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Caged Layer Management

TEXAS A&M UNIVERSITY
TEXAS AGRICULTURAL EXTENSION SERVICE
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COLLEGE STATION, TEXAS

Caged Layer Management

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LARGE SCALE PRODUCTION of eggs from caged hens has spread across the nation. The practice which originated on the West Coast toward the end of World War II has caused many innovations in egg production.

Growth of the cage method of producing eggs necessitated a distinction be made between the two predominant layer housing systems—the floor plan and the caged plan. Although many production and marketing problems are identical, the two systems differ enough to justify separate treatment of problems to cage operators.

Cages will never completely replace the floor plan. But as poultrymen attempt to house more birds in less space, multiple-bird cages (2 to 10 birds) and colony cages (11 to 40 birds) will become increasingly popular.

Information in this publication is based on research at Texas A&M University, university experiment stations and field observations. For the past 17 years, the Department of Poultry Science at Texas A&M has conducted an extensive research program in caged layer management.

Cement walkways are investments which more than pay for themselves in convenience, sanitation and wear and tear on equipment.

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LOCATION

One of the most important decisions is location of the egg factory. Several considerations are important before making a final decision on plant site.

1. Know the location of your egg market before you buy a cage or baby chick.
2. Know zoning and health department regulations on poultry plants in your area.
3. Locate far enough from the city limits so the town's growth will not surround your operation and zone it out of business.
4. Locate far enough from neighbors so flies and odors will not annoy them.
5. Allow adjacent acreage for future expansion.

Kind of Bird

In egg production, the most important capital investment is the bird. For maximum return, she must meet exacting specifications. The most important are:

1. Bred to lay at a high rate. (Produce a minimum of 20 dozen eggs in the first 12 months of lay.)
2. Minimum body weight consistent with viability and satisfactory egg size. (3.25 to 3.50 pounds at 50 percent production.)
3. Good livability (88 to 95 percent the first year of lay.)
4. High feed efficiency. (4 pounds or less of feed per dozen eggs.)
5. Satisfactory egg size reached quickly without too large an average egg weight. (Eggs should attain an average of 24 ounces in the third month of lay and not exceed a 25½ ounce average for the first year of lay.)
6. Produce white eggs with good exterior and interior quality (not more than 3 percent poor shells, blood spots and "loss" eggs combined).

Several good strains of commercial layers are available that attain or exceed these standards today. Such birds pay adequately for good feed and management required in the cage system.

Random Sample Egg Laying Test results and the experiences of other egg producers can be valuable guides in selecting the strain of birds best suited for your operation. However, you should consider the results of several tests made over a period of years before making the final decision. Many large egg producers prefer to keep two or more leading strains on their farms.

Your local county agricultural agent can place your name on the mailing list to receive results of the Texas Random Sample Egg Production Test.

Types of Cages

Three general types of cages are in use today:

1. Single cages—one bird per cage, Figure 1.
2. Multiple-bird cages—2 to 10 birds per cage, Figure 2.
3. Colony cages—11 to 40 birds per cage, Figure 3.

NOTE: Colony cages are multiple bird cages, but our definition of multiple bird cages sets a limit of 2 to 10 birds per cage. Cage width refers to the horizontal distance across the front of the cage measured from one partition to another, while cage depth refers to the distance from front to rear of the cage, Figure 4. Cage height will vary. Usually, height at front will be greater than height at rear of the cage, giving a slope to the floor.

Figure 1. Single cages—one bird per cage.

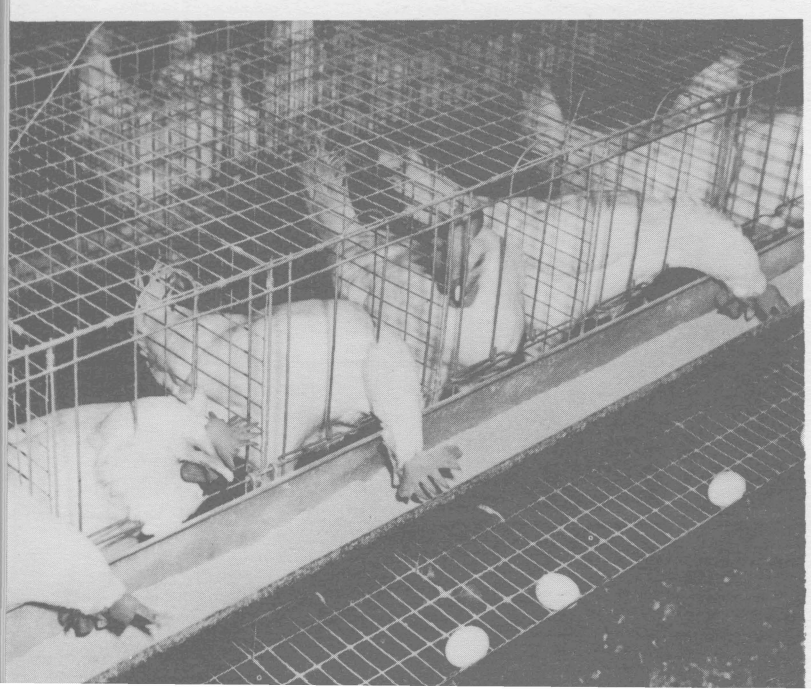
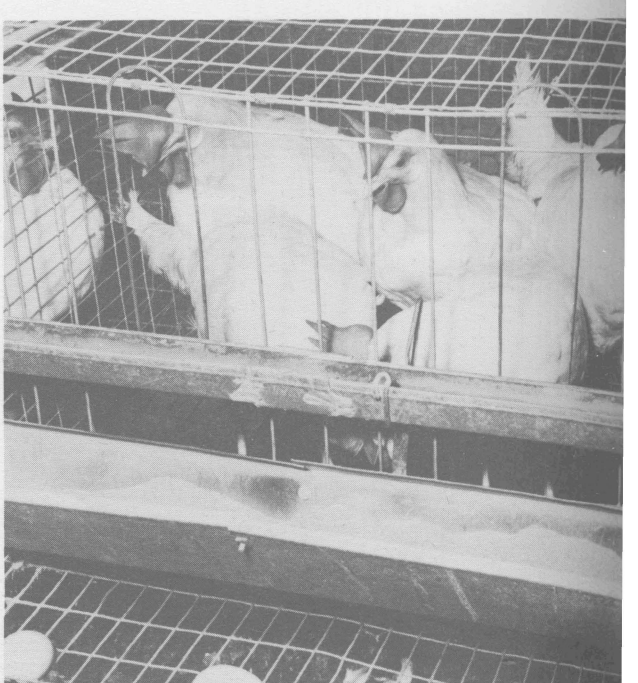


Figure 2. Multiple bird cages—2 to 10 birds per cage.



SINGLE CAGES

Although there are published reports to the contrary, comparisons made at Texas A&M University show that birds housed in individual cages lay more and larger eggs on less feed and experience less mortality than birds housed either in multiple-bird or colony cages or in litter-floor pens.

The most popular single cage sizes are 8, 10 and 12 inches wide and either 16 or 18 inches deep. For most current strains of egg production stock, the 8 x 16-inch individual cage is adequate. If you convert these single cages to multiple-bird cages, the minimum size cage that should be installed is 10 x 18 inches.

Cages may be arranged in a variety of ways.

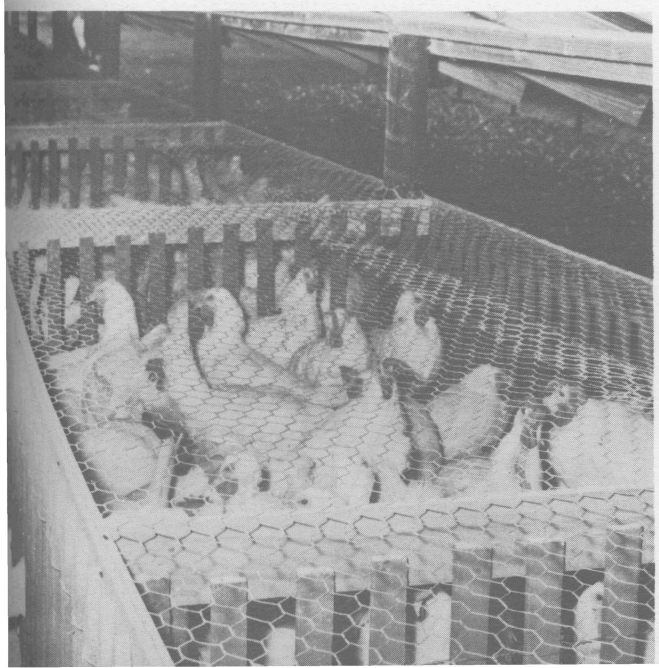
Single Row

In this design two single rows of cages are separated by an aisle, Figure 5, with each row containing its own feed and water trough. A single row of cages 18 inches deep will occupy a space 27 inches wide. This space includes 18 inches for cage, 2 inches for water trough extending down back of cage and 7 inches for egg "roll out" tray. The aisle between these two rows should be a minimum of 30 inches wide. Single rows are primarily used in narrow houses less than 20 feet wide. Two inches less space is required per row when 16-inch deep cages are installed.

Back-to-Back

Two rows of single cages are placed back-to-back and share a common water or mechanical feed trough, Figure 6. The primary reason is to increase capacity by reducing the number of aisles in houses 20 feet and wider. Back-to-back rows are primarily used in combination with single rows for maximum utilization of space. A back-to-back row of 18-inch cages measures 50 to 56 inches from the tip of one roll out tray to the tip of the other, depending on the type of trough between the cages. Installation of 16-inch cages reduces the overall width of a double row by 4 inches. Suspend or support single row and back-to-back cages at a height comfortable to the operator.

Figure 3. Colony cages—11 to 40 birds per cage.



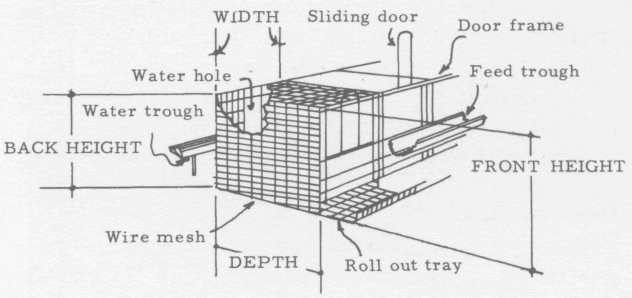


Figure 4. Cage width refers to the horizontal distance across the front or rear of the cage.

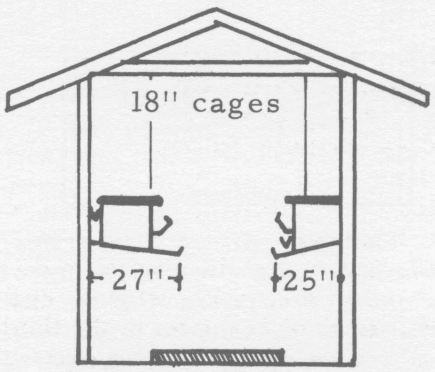


Figure 5. Single rows—This design is primarily used in narrow houses less than 20 feet wide.

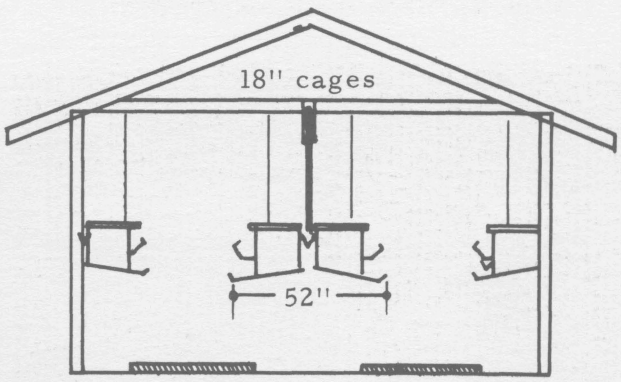


Figure 6. Back-to-back rows—Two rows of single cages are placed back-to-back and share a common trough. It is primarily used in houses over 20 feet wide in combination with single rows for maximum space utilization.

Stair-step

Arrangements of this type are popular where *land is high and space limited. A stair-step design* is attained by off-setting one tier of single cages below another. The rear of the lower cage is attached to the front of the upper cage so that the roll-out tray of the upper cages overlaps and rests on top of the lower row, Figure 7. Droppings fall to the ground rather than on dropping boards which is typical for most two-level cage systems.

Most stair-step systems use 16-inch deep cages with both waterers and feeders on the front of the cages. Water troughs can be located easily at the rear of upper rows of cages. Stair-step cages vary from 39 to 41 inches wide, depending on the location of the water troughs. Back-to-back stair-step assemblies usually are about 78 to 81 inches wide.

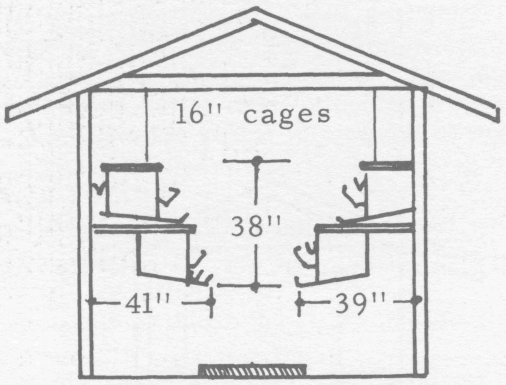


Figure 7. Stair-steps—Arrangements of this type are attained by attaching the rear of the lower cages to the front of the upper cages so that the upper "roll-out" tray overlaps the top of the lower cages. Unlike most two-level cage systems, droppings fall to the ground.

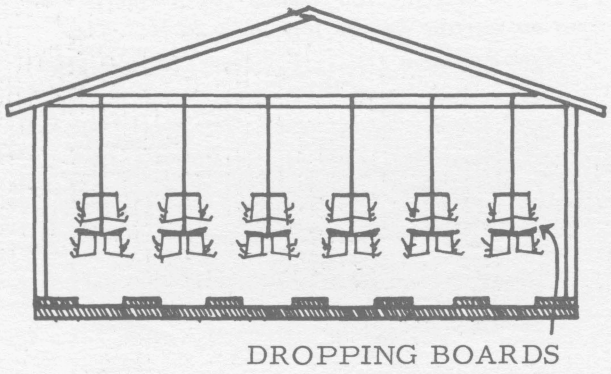


Figure 8. In areas where land housing costs are high, cages are sometimes double-decked. Two major problems are associated with this arrangement—the necessity for frequent manure removal and difficulty in providing birds on the lower level with enough light to stimulate maximum egg production.

A major disadvantage of the stair-step and double-deck arrangement is that cage heights must be a compromise; thus causing top row to be too high and bottom row too low for maximum comfort of operator.

Double-deck

This arrangement consists of placing one row of cages directly on top of another. A dropping board must be placed between the two rows to prevent manure from falling on birds in the lower row, Figure 8. The most popular size cages for this design are 16 inches deep. Use this system only in situations where housing costs are extremely high. The two major problems of this cage design are necessity for frequent removal of manure from dropping boards and difficulty in providing sufficient light to birds in lower cages to stimulate maximum production. The double-deck system is used frequently in environmentally controlled houses.

MULTIPLE-BIRD CAGES

Placing two or more birds in the same cage introduces a new set of management factors. Multiple-bird cages will become more popular with margins decreasing and capital for increasing flock size becoming more difficult to obtain.

Most multiple-bird cages in use today were designed as single bird cages with one or more partitions removed. Cage size may vary, but for optimum performance, allow a minimum of ½ square foot of floor space, 3 inches of feeder space and 1 inch of water space per bird. Some of the more popular bird densities range from two to five birds per cage. Multiple-bird cages may be arranged in the same way as single-bird cages.

Both experiment station and field results from across the nation indicate that two birds in a 10-inch-wide cage arranged in the stair-step design is the most profitable cage system.

Several equipment manufacturers market a heavy gauge, 20-inch deep cage in a variety of widths, designed especially for multiple-bird cage operations.

Commercially manufactured flat deck cage assemblies housing three to five birds are sometimes used in areas where housing costs are high, Figure 9. This allows concentration of many layers in a relatively small space. Birds are fed and watered, eggs collected and manure is removed automatically. Disadvantages of this system are high initial costs and difficulty in seeing and reaching birds in middle of unit.

COLONY CAGES

Colony cages afford lower housing and labor costs than any other housing system. But without

superlative management and careful attention to details, these lowered costs will be more than offset by increased mortality, reduced production, more dirty and broken eggs and a greater fly problem. Research at Texas A&M University has shown that the performance of birds housed in colony cages is significantly below that of layers housed in multiple-bird or individual cages in egg production, livability and feed conversion.

There is no standard size for colony cages. The four sizes most commonly used by Texas producers are: 3 feet deep by 5 feet wide; 3 feet deep by 8 feet wide; 4 feet deep by 4 feet wide; and 4 feet deep by 8 feet wide, with the last two sizes by far the most popular. Cages more than 4 feet deep make it extremely difficult to remove sick or dead birds, and there are more problems with egg roll-out. The ratio of cage depth to cage width should be no greater than 1 to 1.

Colony cage size significantly affects egg production. Layers housed in smaller cages, at a given floor space per bird, consistently produce at higher rates.

Bird density is even more important than cage size. For optimum production, adjust bird numbers

Figure 9. Single "flat-deck" cage assemblies can be purchased from commercial manufacturers. Layers are fed, watered, eggs collected and manure removed—all automatically. Major disadvantages are high initial cost and operators are unable to see or reach inside birds easily.

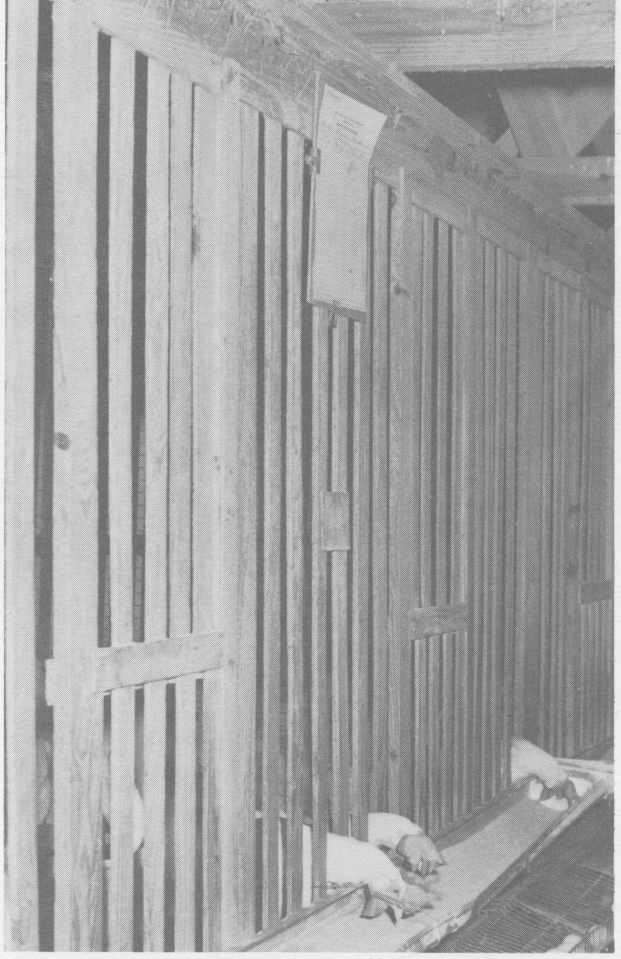


Figure 10. In the early construction of colony cages, front and rear walls extended from the bottom cage to the ceiling. Birds were difficult to cull, observe and light in these cages. Layers kept in taller cages are also flightier.

to provide a minimum of 1 square foot of floor space per bird. The larger the number of birds per cage, the more critical floor space becomes.

Front and rear walls of most colony cages constructed in the past have extended from the bottom of the cage to ceiling, making the cage 4 to 6 feet high depending on the building height, Figure 10. Most operators now feel that these cages should be no higher than 24 inches at the front and 18 inches at the rear and should be covered with poultry netting. Reducing cage height allows easier observation and culling of birds; birds are calmer and lighting is easier.

Elimination of floor support in the area where the roll-out tray passes under the front wall of the cage will significantly reduce the number of broken and dirty eggs, Figure 11. A slope of approximately 1½ inches per foot encourages quick roll-out of eggs.

Use of nests in colony cages at Texas A&M University had no significant effect on egg production, body weight, feed efficiency or livability. Birds with no nests in their pens produced larger eggs than those with nests.

CAGE HOUSES

Real estate, including laying, brooding and feed houses, represents about 45 percent of the capital investment of a poultry operation. Therefore, poultry housing costs should remain within the range that makes it possible for the earnings to justify the investment.

Construct Texas cage houses with special emphasis on layer comfort during the summer heat. But housing must also protect birds against the few severely cold winter days.

When constructing a cage house, consider the following:

1. Location of the house for good natural drainage to prevent flooding by surface water.

2. Proposed site of the house graded and leveled with provisions for a drainage trench around the house. The floor should be several inches above the surrounding area.

3. The ridge of the poultry house runs east and west so that the sun travels along the ridge rather than shining directly into the house. Shrubbery, trees or a slat fence may be used to shade the northwest corner of the house from late afternoon sun.

4. A side wall height of 8 feet is recommended. Side walls should have at least two tiers of panels or a plastic curtain which can be raised or lowered to provide air movement. Good air movement over the droppings is important. In areas of high winds, construct panels to open into the building. Covering the sidewall and the ridge ventilator openings with woven wire prevents potential disease-carrying wild birds from entering the house.

5. The roof overhang should extend enough to shade the sidewalls and floor area from direct rays of the summer sun.

6. A gable roof with a peak 12 feet above the ground is recommended. Provide a 1½-foot opening at the peak of the ridge for a continuous ridge row ventilator. Install dampers so that air flow can be regulated during the winter months.

7. Cage houses should be narrower than floor-type houses. In exremely wide houses, ventilation is a problem. Hens in center rows of cages often need more air while those on outside rows are too cool.

A house 24 feet wide (Extension Poultry House Blueprint 397) will accommodate three double rows of back-to-back cages, Figure 12. This width allows from 30 to 36 inches for each aisle between the rows of cages. These are the minimum row widths for convenient feeding, egg gathering and manure removal from under cages. Allow at least 6 feet of space betwen end cages and walls for turning room. Houses longer than 150 feet should have a break in the rows of cages for a cross aisle through the center to facilitate movements from row to row.

8. A metal covering for the roof and walls is recommended. Both aluminum and galvanized iron are available in lengths up to 40 feet. Saving on labor and material by eliminating end laps, plus the added strength afforded by these longer lengths, more than compensate for the somewhat higher cost.

Protect metal siding at lower sidewall levels from poultry manure because of corrosive action of droppings.

9. Field observations indicate that adding ceiling insulation is beneficial, Figure 14. A method of rating insulation is based on the ability of material to resist the heat flow. A small "r" expresses the resistance for a 1-inch thickness and a capital "R" is used normally to express overall heat resistance value ("R" value) of a material. The larger the "R" value of the insulating material, the more comfortable your house will be. For maximum benefits, poultry house ceiling insulation should have a heat resistance number in the magnitude of 13 R. Cover insulating material with a waterproof material to prevent moisture from penetrating and ruining the insulation.

10. The house may be pole type or foundation and frame. While minimum housing cost is desired, do not confuse with light or inferior type construction. A study of poultry houses damaged by severe weather indicates most damage results from not securely fastening studs to foundation.

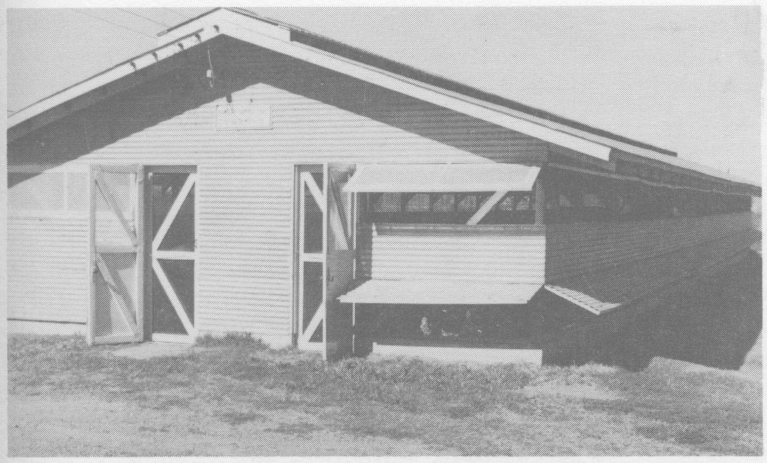


Figure 12. Plans for this 24-foot wide house may be obtained from county Extension agents by asking for Extension Blueprint 397.

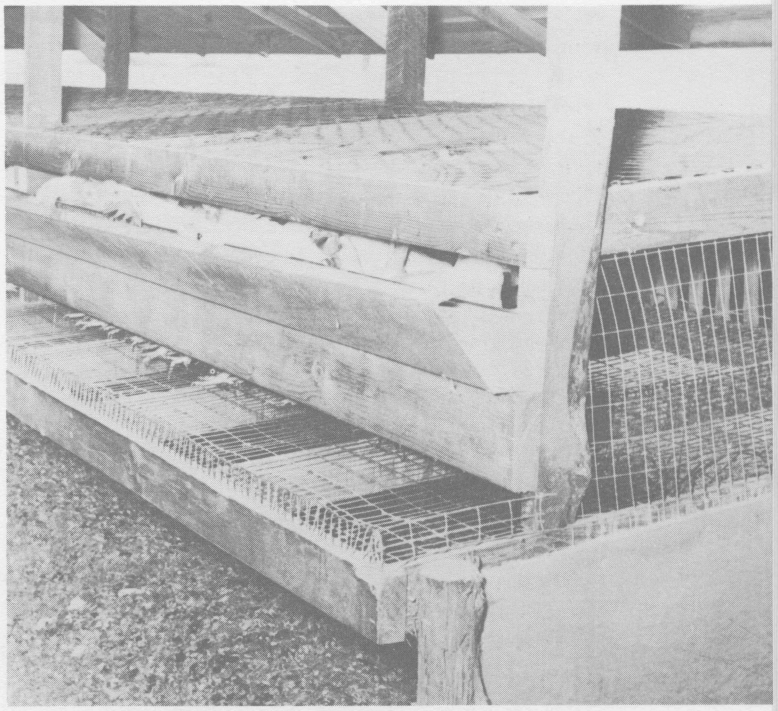


Figure 11. Moving the floor support from the area where the cage floor passes under the front wall to the edge of the "roll-out" tray will reduce the number of broken and dirty eggs.

Figure 13. Eggs are gathered conveniently on a mechanical cart. Narrow, 7 to 9-foot wide cages, shown here, are popular in the southern half of Texas and Florida. Birds housed in this type facility usually do well.

Figure 14. Field observations indicate that ceiling insulation is most beneficial to the laying flock during the summer and winter months. For maximum benefits, this material should have heat resistance value in the magnitude of 13R.

11. Floors usually consist of dirt left after site for poultry house has been filled and leveled.

12. Texas cage houses to be completely enclosed for environmental control must have some type mechanical cooling in addition to exhaust fans during the summer months. (See Temperature Control.)

13. When poultry house is completed, seed surrounding area with grass and mow as needed. This adds to the appearance of premises and helps control dust and prevent reflection. Cut grass often enough that it will not obstruct movement of air into floor line ventilators.

MANAGEMENT OF CAGE LAYERS

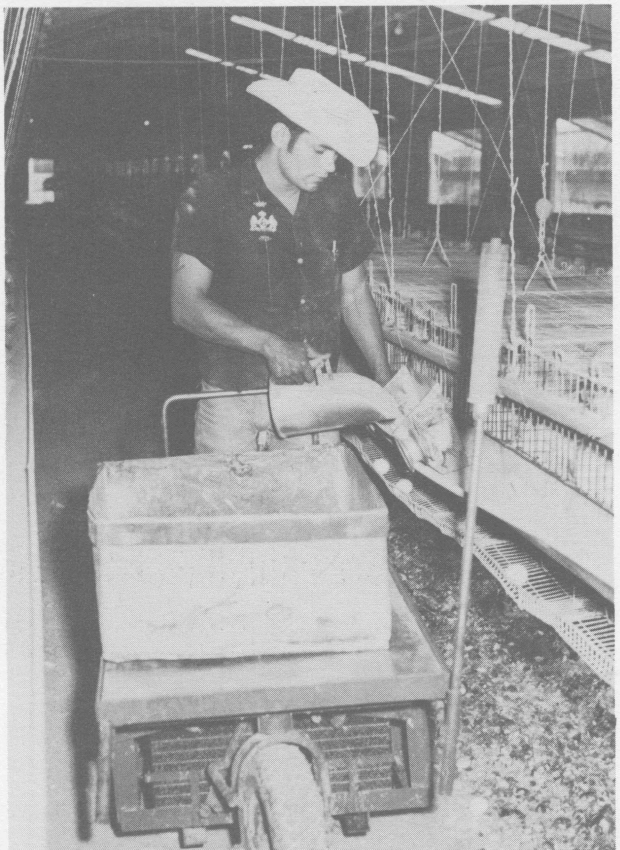
Pullets

The best time for moving pullets to cages depends on:

1. The price of eggs. This is important in determining when to replace your cage layers with young pullets.
2. The rate at which your old birds are laying.
3. The method of raising replacement pullets.

Most successful operators house their pullets at approximately the same age each year. It usually pays to hold pullets in the growing houses as long as possible. However, most cage operators prefer to move their pullets into cages before they reach 5 percent production because stress is placed on the birds while they are adjusting to their new surroundings. The ideal age for housing birds is approximately 20 to 24 weeks.

Figure 15. The battery-powered feed cart is the most popular means of feed distribution to cage birds.



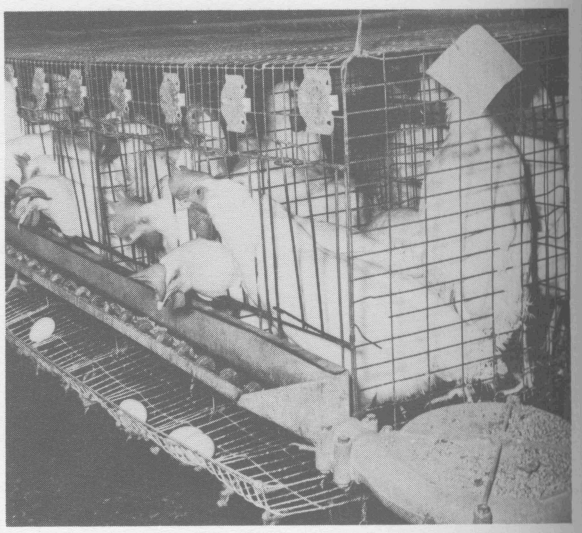


Figure 16. Mechanical feeders are becoming more popular in cage operations. Usually automatic feed troughs are located at the rear and between rows of back-to-back cages for maximum utilization of feeder space, rather than on the cage front, as pictured here.

Feeding

Poultry nutritionists generally recognize that birds kept on wire, without access to litter and excreta, have different feeding requirements from those kept in litter floor pens. For information concerning the feeding of cage layers ask your county agent for a copy of L-594—*Feeding Laying Hens.*

Feed may be distributed to cage layers by hand, battery-powered feed carts or mechanical feeders. Troughs normally are located on the front of the cages when birds are fed by hand or mechanical cart, Figure 15.

Mechanical feeders are becoming more popular in cage operations, Figure 16. Where these feeders are used in conjunction with single and multiple bird cages, troughs usually are located at the rear and between two rows of back-to-back cages for the maximum utilization of feeder space. In colony cage operations, mechanical feed troughs also are normally located at the back, between back-to-back rows or occasionally through the middle of deep colony cages.

When using a mechanical feeder in multiple-bird or colony cage operations where birds are heavily debeaked, troughs should be approximately half-full at all times. Otherwise, the birds will not be able to obtain enough feed to support a high rate of production. Frequency of operation and chain length of the automatic feeder are important

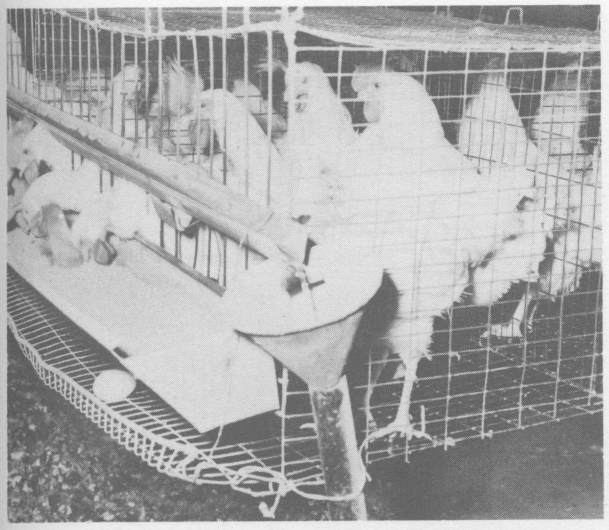


Figure 17. Continuous flow troughs are by far the most prevalent cage layer watering systems found in Texas.

considerations in keeping adequate feed in the troughs without wastage.

Research conducted by the Department of Poultry Science indicates that 3 inches of feeder space per cage layer is adequate to maintain body weight. And it will also support a high level of production, provided the feed is of sufficient depth for birds to satisfy their nutritional requirements.

For information concerning the feeding of egg type pullets, ask your county agent for a copy of L-593 *Feeding Flock Replacements.*

Watering

At moderate temperatures (55 to 85 degrees F.) leghorn-type laying hens will consume 5.0 to 7.5 gallons per 100 birds per day. When the thermometer registers above 90 degrees, these same 100 hens will consume 9 or more gallons per day. The perfect watering system has not yet been developed, but three systems give satisfactory results:

1. *Continuous flow troughs* in which a stream of water runs continuously are by far the most popular cage watering systems in Texas. The major disadvantages are that it requires a cheap but dependable supply of water, and disposal of the unused run-off water may be a problem.

Pumps are available which recirculate run-off water for reuse by the birds. Unless there is some type of purification (without affecting the palatability) this could be a risky practice, Figure 17.

Galvanized iron, stainless steel, plastic and fiberglass are the materials most commonly used in trough construction. In areas where mineral content of the water is high, metal troughs may soon become unserviceable. Plastic lined metal troughs seem to provide the best service in most Texas areas.

Location of the trough on the cage may vary, but most waterers are at the rear of the cage. When automatic feeders are used, the water trough is usually on the front of the cage. In some instances both the feed and water troughs must be located on the front of the cage with the water trough above the feed trough. This arrangement may create problems if there is leakage or if the cage rows are long and level.

Water troughs should be no longer than 200 feet. At one time most water troughs were placed level, but overflows occurred from trough sagging. To maintain flow at a velocity that will minimize feed sediment build-up, yet insure an adequate supply of water, there should be a fall in the trough of 1 inch vertically for every 40 feet of horizontal distance. For debeaked birds, the water level in the trough should be a depth of ½ inch. Other birds should have access to a depth of ¼ inch.

Some means must be developed for thoroughly cleaning the water trough at least once daily to prevent build-up of mold growth. Cage layers should have a minimum of 1 linear inch of water trough space per bird.

2. *Drip nipples* are valve devices with a drop of water hanging from each nipple. When the birds reach for the water they touch the nipple which activates the valve and allows more water to flow. The greatest disadvantage of this system is that it provides a constant source of dripping water.

3. *Automatic cups or founts* have the nipple in a horizontal position and extending into the cup. As the layers reach into the cup for water, their beaks strike the nipple and activate the valve that fills the cup with water. When the water, Figure 18, reaches nostril levil, birds quickly withdraw

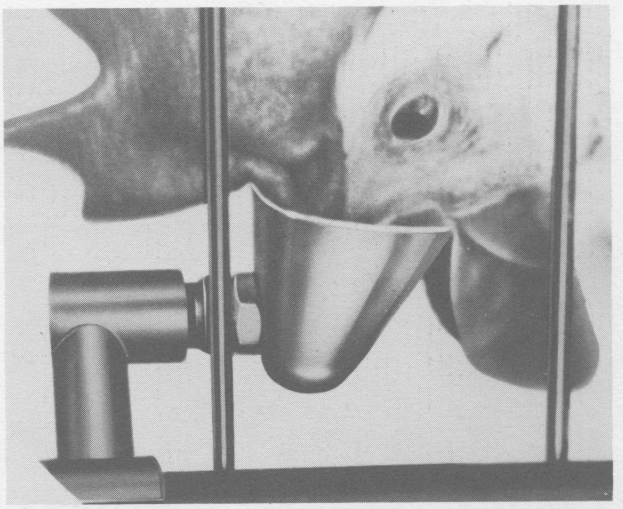
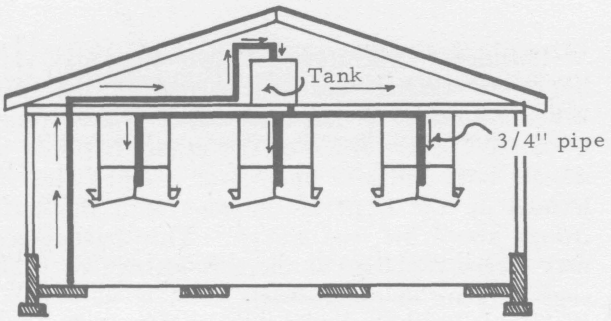


Figure 18. In some areas automatic cup waterers are popular. This is true especially where water is limited.



WATER DIAGRAM

Figure 19. An auxiliary water tank can be valuable in emergency situations such as power failure, storms, etc. They are also useful in the medication of layers.

their beaks from the cup, shutting off the water flow. Water wastage is greatly reduced with this system.

Due to the slow movement in the second and third systems, the water is likely to freeze in the winter and heat in the summer. Both systems are highly subject to jamming from foreign material in the water line. The cup-type waterer also may fail because of the accumulation of feed particles. This system should be flushed weekly. Pullets placed in cages with a "bird activated" water system may encounter difficulty in learning how to use it, unless raised on such a waterer.

Every cage house should have an auxiliary water tank of some type. These tanks supply water in case of emergency and facilitate medication or vaccination of the birds, Figure 19. Many cage operators now use an automatic proportioner for medication and vaccination.

Regardless of the type of watering system used, protect pipes and troughs with heating tapes or cables during the winter months. For information concerning the use and installation of heating cables and tapes ask your county agent for a copy of L-191 *You Can Warm Poultry Water With Soil Heating Cable* and USDA Leaflet No. 434 *Frost Proofing Water Systems in Poultry Houses.* If pipes and troughs freeze, get water to birds as soon as possible. Never allow birds to be without water longer than 2 or 3 hours.

A quantitative mineral analysis of your poultry water can be helpful. When the mineral content of the water exceeds 1,000 parts per million, chickens will not voluntarily drink it. When forced to drink highly mineralized water, poultry can gradually acquire a tolerance (depending upon the mineral) both for taste and physiological effects, without incurring death. However, there may be side effects such as loose droppings, reduced production and lowered vigor.

Texas A&M University provides an analytical water service for poultrymen. See your local county agent for the necessary form that must accompany each sample. (D-167—*Information Sheet for Irrigation Water Analysis*).

Lighting

There are three basic recommendations for caged layer lighting:

1. *Never let the light period decrease in length.* With seasonal changes, poultrymen must adjust artificial light to compensate for variation in natural daylight. Birds in production should never receive a decrease in total light. Birds in houses that do not have complete environmental control will be exposed to the longest day of the year on June 21. Check with local radio stations, newspapers or TV stations for the time of sunrise and

Figure 20. Reflectors provide better distribution of light. They must be cleaned for maximum benefit, however.

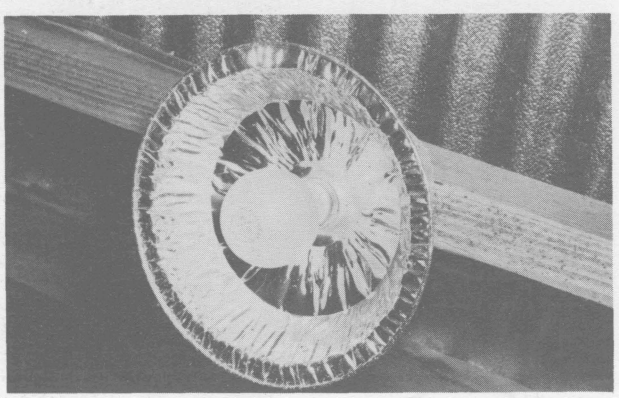
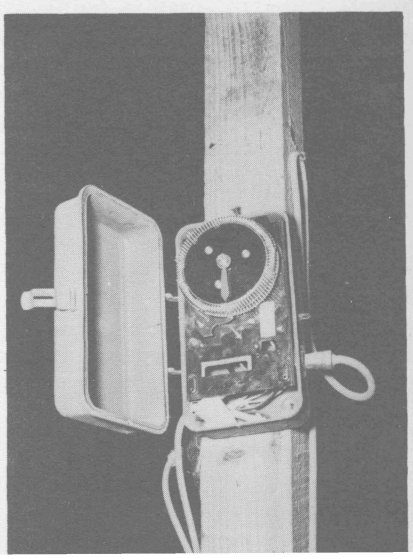


Figure 21. An automatic electric time clock is essential for a successful lighting program. Time clocks should be checked weekly, since they are subject to malfunction.



sunset for this day. As daylight hours decrease from this date, increase the use of artificial lights in your poultry house to maintain a constant light period.

2. *Maintain a constant light day by using both morning and evening lights.* Because the changes in natural daylight are not constant or evenly distributed between sunrise and sunset, layers should be given both morning and evening lights to avoid a decreasing day length.

3. *Give layers a minimum of 14 hours of light per day* but never less light than they receive on the longest day of the year.

Laying hens need a minimum of 1 foot candle of light per bird. (Your electric serviceman can check the light intensity at bird level.) One of the most important lighting factors for layers is that the light be distributed evenly throughout the pen. One 40-watt bulb placed every 10 feet over a row of back-to-back cages supplies adequate light. If three double rows of cages are placed in a house, stagger the center row of lights so that bulbs are mid-way between the bulbs of the two outside rows. Colony cages should have one 40-watt bulb over each cage. If the lower type cages are used, a row of 60-watt bulbs should be placed down the center aisle, 10 feet apart. Figure 20 shows a reflector for better light distribution.

Bulb maintenance is also an important factor in cage layer management. Operators should develop a routine for cleaning and replacing bulbs. Dirt and dust can reduce the efficiency of an electric lamp as much as 25 to 50 percent. Frequent cleaning of bulbs makes the job easier. A damp cloth will clean most bulbs, but water with a detergent may be needed for those extremely dirty. Always remove bulbs from electrical outlets before washing. Never handle or jar bulbs while they are hot. A bulb will burn an average of 700 to 1,000 hours, which approximates the hours of artificial light needed to maintain a constant 14-hour day for 12 months.

An automatic electric time clock is essential to a successful lighting program. Time clocks should be checked at least once each week. Like anything else mechanical, they are subject to malfunction, Figure 21.

Culling

Easy, accurate culling was once believed a major advantage of the cage system, but the importance of frequent culling has been reduced by these changes:

1. Placing more than one bird per cage. Establishment of the multiple bird system makes it impossible to cull birds on the basis of individual production records.

2. Salvage value of culls is extremely low. The market value of non-layers removed from laying cages has gradually decreased over the years. Producers can only recover a small proportion of their pullet replacement cost by selling culls.

3. Many birds will recover from pauses in production to lay at a profitable rate. For many years it was recommended that if a bird did not lay 7 eggs every 14 days she should be culled. Research shows this to be a questionable practice.

4. Rate of culling has decreased with improvements in breeding. The only culling now recommended before the ninth month of lay (15 months of age) is to remove the unthrifty and unhealthy birds. After the ninth month of production, birds that show pigmentation and poor handling qualities should be culled as they are detected. Birds this advanced in their production year usually will not regain full production while completing an early molt or regaining weight. Ask your county agent for a copy of USDA Farmer's Bulletin 2216, *Culling Hens.*

If many birds go out of production before the ninth month of lay, problems usually lie with feeding, health, lighting, housing or other management factors.

Health

An investment in a hen will show profits only when she lays at a consistently high rate. Death loss of more than 1 percent a month is excessive. A good vaccination program will mean a better chance of survival when the pullet is placed in the laying house. Ask your county agent for a copy of B-1031, *A Manual of Poultry Diseases.*

Prompt diagnosis is essential in disease control. A competent poultry diagnostician should be located before the need arises. Clean premises and strict sanitation are the keys to poultry health. Prompt and thorough disposal of dead birds is essential. Commercial incinerators are available for effective and economical carcass disposal, Figure 22.

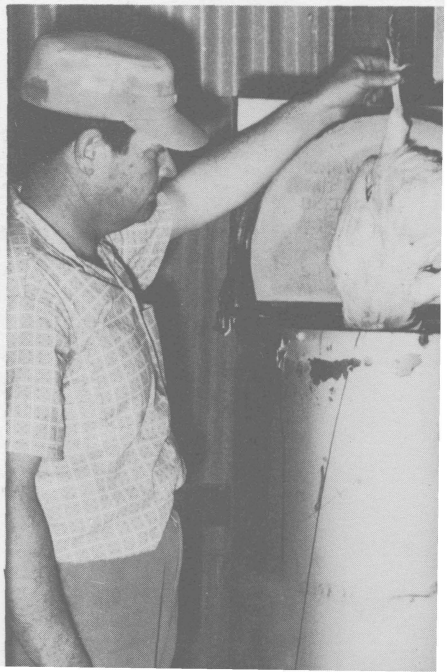


Figure 22. Prompt and complete disposal of all dead birds is a ***must*** *in maintaining a healthy productive operation. Presently, incinerators are the best methods of disposal.*

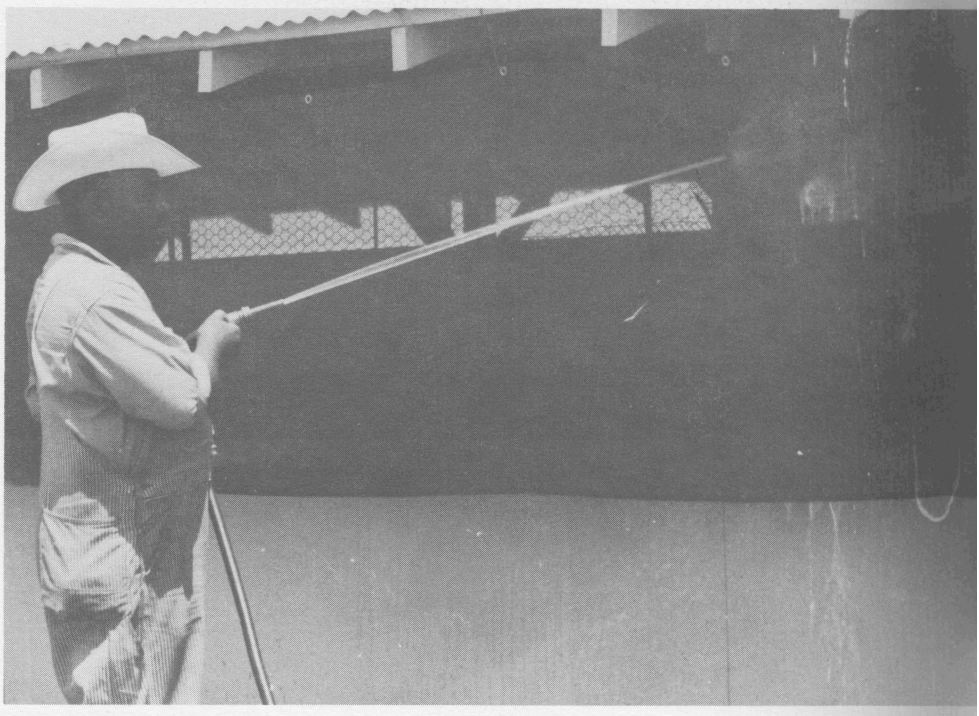


Figure 23. Shade curtains are beneficial in reducing death loss because of heat prostration. In hot weather these may be saturated with a garden hose.

Internal parasites can be a problem in cage layers, if pullets are not wormed before placed in cages. Primary source of these problems is the large intestinal round worm *Ascaridia Galli.* Producers should constantly check the droppings for this parasite. If a roundworm infestation occurs, commercial wormers may be placed in the water or feed to worm an entire flock simultaneously. Always check to see if wormer may be given to laying hens in full production without seriously affecting birds or egg production.

A small sample of birds should be checked periodically for presence of external parasites. For information on control of these parasites ask your county agent for a copy of MP-691, *Texas Guide for Controlling External Parasites of Livestock and Poultry.*

Temperature Control

Birds housed on wire are more sensitive to extremes in temperature than are floor-housed birds. They are completely surrounded by either hot or cold air and receive little insulation value from the floor or other birds.

Some practices that will help to keep birds comfortable are:

1. *Keep birds shaded at all times.* A curtain material available in various widths may be attached to the edge of the roof to extend downward and shade the outside rows of cages. In extremely hot weather, this material may be saturated with a garden hose, Figure 23. The evaporation that occurs helps reduce heat. These curtains also reduce ground radiation.

2. *Fogging birds.* Fogging or mist spraying will wet and cool birds by evaporation. Experimental work at the University of California shows that when the birds are wet by the fog, the cooling effect persists for slightly more than an hour.

For a successful fogging system, the California scientists recommend:

a. A ½-inch diameter pipe.

b. Nozzles that screw into a ⅛-inch hole tapped into the pipe or put into tees with a bushing.

c. Wide-angle spray with a cone of about 120 degrees radius.

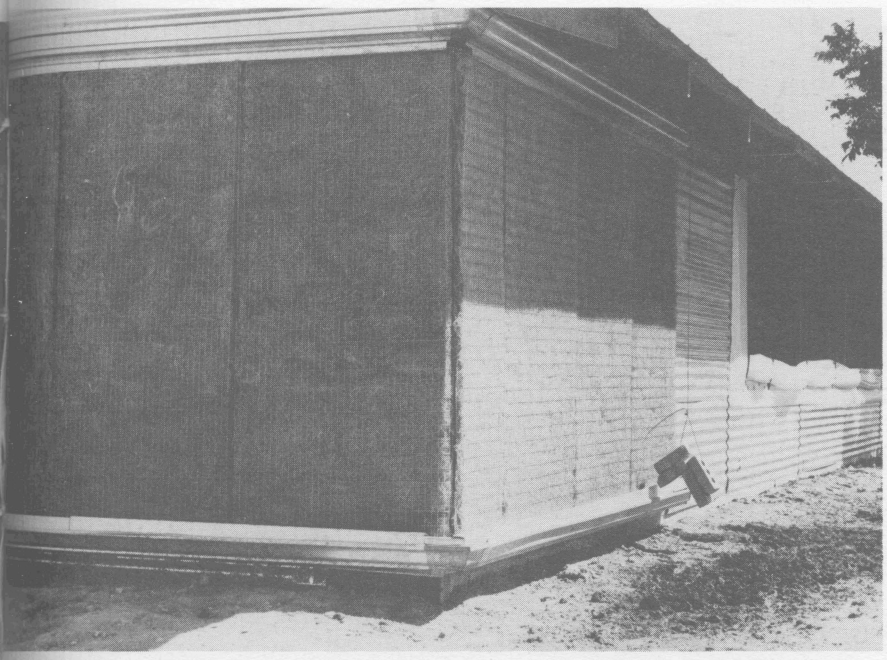
d. Water pressure of at least 25 pounds.

e. Strainer with a mesh of about 100 per square inch installed in the line ahead of the nozzles.

f. Low water consumption. (1 to 3 gallons per hour.) If nozzles with greater flow rates are used, a time switch to restrict fogging to 15 minutes out of every hour should be installed.

g. Nozzle locations determined by the cage system and prevailing winds. If two lines are used in a house, a staggered arrangement of nozzles will give better coverage. Foggers used at Texas A&M have greatly reduced cage bird mortality from heat prostration.

3. *Pad and fan cooling.* The potential amount of cooling that can be obtained with evaporative equipment depends upon the difference between wet and dry bulb temperatures, Figure 24. Evaporative cooling seems effective in relieving heat stress

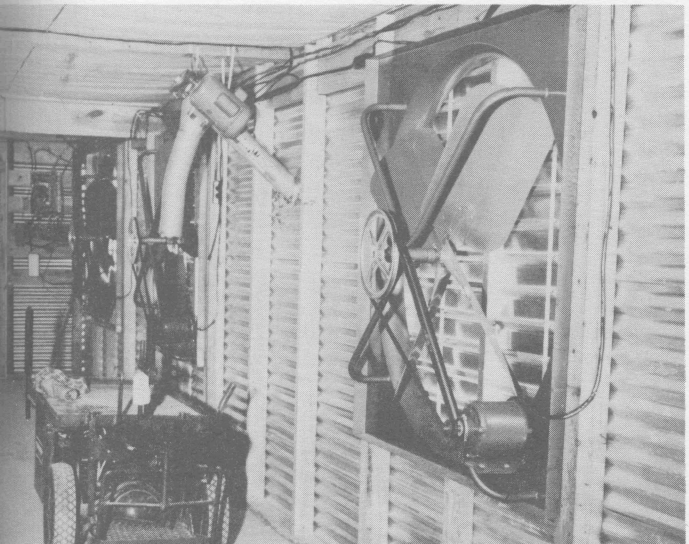


a

b

Figure 24. Pad and fan cooling systems have been reported to reduce the internal temperature of the laying house 10 degrees F. below the outside temperature. Fans are located on the opposite ends of houses from pads. (a) outside view (b) inside view (c) fan arrangement.

c



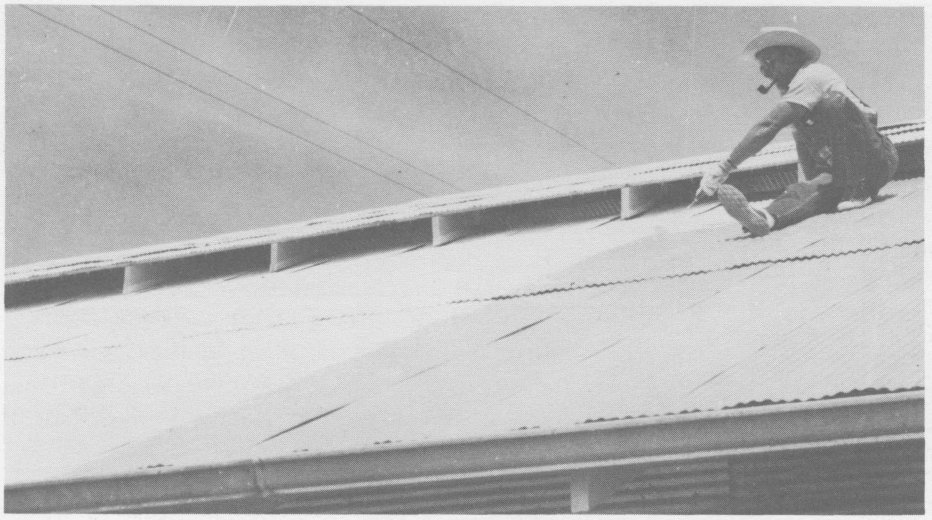


Figure 25. White roofs reflect heat, thus reducing the inside temperature of the building. This can be accomplished by painting or white washing.

at critical periods. However, this may be overlooked in the areas of normally high relative humidity, unless temperature and relative humidity conditions are examined carefully.

When the temperature rises above 90 degrees F., the relative humidity drops to between 50 and 60 percent. This permits approximately a 10 degree reduction in temperature.

Tests conducted by the Department of Agricultural Enginering, Texas A&M University revealed:

a. One air change per minute seems to give satisfactory results in evaporative cooling with a pad and fan system.

b. An air velocity through the pad of 150 feet per minute gives good results.

c. An ordinary 4-inch eave gutter with 3/16 inch holes on 4 inch centers drilled in the bottom was found satisfactory in distributing water to the pad.

d. A water flow of ⅓ to ½ gallon per minute per running foot of pad gave best results. A centrifugal sump pump was found efficient in supplying and recirculating water.

e. Pad area is determined by dividing the volume of air by 150 feet per minute. This equals square feet of pad needed. Volume of air is calculated by multiplying length of house x width of house x height of house from ground to plate. Example: House 200 feet long by 30 feet wide with sidewalls 8 feet high – 200 × 30 = 6,000 × 8 = 48,000 cubic feet of air: 48,000/150 = 320 square feet of pad area is needed for best results.

f. Evaporative pads of aspen wood 2 inches thick of heavy density and medium shred gave the best results.

g. Cooling systems should be designed to move air in the shortest, most direct, feasible path. Arrangement and management practices should definitely be considered in any design.

h. Water requirements can be estimated with reasonable accuracy. A house with a pad and fan system designed for one air change per minute will require approximately 90 gallons of water per day per 1,000 square feet of floor space if an average temperature drop of 10 degrees is obtained.

i. From 16 to 48 kilowatt hours per day will be required for 3,000 square feet of floor space. The smaller the operation the higher the cost usually. Thirty-five kilowatt hours per day per 3,000 square feet of floor area is an average figure for most installations.

j. Pad and fan installations will range from 35 cents to $1 per bird. Maintenance on equipment is low except for the pad. Pads usually need to be replaced once each year. Under extremely dusty conditions, they need washing occasionally. Copper sulphate added to the water will prevent algae growth.

k. Cooling heavy breed layers gives greater returns than cooling light breed hens.

4. *White cage house roofs.* This can be accomplished by painting or whitewashing. Alternate 3 feet x 12 feet galvanized steel sections of two cage house roofs at the Texas A&M Poultry Research Center were painted with a white plastic base paint. Temperatures underneath both the painted and unpainted sections were measured 2 inches from the metal surface, Figure 25. It was 7 to 10 degrees cooler under the painted sections. A reflective whitewash mixture recommended by the American Zinc Institute contains 20 pounds hydrated lime and 1 quart of Polyvinyl Acetate Copolymer Emulsion + 5 gallons water. This will cover about 700 square feet and will last for three summers. Materials cost about 1 cent per square foot.

5. *Plant grass* on the areas adjacent to the cage house. Keep it mowed.

6. *Roof sprinkling.* This system requires little equipment, but large volumes of water are needed for successful operation. A lawn soaker hose placed on the roof reduces radiant heat.

7. *Hose spraying.* A garden hose equipped with an adjustable nozzle can be used to spray birds in extremely hot weather. This requires a great deal of labor and cannot be relied upon solely if hot spells are frequent, or if you maintain a large flock.

8. The best cold weather aid is a *source of supplemental heat.*

Records

Every successful businessman must keep records of cost and income. Records are useful to determine the overall earning of the flock and to measure performance levels affecting earnings. They also are useful as a basis for management decisions and husbandry changes.

Management decisions can best be made by maintaining separate records on each age group. It is no longer economically sound nor feasible to maintain individual laying records, even on birds housed in single cages. Keep records on a row or house basis.

Summarize the following performance records on a weekly basis in the laying house:

1. Daily egg production.
2. Daily mortality.
3. Amount of feed delivered for the week plus change in feed inventory.

An important management function is to know the weekly earnings of the flock. In preparing weekly results, the only flock income is the money received from eggs sold. Since eggs usually are delivered on certain days each week, one of these days would be used as a weekly cut-off date. The dozens of eggs sold as shown on the sales ticket and the total dollars received for these eggs during that week will be entered in the income column.

Three items are considered in the cost figure:

Pounds of feed per week, determined from weekly flock records, multiplied by average cost of feed, gives weekly feed cost.

Flock depreciation is determined by multiplying the total dozens eggs sold during the week by an average depreciation figure per dozen. Experience has shown that a depreciation figure of 8 cents per dozen is typical for most flocks.

The third cost item, called other expense, is determined by experience. It represents the depreciation and repair of buildings, equipment, utilities, medication and supplies. In some flocks it averages about $15 per week per 1,000 layers.

The difference between gross income for eggs sold and total expenses will be labor and management income for the week. You may obtain the following forms from your county agent:

D-464 *Egg Production Result Summary*
D-467 *Replacement Pullet—Cost Summary*
D-468 *Weekly Laying Flock Record*
D-580 *Weekly Earning—Egg Production*

Figure 26. This mechanical "stirrer" is used to mix and dry droppings for sale as commercial fertilizer.

Pullet Replacement

Though good in theory, the continuous replacement program once associated with cage layers has proved neither practical nor profitable.

Mixing young pullets with older birds can cause serious disease problems. Subjecting young birds to the rigorous lighting schedule of these older birds can decrease egg production.

It is usually unprofitable to keep layers much longer than 12 months of production. Most well-bred and well-managed birds will pay their replacement costs and provide maximum profit in 12 months of lay, calculated from the day the flock reaches 50 percent production. Force molting investigations conducted at Texas A&M University indicate that it is economically unsound, if young pullets are available.

Problems of Cage Layers

Fly control and wet droppings. Fly control, one of the most serious cage problems is virtually impossible if droppings are wet. Both of these problems are much worse with multiple-bird and colony cages than with individual cages. Since the fly larva requires moisture during development, the fly population is directly related to the moisture content of the manure under the cages.

The following programs may help solve these problems:

1. Prevent leakage or spillage from water troughs, Figure 27.

2. Use a low salt level in the cage layer diet (no more than 5 pounds per ton). A quantitative water analysis is beneficial in helping feed manufacturers adjust salt level of the ration.

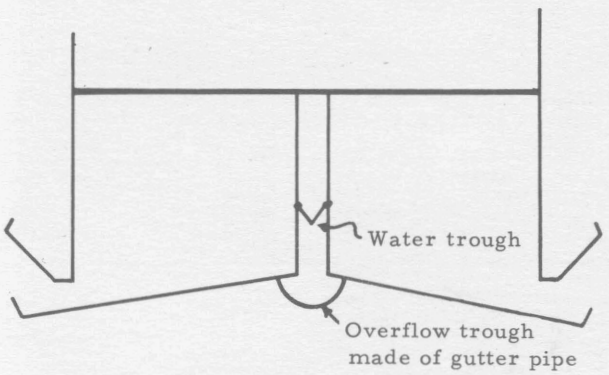
3. Allow good air circulation over droppings.

4. Spray regularly for fly control. Alternate use of insecticides so that flies will not build up immunity to particular sprays. For information concerning the use of insecticides, ask your county agent for a copy of MP-691, *Texas Guide for Controlling External Parasites of Livestock and Poultry.*

5. Eliminate wet spots with lime or superphosphate. This treatment should be accompanied by an insecticidal spray or dust.

6. Use splash boards to reduce moisture content of droppings under cages. A 1 x 8-inch board suspended 18 to 24 inches below individual or multiple bird cages facilitates drying of manure, Figure 28. Also, a drying platform can be constructed for colony cages and multiple bird cages containing more than three birds. Ask your county agent for a copy of L-544, *Splash Boards for Multiple-Bird and Colony Cages.*

Figure 27. A piece of gutter suspended below the water trough helps eliminate wet droppings.



ALTERNATE CROSS SECTION

Cannibalism. Tranquilizers and high-fiber laying diets will not control adequately cannibalism in caged layers. Use of plastic or aluminum specs reduced cannibalism significantly but also reduced production below that of properly debeaked birds in tests conducted at Texas A&M University. Specs are special goggles which fit over nostrils and prevent birds from seeing directly ahead. Debeaking is the most satisfactory method of cannibalism control for birds housed in multiple-bird and colony cages.

Extension Leaflet L-631, *Debeaking Laying Stock to Control Cannibalism,* describes in detail a procedure for properly debeaking cage layers.

Cage layers should have an all-mash ration. Feeding pellets or crumbles will encourage cannibalism. Hens tend to eat to satisfy their energy requirements. Once these requirements are met, they have idle time to peck each other. When the ration is fed in a concentrated form, such as pellets and crumbles, birds can satisfy their energy needs quickly, allowing more idle time to peck.

Cage fatigue. Cage fatigue normally occurs a month or so after the birds come into production while they are attaining a high rate of lay. Birds become partially paralyzed and prefer to remain in a sitting position to relieve the weight from their legs. At first glance, the condition may be mistaken for leukosis. The cause of cage fatigue is still unknown. A relatively small percentage of the birds usually are affected and in most cases will recover in a short time, if removed to a floor pen.

Fatty liver syndrome. Another problem that is responsible for considerable death loss in laying birds is the fatty liver syndrome. Such losses, though not restricted to cages, have been more prevalent in caged layers and generally seem to be related to the caloric value of the ration. This condition is characterized by a rapid increase in body weight, a decline in egg production and increased mortality.

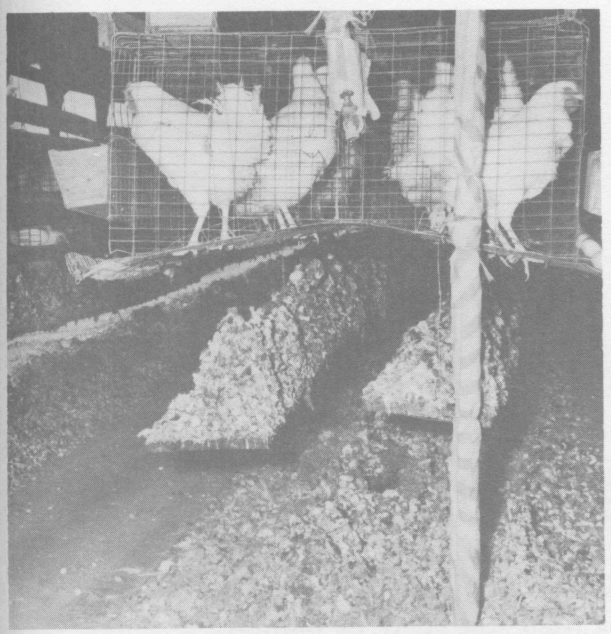


Figure 28. Splash boards suspended below individual and two-to-three-layer multiple bird cages will decrease manure drying time.

On post mortem examination, excessive abdominal fat, fatty livers, capillary hemorrhages and blood-filled tumors are often found in the liver. Little is known about the cause, prevention or cure of this condition.

Broken, stained and dirty eggs. Comparison at Texas A&M University of cage and litter floor systems of housing layers indicate that the cage system yields a higher percentage of broken, slightly stained and dirty eggs.

Weekly brushing of egg roll-out trays with a stiff brush will help reduce the number of stained and dirty eggs.

For recommended methods of cleaning eggs, ask your county agent for a copy of MP-576, *Cleaning Eggs.*

REFERENCES

B-1031—*Manual of Poultry Diseases*
Blueprint 397
L-191—*You Can Warm Poultry Water with Soil Heating Cable*
L-241—*Control Poultry Losses—A Suggested Vaccination Program for Poultry*
L-544—*Splash Boards for Multiple-Bird and Colony Cages*
L-593—*Feeding Flock Replacements*
L-594—*Feeding Laying Hens*
L-631—*Debeaking Laying Stock to Control Cannibalism*
MP-576—*Cleaning Eggs*
MP-691—*Texas Guide for Controlling External Parasites of Livestock and Poultry*
TAP-345—Vo. 9, No. 5, pages 7-9, *Factors in Poultry House Temperature and Moisture Control*
USDA Leaflet No. 434—*Frostproofing Water System in Poultry Houses*
Farmer's Bulletin No. 2216—*Culling Hens*

Forms

D-464—*Egg Producing Result Summary*
D-467—*Replacement Pullet—Cost Summary*
D-468—*Weekly Laying Flock Record*
D-580—*Weekly Earning—Egg Production*
D-617—*Information Sheet for Irrigation Water Analysis*

Figure 29. Use 3 inches of litter under cages and a 2-inch gravel base under litter. This will facilitate coning of the droppings when filling the house with new birds.

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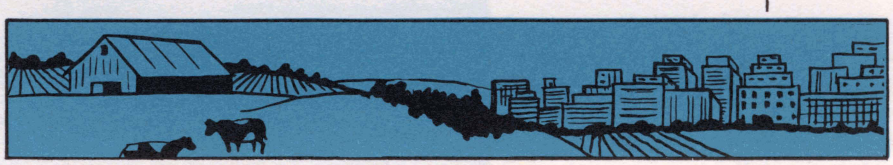

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