of age. While young breeders may begin to lay a few eggs as early as 18 weeks of age, do not expect consistent egg production until about 22 weeks of age. Young chicks and immature birds are maintained in a dimly lit environment to reduce cannibalism and allow uniform sexual development. Immature birds do best on as little as 10-11 hours of light/day. At 19 weeks of age, increase the length of daily light period birds receive by an hour a week until the birds are receiving 17 hours of light/day, which should occur at about 25-27 weeks of age. In order to reduce cannibalism, light intensity should not exceed 1 foot candle. Interior walls of the house should be white or light-colored to reflect the light provided and reduce dark spots in the house. After the light has reached 17 hours/day, it is extremely important to maintain this day length. Any sudden decrease in hours of light per day will cause a decline in egg production.

The ease of maintaining a lighting program depends on the cost of labor and building construction. For birds receiving natural daylight, add the additional hour(s) of light equally at the begin-

ning and end of the natural daylight. For example, when birds have reached the point they require 16 hours of light daily, but the natural daylight and time of year produces 12.5 hours of daylight daily, breeders will require an additional 3.5 hours of light/day. Use an automatic timer device to turn lights off and on each day. Turn lights on (or set an automatic timer) about 2.0 hours before the normal daylight begins; set the timer to turn off about 1.5 hours after sunset. Producers who raise birds in total blackout facilities (not exposed to natural day lengths) should have no problem meeting the outlined schedule (Table 1).

Table 1. Lighting requirements for Bobwhite quail at different ages

Bird age, weeks	*Hours of light per day*
19	11
20	12
21	13
22	14
23	15
24	16
25	17

Housing

Ideally, maintain breeders in a comfortable, well-ventilated environment. Keep temperatures between 65 and 85 degrees F to achieve acceptable feed conversion and production levels. Research indicates that temperatures lower than 65 degrees F will increase the bird's energy requirement, which will lower feed efficiency and, more importantly, reduce egg production. At temperatures greater than 85 degrees F, feed intake is often reduced, which may also lead to reduced egg production. In contrast to most other domesticated birds, bobwhite quail often peak in egg production during the warmer portions of their production cycle, possibly suggesting they are more heat tolerate. However, excessively high ambient temperatures often result in reduced fertility in other avian species. A properly designed and operated negative pressure evaporative cooling system may be profitable. Benefits include a significant increase in egg production, shell quality and fertility during summer and early fall.

Regardless of temperatures, ventilation in the breeder facility must be maintained to remove excess dust, ammonia, moisture and potential pathogens. The ventilation system should not subject the birds to a direct draft, although in the warm summer months this poses less of a problem. Breeders are typically housed in one of three ways: in large community floor pens, in smaller communal cages designed for 10 to 20 birds each, or caged as pairs or trios. Each of these house types has its drawbacks.

Floor pens, in the traditional sense, may be the least desirable type of housing for breeder quail. When birds are housed directly on the floor, collecting eggs is often more difficult and time consuming, which often leads to less frequent egg gathering. Infrequent collection can cause egg loss due to shell damage and contamination, birds consuming eggs, or pre-incubation of the developing embryos. These factors will lead to reduced egg numbers harvested, lower hatchability and poorer chick quality. In addition, there is normally a significant increase in the number of dirty eggs from birds housed on the floor. Dirty eggs cause increased egg contamination, which will also reduce hatchability and chick quality. With floor laying flocks, producers cannot identify and cull low- or non-producing birds. Lastly, birds raised and maintained on the floor have increased exposure to parasites or other disease causing pathogens.

A modification of housing birds in floor pens, eliminates many of the problems previously discussed (Figure 1, page 5). Housing birds in large pens on slatted floors similar to the traditional floor pen setup has been successful. The house design is the same, but the problems associated with birds raised directly on the litter are eliminated. There is an added expense to cover the majority of the floor of the house with a removable slatted or wire-type floor, but many producers have benefitted from this arrangement. Bird health is often improved as well as eggshell quality. Birds have a tendency to lay eggs on the slatted floor instead of in the nest boxes, but the eggs do not come in direct contact with fecal material.

Figure 1. Modified floor pen. Note the birds are housed on slats.

Placing birds in wire cages has several advantages over the traditional floor pen design. Eggshell quality is improved, as the eggs are much cleaner. Eggs don't come in direct contact with fecal material and roll away from the bird shortly after they are laid. Cleaner eggs increase hatchability and chick quality. In some cases, it enables the use of an automatic egg collection system, which further improves egg quality as the egg gathering process is faster and occurs more regularly. In addition, when new breeding stock is to be produced from the current flock of breeders, the ability for selection of replacement birds based upon genetics and performance is possible. As mentioned earlier, identification and removal of low or non-producing birds from the breeding stock is possible with this housing design.

Experience has shown (for other than hobby operations) it is most practical and economical to house breeders in colony cages (<36 inches deep) using an in-line flat deck or stair step system. Use nipple, cup or cup-nipple waterers. Trough feed breeders. Flooring should be of quality ½" x 1" welded wire. Eggs from cage breeders will cool more rapidly and be much cleaner than floor type situations. Pecking and cannibalism will not be a factor if approximately one-third of the upper beak of hens is removed at housing. Cocks should be lightly block snubbed (hold beak closed and touch end to hot snubbing blade until blocked).

However, placing birds in wire cages has disadvantages that must be considered. Since the birds will spend their entire life on the wire, the bottom of the cages must be smooth and free of sharp points to insure it does not cause damage to the bird's feet. Injured and sore feet reduce fertility as mating frequency is drastically reduced. In addition, any open wounds increase the chance of infection, disease, and the eventual death of the birds. Greater expense is incurred and additional attention to detail is often required as each cage must be equipped with a feeder and waterer. If birds are housed in cages with one to two males per cage, average fertility for the entire flock is often reduced. Communal cages, or cages designed for 10 to 20 birds per cage, will often alleviate the suppressed fertility from breeders maintained in cages. Caged birds will require about 0.5 square feet per bird. Cannibalism is often a bigger problem with birds housed in smaller cages as they are not able to escape and hide from the more aggressive birds. Lights must be dimmed to about 0.5 foot candles to reduce aggression and pecking, but lower light levels are not recommended as mating activity may be reduced.

Incubation

Hatching egg sanitation often determines the quality and certainly the quantity of chicks hatched. To optimize the number of clean and viable hatching eggs, collect them several times each day (3-5 times). Make the final pickup late in the day to minimize the time eggs spend in the breeder house. This is particularly important during the warmer summer days. The most desirable eggs are those that are clean, free of shell defects, fairly large, and yet retain good shell quality. Embryonic development begins at temperatures at or near 75 degrees F. To stop excessive development and weakening of the embryo, cool eggs shortly after they are laid. Repeatedly starting and stopping embryo development usually causes poor hatchability due to embryonic mortality.

Store hatching eggs until an appropriate number of eggs are obtained in order to produce the quantity of chicks desired from a single hatch. Store eggs with the large end up in *clean* egg flats in an egg room or cooler. Maintain the egg storage room at 55-70 degrees F and about 70-80 percent relative humidity. Egg storage beyond seven days will reduce hatchability; therefore, the date the eggs were laid should be clearly marked in pencil marker on the eggs or egg flat. Many producers are pre-warming hatching eggs for several hours prior to setting. When eggs are pre-warmed, they are removed from the cool room and allowed to gradually warm to room temperature. Gradually warming the eggs reduces "sweating," or the condensation of water on the eggshell surface. "Sweating" enables bacteria on the egg shell surface to multiply and for motile bacteria to penetrate the eggshell. Pre-warming, if not properly done, may reduce hatchability and chick quality. The pre-warming environment must have a strong airflow so that condensation moisture evaporates as it is formed.

Factors Affecting Hatchability

For successful incubation, a number of factors must be controlled: temperature, humidity, egg turning, ventilation and sanitation. Temperature, humidity and turning are the three most critical factors with hatching eggs (Table 2). Bobwhite quail eggs will hatch 23-24 days from the time they are set in the incubator. The ideal temperature in a forced-air incubator should be 99.5 degrees F with a relative humidity at approximately 60 percent. Temperature fluctuations may prolong or shorten the exact length of incubation. Eggs are generally transferred to a separate hatcher on day 21 of incubation. Using separate setters and hatchers results in cleaner chicks and less cross contamination between the hatching eggs and any newly set eggs. The relative humidity in the hatching machine should be a little higher, 70-75 percent, with a slightly lower temperature of 97-99 degrees F. However, the ideal temperature will vary between machine types and hatcher room conditions. Noticeably prolonged or shortened incubation periods or unusually low hatchability may be caused by warm or cool spots in the incubator. To check this out, place several accurate thermometers in the incubator and check them several times daily. If this is the problem, contact the incubator manufacturer for suggestions. Severe or prolonged temperature variability in the incubator room may affect conditions on the incubator's interior, especially if the incubator is inadequately insulated. Such variations may adversely affect chick quality.

Incubators are of either the still- or forced-air ventilation type. Both types can be successfully used, but forced-air machines provide a more uniform environment for hatching eggs. While developing embryos require oxygen, with an increasing requirement during the latter stages of incubation, it is critical to remove carbon dioxide (CO_2) and moisture from the incubator. Forced-air incubators ensure a steady flow of incoming and exhaust air through the machine.

Ventilation in the incubator and incubator room are equally important. Be sure to maintain an adequate flow of fresh incoming air into the room

Table 2. Incubation time and requirements for Bobwhite quail

Item	Optimum Value
Incubation time, days	23-24
Forced air temperature[A], °F	99.75
Humidity[B], %	84-86
Operating temperature last three days of incubation[A], °F	99
Humidity last three days of incubation[B], %	90-94

[A] All operating temperatures are given in degrees Fahrenheit - Dry Bulb.
[B] Humidity is presented as degrees Fahrenheit - Wet Bulb.

and remember that oxygen requirements increase as the embryos grow. Do not use a room air conditioner in the incubator room to maintain room temperature and humidity as they remove moisture from the air. Therefore, the air going into the incubator will be too dry.

During incubation, eggs require regular turning to prevent the embryo from sticking to the membranes. Mechanical egg turning devices are recommended and are necessary with large numbers of eggs. If relatively few eggs are being incubated, the eggs can be manually turned and marked with an X on one side of the egg to ensure all eggs are turned each time. Turn incubating eggs no less than three times per day. Rotating eggs is not necessary during the last third of incubation, but most continue to turn eggs until they are moved to the hatching machine. Place eggs on their sides in enclosed baskets in the hatcher.

After 7-10 days of incubation, candling a sample of eggs provides valuable information if hatchability problems occur. Remove those eggs lacking a distinct blood vessel network – "clears" – and perform a "breakout" of these eggs to determine the cause of failure. Record early embryonic mortality during the egg breakout for trouble-shooting problems in hatchability. Patterns of embryo loss will enable identification and separation of fertility, egg handling, or incubation problems. Should assistance be needed to distinguish truly infertile eggs from early embryonic deaths, consult a local county extension agent, University Poultry Extension Specialist, or the Georgia Poultry Diagnostic Laboratory.

Several subtle causes of reduced fertility are:

- Improper ratio of males:females in the house.
- Leg problems in the males, which reduce mating activity.
- Excess temperatures reduce mating activity
- Improper or inadequate lighting. Most quail producers maintain their birds in dim light facilities; proper light stimulation is extremely important if the birds are to develop sexually. After egg production has begun, do not reduce the hours or intensity of light the birds receive each day; overall production will be severely disrupted.

Position incubating eggs large end up. Failure to properly position eggs may lead to a variety of deformities, including a fully formed embryo with its head in the small end of the egg. After chicks hatch, leave them in the hatcher until 90 percent are dry. Then remove them to the brooder.

To reduce the possibility of eggs exploding in the incubator, be sure not to set cracked or leaking eggs. Eggs explode because of bacterial production of gas within the egg. Exploding eggs shower the incubator's interior with bacteria and possibly mold spores. The bacteria contaminate the other eggs and may contaminate the embryos within those eggs.

Table 3. Causes of poor hatchability

Problem	Possible Causes
Early embryonic death	Temperature too high or low, pre-incubation of eggs
Embryos dead, 2nd weed of incubation	Improper turning, temperature too high or low
Air cell too large	Humidity too low
Air cell too small	Humidity too high
Chicks hatch early	Temperature too high, humidity too low, inaccurate
Chicks hatch late	Temperature too low, humidity too high, inaccurate
Chicks dead after pipping shell	CO_2 content too high, improper turning of eggs
Sticky chicks	Humidity too low, temperature too high

Bird Management

Brooding

The brooding period is the first six weeks of the chick's life. This critical period is important in getting the chick off to a good start. It is a basic fact of game bird management that immediately following hatching, chick quality cannot be improved, but it certainly can be impaired. Be prepared for chick arrival. Cleaning, disinfecting and quail brooder house setup should be complete several days prior to the chicks' arrival. Regardless of the season, the brooders should have been running for at least 24 hours and the litter temperature should be approximately 95 degrees F. Chicks have sufficient material in their yolk sac when hatched to survive two to three days without feed (assuming the temperature is correct), but they need water. It is important that the chicks find the water source shortly after arrival to prevent dehydration and death. Introduce about 10 percent of the chicks to the water by placing water onto their beak. These birds will teach the others the location of the water. To assist the chicks in getting a good start, place a vitamin mix in the water. Stocking density can be as high as 10 birds/ ft^2 during brooding.

Chicks have difficulty self-regulating their body temperature the first 10-12 days of life. They may lose significant quantities of heat through their feet, which explains the emphasis on maintaining the litter at 95 degrees F. Chilling causes the chicks to huddle, causes premature closure of the yolk sac stalk, and makes the chicks more susceptible to disease. Please remember the chicks are only about 2 inches tall. Brooder temperatures must be monitored at chick height because temperature can vary as much as 5 to 8 degrees F from the ground to 4 or 5 feet above the floor. Reduce brooder temperatures by about 5 degrees/week until a temperature of 70 degrees F is reached. Brooding is generally accomplished in circular units about 7-8 feet in diameter called "brooder rings." The ring is commonly made of cardboard or inexpensive sheet metal. The function of the brooder ring is to keep the chicks in the vicinity of the heat, water and feed. Chicks will be able to fly over the ring by about nine days of age, so remove the ring at about eight days of age.

Figure 2. Bobwhite quail infected with quailpox virus.

Most gamebird producers use nipple waterers. Nipple waterers significantly reduce the occurrence of wet litter and are simpler to clean than trough waterers. As a general rule, each nipple will supply water to approximately 15 birds.

Quailpox virus is a slow spreading disease of approximately 60 avian species (Figure 2). Mosquitoes are the most common carrier to birds. Quailpox vaccine is recommended. Vaccination is performed in the wing web using a small twin-pronged fork, supplied with the vaccine. Birds of any age may be vaccinated. Typically, quail are vaccinated between five to eight weeks of age. While vaccinating, keep the vial of vaccine in an ice bath. Vaccine not used within 4 hours of reconstitution at ambient temperatures of 50-70 degrees F should be discarded. The vaccine cannot be stored in the refrigerator for later use. Under normal circumstances, vaccination confers lifetime immunity.

In addition to vaccinating, environmentally friendly mosquito control methods and biosecurity should be adopted. These include emptying buckets of standing water, mowing around gamebird pens, encouraging purple martins to nest in the area, and the using electrocution lamps.

Growout

At six weeks of age, chicks are typically moved from the brooding facility into outside flight pens until 17 weeks of age, and then birds are marketed to hunting plantations. The density of birds placed

in a flight pen is estimated as 0.70 birds/ft^2. Flight pens generally contain approximately 20 percent of the total pen space enclosed for shelter and dry space for feeder and waterers. Flight pens are relatively inexpensive, consisting of wire or netting supported by 4 x 4 wood posts. Several variations of flight pens are used and the actual cost depends on the resources available on the farm. If most of the materials used to construct a flight pen are purchased, then the facility may cost approximately \$0.70/ ft^2. The disadvantage of flight pens is a high rate of mortality. The high rate of mortality probably occurs due to exposing quail to a cold, wet environment. This condition creates an excellent environment for disease outbreaks such as Bronchitis, Capillaria, Histomonas and Ulcerative Enteritis.

Conversely, a low percentage of growers (*ca.* 10%) are raising Bobwhite quail in scaled down "Broiler Houses" for the entire 17-week production period (Figures 3 and 4). Bobwhite quail production should be a primary enterprise on a farming operation for a grower to invest in this type of facility, which ranges \$7-8/ft^2. With a bird density in enclosed barns at 2.0-2.5/ ft^2, housing 25,000 quail could be very expensive. The primary advantage of a quail barn is that the birds are removed from a cold, wet environment. Pine shavings are usually placed in the house at a depth of 4 inches. The incidence of mortality is relatively low in this type of facility because of the warm, dry environment it provides. Growers producing quail in an enclosed facility have experienced the percentage of flock mortality as less than 5 percent. This reduction in mortality can help offset the increased building cost associated with a quail barn.

Additional advantages of quail barns include a lower incidence of cannibalism and reduced feed cost. From 5 to 14 weeks of age, birds are grown in the dark to prevent cannibalism. Light stimulates bird activity, thus less cannibalism occurs with birds grown in darkout housing. However, dim light should be provided to the birds at 14 weeks to stimulate feed consumption so that birds will have adequate energy reserves for flying when marketed at 17 weeks of age. Another advantage with raising quail in barns is that feed consumption may be decreased about 25 percent compared with flight pens. The increased feed consumption with flight pens is probably a result of temperature variation. Outside temperatures can vary as much as 40 degrees F when birds are raised in flight pens during a growout period. During cold temperatures, birds consume additional feed to compensate for lower ambient temperatures.

Figure 3. An outside view of a quail barn.

Figure 4. An inside view of a quail barn.

Disease Prevention, Sanitation and Biosecurity

One of the biggest challenges Bobwhite quail producers are faced with is preventing disease outbreaks. A disease outbreak can result in flock mortality approximating as high as 50-90 percent, which can have a negative impact on your economic bottom line. Unlike commercial poultry, only a few medications are approved for Bobwhite quail. Therefore, producers must identify a preventive management plan to minimize disease outbreaks.

Common Diseases

The three most common diseases that occur with Bobwhite quail production are Quail Bronchitis, Ulcerative Enteritis and Quail Pox; however, other diseases (Myoplasma, Botulism, Coccidiosis, and Capillaria worms) have also been problematic with quail. A brief description of prevention and clinical signs of Quail Bronchitis, Ulcerative Enteritis and Fowl Pox is presented below. If additional information is needed regarding other diseases, contact your local veterinarian or an Extension Poultry Scientist.

Quail Bronchitis (QB) is caused by an adenovirus. Transmission is both vertical (through the egg) and horizontal (from bird to bird). Scientific evidence indicates QB maybe introduced by wild birds. Morbidity approaches 100 percent and mortality is frequently 50 percent, but it may be much higher. Once into a flock, QB spreads rapidly through a pen and from pen to pen. Generally, quail less than four weeks of age are severely affected. Birds over eight weeks may have a sub-clinical infection. Recovered or sub-clinically infected birds may be shedders of the virus. Clinical signs are increased mortality, depressed appetite, and rattling respiratory signs. Necropsy reveals white mucous fluid through out the body. There is no treatment for QB. The best course of action is good management. Increase the temperature several degrees to prevent huddling and possible suffocation. Add a vitamin/mineral pack to the water. Practice good biosecurity to minimize the chances of getting QB. Recovered birds may be kept until the following year and used for breeders. Typically, they will pass anti-bodies through the egg to the embryo.

Ulcerative Enteritis (UE) is probably the most common disease observed in quail. UE also occurs in young turkeys, grouse, pheasant and other game birds. The causative agent is a gram-positive bacterium known as *Clostridium colinum.* Clinically, birds diagnosed with UE lose body condition rapidly and become dehydrated and emaciated. Birds may sit with their heads drawn back and the back humped. The breast becomes thin, shriveled, dehydrated and has a razor-like edge. Lesions are found in the lower small intestine, cecal pouches and large intestine. Deep ulcers are visible through the unopened intestinal wall. Wear disposable shoes, garments and gloves should you visit another farm.

Quail Pox is a viral disease that gains entry to the non-feathered areas of the skin by minor abrasions or by mosquitoes. It enters *via* litter ingestion, minor abrasions to the upper digestive tract, and possibly swallowing infected tears. Fowl pox occurs most frequently during the fall and winter months. Fowl pox lesions are characterized as a raised, blanched nodule. The nodule enlarges, turns yellow and progresses to form a thick dark scab. Birds are vaccinated in the wing web at six to eight weeks of age. Elimination of mosquito breeding sites also helps control fowl pox. No specific treatment for fowl pox exists.

Sanitation and Biosecurity

Sanitation and biosecurity are inexpensive forms of insurance. Initiating and following a number of procedures reduce the possibility of a disease outbreak. Biosecurity includes measures that prevent the entry and survival of viruses, bacteria, parasites, fungi, insects, rodents, *etc.,* into a gamebird flock. Any of these agents may endanger the health of a flock, regardless of age.

Biosecurity should begin with planning the gamebird farm. For example, consider placing propane gas tanks near the front of the facility so propane gas service personnel will only have to come into contact with the gas tank. Consider the farm's location and proximity to any other poultry or gamebird farms. Are other farms upwind or downwind? Can the farm be situated in a reason-

ably isolated location? This is known as "conceptual biosecurity." Unfortunately, for a variety of reasons, few producers initiate biosecurity so early in a flock's lifetime. For most, disease prevention begins when a flock is purchased. Purchase chicks from a reputable hatchery, which has been tested free of diseases.

Ideally, only birds of a single age and species are present on the premises at any given time. Some diseases are carried by certain species without apparent effects. Yet, the same organism in a different species can do considerable damage. A good example is the protozoan *Histomonas*, which causes blackhead. Chickens carry *Histomonas*, generally without any visible signs. Chickens pass *Histomona*s cysts in their feces. Bobwhite quail that ingest feces containing the protozoan may become ill with blackhead.

Most producers have gamebirds of a variety of ages. When feeding, cleaning, *etc.,* start with the youngest birds and finish with the oldest birds, if possible. Separate feeders and waterers should be available for each age group. Do not move the feeders, waterers or any other piece of equipment from an older to a younger group without cleaning and disinfecting it first. In addition, clean feeders when they appear dirty. Many quail producers now use nipple waterers. Those who continue to use bell type or inverted mason jar waterers should clean them out at least twice weekly during cooler weather and more frequently in the warmer seasons. It is a good idea to have on hand at least twice the number of waterers required for the flock. This enables the flock owner to disinfect waterers by soaking in dilute chlorine bleach (1:10) for 30-60 minutes. After removal from the bleach solution, rinse the waterers and allow the chlorine odor to dissipate overnight. Alternatively, the water supply may be chlorinated. Chlorine levels at the point of consumption should approximate 1 ppm.

If you maintain different species on the same premises, confine each species to a specific area. When constructing pens, pay attention to the drainage. Drainage of fecal or toxic material may cause problems. To prevent a buildup of parasite eggs in the pens, salt the ground at the rate of 60 pounds/1,000 ft^2. Wet the ground thoroughly after the applying the salt and till the salt into the ground to a depth of several inches.

Maintain chicks in isolation from older birds. It is a good idea to wear disposable plastic overshoes between pens. Make sure the plastic is sufficiently thick to prevent tearing.

Personnel who tend to chicks should change clothes and pay close attention to hand and boot washing should they find it necessary to go from older to younger birds. Do the utmost to prevent the transfer of manure from older to younger birds. Manure contains oocytes or ova of many parasitic diseases.

Place feed and water containers so fecal contamination is minimized. A simple method to prevent birds gaining access to feces is to construct a small pit near the feed. Attach ¼-inch hardware cloth to boards. Wire should be free of any sharp protrusions so birds do not damage themselves. Pull the wire taut prior to securing it to the boards. Now, position cinder blocks so that the wire structure may be positioned over the blocks so as to have some security and firmness.

Rodent Control

Rodent control is an integral part of biosecurity. Not only will rodents destroy and contaminate feed, they may attack and panic the birds and/or destroy wiring and introduce diseases, especially *Salmonella, Leptospira,* coccidia and other parasitic diseases. Rodents may be effectively controlled by a variety of measures.

First, plug all holes they may use to gain entry. Eliminate nesting-hiding areas by removing any rubbish and unnecessary equipment from around the facility. Keep the lawn mowed to at least 50 feet from the facility. Rodents prefer cover. Rodent-proof the feed bins and keep spilled feed to a minimum. Establish a baiting program. Baiting programs require some knowledge of rodent habits to be effective. Also, they are most effective when alternate sources of feed are eliminated or minimized, thereby forcing the rodents to eat the bait.

Summary

1. Bobwhite quail production can be a viable enterprise if birds are managed properly.

2. It is recommended that quail producers either raise hatching egg chicks or growout quail from hatching until 17 weeks of age and avoid producing both at the same time.

3. For growers starting out in the business, we strongly recommend that you learn how to grow birds before producing hatching eggs because of the additional management and investment required with breeder production.

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