Chapter 5

Poultry Farm Management

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Abstract

Poultry farm management is a prerequisite for running poultry enterprise in a successful manner. Special care is needed for purchasing good quality chicks and similarly good brooding is required for better production performance. Farm practices like feeding, watering, ventilation, vaccination, debeaking, lighting, shifting of birds, weighing are routinely practiced to fetch better economic output. Farm records and feasibility reports are also necessary for poultry farming business.

Keywords: Brooding, rearing and production practices, feeding, molting, feasibility reports.

Introduction

Proper prebrooding and postbrooding management practices will ensure better brooding of chicks. Proper floor space, feed, quality water, vaccination, medication, temperature, relative humidity, ventilation, disinfectation, sanitation, debeaking, weighing and shifting are prerequisites for successful poultry farming. Flock management during winter and summer season requires due consideration. Nowadays cage farming is preferred by poultry farmers due to efficient production performance and more profit margins. Proper light intensity and duration, feeding methods, induced molting techniques, computers and feasibility reports have important role in poultry farming.

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5.1 Preparation for Receiving the Baby Chicks

Special practices and measures that are performed before chicks arrive at a farm to take proper care with a good start are termed as pre-brooding practices/measures.

5.1.1 Pre Brooding Management

Pre brooding management means various measures for brooding of newly hatched chicks before arriving at a farm which are dicussed below.

5.1.1.1 Selection of Shed

Select shed for brooding carefully which should be isolated from other sheds. It should be at least 80-100 ft. away from other sheds. It reduces chance of infection. Fence or boundary wall save birds from predators.

5.1.1.2 Cleaning

Newly built shed requires little cleaning/disinfection with proper fumigation. If shed was occupied by a flock, special care must be taken for its cleaning.

5.1.1.3 Litter Removal

First of all, remove all cages, drinkers and feeders from shed as they would prove a hurdle in litter removal. Equipments should be cleaned, washed and disinfected. Litter removed should be dumped far away from shed to reduce contamination risk.

5.1.1.4 Dusting, Web Removal and Repair

Once litter is removed, next priority should be removal of spider webs that bloom up here and there on walls. Remove dust sticking to walls. Flying birds usually find their way into sheds and build themselves nice and comfortable nests in the ceilings. These too should be removed. Next comes repairing. All cracks, crevices/gapes in walls, floors or ceilings should be filled up. All leakages, in gas or water pipes should be repaired and sealed. Electric short circuits should be repaired. All supplies should be checked. Walls should be cemented plastered at least 2.0-2.5 feet. from ground to reduce chances of microbial growth.

5.1.1.5 White Washing

After, cleaning and repairing, next step is white washing, this too would not only bright the shed, but also disinfect it especially if chemicals like $CuSO_4$.

5.1.1.6 Washing and Disinfection

Once cleaning, repairs and white washing have been done, it is best to wash whole shed and if possible give it second washing using some detergent, with water. Shed may then be disinfected with a strong disinfectant such as quaternary ammonium compounds or phenols. Walls plastered (2.0-2.5 feet) too should be disinfected preferably with boiling water because it is powerful and economical.

5.1.1.7 Equipment

Equipments earlier removed should be scrubbed clean with brush and later on sprinkled with some disinfectant such as $KMnO_4$. Once clean, they may be dried in sunshine and then transferred to sheds before fumigation.

5.1.1.8 Fumigation

Next on the agenda would be fumigation. For this purpose, formaldehyde gas is most suitable, at strength of 3X. 40% formalin + $KMnO_4$ in an earthenware can be used for fumigation (1X = 17.5 g $KMnO_4$ + 35 ml formalin for 100 $feet^3$).

5.1.1.9 Clean and Disinfect the Ground

Remove debris, burn feathers and grasses should be sprayed with disinfectant.

5.1.1.10 Time

Shed cleaning and disinfection is recommended at least a week before arrival of chicken. All pathogens cannot be eliminated; survivors may multiply on chicks, feed and waste. A shed left empty may wipe out pathogens as nothing is there to multiply on.

5.1.1.11 Supplies

i. Litter: Rice hulls or sawdust (soft wood) is usually used as litter material.

ii. Feed: Usually ground maize (with less than 12% moisture) is offered to day chicks which because it is easily digestible and its high fiber content reduces pasting problem. However, offering feed to day old chicks is also in practice.

iii. Fuel: Sufficient stock of diesel, wood, coal is to be maintained at farm.

iv. Spare parts: Specially, if away from main city, store required spare parts.

5.1.1.12 Equipment Testing

Never forget to check functional capability of brooders. Burners should be controlled properly: gas or electric supply should be proper. Similarly, hover and wire netting should be nice clean and disinfected.

5.1.1.13 Chicks Arrival

Chicks arrival early in the morning is preferred to take care properly. Counting of chicks is recommended. In cold weather brooders should be turned on at least 10 hours before arrival to warm up the shed. Place chick guard 2-3 ft. from brooder edge and increase area weekly and remove it after few weeks when they learn heat source. This reduces cannibalism and increase feed utilization. Litter should be two inch deep with double layer of newspaper paper on it. Usually upon arrival flushing is done using sugar solution. Feeders initially is not required, feed may be spread on brooding paper. Antibiotics may be administered for 3-5 days to reduce early chick mortality. At the end of day, replace upper layer of papers which could have become wet. Manager should be present and ever alert. Closely regulate shed and brooder temperature. Carefully observe the chicks during brooding period for proper management (Brown 2010; Prasad 2010).

5.2 Brooding Requirements and Rearing of Young Stock

5.2.1 Litter and Paper Materials

During brooding, type and condition of litter material is very important. There are many types of litter material such as sawdust, rice hulls and wood shaving. Provide litter material which is more absorbent and less costly. In Pakistan, mainly rice hulls are used; it is cheap and has poor absorbing power. Sawdust is a good litter material having high absorbing property but somewhat costly. Brooding paper or newspaper is used during first week to offer feed on floor system. If litter is too much dry there is a tendency to increase respiratory problems. If litter becomes too wet, increases chances of respiratory problems, worm infestation and coccidiosis.

5.2.1.1 Properties of Good Litter Material

Good litter should be good absorbent, light in weight, having medium size particles, inexpensive and easily available. Cover floor with about 2 inches of the material. Do not use a litter treated with an insecticide/herbicide preservative.

5.2.2 Chick Guards

Chick guards are necessary to confine day-old chicks to the heated area and to concentrate the feeders and waters within small areas. They are also helpful to keep out draft and cold air. A chick guard made of cardboard or metal sheet with 15 to 18 inches height should be placed around the hover. Chick guard will need to be farther from stove, normally distance should be about 30 inches (76 cm) in winter and 36 inches (91 cm) is summer. As soon as chicks learn source of supplementary heat, guard must be expanded to allow a greater area inside them. Start increasing floor area on 3rd day. Chick guards are used up to 6-9 days and then removed.

5.2.3 Floor Space Requirement

Growth and feed conversion are related to floor space per bird, more you crowd birds, poorer the results. Recommended floor space is given in Table 5.1.

Table 5.1. Floor space for each chick during 5 or 6 weeks of age.

Type of bird	Floor space per bird		
	Ft²	m²	Birds/m²
Broiler	0.500	0.050	20.0
Leghorn egg type pullet	0.758	0.070	14.3
Leg horn breeder pullet	0.850	0.079	12.7
Leghorn egg type cockerels	1.000	0.093	10.8
Meat type breeder pullet	1.000	0.093	10.8
Meat type breeder cockerels	1.250	0.116	8.6

Source: Haq and Akhtar (2004)

5.2.3.1 Effect of Reduced Floor Space

Provision of less floor space to flock may decrease feed consumption, growth rate, feed efficiency and increase mortality, cannibalism and breast blister.

5.2.4 Temperature and Lighting

Temperature is one of the most important requirements of brooding. Temperature should be properly controlled during winter and summer months. Sufficient heat should be provided in winter month to avoid chilling while excessive heat should be minimized in summer months to avoid overheating. Thermo-regulatory mechanism of young chick is not equipped for maintaining normal body temperature when chicks are exposed to high or low temperature. Young chicks when exposed to such an abnormal temperature for even a short time will develop intestinal disturbance, which are manifested by diarrhea. In brooding chicks, it is desirable to provide range of temperature so that chicks may have some choice in selecting temperature more suitable to them. It is difficult to recommend any brooding temperature applicable to all type of brooders and in all conditions. However, 95°F plus minus 5°F temperature at 6 inches distance outside canopy and 2 inches above top of litter is satisfactory for chicks at first week of age. Brooder temperature should be reduced by 5°F weekly according to age but not beyond 75°F. Chicks placed under brooder locate heat source being surrounded by chick guards.

In case of brooding of breeder flocks, to male chicks of 2-3 days provide, 2-5°F more temperature than required for females, remembering that they have hatched a few hours earlier than females and subjected to additional operation of dubbing, toe clipping along with beak trimming. Keep birds comfortable all the times. High brooding temperature causes dehydration, pasting, reduced feed consumption. Due to dehydration, there will be electrolyte imbalance and thus no uniformity in growth. Low temperature causes chilling, respiratory problems, and increases feed consumption that disturbs feed conversion ratio. Temperature of breeder chicks should be determined with accurate thermometer and controlled with reliable thermostat. Behaviour of chicks will provide best guide for measuring temperature. If chicks are uniformly spread in brooder area it means temperature is comfortable for chicks. If they are too far out, temperature is too high, if under the brooder then temperature is too low. If chicks are on one side of brooder it means that they move to avoid cold draft coming from opposite side. Meanwhile chicks to be provided 24 hours light through energy savers or light emitting diodes fitted at 6 feet height.

5.2.5 Ventilation

Ventilation is supply of fresh air (oxygen) and removal of metabolic and toxic gases from shed such as CO_2, CO, NH_3. Ventilation should be properly controlled; ventilation is harmful for birds. Main problem in cold environment is removal of moisture from house because bird's droppings contain approximately 75-80% moisture, so considerable air exchange is required to keep brooding area dry. Excessive moisture, NH_3 and CO is removed during brooding of chicks. This condition can be controlled in moist climate by having open front brooder house,

which may partially close with curtains in cold weather. In cold weather when chicks are brooded in tightly close brooder house with fuel burning stove. CO_2, CO gases may increase in concentration to a point which is fatal to chicks. Poisoning can occur when air contains about 0.01% CO. In acute cases symptom of this poisoning is gasping, head thrown back, spasm and death. When poisoning is slow only a stunted growth and unthrifty condition can occur.

The injurious effect of CO poisoning is caused by asphyxiation, which results from combining of CO with haemoglobin of blood and thereby destroying ability of blood haemoglobin to carry oxygen to tissues. In winter ventilation is increased to remove moisture produced by poultry as they grow in size, more cold air is drawn in from outside and some supplementary heat should be provided to heat this extra volume of cold air. In winter, ventilation which keeps brooder house reasonably dry would assume an ample supply of fresh air. Be careful temperature should not be maintained at expense of ventilation. An air flow of 2 cubic feet per minute per 100 chicks will be enough during brooding period. Proper ventilation is necessary for O_2supply and removal of metabolic products such as CO_2, NH_3 and CO. Removal of moisture and heat is important in determining ventilation rates.

5.2.6 Humidity

Relative humidity (RH) in brooder house may vary from 30-75% without any harmful effect but 65% is ideal one. Try to maintain 65% relative humidity. Extremely high or low humidity will not give better results. High humidity will cause damp litter, which will help in the multiplication of microorganisms. Parasitic infestation chance increases for coccidiosis disease. Very low humidity will cause poor feathering and dusty litter, which will cause permanent irritation in respiratory tract that, can lead to respiratory problems. Try to keep litter dry avoid excessive dampness. Droppings contain 75-80% moisture which causes high humidity especially in winter. Sunlight is powerful disinfectant, as well as good source of vitamin D which is required for bones development. In cold weather, litter becomes wet very soon, so to control this open window and allow sunlight entrance in shed. It will not only keep the litter dry but also act as a disinfectant.

5.2.7 Sanitation

During brooding care should be taken regarding sanitation as chicks are very sensitive to diseases. Many disease organisms may be transferred with chicks from hatchery if brooder house is not properly clean, losses due to mortality can increase. A brooder house should be thoroughly cleaned and well disinfected before starting brooding at least one week before the arrival of chicks. Spray formalin 40% (1:12 formalin: water) in brooding room. Keep separate attendants in brooder houses and do not allow them to move in other sheds. Keep visitors away from brooder house and take care of visitors/attendants dress when they enter into brooder house. Damp litter and sick birds cause spreading of diseases. So always keep litter dry. Scatter an absorbent such as superphosphate on litter over dropping. It not only acts as absorbent but also as a preservative for making a good fertilizer after mixing with droppings. Frequent change of drinkers place will help to keep

litter dry. Stir litter otherwise it will become lumpy and wet. Separate and treat sick birds. Dispose off dead birds in disposal pit or incinerate them. Adult birds should not be mixed with young chicks. Many disease organisms are filth born and unless brooder rooms or houses are reasonably cleaned, losses from mortality may increase. Thoroughly clean and disinfect brooder house before starting brooding or at least one-week before arrival of chicks (Sreenivasaih, 2006).

5.2.8 Flushing and Supplements

After receiving chicks first of all flushing is done to provide energy source (3% sucrose solution) as well as to clear digestive tract. For this purpose, use 250 g sugar/gallon of water followed by vitamins and essential amino acids in water/feed.

5.2.9 Feeding and Drinking

Feed should be offered 4-5 hours after flushing and water be provided 24 hours.

5.2.10 Broad Spectrum Antibiotics

During first week use any one broad-spectrum antibiotic for 5-7 days to reduce chances of infections.

Furazolidone	15-20 g/bag feed
Furazole	80 g/bag
Furasole	1 teaspoon/gallon water
Tribersin	1 ml/gallon water
Trimodin	1 teaspoon/gallon water
Erythro FZ	1 teaspoon/liter water

In winter use medicine through feed and in summer mostly through water.

5.2.11 Vaccination

To reduce chances of disease outbreaks following vaccines must be used in addition to other vaccines as per recommendation of Pakistan Poultry Association.

From	7-10 days	ND eye drops
From	10-14 days	Gumboro eye drops
From	22-25 days	ND 1/2 CC (sub-cut)
From	30-32 days	Gumboro in drinking water
From	6-8 weeks	Fowl pox (wing web)

5.2.12 Debeaking

Process of cutting 1/3rd of upper beak (1/8th of an inch of upper beak) and making it blunt so that feather picking habit can be controlled is called debeaking. Debeaking is necessary to prevent cannibalism, toe picking, vent picking and feather picking. It is done at the age of 07-10 days of age. Prospects and consequences of debeaking are given in Table 5.2.

Table 5.2. Pros and cons of debeaking in poultry.

Advantage	Disadvantage
Cannibalism problem is reduced.	Birds lose weight for 1-2 weeks.
Feed efficiency is improved.	Growth rate is reduced for long period.
Live ability is better.	
More uniformity of birds in the flock.	

5.2.13 Avoid Predators and Pilfering

Control predators like mice, mongoose, dog and cat. These can be controlled by traps and using chemicals. Their control is necessary because they can waste feed and transmit many diseases. Avoid pilfering by making sudden visits to farm.

5.2.14 Weighing

Birds kept under brooding are weighed on weekly basis at random to know their growth and assess feed supply from time to time.

5.3 Shifting and Housing of Pullets

Growing or rearing period follows brooding up to sexual maturity of birds. It is about 12 weeks in case of laying strain. How well a bird is grown will greatly determine how it does in laying house. Performance of laying birds depends upon the efficient management during this critical period, regarding housing, feeding, watering, temperature, ventilation, sanitation, lighting and disease control. Poor quality pullets at maturity will always perform below breed's standard of egg production, egg quality, feed conversion and size of egg.

5.3.1 Housing Management

Mostly young pullets are removed to rearing houses from brooding houses at 6-8 weeks of age. But nowadays in modern poultry rearing this practice is no longer used. Birds are left in brooding house until they are 10-12 weeks of age, then they are moved to growing house and laying is complete there. Keeping birds in brooding house for entire life or transfer of birds to permanent laying houses at young age reduce stress and chances of disease out breaks.

In Brood-Grow house, birds are kept in same house during brooding and rearing period while in Grow-Lay house birds are moved at 10 weeks age to permanent-laying house. However, in Brood-Grow-Lay house birds are kept in same house from one day of age until end of laying. In Partial-Cage-Rearing birds are brooded on floor up to 6-8 weeks then moved to cages for rearing and laying while in Complete-Cage-Rearing birds are brooded in battery brooders, kept in cages for rearing and laying period.

5.3.2 Floor Management

In Litter Floor system floor is completely covered with litter while in Slat and Litter Floor system a portion of floor is covered with slats. In this system, feeders and waterer are placed on slats to concentrate droppings there. In All Slat Floor system birds are kept in a house having slats over entire floor.

Table 5.3. Floor space requirements during rearing (litter floor system).

Line	Floor space / bird ft^2	Floor space / bird m^2	Birds/m^2
Mini Leghorn pullets	0.8	0.07	14.3
Leghorn pullets to 18 weeks	1.0	0.09	11.1
To 22 weeks	1.5	0.14	7.1
Medium size pullets to 18 weeks	1.2	0.11	9.1
To 22 weeks	1.7	0.16	6.3

5.4 Cage vs. Floor Management

Broilers, layers and breeders are kept on floor for efficient production however; cage system is also used effectively in layers. Cage rearing was introduced in Pakistan about thirty years back however during last decade cage rearing of layer birds was very much popularized and there is a geometric shift in layer farmers towards cage management after the adaptation of environment controlled housing. However, in case of broiler and breeder birds still needs a long way to go and for them most popular management is floor management. Main reasons for which may be small life span of 35 days in broilers and difficulty in mating and unavailability of skilled labor for artificial insemination. Despite these factors there are examples of cage rearing in broiler as well as breeder cage management. Floor and cage space requirements during rearing are given in Table 5.3.

5.4.1 Management of Pullets on Floor

Criteria of a laying hen are set on ability to produce eggs economically. One must start with a healthy pullet to ensure good productive performance during laying period. As layer beings to produce eggs, ability to do her job well will depend on management. Good management comprises of proper environment, modern and adequate equipments, proper light, balanced nutrition and timely vaccination. All these result in improved livability, endocrine activity, reproductive performance and ultimately in good and economical egg production.

5.4.1.1 Laying Period

Layer bird matures at 16-20 weeks of age with 1250-1300 g of live weight. At peak production (28-29 weeks of age) its live weight should be 1500 g. Layer birds may be kept from 20 to 72 weeks of age or even in cage system.

5.4.1.2 Selection

In order to obtain good production yield during laying period, a healthy flock must be selected. Moreover, the flock should be uniform with respect to age and weight.

5.4.2.3 Preparing for Pullets

i. Cleaning

While moved from a growing house to a laying house just prior to sexual maturity, young pullets must be given a clean start. So, usual routine of cleaning house and equipment, disinfection and sanitation must be made a part of management program.

ii. Litter

A cleaned house needs new litter. Litter be dry, easily available, free of mold and economical. Add about 3 inches in summer and 4 inches in winter months. Commonly used litter materials includes saw dust, rice hulls and sand.

iii. Nest Preparation

A good, dry, dust free nesting material should be used to avoid egg breakage. Nests should be open about a week before first eggs are laid, so that pullets get accustomed to them. Nesting material should be cheap, absorbent and possess cushioning ability. Nests are placed at dark place.

iv. Automatic Equipment

Be sure that all automatic equipments are in working condition. For example, stand by generator, bulbs, fans and valves of automatic waterers.

5.4.2.4 Space Requirements for Layers

i. Type of Floor

When covered with litter, floor may be either of mud/bricks or concrete. Concrete is easier to clean and maintain and is recommended. Chance of disease transmission to new flock is also reduced.

ii. Floor Space Requirements

Larger the bird, more the floor space is needed. It also depends on type of floor as layers on slats or wire require less space than those on litter floor. Required floor space per birds is 1.00-1.25 sq. ft.

iii. Feeders

Keep bottom of feeder at same height as backs of birds. About 20% more birds can eat from same feeder space provided by a round pan as compared to that provided by a straight trough. Feeding space requirement per bird is 3 inches on trough.

iv. Drinkers

Many type of drinkers are used in floor type layer housing. Some are automatic trough type or circular, other have running water, pans, cups and nipples. Since pullets drink more water at high temperatures, therefore while planning for drinkers, plan for maximum water requirement. Drinking space of 1.25 inches / bird is required.

5.4.1.5 Nests

i. Single Compartment Nests

It is preferred by most poultry men to keep commercial layers on floor. Provide one nest hole for each five pullets to have an ample space during high egg production. Sufficient nest will aid in prevention of floor eggs. Hens will use these nests better if placed crosswise in shed. For laying birds, nest should be 12" wide and 14" deep.

ii. Community Nests

They are occasionally used as 1 for 35 hens. A compartment of 2'× 8' feet in size has a hole at each end for birds to leave and enter. Bottom should be 24 inches above floor.

i. Roll Away Nests

In these nests wire bottom is sloped so that eggs roll to a compartment in back. When used in a litter floor house, bottoms should be 24 inches above floor (Bell and Weaver 2007).

5.4.1.6 Feeding Program

Layer birds are fed chick starter (ration No. 1 or 11) from 1st to 8th week of age; ration number 2 or 12 (chick grower) from 9th to 20th week of age and ration number 3 (layer mash) or 13 (layer crumbs) from 21st week onward.

i. Change in Feeding Program

To fulfill laying requirement ration number 3 or 13 (with 17% CP and 2700 M.E.) is offered to birds. In order to avoid over-weight problem, feeding is regulated in a way that an amount of 5 gm per week is added 71+5 g feed by start of laying at 20th week of age and at peak provided @ 110 g feed/day.

5.4.2 Management of Layers in Cages

In case of layer management, cage system is best one, however, with respect to health and production, cage system is better than floor system. Cages are mostly used in environment controlled houses.

5.4.2.1 Laying Cage Size

Although height of most laying cages is quite similar (16 inches) at rear of cage, size of floor area is highly variable. Some common floor dimensions (width × depth) are as follows:

Width × depth (inches)

10 × 16
12 × 16
12 × 18
14 × 18
16 × 18
24 × 36 (colony cages)
24 × 48 (colony cages)
49 × 36 × 24 cm (height × depth × width) for two birds

There are different types of pullet cages according to number of birds. In Single bird cage one or two pullets are kept in a cage while in Multiple bird cages two or more pullets are placed but not more than eight. Colony cages are suitable for holding 20-30 pullets.

Laying cages are of different types cages according to number of birds. In Single deck one tier cage cost is high. This type is used only in warm climate where house consists of nothing but a roof. Double deck cages are popular because upper deck of offset, allowing droppings to fall through wire mash on house floor without touching lower deck. Triple, four and five deck cages are also common. Tilting dropping boards installed below the top cages cause manure to fall in to the area. Flat deck cages are also called wall to wall houses. Cages are placed closed together without distance.

Table 5.4. Floor space of caged Leghorn at different stages.

Hen (White Leg Horn)	Brooding Stage (0-5 Weeks) $(inches)^2$	Rearing Stage (6-18 Weeks) $(inches)^2$	Laying Stage (Above 19 Weeks) $(inches)^2$
1) Floor Space			
Mini Leghorn	20	36	48
Standard Leghorn	24	45	60
Medium Leghorn	28	54	70
2) Feeder Space			
Mini Leghorn	1.6	2.0	2.4
Standard Leghorn	2.0	2.0	3.0
Medium Leghorn	2.2	2.7	3.3
3) Water Space			
Mini Leghorn	0.60	0.80	1.25
Standard Leghorn	0.75	1.00	1.50
Medium Leghorn	0.80	1.20	1.70

5.4.2.2 Floor Material

Floor material is made up of fabric wire, which should be welded. Mesh size is usually ½ inch and floor should be covered with paper for first 2 weeks.

5.4.2.3 Feeder

Trough feeder is usually used during brooder.

5.4.2.4 Temperature

House temperatures should be maintained at 70-75 °F. If temperature is above this range, dehydration occurs. Feed intake is also low due to high temperature. In case of hot weather, temperature can be maintained by plantation around the sheds and spray water on roof. Due to high temperature, feed consumption of chicken is reduced. So, increase nutrients level is feed. Artificial heating can be provided in cold weather if needed.

5.4.2.5 Construction Style of Floor

Floor of cage is constructed in such a way that egg cannot stay at the laying point. So floor wire of cage should be sloppy.

5.4.2.6 Water

In case, birds use more water as compared to floor birds. Supply more water in cage management due to restricted area allocation for birds.

5.4.2.7 Transfer Pullets to Laying Cages

Between 12-14 weeks of age, transfer pullet to laying cages earlier to settle.

5.4.2.8 Automatic Drippings Collector

In laying cages, use automatic egg collector. It consists of 2-4 inches wide belt, which cause movement of eggs to collection point.

5.4.2.9 Prevention of Feed Wastage

Feed loss in cages is more and low light intensity reduces feed wastage. Don't overfill feed in trough. Proper debeaking reduces feed loss.

5.4.2.10 Poor Egg Shell Quality

Egg shell is of poor quality at the end of laying year. It is still common in summer months, vitamins requirement for egg production increases during high egg production. Major vitamins are A, D, E, K, thiamin, riboflavin, pantothenic acid, niacin and vitamin B_{12}.

5.4.2.11 Major Problems

In cages, major problem is more flies. To control this problem, frequently clean droppings. Successfully fly control problem is possible by keeping droppings dry, encouragement of beneficial insects that consume parasites, immature and mature flies. Spray of Neguvon on litter dropping and better sanitation reduces flies.

5.5 Raising Broilers, Layers and Breeders

5.5.1 Broiler Management

Broilers are chickens kept for meat purpose to meet protein requirements. Broilers have inherited ability to grow rapidly and attain 1.5 kg of live body weight by consuming 3.0 kg feed within 5 weeks. Broiler production is becoming very

important aspect of poultry production because of scarcity of meat. Before starting any business keep in mind cost and return from business.

5.5.1.1 System of Broiler Keeping

Most practical program for broiler rearing is all in all out system. In this system broiler chicks of one age are at farm at same time. All chicks are housed on same day and later sold on the same day. After this there is a gap when no chicks are on the farm. This gap breaks the cycle of any infectious disease.

5.5.1.2 Housing

Broiler houses are also termed as brooder houses because broilers are sold at 5-6 weeks age. Usually two types of broiler houses are commonly used.

i. Open Sided Houses

Open sided houses are non-insulated with three solid walls and remaining side closed with wire netting. Usually curtains are used to open and close this open side. In humid and hot zones where temperature and humidity are very high all the year, use of open houses is recommended.

ii. Environment Controlled Houses

Such houses are light proof and artificial light is used in the building and ventilation is by exhaust fans. Temperature and humidity are automatically controlled.

iii. Size of Broiler House

Broiler house size depends upon the number of broilers to be housed and housing system.

iv. Depth and Length of the House

Open sided houses should be 30 feet wide. It may be of any length whereas environmentally controlled houses should be 40-50 feet wide and 200-400 feet long.

5.5.1.3 Feeding

Broilers have inherited ability to grow rapidly and it became ready to be market in just 5 weeks. This is due to their better feed consumption and conversion. Provide quality feed in right amounts. Before feeding chicks, keep in mind nutritional requirements. Provide 2″ trough space up to 5 weeks and 3″ until market time. Provide 20 % less space/bird when circular pans are used. One pan/3.3 chicks should be provided.

5.5.1.4 Antibiotics

Broilers are more susceptible to diseases so use some broad spectrum antibiotics to chicks to prevent the early chick mortality. Provide antibiotics from 3-7 days of age. If flock is healthy then stop antibiotic supplementation after 3 days.

5.5.1.5 Water

Water is most important factor in broiler management. Broiler body contains about 70% water so the birds should be provided ample amount of water to keep this amount 70% constant. Water is also essential in digestion, absorption, metabolism and temperature control. Water should be free from any kind of contaminations and also it should not be salty because salty water may cause salt poisoning. Provide two chick founts for every 100 chicks at the start of brooding period. Later each broiler should have 0.75 inch (2 cm) of drinker space when troughs are used. Provide 20% less space/bird when circular pans are used. Provide 1-gallon drinker for 25-30 broilers. In environment controlled house one nipple drinker is provided to 10-12 birds.

5.5.1.6 Vaccination and Disease Control

Vaccinate birds according to vaccination schedule prevailing diseases in the area. Vaccination schedule for broilers as given in Table 5.5.

Table 5.5. Vaccination schedule for broilers.

Age (Days)	Vaccination	Method
07	New Castle Disease	(Eye Drops)
10-14	Gumboro	(Eye Drops)
16-17	Hydropericardium	1/2 cc I/M
22-25	New Castle Disease	1/2 cc I/M
30-32	Gumboro	Drinking water

5.5.1.7 Special Care

Do all vaccinations at proper time. Pay special attention to sanitation always provide broad-spectrum antibiotic during first week to reduce chance of early chick mortality. Then use any coccidiostat at the end of 3rd week to reduce chance of coccidiosis especially during high humidity season or wet litter conditions. Always remember that vaccines and medicines are not free meal so use them judiciously only when needed.

5.5.2 Layer Management

Criteria of a laying hen is set on her ability to produce egg economically. One must start with a healthy pullet to ensure good productive performance during laying period.

5.5.2.1 Laying Period

Layer bird starts egg laying mostly at 16 weeks age and may be kept up to 72 weeks of age. However, in cage system, hens are also kept for longer durations.

5.5.2.2 Selection

In order to obtain good production yield during laying period, a healthy flock must be selected. Moreover, the flock should be uniform with respect to age and weight. Floor space requirements are given in Table 5.4.

5.5.2.3 Preparing for the Pullets

i. Cleaning

While moved from a growing house to a laying house just prior to sexual maturity, young pullets must be given a clean start. Usual routine of cleaning house and equipment, disinfection and sanitation must be made a part of management program.

ii. Litter

New litter is added in a clean and disinfected house. 3 inches litter is added in summer and 4 inches in winter months. Commonly used materials as litter include saw dust, rice hulls, sand and crushed corn cobs.

iii. Nest Preparation

A good, dry, dust free nesting material should be used to avoid egg breakage. Nests should be open about a week before first eggs are laid, so that a pullet gets accustomed to them. Nesting material should be cheap, absorbent and possess cushioning ability. Keep nest at dark place.

iv. Automatic Equipment

Be sure that all automatic equipments are in working condition. For example, stand by generator, bulbs, fans and valves of automatic waterers.

5.2.4 Space Requirements for Layers

i. Type of Floor

When covered with litter, floor may be either of mud/bricks or concrete. Concrete is easier to clean and maintain and is recommended. Chance of disease transmission to the new flock is also reduced.

ii. Floor Space Requirements

Floor space depends on type of floor as layers on slats or wire require less space than those on litter floor. Required floor space per birds is 1.50-1.75 ft^2.

iii. Feeders

About 20% more birds can eat from same feeder space provided by a round pan as compared to that provided by a straight trough. Feeding space requirement is 3 inches on trough.

iv. Drinkers

Many type of drinkers are used in floor type layer housing. Some are automatic trough type, some are circular while other has running water, pans, cups and nipples. Since pullets drink more water in high temperatures, therefore while planning for drinkers plan for maximum need. Drinking space of 1.25 inches/birds be provided.

5.5.2.5 Nests

i. Single Compartment Nests

It is preferred by most poultry men to keep commercial layers on floor. Provide one nest hole for each five pullets to have an ample space during high egg production. Sufficient nest will aid in prevention of floor eggs. Hens will use these nests better if placed crosswise in the house. Place floor of lowest tier, 24 inches above floor. For laying birds, nest should be 12" wide and 14" deep.

ii. Community Nests

They are occasionally used as 1 for 35 hens. A compartment of 2' × 8' feet in size has a hole at each end for birds to leave and enter. Bottom should be 24 inches above the floor.

i. Roll Away Nests

In these nests wire bottom is sloped so that eggs roll to a compartment in back. When used in a litter floor house, bottoms should be 24 inches above floor.

5.5.2.6 Feeding Program

Layer birds are fed chick starter (ration No. 1 or 11) from 1st to 8th week of age; ration number 2 or 12 (chick grower) from 9th to 15th week of age and ration number 3 (layer mash) or 13 (layer crumbs) from 16th week onward.

i. Change in Feeding Program

To fulfill laying requirement ration number 3 or 13 (with 16% CP and 2750 M.E.) is offered to birds. Feed is offered according to Layer Management Guide/ Manual. During production hens are provided feed @ 110 g/day.

5.5.2.7 Weekly Culling

Under weight, emaciated, inferior, crippled and deformed birds should be removed from flock during growing period, because they do not perform well in laying houses.

5.5.2.8 Sanitation and Bio-Security Measures

Bio-security principles and sanitation measures are most important managemental practice during rearing of laying strain, to avoid any disease outbreak in flock during this critical period. These points require due consideration; separate caretakers should be employed in each unit or house, before start of rearing period growing house should be properly disinfected, add clean litter to the house and keep the litter free from moisture, keep equipment clean and different disinfectants and sanitizers should be used after 3-4 days in house and in proximity. Keep rodent (rat) and wild birds (sparrow) away from growing houses because they transmit many pathogenic organisms, used litter material and dead birds should be kept away from house, vehicle used for feed delivery be kept away from growing house. Daily visit should be performed with respect to flock health.

5.5.2.9 Vaccination and Disease Control

Disease outbreak during rearing period not only causes mortality but also greatly depresses performance in laying houses and so causes great economic losses. Follow proper vaccine schedule during brooding and rearing period to control outbreak of disease like ND, Infectious coryza, laryngotrachietis, fowl pox and Marek's. Proper management of litter reduces the chances of parasitism.

i. External Parasites

Birds be checked for presence of ecto-parasites after very 3-4 weeks. Lice, mites and flies should be controlled by using DDT (1:8 ratio of DDT: ash), Coopane powder and Ecofleece.

ii. Internal Parasites

Internal parasites are Round worm (Ascaridia galli), Caecal worm (Heterakis gallinarum), Capillaria worm (Capillaria obsignata) and Tape worm (Raillietina sp.). These should be controlled by using different dewormer like Piperazinc powder (1 g/kg of feed), Rintol (1 g/kg of feed), Albendazole, Oxyclozamid and Systamax.

5.5.2.10 Record Keeping

To keep all sorts of record is another important practice during growing period. Record keeping tells us about what happened in past and help us to plan for future business. During rearing records regarding source of flock, vaccination, medication, feed consumption, body weight, culling and mortality are maintained.

5.5.3 Breeder Management

Birds from grandparent flocks are kept as breeders to get progeny to produce meat or eggs. There are two types of breeder parents.

5.5.3.1 Meat Type Breeders

Meat type breeders are those which produce straight line the broiler chicks. These are hybrid of two breeds. From female line *Plymouth Rock* or *New Hampshire* is used and from male line *White Cornish* is used for the production of white skin broiler and light Sussex is used for the production of yellow skin broiler.

5.5.3.2 Egg Type Breeders

These breeder parents produce commercial pullets those lay white or brown-shelled eggs for human consumption. Breeder parents, producing pullets which lay white eggs, are developed from cross of different strains of pure white leghorn. Breeder parents, producing pullets, which lay brown-shelled eggs, are hybrids of Rhode Island Red (male line) and barred Plymouth Rock (female line).

i. Rearing Methods

These are methods of rearing the breeder parents.

a. Sexes Reared Separately

It is recommended to rear cocks and pullets separately until 21 weeks of age and then mix 12 cockerels with 100. At sexual maturity (about 22-24 weeks) reduce No. of males to 9-11/100 females.

b. Sexes Intermingled

Keep sexes separate for first week, during this period beak trimming is done and smaller cockerel chicks will get a good start.

ii. Housing Systems: Same as in layers please refer to section 5.3.1.

iii. Floor Management: Same as in layers please refer to section 5.3.2.

iv. Target Weight

Target weight of broiler breeder male is 3.0 kg and female weight is 2.5 kg at 23 week of age for sexual maturity these targets can be achieved by suitable feeding and lighting programme. In case of layer breeder flock, target weight at sexual maturity for male and female should be 1.5 kg and 1.3 kg at 20 weeks.

Table 5.6. Body weight recommendation with respect to feed (Hubbard).

Age (weeks)	Weight of male (g)	Weight of female (g)	Feed consumption of male (g/day)	Feed consumption of female (g/day)
7	850	725	43-50	45-55
8	970	825	45-53	50-60
9	1090	925	48-55	55-65
10	1210	1025	50-58	60-70
11	1330	1125	53-60	63-73
12	1450	1225	55-63	65-78
13	1580	1315-1340	58-65	68-80
14	1710	1405-1455	60-68	73-85
15	1845	1500-1570	63-68	78-88
16	1985	1600-1685	68-75	83-93
17	2130	1700-1800	73-80	85-98
18	2280	1800-1915	80-88	88-103
19	2430	1900-2030	88-95	93-108
20	2580	2000-2145	95-103	98-110
21	2750	2155-2290	103-110	100-118
22	2950	2290-2450	110-118	103-115
23	3180	2450-2650	118-125	105-118

Source: Haq and Akhtar (2004)

v. Number of Breeder Males Required

Number of breeder males to start should be determined by each company's experience. Under normal circumstances 12-15 breeder males/100 females should be started and brooded. This will normally provide 10-11 healthy and vigorous breeder males per 100 female housed. Too many males in the

breeding pen reduce fertility. Correct ratio of males and females depend upon size and type of birds involved. 100 pullets require more males on slats, slats-and-litter than on all litter floors. Male to female ratio does not affect frequency of male mating.

vi. Feeding and Watering Management

a. Feeding Management

Proper amount of feed should be given to birds to meet body needs and to control body weight, follow feed restriction if required as already discussed. Old feed should not be left in feeders. Upper rim of trough should be approximately level with bird's back. In order to avoid feed wastage trough should be filled only one-fourth full. Set time clock for more frequent feedings as it increases feed consumption. A drop in feed consumption may be an indication of a disease problem or poor feeding.

b. Grit Feeding

Grit/any calcium source is necessary for bones and strong eggshell. To avoid economic losses due to eggshell problems, grit/calcium supplementation alleviates eggshell problems.

c. Water Management

Water consumption is highly variable for all types and ages of chickens depending upon ambient temperature, humidity, density of feed and amount of feed restriction. But during rearing period if all these conditions are good then water should be given to birds 30 minutes before and 1.5 hours after feeding and after every 2-3 hours water is given to birds for 20 minutes. According to our environment ad-libitum water is more suitable.

d. Automatic Drinkers

Automatic waterers are used and water level is maintained through valves. V-shaped trough is also used but depth of trough should not exceed from 1.3 cm. There may be accumulation of debris in depth and there will be more chances of disease out breaks. Always keep waterers clean: wash them daily Keep water level as high as possible during the first days. In order to avoid spoilage, maintain lower water level in drinkers. Check height of automatic waterers and adjust to height of back of birds. Wet litter must be removed. The area around the water should not be wet because due to wet litter there are more chances of parasitic infestations.

vi. Average Body Weight

Average body weight must be according to recommended body weight of breed. Weight losses due to transportation or other stress factors may alter average weight. Good uniformity in growing period is a pre-requisite for good production. 80% or more of pullets should be within 10% of average recommended body weight of flock.

vii. Methods to Control Body Weight

There are two methods to control body weight of breeders up to target weight.

1. Quality restriction
2. Quantity restriction

As body weight is main criteria, in case of breeder flock restrict quality (protein and energy) of feed or quantity of feed or restrict both quality and quantity of feed. When birds are underweight then improve quality of feed by adding different amino acids for proteins or by adding fat. Increase quantity of feed by increasing amount of feed offered daily or both operations can be done simultaneously. To increase birds weight, make weight groups of birds.

viii. Measuring Weight Progress

Take individual weight of 100 birds at intervals to determine uniformity and average weight of flock. When birds are not uniform (80% of birds within 10% of average) cause may be overcrowding, disease, poor debeaking or inadequate nutrient intake. During growing period, weight birds one week before a ration change is planned. If they are not at desired weight, change of ration is not recommended. When proper weight for age is accomplished, a change to less dense ration may be made. Weight birds before they are moved. Do not weight them for at least 2 weeks after moving. A two week delay in weighing will allow birds to adjust to their new housing and return to a normal body weight.

ix. Culling

Males having leg defects or other undesirable traits should be culled from flock to maintain uniformity. Inferior, crippled and deformed birds should be removed from flock during growing period.

x. Sanitation

Sanitation measures includes strict security, no visitors, lock the premises, dry litter and regular disinfection.

xi. Record Keeping

Proper record are maintained for daily feed intake, feed consumption, live body weight, medication, vaccination, mortality and unusual flock symptoms.

5.5.4 Male Breeder Management

Importance of males in breeder flock cannot be neglected. They do not only contribute their half of the genes to newly hatched chicks but they are also responsible for hatching egg fertility.

5.5.4.1 Brooding

In hot weather or after a long journey provide then water to avoid dehydration. To maintain a good health, temperature should be one degree higher than for female.

5.5.4.2 Rearing Methods

i. Separate Rearing

Where possible rear males separately until 23 weeks of age. Advantages of separate rearing are maintaining recommended weight easily, easier to maintain uniformity and better control on sexual maturity.

ii. Rearing Males Mixed with Pullets

Where separate rearing facilities are not available it is advisable to rear males with the pullets from around 6-8 weeks. In mixed rearing. Feeding males and female separately is recommended.

5.5.4.3 Floor Management

Clean and dry litter is necessary if breeders are to be kept on floor. 6 birds are kept per m^2 (1.8 ft^2/bird, 1.9 for pullets and 2.1 for breeder male for standard strains) at rearing stage. While, 4.5 birds/m^2 are kept during production period (1.75 ft^2/bird for Leghorn and 3.0-3.25 ft^2 for meat type breeders).

5.5.4.4 Feeding and Watering

Feeding program during growing period is same for male and female. Feeding Space: 8.75 cm space is required for one male bird on through feeders. Adequate fresh water supply is important to breeder flock and demand increases greatly as ambient temperature rises. With through type waterers provide a minimum drinking space of 2.5 cm per bird.

5.5.4.5 Weight Control

Excessive weight at maturity must be avoided. Try to maintain recommended weight according to breed i.e. in broiler breeder males weight at maturity is 3.3-3.5 kg. In layer breeder males, weight at maturity is 1.5-1.7 kg. In overweight or underweight control it by changing quantity and quality or feed and make different weight groups of males. Feed according to their weights. Body weight of broiler breeder is as given in Table 5.6.

5.5.4.6 Special Care of Breeder Flock

During 26-34 week bird mostly become heavy due to poor management of lighting and feeding. They must be supplied proper light and feed. So for getting good production manage feeding as given below:

Weight (g) at 26th week		Feed (g/bird/day) 26th week
Male	3815	120
Female	3135	140
Weight (g) 34th week		Feed (g/bird/day) 34th week
Male	3950-4310	130
Female	3350	170

5.5.4.7 Feeding after Peak Production

Reduce feed gradually after peak production (3-4 g) per week in such a way that it reaches 135-140 g at the end of production. Sudden change in production causes negative effect. From 26-34 weeks increase feed in small quantities (4-5 g/bird/week). Sudden supply of full feed will increase the body weight.

5.5.4.8 Lighting

Lighting duration should be 10 hours at 24th week. It should be 12hrs at 25th week. After that increase light at the rate of ½ hrs/week till it reaches 16-17 h then fix it.

5.5.4.9 Culling

Individual unproductive and inferior pullets should be removed from laying house. Remove birds with a hook about once a week. Do not catch entire group to remove cull birds. Such handling generally will reduce egg production in entire flock. It is not difficult to select laying from non-laying birds. Chart for selection and culling of breeder flocks is shown in Table 5.7.

Table 5.7. Selection and culling chart for breeder flock.

Character	Select	Cull
Health and vigor	Vigorous, active and good capacity	Weak, sluggish, under sized and lacking capacity.
Comb and wattles	Full. smooth glossy bright red	Shrunken, dull, dry, pale and scaly
Eyes	Prominent bright eyes	Not bright
Vent	Large, moist, smooth	Small, dry, round
Pubic bones	Thin, flexible and well spread	Thick, hard, closed together
Abdomen	Soft, pliable	Contracted firm with coarse skin.
Pigments	Bleached vent, eye rings, ear lobe, beak & shanks	Yellow pigments, on shanks. Eye rings, ear lobe and beak.

Source: Haq and Akhtar (2004)

5.6 Causes of Poor Performance of Layer and Breeder Flocks and their Remedies

Poor performance of poultry flocks can be attributed to numerous factors of layer and breeder flocks are discussed separately in following subsections.

5.6.1 Main Causes of Poor Egg Production

Improper production results in economic loss. Whereas, good production means less cost more profit. There are three factors affecting the egg production.

5.6.1.1 Genetic Factors

Egg production is genetic factor with 15% heritability.

a. Sexual Maturity

Age at sexual maturity is 25% heritable. Sexual maturity should be at proper age with proper live body weight.

b. Rate of Laying

Number of eggs per clutch is characteristic of each individual bird and rate of laying is highly heritable in White Leghorn.

c. Broodiness

There are breed differences with respect to amount of broodiness among laying flock. It is believed that a sex-linked gene and at least one autosomal gene are involved in broodiness.

d. Uterine Prolapse

This is also genetic character and mostly uterine prolapse occurs in the bird due to genetic factor and cause low egg production.

e. Persistency of Production

First laying year includes period from commencement of laying to cessation of egg production, proceeding to onset of first complete cycle.

f. Moulting

Early moulters are usually poor layers whereas late moulters are good layers.

5.6.1.2 Environmental factors

There are several environmental factors that affect rate of lay and total number of eggs produced by a flock during the laying year.

a. Date of Hatch

With respect to market approximate date or season of year when chicks are hatched is of great importance. In some cases, chicks hatched during January and February may start laying during July or August which affects production.

b. Location

Three strains of pullets of same breed showed that difference in egg production due to location and environment were more consistent and significantly greater than the difference due to strain.

c. Temperature

At high temperature birds consume less feed which will affect egg production. At low temperature birds use energy to maintain the body temperature and egg production is affected.

d. Smoke

Pathological findings showed congestion hemorrhage in ovaries, trachea, lungs and intestine. Kidneys enlarged by 1.5 to 2.5 times than normal due to smoke. So, egg production is dropped and death or disease can attach by more smoke.

e. Noise

Due to noise age at 1st egg may slightly be delayed. When their egg production was subjected to noise it was 20 % less than that of controls. But no difference occurs in egg shell mineral content.

5.6.1.3 Management Factors

Egg production might decrease due to followings;

a. Housing

Due to improper housing birds have permanent stress and low egg production.

b. Water

Fresh and clean water should be provided because feeding and watering have strong correlation. If watering is not proper, then less feed intake and low egg production can result.

c. Light

Light should be according to required duration and intensity, which is 16-17 hours (¾ foot candle) during production. Avoid fluctuation during production. Never decrease light during production.

d. Shifting of the Birds

Birds be shifted to laying house 3-4 weeks before start of egg production.

e. Improper Feeding, Watering and Floor Space

Les floor space cause cannibalism, injury and stress and can reduce egg production. Less watering and feeding space results in less consumption of feed and water which reduce egg production.

f. Culling

This includes sick, small and cannibalistic birds and birds out of production. It these birds are more in number; this will reduce egg production. Culling should be done in layers regularly specially at 15-20th, 30th and 45th weeks of age.

g. Imbalanced Ration

Major causes of poor egg production are due to improper nutrition, toxic feed and poor feed intake (salt, vitamin D, calcium, protein and phosphorous). For normal egg production, bird's requirements are as follows;

Protein requirement	7.00 g/bird/day.
Ca requirement	3.75 g/bird/day.
M.E. requirement	260-270 Kcal/bird/day

h. Diseases

Diseases like Infectious bronchitis (IB), Fowl cholera, Coryza, New castle disease (ND), Avian influenza, Mycoplasma gallisepticum affects production performance of birds.

i. Parasites

Parasites have severe effect on egg production. The birds should be free from internal and external parasites. Do regular deworming for this purpose. Different medicines are used to control parasites.

J. Mortality

Mortality affects production of the flock which may be controlled through proper management, vaccination and medication.

k. Other Changes on the Farm

These changes are in labour, feed manager and vaccination programs. During production, any one of them can affect production performance.

l. Stress on Birds

Stress also effect on bird's performance. Try to eliminate all kinds of stresses (Daghir 2008). General causes of stress in layers are given in Table 5.8.

Table 5.8. General causes of stress in layers.

1.	Coldness	2.	High temperature
3.	Vaccination	4.	Transportation
5.	Debeaking	6.	Diseases
7.	Feed change	8.	Appearance of stranger.
9.	Electric failure.	10.	Change in lighting schedule.
11.	Predators	12.	Delay in feeding and watering

5.6.2 Major Reasons of Poor Performance of Breeder Flock and their Remedies

5.6.2.1 Genetic Factors

If a bird has a poor genetic potential like poor feed efficiency, poor growth rate, less resistance to diseases, bird performance will be poor. A bird should have a genetic potential to grow fast have acceptable body conformation, be resistant to diseases. Chicks should come from disease free breeder. Chick quality at hatching influences performance of birds at later stages. So, a broiler should have the genetic potential to be efficient in converting feed into meat.

5.6.2.2 Effect of Pre-Brooding Management

Extra care should be taken during pre-brooding and brooding to avoid any disease outbreak in early life of chicks. Following factors can affect the performance of breeder chicks.

a. Un-Hygienic Condition

Hygiene and sanitation is very important to control the early chick mortality so if proper measures are not adopted regarding sanitation early chick mortality may causes great Economic loss. Disease outbreak in a flock not only causes high mortality but remaining flock cannot achieve standard production targets.

b. Old Litter

Old litter contains lot of microorganisms and it is not viable to take risk by using old litter in case of breeder flock. Used litter increases chances of diseases out breaks.

c. Temperature

Temperature is one of most important factor during brooding which affect growth of small chicks. Any abnormal temperature cause stress on to birds which in turn causes disease outbreaks. Abnormal temperature reduces feed intake, depresses growth and feed conversion ratio of birds.

d. Improper Handling

Improper or rough handling during vaccination, debeaking and dubbing increases stress in chicks and affect their growth. They should be handled in proper way in young age.

e. Control

If brooding room is new then only spray with any disinfectant will suffice the purpose. In case old brooding room then remove old litter, wash equipments by dipping in $KMnO_4$ solution, also wash water tank with $KMnO_4$ repair the building fill cracks, repair the electricity, sui gas connections and wiring. White wash house including $NaOH/CuSO_4$ which kills microbes. Temperature of house should be 95 °F before arrival of chicks. Brooder should be started at least 10-12 hours before arrival of chicks.

5.6.2.3 Brooding and Rearing Problems

Some managemental problems include followings.

a. Temperature

Temperature should be 95 °F when the chicks are first placed in brooder house. Chicks should be confined near heat; temperature may be reduced by 5°F for each week. Excessive heat causes dehydration, poor feed intake and more water intake of birds. Low temperature will cause chicks to huddle together and some may become smothered. During brooding provide 2-3 °F more temperature to males. Avoid smoke in house during brooding which can cause respiratory problems.

b. Ventilation

Excessive moisture, NH_3, CO and CO_2 are required to remove otherwise they affect health of birds. Improper ventilation also helps in diseases outbreak. So, use exhaust fans for proper ventilation.

c. Early Chick Mortality

It is very common managemental problem that is seen in first two weeks of life of chicks and it is due to pasting, starvation and poisoning.

i. Pasting

It may be due to overheating of chicks or due to infection. To overcome pasting flushing is done.

ii. Starvation

This problem is seen when chicks are received from a very far distance. Symptoms are loss of weight, emaciation and death during first week.

Control

Chicks must be fed after 16 hours of hatching. Feeding space should be proper. Proper lighting and temperature should be provided.

iii. Litter Poisoning

Wet litter allows molds to grow and cause NH_3 poisoning and Coccidiosis. Keep litter dry to control litter poisoning.

iv. Cannibalism

It is habit of vent picking and toe picking. It may be due to less water, feeding and floor space. It may also be due to deficiency of different nutrients. For control of cannibalism separate affected birds, reduce light intensity and keep birds busy by hanging grasses.

v. Floor Space

If floor space is improper then feed intake will be less, growth rate will be poor and disease outbreak will be more. Birds are always in stress. Therefore, proper space should be provided at each stage of birds.

vi. Predators

Rats and mice can cause heavy losses. They eat feed and transmit diseases.

Control

For rodents control store feed properly. Remove all wastes of birds and seal all cracks and openings. Rodenticides may also be used for this purpose i.e. Boremethalene zinc phosphide.

vii. Injuries

Injuries may occur during sexing, cannibalism and dubbing. During sexing injuries like broken legs, wings, damage of rectum and cloaca may occur. If wounds increase in size it may cause septicemia and death may occur. Dubbing results in injuries of comb.

viii. Pilfering

To avoid stealing by workers sudden checks must be made at farm. For control of this bad habit proper record and checking is necessary.

ix. Hatching Time

Hatching time should be proper according to breed of birds. Early hatched chicks are weak and smaller in size while late hatched chicks are also weak, lazy and more prone to diseases.

Control

Temperature, relative humidity and ventilation of incubator should be proper and use clean eggs for hatching.

x. Feed, Water and Medicine Poisoning

Sometimes salt in feed especially when fish meal is used increased salt level which may cause salt poisoning. Fungus infected feed is also a cause of poisoning. Over dose of the medicines also cause poisoning in birds.

Symptoms

Liver and kidneys are inflamed and damaged. Hemorrhages on breast and thigh muscles are noted in case of feed poisoning. Water deposition in abdomen of chick is sign of salt poisoning. For control flushing is done to remove poison from body.

5.6.2.4 Production Stage

i. Target Weight

Our target is to produce healthy and quality parents. For this purpose, weight of broiler breeder should be 3.5 kg for male and 2.9 kg for female at 24 week of age. Target weight for layer breeder should be 1.5 kg for male and 1.260 kg for female at 20 week of age.

ii. Feeding

Controlled feeding is necessary for maintenance and growth. Over feeding affect fertility, hatchability, weight gain in male and females and egg production in layers.

Vitamins should be given along with water to control stress. If feed is sub-standard, production efficiency will be affected. Vitamin B-complex. pantothenic acid, riboflavin and vitamin E should be especially provided.

Factors affecting feed efficiency are quality of feed, temperature, rate of egg production, health and weight of layer

iii. Lighting

To obtain optimum age and weight at sexual maturity and production, the influence of day length and light intensity is very important. Sexual maturity is also influenced by light stimulation. It is major factor which affects necessary physiological changes, which stimulates the ovulation. Always provide recommended light duration and intensity. Never decrease light during egg production. Provide 16-17 hours of light per day during this critical period. Provide light intensity of ¾ ft. candle at bird level during laying period. Avoid decreasing light time and intensity. Do not use dim light at night.

iv. Male and Female Ratio

Keep under normal circumstances 12-15 breeder males for 100 breeder females.

v. Broodiness

Broodiness almost has been removed in most of strains but it can cause problem in broiler breeder and brown egg shell layer breeder flock. Factors which enhance broodiness must be eliminated. For controlling this problem frequency of egg collection must be increased and proper nesting managemental practices must be followed.

vi. Management of Male

Male is more important than female because half the germplasm of newly hatched chick is transferred from the sire. If there is some problem with males (nutrient deficiency, over and underweight) it can cause great loss to males. If not managed properly, farmer cannot get production up to the mark. For getting good production at 24^{th} week age male must be only 30% heavy than female. At mid and end of production it must be 8.4% heavy than females. During breeding period, males must be carefully watched and inferior male must be removed. There is proof that male mate with certain females and if a particular male become unable to mate his matching females she will not take another male until he is removed from flock. Do not catch males with one leg. Catch them carefully by both legs. Handling of male by one leg may permanently injure birds. Males exercise is necessary to maintain proper weight, and strong legs. Male must jump to get feed from feeder. Feeding some grain in litter in afternoon induces scratching worth with exercise. Sometimes competition in feeding is also helpful in exercise. As bird ages during laying cycle there is natural reduction in fertility. A serious economic situation may be produced. Hatches may be poor. Some poultry men replace old males in a flock with a set of new and younger ones after about two-third of egg production period are over so due to this, fertility increases but it can affect peck order. Males set up a social order as do females; more timid males must be adequately produced. Be sure they are getting enough feed to maintain

recommended body weight. If underweight you should add cockerel feeders to the pen to increase the male feed consumption.

vii. Hatching Eggs Care and Management

Maintaining quality of hatching eggs is of vital importance. Eggs should be gathered from nest at least four times a day. During period of extremes in temperature more collection is advisable. Frequent egg gathering is necessary to prevent egg contamination from bacteria. Farm workers are urged to disinfect their hands before each collection. Nest egg should be picked up with clean hands. One of the poorest practices is to pick floor eggs, dead birds and nest eggs at the same time. Keep nest clean and in good condition. Use clean plastic trays or new fiber trays to prevent disease transmission. It is advisable to grade the eggs during or after each pick up. Imperfections, in shell shape and size must be kept away from hatching eggs. Hatching eggs should be sanitized immediately after each collection. Spray the eggs thoroughly with eggshell sanitizer i.e. Quaternary Ammonia. In case of Formaldehyde gas, it should be done at temperature of 75 ºF or higher and at relative humidity of 75% or more. Cool hatching eggs gradually. Eggs should be stored in a temperate below threshold of embryonic development. For short time storage egg room temperature should be 60-65°F (16-18°C). When eggs are held for more than 14 days the temperature should be towered to 56°F (13-14°C). Relative humidity of air should be maintained at 75-80%. Keep egg room as clean as possible and disinfect periodically. Always place eggs with large end up. Keep egg room clean: disinfect the room twice a week.

vii. Vertically Transmitted Diseases

Vertically transmitted diseases are Salmonella, Mycoplasma, Avian Leukosis and Avian Encephalomalacia. It is recommended to control diseases by regular laboratory testing and removal of carrier birds.

ix. Hot Weather

Prior to high temperatures, it is advisable for male to be allowed to gain little extra weight and fleshing as they will surely lose condition in the high temperature and will produce poor semen quality which can reduced fertility.

x. Health

Main diseases of breeder are Marek's disease, Bronchitis, Infectious Bursal disease, Fowl pox, NewCastle disease, Avian Encephalomyelitis and Avian Influenza.

Key points for healthy production are to maintain premises free of potential disease hazards, proper dead bird disposal, disease diagnosis and vaccination.

5.7 Light Management

5.7.1 Lighting for Broilers

In broilers light intensity and duration is not as important as in case of layer or breeders. Only that amount of light should be provided to birds so that they can move, see, eat and drink properly. For this purpose, provide 40 watt bulb/200 ft^2 area for 24 hours.

5.7.2 Lighting for Layers and Breeders

Light intensity as well as duration affects age at sexual maturity. Thus, lighting management during brooding is an important responsibility of manager of a layer and breeder farm because if duration of light period is less it causes late maturity. If duration of light period is more then it causes early maturity of bird due to which egg size remain small for several months and chances of prolapse also increases. Light provided during rearing is 10-11 h, which give satisfactory results. In most cases, natural day length is provided to birds but in light proof houses during rearing period light is also provided in regulated means by artificial source. In growing houses where natural daylight is provided, light period should be adjusted with change in day length. Do not increase light duration during rearing period.

5.7.2.1 Duration of Light for Pullets

If chicken hatched between 1st March to 31st August (in season) then provide 24 h light for first 3 days. Provide natural light up to 15 weeks. Then provide 10 h light during 16 weeks of age and 12 h light during 17 week of age. Then increase 30minutes light time per week until 16-17 h.

If chicks hatch between 1st September 28 February (out season birds). Then provide 24 hrs light for 1st 3 days. Then determine day length at age of 20 weeks. Add 7 hrs in it for 1st week, and then decrease the light by 20 min/week until 19 weeks of age. At 20 weeks supply, at least 10 hrs light and during 21 week provide 12 h light. After 21 weeks of age increase 30 minutes time/week until 16-17 h light is achieved, this target will continue till end of productive life birds.

5.7.2.2 Intensity of Light

High or low intensity of light affects age and weight at maturity and ultimately performance of birds in laying house. It should be 2 feet candle during brooding, ½ foot candle during rearing and ¾ foot candle during laying.

5.8 Management of Flock during Hot and Cold Climates

5.8.1 Poultry Farm Management in Hot Climate

Chick is warm blooded with high metabolic rate. Overall performance of chicken either for meat or egg is governed by the interaction of two important factors.

5.8.1.1 Genetic Constitution

A bird can full fill its genetic potential only when it is treated with sound management practices.

5.8.1.2 Environment

Extreme summer and winter are quite detrimental for birds. Summer heat is one of major important environmental factors that all farmers of tropical countries experience among their flocks. At environmental temperature of 32°C higher results heat stress leading to production losses. When temperature of 35°C or more persists, farmers can suffer many problems.

i. Problems due to High Temperature

High temperature in poultry results in high mortality, low feed intake, reduced egg production and size, poor eggshell quality, increased respiratory rate, reduced resistance to diseases, reduced fertility and Nervous signs.

ii. How the Effect of High Temperature Can Be Reduced

a. Construction of Poultry House and Management

Construct buildings for keeping in view climate of the area. Site of building should be appropriate. Long axis of house should be from east to west and sides should face north to south in hot areas to prevent direct sunshine. Convection ventilated housing is usually suitable for temperature in tropical areas. Normal body temperature of chick is 41ºC and relative humidity requirement is 65%. Interior Apex should not be less than 4 m to reduce air temperature at bird level. Roof overhead should be extended at least 0.8 m to limit solar gain though sidewalls. Lateral ventilation opening should comprise 60% of wall area. Roof should be insulated with fiber glass blanket or polyurethane sheet. White washing of roof with a good coat of line or aluminium painting will reduce temperature by about 10 ºF. Spray water on birds and roof of shed during hottest part of day. Plantation around shed also helps to reduce temperature inside the shed.

i. Ventilation

Heat disseminated from bird along with environmental heat cause a server threat to birds. Heat built up in sheds be eliminated out quickly otherwise heat stroke may result. Eliminate heat by installing fans and exhaust fans.

ii. Litter Depth

In summer, it should be decreased from usual recommended level. Litter should be raked properly. Some farmer use sand as litter.

iii. Floor Space

In hot season floor space should be more because more heat will be produced when recommended space is used. This heat produces more stress problems in addition with environment heat. It is advisable to reduce stocking density by

increasing floor space allowances. Floor space requirements (m^2) for broiler, layer and breeders are 7.0, 4.5 and 3.4, respectively.

Feed Consumption and Utilization

a. Feed

Ration energy content is prime factor in controlling feed intake, because birds eat primarily to satisfy their need for energy. During hot season the feed consumption usually reduces due to lower maintenance energy requirement. Reduction in feed intake is 3.6% per degree increase between 22 and 32 ºC. It could be related to age and genotype of birds. Energy level should be reduced; protein, calcium, phosphorous and all other important vitamins level in ration should be increased in extreme hot season. 17 gm protein and 270 kcal (M.E.) energy must be provided daily to each layer bird. Calcium requirement increases during hot weather, due to reduced feed intake and low blood supply to egg forming, system. Calcium and Phosphorus balance effects survival time during heat stress. Daily phosphorous requirement of bird is 225 mg but excess should be used during heat stress. In growing layer, chicks potassium requirement increases with increase in temperature being 0.4% at 25.7°C and 0.6% at 37.8°C. In hot weather, requirement of vitamin C increases. Provide more vitamin C as it helps to reduce effect of heat stress. During high temperature 200 mg/kg feed of Vitamin E is associated with immune response, in addition to maintaining integrity of the circulatory system. Vitamin E absorption and metabolism is elevated at 37°C compared to 24°C. Antibiotics, coccidiostat and growth promoters can be used.

b. Water

Water consumption is increased at higher temperature in comparison to normal season (22°C). Water consumption at 32°C and 37°C was 2.0 and 2.5 times higher respectively. Therefore, provide the cool, clean and fresh water.

Feed	Water
Normal (75°F)	1:2
When (95°F)	1:4

Ice block should be added to water at extreme hot temperature period. Cool butter milk can also be provided to bring down the stress. Antistress vitamin like vitamin C 1 to 2 g/20-liter water (½ tea spoon/5 gallon) can be helpful. More number of waterers should be provided. Use of molasses, can also be helpful.

c. Effects of Heat Stress on Health of Birds

Disease resistance of birds decreases in summer season so diseases can outbreak in hot season e.g. ND. Infectious Bronchitis, Infectious Bursal Disease. Heat stroke is most common in summer season which can cause brain hemorrhage. Symptoms of heat stroke are high body temperature, comb colour changes from red to bluish red and brain haemorrhages. To overcome this problem, use cold water tub at farm and dip suffered bird in tub especially bird head. It is helpful to remove this problem. Hot humid weather provides ideal

circumstances for coccidiosis and coryza. Adopt preventive measures to reduce mortality due to these conditions.

Precautions

Strict sanitation and disinfection with proper vaccination schedule be adopted.

5.8.2 Poultry Farm Management during Cold Climate

5.8.2.1 Influence of Winter

A high metabolic rate is observed in chicks, which are warm-blooded. Each bird has a genetic potential according to which it exhibits its productive performance. This genetic potential which has been gifted to birds by nature shows its full swing only when it is treated with a proper approach of managemental practices. Birds are unable to withstand or combat extremes of weathers. Very hot as well as very cold weather usually affect birds' performance. Extremely hot above (37°C) or extremely cold below (25°C) weather is lethal for bird's performance.

Open houses are best places where birds perform up to peak but in winter season, there is a headache of providing proper heating and ventilation. Birds suffer stress during winter. This stress must be lifted to let the bird exhibit its productive potential. During cold weather, birds become more prone to respiratory infectious diseases like Coryza and C.R.D. There will be poor weight gain in broilers and reduced egg production in layers. Certain precautionary steps must be taken, to reduce winter stress.

a. Brooding

i. Proper Brooding Practices

It is imperative to provide proper brooding practices especially in cold climate to get long range results. It is the only way which can make the bird exhibit its full genetic potential.

ii. Chilling

If the low temperature prolongs constantly rather frequently, there is a strong chance that the birds tend to be chilled. Situation is pretty much dangerous in young chicks and may lead to congestion of lungs and death.

iii. Suffocation and Trampling

During cold nights, evidence of over-chilling lies in fact that they tend to huddle together to warm themselves. Death occurs due to suffocation and trampling or piling. To eradicate this severity, increase bulbs or wattage/brooders.

iv. Electric Failure

Electric failure may cause the problem. To fight with this problem Petromax light or stoves must be kept ready. Preventive arrangements must be made for chance if smoke starts arising from stoves.

v. Cool Breeze

To cope with lashes of cool breeze entering poultry house, double curtain, one inside and one outside must be provided.

vi. Starvation of Chicks

In winter season, starvation of chicks occurs due to poor visibility of chicks resulting from drawn of curtains during day time. They find difficulty in locating the feeders. Lights should be on to combat this situation. At night if temperature is low birds do not come out of brooder, therefore feeders must be placed close to birds or preferable half way inside brooder.

b. Some Common Measures

Other measures for all ages of birds including broilers and layers are given below.

i. Dry Litter

Litter may also become a source of heat during winter. This must be properly exploited. Provision of dry litter with 2-3 inches thickness would serve purpose. It is also very essential to put a fresh litter. It is also advocated that litter must be regularly stirred and periodically lime powder must be mixed with to absorb moisture present there and to alleviate the ammonia smell. Eggs may become soiled in case if there is much moisture in litter material. It can also lead to outbreak of coccidiosis. To avert it, avoid flow of water form drinkers. If litter material is wet, then replace it with fresh dry litter.

ii. Energy and Protein

During winter season, grains must be replaced by 50% maize to increase the energy content. Energy, protein and vitamins must be present in diet in proper proportion.

iii. Feeding during Winter

To generate more heat in bodies of birds, some extra feed i.e. 5-10 g per bird must be offered during cold winter days.

iv. Water Consumption

Due to cold environmental temperature, water consumption is affected. Therefore, it is advocated that luke warm water, matching with room temperature must be provided to birds during very cold weather.

c. Most Common Diseases Related to Cold Weather

i. Coccidiosis

It is a managemental disease which outbreaks after 3rd week of age. Chicks and growers are much prone to this disease. Winter provides most suitable environment for spread of disease. Only preventive measure is to keep litter dry as much as possible by stirring periodically or using some other means.

ii. Chronic Respiratory Disease and Coryza

Chicks of all ages are prone to these diseases but growers and young pullets are more susceptible. Prevent them by improving sanitary and hygiene conditions.

iii. Feed Toxicity

It is very usual in rainy season. This must be checked timely otherwise it will lead to drop in egg production in layers, weight loss in broilers while mortality and lameness in chicks. Proper storage with more ventilation is required.

5.9 Feeding Practices

5.9.1 Broiler Feeding Management

Broilers are selected for rapid weight gain and efficient feed utilization. These chicks have a great capacity to convert feed into tender meat by their genetic background. It is difficult to establish a single set of nutrient requirement that is appropriate to all types of broiler production. In broiler production, it is necessary to take advantage of the early rapid growth. It requires careful attention to their feeding management.

5.9.1.1 Nutrient Requirement of Broilers

Due to rapid growth in broilers, their nutrition requirements are higher than of chickens being raised for egg production. Rapid growth of broilers results in higher nutritive requirements. There are two main feeding programs, one involves two rations and other involves three rations as given in Table 5.9. and Table 5.10.

Table 5.9. Requirements for two rations feeding programme.

Ration	ME (Kcal/kg)	CP (%)
Broiler starter ration # 4 or 14 (0-4 weeks)	3190	23-24
Broiler finisher ration # 5 or 15 (5^{th} week,-market)	3300	20-21

Table 5.10. Requirement for three ration feeding programme.

Ration	ME (Kcal/kg)	CP (%)
Broiler starter (1-14 days)	3080	24
Broiler grower (15-39 days)	3190	21
Broiler finisher (day 40 to market)	3300	18.5

Last five days before marketing is the drug (antibiotic) with drawl period.

5.9.1.2 Water and Feeder Space for Broilers

Ample water space that is 0.75 inches per bird should be provided and ensure the 24 hours supply of fresh water. Feed space about 2 inches (through space) up to 5 weeks of age and 3 inches until marketing should be provided per bird to ensure the maximum feed intake. Broilers are reared under 24 h light programme so that they can have unlimited access to feed level in the feeders fill (1/3 full) to prevent feed wastage.

5.9.2 Layer Feeding Management

Growing and developing a good pullet is one of the most important items in operation of a layer/breeder farm. Undoubtedly quality of bird at time of her production cycle begins, will greatly determine how profitable she will be during her period of lay. Therefore, special emphasis must be placed on feeding growing bird so that she may develop into a healthy productive individual and one that can fulfill her genetic potential. Mistakes made during growing phase cannot be corrected during laying cycle.

5.9.2.1 Nutrient Requirements of Egg Type Pullets

Each group of egg type pullets must reach sexual maturity at the correct weight.

For the sake of these reasons, the nutrients requirements of these egg type birds are lower than the meat type birds. Nutritional standards are given in Table 5.11. In market three types of rations are available for egg type birds.

a. Chick starter ration No. 1 or 11 (fed from 0-8 weeks)
ME = 2900 Kcal/kg CP 19%
b. Grower mash ration No. 2 or 12 (fed from 9-20 weeks)
ME = 2700 Kcal/kg CP= 15%
c. Layer mash ration No. 3 or 13 (fed from 21 wks.-end of production)
ME = 2800 Kcal/kg CP=17%

Table 5.11. **N**utritional standards for layers.

Nutrients	Amounts Required					
	Cool Climate			Warm Climate		
	6-12 week	12-20 week	21-72 week	6-12 week	12-20 week	21-72 week
Metabolizable energy Kcal/kg	2970	2750	2640	2750	2695	2750-2860
Protein %	17	15	19	19	16	17
Lysine %	0.85	0.75	0.75	0.95	0.95	0.72
Methionine %	0.42	0.38	0.38	0.47	0.42	035
Calcium %	1.00	1-3	4.00	1.00	1-3	4.00
Available Phosphorus %	0.50	0.50	0.50	0.50	0.50	0.50
Vitamin A IU/kg	11000	11000	11000	11000	11000	11000
Vitamin K mg/kg	4.4	4.4	2.2	4.4	4.4	2.2
Choline chloride mg/kg	1320	499	500	1320	499	500
Vitamin B_{12} mg/kg	0.013	0.013	0.026	0.013	0.013	0.026

At an age that is optimum to produce eggs economically during her laying year.

5.9.2.2 Feeding during First 6 Weeks

During first 6 weeks of life of chick, a well-balanced diet should be fed. In some instances, starter is fed for more than 6 weeks, if body weights are below standard.

5.9.2.3 Feeding from 6-20 Weeks

This is a critical period in development of an egg type pullet for how well she is grown will have an important bearing on her productivity during her laying period.

Feeding standards from 6 to 20 weeks are given in Table 5.12. A pullet must develop at a rate appropriate for her strain and reach sexual maturity at an opportune and economical age. Nutritional requirement during growing phase are vastly different from starting phase, especially amount of protein in growing ration. Protein must be materially reduced as her body weight increase. Because daily protein requirement of growing bird is relatively constant (7-8 g/day). Normally, total protein in ration should be reduced by about 1% per week after 6th week until it is 15%. Increasing protein in diet, increases body weight at maturity and decreases days to sexual maturity. Pullet should weight 1.35 kg at 20 weeks of age for maximum production potential.

i. Feed Control and Optimal Mature Weight

Feed control during growing period varies from full feeding to some degree of feed restriction to attain a given body weight and age at sexual maturity. For this program to be effective, it is necessary to maintain body weights on a weekly schedule beginning at 7 or 8 weeks of age. There are two methods of feed restriction.

a. Qualitative Restriction

Birds are fed low energy or low protein diets or diets low in both, however, birds are fed ad libitum.

b. Quantitative Restriction

The bird's feed is quantitatively (10-20% of recommended) reduced to provide the optimum amount of protein and energy.

5.9.2.4 Grit Feeding

Beginning from 8th week, feed 0.5 kg/100 birds/week hen size grit (0 number) on litter floor. Feed the allowance on one day/week.

5.9.2.5 Feed Changes at Sexual Maturity

Just prior to egg laying begins, several management practices and feed changes must be carried out such as increase in total light duration, feed allocation and growing ration must be replaced with a laying ration.

1. Calcium consumption must be increased.

Amount of feed consumed by the individual pullet just prior to and after production of her first eggs has an almost unbelievable pattern. Rapid daily increase in feed intake during first four days of egg production takes place. Pullet's calcium requirement is relatively low during growing period, but when first egg is produced the need is increased at least four times, for production of strong egg shells. Do not increase calcium until ten days before flock is expected to produce first egg. Two thirds of calcium supplemented should be large size flake oyster shell of coarse lime so that it can stay in gizzard. Grit should be provided @ 11.3 kg/1000 birds/month.

Table 5.12. Feeder and water space requirement.

	0-8 weeks	9-20 weeks	Onward
Feeder trough space	1-2"/bird	3"/bird	4-5"/bird
Waterers	2/100 birds/gal	2/100 birds/2 gal	100 birds/2 gal

5.9.2.6 Some Recommendations

a. Full feed starter until chickens are 5 weeks of age.
b. Full feed grower during 6th and 8th week.
c. Begin controlled feeding at 9th week of age.
d. At 20th week of age feed 13.6 kg of flaked oyster shell per 100 birds/week.
e. At 22nd week of age, if controlled feeding in growing, change to full feed.

5.9.3 Breeder Feeding Management

Breeding chickens may be divided into two groups; egg type and meat type. Because meat type breeders tend to become obese, their feed and feeding programs are much different than those used for egg type breeders, including the starting, growing and laying phases. Breeder parents have different nutritional requirements from commercial layers; careful attention is required for feeding management.

Nutrient Requirement of Breeders for Different Phases

a. Ration during Brooding
ME 2750-2850 Kcal/kg CP 17-18% and Ca 0.90%
b. Ration during Growing
Layer breeders
ME 2950 Kcal/kg CP 15% (6-20 weeks) and Ca 0.90-0.95 %
Broiler breeders
ME 2860 Kcal/kg CP 18% (5-9 weeks) and Ca 0.90-0.95%
15% (10-15 weeks)
12% (16-22 weeks)
c. Ration during Laying
Layer breeders
ME 2970 Kcal/kg CP 17% and Ca 3.5-4%
Broiler breeders
ME 2860 Kcal/kg CP 16% and Ca 3-3.5%

5.9.3.1 Feeding Breeders during Starter Period

From day old to 5 weeks, the starter rations should be approximately same for egg type male and female breeders as for commercial egg type pullets. However, if chicks are raised on a litter floor or slats a coocidiostat should be added. If average weights of birds are below standard, continue feeding starter until target weights are attained. Easy access to feed can be provided by use of chick feeder trays or clean chick box lids at the rate of one per 100 chicks during first week. Feeding and watering space for breeders are given in Table 5.13.

5.9.3.2 Feeding Breeders during Growing Period

Breeder pullets should become sexually mature (produce egg) at a specific age and specific body weight. Pullet stimulated into production before are not in optimum physical condition, will fail to peak, have poor egg size, producer a high percentage of double yolk and suffer an increased risk of prolapse.

a. Layer breeder target weight at 24 weeks

Male	1.9 kg	Female	1.5 kg

b. Broiler breeder target weight at 26 weeks

Male	3.0 kg	Female	2.5 kg

Meat type breeder females producing broiler off springs possess the inherent ability to grow rapidly. When full fed during the growing period they gain excessive weight and deposit too much fat. Restrict the caloric intake to produce pullets that are smaller at time of laying. Process of weight control must be under taken in entire growing period of broiler breeders. Always adjust the amount of feed to meet body weight target. Commence controlling amount of feed from 6-8 weeks of age.

i. Method of Controlled Feeding

In quantitative restriction birds are offered a measured amount of normal feed to meet body weight target while in qualitative restriction birds are fed low energy, low protein or low energy and protein diet. Birds are full fed in this programme.

ii. Uniformity

Body weight at different ages must be according to company recommendations. To maintain the uniformity first weigh a sample of each group of birds within house and established an average weight for flock. Acceptable weight band is established by multi playing average weight by 110% to obtain upper limit and by 90% to establish lower limit. Weigh birds in flock and remove all light weight birds to a separate pen. Overweight birds should also be separated at this time. Underweight birds should be gradually brought up to target weight for age by a small increase in their daily feed compared to average, but do not attempt to make up weight difference too quickly. Over weight birds should not have their feed reduced, but increases in feed should be low than those given to birds within target weight band. 90% of birds should always be in weight band of ± 10% of average of flock.

iii. Feeding Grit during Growing

On a feed day, feed 0.5 kg of large size grit (zero number) per week per 100 birds. Program of changing egg type breeders from the growing to the breeding ration is identical to program for changing egg type commercial pullets from a growing to a laying ration. Necessarily a breeder ration capable of producing high hatchability of the egg laid is to be used rather than a laying ration. Substitute breeder ration when flock is about 20 weeks of age to build yolk reserves for vitamins and other components. Although feed formula must be changed during period of egg production to compensate for production of eggs that can hatch into quality chicks.

5.9.3.3 Nutritional Requirement of Breeder during Laying

Energy requirement of breeder diet for egg type strains is slightly higher than diets for egg production alone. Meat type strain tends to get too heavily if full fed during laying as well as during growing. Meat type breeders produce fever eggs. For this reason, the energy content of the meat type breeder ration is usually lower than that of egg type breeder. It depends upon environmental temperature, caloric content of diet and rate of egg production.

i. Dual Feeding System

Feeding two separate rations to male and female during breeding season is known as dual feeding. Pullets are fed their regular rations but cockerels are fed a ration low in protein, energy and calcium. For this purpose, two independent feeding systems must be used. Male exclusion grills over female feeder have an opening 41 mm wide: provide 6 inches of trough space per pullet. Male feeding system is raised 18-20 inches (46-51 cm) above floor level to exclude females. Fill feeders in the evening and serve feed in next day morning to birds once a day.

Table 5.13. Feeding and watering space for breeders.

Type of Birds	Feeder space (inches/bird)		Watering Space (inches per bird)
	Growing	Laying	
Leghorn breeder pullets	2.50	3.75	0.75
Leghorn breeder cockerel	2.50-3.00	3.75	0.75
Meat type breeder pullets	5.00	6.00	1.00
Meat type breeder cockerel	6.00	6.00-8.00	1.25

5.10 Induced Moulting and Poultry Welfare

Forced moulting is replacement of old feathers with new ones. Moulting is believed to be a period of restoration and rejuvenation of reproductive system, enabling hen to produce eggs in subsequent production cycle. Induced moulting is desirable when cost of replacement flock is high, feed cost is more and egg prices are less. Start of moulting depends upon economic condition of individual farm. A new bird is generally more productive as compared to moulted bird.

Advantages of induced moulting are reduced layer replacement cost, improved production, eggshell quality, feed efficiency and fewer small eggs. Disadvantages of forced moulting are lower rate of production than in pullet year, more rapid decline in egg quality, greater percentage of off-grades and defective eggs, handling problem with high-speed equipment, more disease build-up, mortality may be higher and houses may be empty if flock becomes unprofitable earlier than anticipated.

During molting thyroid gland under goes a series of changes, feather replacement is under the control of thyroid hormone namely tri-iodothyronine (T_3) having synergistic effect with progesterone and antagonised by oestrogen activity. Standard metabolic rate increases (45%) during moulting which results in a higher

body temperature than normal. Normal sequence of feather replacement is given in Figure 5.1.

Then new feathers grow under control of normal thyroxin level. Feathers growth is retarded by a high level of circulating oestrogen as occur during egg laying. Progesterone administration prevents ovulation and induces moult by stimulating follicles replacement. All the mechanism i.e. reduction in oestrogen and increase of T_3 and Progesterone are controlled by the hypothalamus, interior pituitary under the influence of nerve impulses (Figure 5.2.)

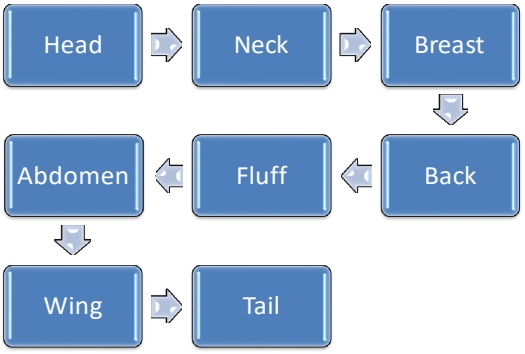

Fig. 5.1. Feather shedding pattern during moulting.

Fig. 5.2. Hormonal changes during moulting.

All these hormonal changes results in plumage change and change in body fat, ovary, oviduct, gastro-intestinal tract. By these changes there is 25-30% loss in body weight. Main idea of moulting is to reduce body weight by 25-30%.

5.10.1 When to Moult Flock

Poultry flocks are molted when spring like conditions prevails or house temperature is 75 °F, birds are healthy not underweight and not under stress.

5.10.2 Moulting Procedure

Before starting induced moulting followings practices are necessary (one week prior to start); deworming, use of antibiotics, vitamins, vaccination (I.B+ND) for optimum titer level, ad libitum feed and water.

5.10.3 Methods of Moulting

Moulting is done generally by:

a. Administrating hormones like thyroxin, progesterone, prolactin, metals like zinc or aluminum or exerting stress to change its hormonal profile.

	Days	Feed	Water	Light
8-10 day		No feed	No water	6 hours light
11-14 days		No feed *	*Ad-libitum*	6 hours light
15-49 days		45 g ground maize/bird + $CaCo_3$ or ration No. 2	*Ad-libitum* water	6 hours light
After 50 days		Ration No.3*ad-libitum*	*Ad-libitum* water	12-15 hour light

**Feed can be withdrawn for 1-14 days depending on season and body weight loss.*

Other Methods are

a. Feed withdrawal (without feed), *ad-libitum* water for 14 days.
b. Zinc Oxide =3.0-5.0 g/kg feed depending on concentration for 14 days.
c. Aluminium Oxide = 4.0 g/Kg feed for 14 days.
d. Progesterone = (Hydroxy Progesterone) 0.1 ml/bird I/M on alternative days for 14 days.
e. $CuSO_4$ = 4.0 g/Kg feed for 14 days.

After 14 days, use ground maize or ration number @ 45 g/day for 4-6 weeks. Then increase feed slowly i.e. 15-20 g/week so that it may be 110 g at peak production.

5.11 Use of Computers in Record Keeping

Computer is being used in every sphere of life. Its uses are increasing day by day. It seems that after a few years, life would be useless without the computer. There is not even a single field that is beyond grip of computer. It is because of this invention that world has reduced to a global village. Wars are won and lost from computer's keyboard. It is also used in manufacturing, welding and painting cars and buses. This revolutionary development decreased mental and physical burden of mankind.

Computers are everywhere in our lives, today including poultry industry. From accounting to waste management and everything in-between, there are many programs which helps in collection and store right information, make calculations, summarize results, predict future needs, and schedule most efficient ways to get things done, all done to produce a better more efficient product with minimum cost or maximum profit. When the size of a business increase, data on every aspect of that industry increase and requires a system that can efficiently utilize that data and

produce easy to understand and summarized results so that decision making is easier at this point. Computer is doing its job in every business. Regardless of industry, some problems are universal; for example, resource allocation, scheduling and routing, competition, inventory, searching for requirements, replacement and maintenance. A manager in any field has a modern "toolbox" of decision assisting programs at hand, including, for example, inventory control software, statistical analysis, simulation models, forecasting and business analysis.

Interactive models greatly enhance poultry industry efficiency. They utilize a strategic module for long-term questions and to answer "what if" situations. A tactical module contains all kinds of statistical soft wares such as that for projecting egg production, assisting site planning, linear programming, econometric models, and so on. Thirdly, an operational module provides day-to-day advice about hot day, flock planning, processing plant planning and shift planning. Decision making software that can project current production for the future and assess profit or loss and in case of loss steps to be taken to avoid that loss are the need of the world of business. One thing for sure that only properly interpreted data is of any benefit in these situations otherwise "Garbage in Garbage out" would be true.

Due to technology advancements competition among poultry industry is increasing day by day this time, future will be of that company that will be reducing losses from different sources and producing poultry meat and eggs at minimum cost. It will be possible when there will be well managed data management system for different enterprises of poultry business, well manners data makes a very efficient decision making system that can analyze even minute change in inputs of industry. Future should include alternatives to linear programming for feed formulation, better nutrient prediction, assisted disease diagnosis, more accurate price forecasting, supply chain optimization etc. Topics such as simulation, artificial intelligence and dealing with complexity will receive greater attention as technology advances.

5.12 Feasibility Reports

5.12.1 Feasibility Report for 30,000 Broilers in Environment Controlled House

Feasibility report can be recalculated according to market rates as there are always fluctuations in the rates of inputs and outputs. Land is available

5.12.1.1 Capital cost

i. Building Construction Cost (Rs.):

Construction of Shed	400×45	=	18000 feet^2 @ 325 / feet^2	= Rs. 5850000
Construction of office	10×10	=	100 feet^2 @ 425 / feet^2	= Rs. 42500
Feed Store	10×15	=	150 feet^2 @ 325 / feet^2	= Rs. 48750
Equipment Store	10×15	=	150 feet^2 @ 325 / feet^2	= Rs. 48750
Labor Colony	20×15	=	300 feet^2 @ 325 / feet^2	= Rs. 97500
Water Tank	7×7	=	49 feet^2 @ 400 / feet^2	= Rs. 19600

Wash Room	2 (5 × 6) = 60 feet^2 @ 400 / feet^2		= Rs. 24000
Total (Rs)			= Rs. 6131100
5% Depreciation (Rs) for one year	= 6131100 × 5%		= Rs. 306555
5% Depreciation (Rs) for 6 weeks			= Rs. 35371

ii. Equipment Cost (Rs)

Feeding Equipment			= Rs. 1250000
Drinking Equipment			= Rs. 550000
Fans	11 fans	@ 28500	= Rs. 313500
Inlets	56 inlets	@ 3250	= Rs. 182000
Lighting + Controller			= Rs. 150000
Pads	66 Pads	@ 3200	= Rs. 211200
Controllers of Feeding, Drinking and Ventilation System			= Rs. 150000
Heater			= Rs. 180000
Generator	2 generator	@ 500000	= Rs. 1000000
Transformer		@ 300000	= Rs. 300000
Refrigerator		@ 32000	= Rs. 32000
Automatic Syringe		@ 5000	= Rs. 5000
Weighing Balance		@ 1200	= Rs. 1200
Water Pump	2 pump	@ 9000	= Rs. 18000
Spray Machine		@ 5000	= Rs. 5000
Chick Guard for Brooding			= Rs. 10000
Total (Rs)			= Rs. 4357900
20% Depreciation (Rs) for one year= 4357900 × 20%= Rs.871580			
20% Depreciation (Rs) for 6 week			= Rs. 100566

5.12.1.2 Running Cost (Rs)

Broiler Chicks (0.6 feet^2 / chick)	= 30000 chick	@ 40	= Rs. 1200000
Feed Bags (3.25 kg / bird)	= 1950	@ 2264	= Rs. 4414800
Vaccination + Medication	= 15/bird		= Rs. 450000
Electricity + Gas charges	= 10/bird		= Rs. 300000
Labor charges	= 5/bird		= Rs.150000
Litter cost	= 3.33/bird		= Rs.100000
Miscellaneous			= Rs.100000
Total (Rs)			= Rs. 6714800

i. Total Flock Cost Items (Rs)

Depreciation of Building (Rs)	= Rs. 35371
Depreciation of Equipments (Rs)	= Rs. 100566
Running Cost (Rs)	= Rs. 6714800
Total (Rs)	= Rs. 6850737

5.12.1.3 Income

Total Birds		= 30000
Mortality	@ 4%	= 1200
Total Live Birds		= 28800
Total Live Weight	@ 2.00 kg / bird	= 57600 kg
Price	@ Rs 130/ kg	= Rs.7488000

Sale of Empty Bags	1950 bags	@ Rs 8.0	= Rs. 15600
Sale of litter			= Rs. 100000
Total income (Rs)			= Rs. 7603600

5.12.1.4 Profit

Income – Expenditure = Profit
Profit = Rs. 7603600 – Rs. 6850737 = Rs.752863.

5.12.2 Feasibility Report for 24000 Layers in Environment Controlled House

Land is available

5.12.2.1 Capital Cost

i. Building Construction Cost

Construction of Shed	400 × 45 = 18000 feet^2	@ 325 / feet^2	= Rs. 5850000
Construction of office	10 × 10 = 100 feet^2	@ 425 / feet^2	= Rs. 42500
Feed Store	10 × 15= 150 feet^2	@ 325 / feet^2	= Rs. 48750
Equipment Store	10 × 15 = 150 feet^2	@ 325 / feet^2	= Rs. 48750
Labor Colony	20 × 15= 300 feet^2	@ 325 / feet^2	= Rs. 97500
Water Tank	7 × 7 = 49 feet^2	@ 400 / feet^2	= Rs. 19600
Wash Room	2 (5 × 6) = 60 feet^2	@ 400 / feet^2	= Rs. 24000
Total			= Rs. 6131100
5% Depreciation for one year	= 6131100 × 5%		= Rs. 306555

ii. Equipment Cost

Cage system (Rs 200/bird)	= 200 × 24000		= Rs. 4800000
Fans	11 fans	@ 28500	= Rs. 313500
Inlets	56 inlets	@ 3250	= Rs. 182000
Lighting + Controller			= Rs. 150000
Pads	66 Pads	@ 3200	= Rs. 211200
Controllers of feeding, drinking and ventilation system			= Rs. 150000
Heater			= Rs. 180000
Generator	2 generator	@ 500000	= Rs. 1000000
Transformer		@ 300000	= Rs. 300000
Refrigerator		@ 32000	= Rs. 32000
Automatic Syringe		@ 5000	= Rs. 5000
Weighing Balance		@ 1200	= Rs. 1200
Water Pump	2 pump	@ 9000	= Rs. 18000
Spray Machine		@ 5000	= Rs. 5000
Chick Guard for Brooding			= Rs. 10000
Egg Tray	80% production (7 days)	@ 25	= Rs. 112000
Total (total trays 7780 @ Rs. 25/tray)			= Rs. 7469900
20% Depreciation for one year	= 7469900 × 20%		= Rs. 1493980

5.12.2.2 Running Cost

Spent layer is purchased

Layers (0.75 feet^2/layer)	= 24000 layer	@ 230	= Rs. 5520000
Feed Bags (38 kg/bird)	= 18240 bags	@ 2120	=Rs. 38668800
Vaccination + Medication*	= 120/bird		= Rs. 2880000
Electricity**	= 108/bird		= Rs. 2592000
Labor charges	= 10/bird		= Rs.240000
Miscellaneous			= Rs.50000
Total			= Rs. 49950800

*Till maturity Rs.50+Rs.10 per month (10×12) =120
** Electricity + diesel (90+72)= Rs. 162/bird for 18 months for 1 year = Rs. 108

i. Total Flock Cost Items

Depreciation of Building	= Rs. 306555
Depreciation of Equipments	= Rs. 1493980
Running Cost	= Rs. 49950800
Total	= Rs. 51751335

5.12.2.3 Income

Total Birds			= 24000
Mortality		@ 5%	= 1200
Total Live Birds			= 22800
Egg / layer			= 280 eggs
Total eggs	280 × 22800	= 532000 dozen eggs	
Sale of egg		@ Rs. 120/dozen	= Rs. 63840000
Sale of Empty Bags	18240 bags	@ Rs. 10	= Rs. 182400
Birds	22800 birds	@ Rs. 150	= Rs. 3420000
Total income			= Rs. 67442400

5.12.2.4 Profit

Income – Expenditure = Profit
Profit = 67442400 – 51751335 = Rs. 5691065

5.12.3 Feasibility Report for 7362 Female and 818 Male Broiler Breeders in Environment Controlled House

Land is available

5.12.3.1 Capital Cost

i. Building Construction Cost

Construction of Shed	400 × 45 = 18000 feet^2	@ 325 / feet^2	= Rs. 5850000
Construction of office	10 × 10 = 100 feet^2	@ 425 / feet^2	= Rs. 42500
Feed Store	10 × 15 = 150 feet^2	@ 325 / feet^2	= Rs. 48750
Equipment Store	10 × 15 = 150 feet^2	@ 325 / feet^2	= Rs. 48750
Labor Colony	20 × 15 = 300 feet^2	@ 325 / feet^2	= Rs. 97500
Water Tank	7 × 7 = 49 feet^2	@ 400 / feet^2	= Rs. 19600
Wash Room	2 (5 × 6) = 60 feet^2	@ 400 / feet^2	= Rs. 24000
Total			= Rs. 6131100
5% Depreciation for one year		= 6131100 × 5%	= Rs. 306555

5% Depreciation for 18 months			= Rs. 459832

ii. Equipment Cost

Feeding Equipment			= Rs. 1250000
Drinking Equipment			= Rs. 550000
Fans	11 fans	@ 28500	= Rs. 313500
Inlets	56 inlets	@ 3250	= Rs. 182000
Lighting with Controller			= Rs. 150000
Pads	66 Pads	@ 3200	= Rs. 211200
Controllers of feeding, drinking and ventilation system			= Rs. 150000
Heater			= Rs. 180000
Generator	2 generator	@ 500000	= Rs. 1000000
Transformer		@ 300000	= Rs. 300000
Refrigerator		@ 32000	= Rs. 32000
Automatic Syringe		@ 5000	= Rs. 5000
Weighing Balance		@ 1200	= Rs. 1200
Water Pump	2 pump	@ 9000	= Rs. 18000
Spray Machine		@ 5000	= Rs. 5000
Chick Guard for Brooding			= Rs. 10000
Total			= Rs. 4357900
20% Depreciation for one year	= 4357900 × 20%		= Rs. 871580
20% Depreciation for 18 months			= Rs. 1307370

5.12.3.2 Running Cost

Broiler Breeder Chicks (2.2 feet^2 / chick)= 7362 chicks @ 200				=Rs.1472400
(Out of these 7362 female and 818 male)				
Feed	(55 kg / bird)	= 8998 bags	@ 2200	= Rs.19795600
Vaccination + Medication		= 20 / bird		= Rs.163600
Electricity + Gas charges + Diesel		= 20 / bird		= Rs.163600
Labor charges		= 40 / bird		= Rs.327200
Litter cost				= Rs.60000
Hatching Cost	1132875 eggs		@ 2	= Rs. 2265750
Miscellaneous				= Rs.50000
Total				= Rs.24298150

i. Total Flock Cost Items

Depreciation of Building	= Rs.459832
Depreciation of Equipments	= Rs.1307370
Running Cost	= Rs. 24298150
Total	= Rs. 26065352

5.12.3.3 Income

Total Birds		= 8180
Mortality + culling	@ 10%	= 818
Total Live Birds		= 7362
Egg produced 180 × 6625		= 1192500 egg
Broken/market eggs	@ 2.5%	= 29813 eggs

Hatchable eggs			= 1162687
If hatchability is 82%			
Chick hatched			= 953403 chicks
Saleable Chicks			= 934335
Sale of chicks		@ Rs 40/chick	= Rs.37373398
Sale of Empty Bags	8998 bags	@ Rs 8.0	= Rs.71984
Sale of litter			= Rs.100000
Total income			= Rs.37545384

512.3.4 Profit

Income – Expenditure=Profit
Profit = Rs. 37545384 – Rs. 26065352=Rs. 11480032

Conclusion

Good brooding of chicks is recommended to have good results from the flock. Poultry birds be handled properly during hot and cold weather. Proper light is required during production period. Layer birds can be kept more than one year by practicing induced molting. Cage layer production is increasing rapidly in Pakistan. Computerized records are a good source of data which can be processed at a rapid rate for knowing performance of present flocks and for future planning.

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