
UNIT 2 MANAGEMENT OF BROILER CHICKEN

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2.0 OBJECTIVES

After studying this unit, you will be able to:

- explain the preparations required before arrival of chicks;
- determine brooding requirements;
- assess comfort of chicks during brooding;
- demonstrate brooding of chicks; and
- evaluate the performance of broilers.

2.1 INTRODUCTION

Do you know that the present day broilers can grow to a weight of 2 kg by 42 days (6 weeks) of age? Imagine a chick weighing about 40 g at hatch, put on 1.96 kg in just 42 days. In other words, chicks gain 47 g per day or approximately 2 g per hour. In fact, the growth rate is so fast during 5th and 6th week that they will be adding up to 4 g per hour. Why do we require this data? It is mainly to realize that the broilers are very sensitive and extremely fast growing. Therefore, unless proper management is done, such performance cannot be expected. Hence, this unit discusses about the management of broilers starting from preparation of the house for arrival of chicks till they are marketed and their performance evaluation. Before going through this Unit, it is suggested to revise the details of various poultry equipments used in poultry farm which is discussed in Unit 3 of previous block for better understanding of the subject.

2.2 PREPARATION FOR ARRIVAL OF CHICKS

Preparation of the brooder house for the arrival of chicks is extremely important because, on most occasions, chicks arrive from a long distance and, sometimes, after 24 hours of hatch. The following are the general guidelines for preparing the house for arrival of chicks:

- Cleaning and disinfection of brooder house.
- Cleaning and disinfection of feeders and drinkers followed by sun-drying.
- House must be thoroughly examined for leaking roof and gutters, drafty doors, functioning of fans, switch-boards, shutters etc. The floor may be given a coating of lime solution.
- The house and equipments may be fumigated using 3X concentration of formaldehyde; the side-walls may be closed with curtains before fumigation.
- Floor of the building has to be cleaned with a suitable detergent and disinfected with a commercial product suitable for floor-cleaning.
- All weeds and debris, if any, surrounding the building must be cleared and the area sprayed with a commercial disinfectant.
- Brooders, feeders, drinkers and other equipments required have to be checked for proper functioning.
- New and clean, dry, mould-free absorbent litter has to be spread evenly on the floor making a thickness of about 6 to 8 cm; care has to be taken not to close all the windows when the litter is being spread so that dust can settle down easily.
- Paper should be spread on the litter.
- Brooder, feeders and drinkers are arranged at least 6 to 8 hours before the arrival of chicks; brooder is put on so that requisite brooder temperature is attained before the arrival of chicks. If required, windows may have to be covered with gunny sacks to save (conserve) heat. This also helps maintain drinking water temperature at $\geq 18^{\circ}\text{C}$.
- Anti-stress factors (B-complex vitamins, Vitamin C etc.) may be added to the water.

- Feed or maize grit is sprinkled on paper to help chicks identify the feed. During the first few days, it is compulsory that the chicks should have feed easily available. For this purpose, feed can be kept in inverted chick box lids, or any such large flat containers.
- It is desirable to have a standby generator. Otherwise, charcoal or coal, kerosene or LPG must be available to meet emergencies in case of power failure.
- All data sheets required for recording various aspects like medication, vaccination, feed consumption, mortality etc. should be kept ready (see Unit 4 Block 2).

Activity 1

Visit a nearby hatchery. Collect information on type of preparation carried out in the hatchery before the arrival of chicks. Visit the brooder house and note down the preparations carried out for receiving the chicks and give your opinion and comments on the preparations.

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2.3 BROODING ARRANGEMENTS

You have come across “Broody hen” which sits on eggs, warms them and hatches them. Hence, the word “Brood” goes with the meaning to warm or heat. Chicks need additional heat during the first 4 weeks of their life. This period, therefore, is referred to as “Brooding period”. Length of brooding period depends mainly on outside temperature. If it is low, brooding period is longer and *vice versa*.

2.3.1 Need of Brooding

You are sure to ask a question: newborn in case of cattle, sheep and goat are not provided any artificial heat; why it is required for chicks? It is sure that you have seen chicks and adult chicken. What are the main differences you would see? First is the size and the next will be absence of feathers in chicks.

Being smaller in size, chicks lose more heat than adults. Again you will ask, why so? Imagine you keep water at same temperature in two buckets, one very small and another large one. In which you would expect water to cool faster? Yes; in the smaller one. You know the reason also from you school; smaller bucket has larger area on its surface in relation to the volume of water it holds. Therefore, it loses heat faster than the large one. Exactly the same way, chicks lose more heat than adults.

Regarding feathers, one of the most important functions is to prevent heat loss (insulation). Chicks do not have feathers; therefore, they cannot maintain body temperature till the feathers grow.

You may know that body temperature of chicken is 42°C which is more than that of other animals and humans (37.8°C). From your science class, you know that more the difference in temperature between two media, faster is the temperature loss from the hotter object. Hence, this makes it much more difficult for the chicks to hold body temperature.

Therefore, chicks cannot maintain body temperature soon after they are hatched. In nature also, hens provide the chicks warmth under their wings or breasts. In a commercial set up, “brooders” are used for this purpose.

Can you tell, what happens if you do not brood the chicks?

Yes; if brooding is not done, chicks obviously feel cold. To overcome this, they huddle and heap on one another. Hence, many chicks at the bottom of the heap may die due to suffocation and trampling. Further, they do not move around resulting in starvation and death. Therefore, brooding is mandatory for chicks.

2.3.2 Brooding Temperature

This is another sure question you will ask? Theoretically, brooding temperature should be 35°C (95°F) which has to be reduced at the rate of 2.7°C (5°F) per week till the required brooding temperature is same as that of house temperature. Hence, brooding is necessary for the first 4 weeks. However, under cold weather conditions, brooding may have to be extended till 6 weeks whereas, brooding may have to be limited to only 1 or 2 weeks under hot weather conditions.

(i) Why is brooding temperature less than body temperature?

It is natural to expect a question from you that body temperature is 42°C; then, why is brooding temperature less than that?

You will be very comfortable in an air-conditioned room, isn't it? But, it is definitely cooler than your body temperature. This is because, we are warm-blooded and produce our own heat always. Chicks also are warm-blooded and produce their own heat. Therefore, brooding temperature is less than body temperature.

(ii) Why is brooding reduced every week?

One of the reasons why the chicks require brooding is that they have not grown the feathers yet. Therefore, if we reduce brooding temperature every week, it stimulates feather growth.

(iii) Where to measure brooding temperature?

Next question from your will be, where exactly one should measure temperature in the entire brooding area? Brooding temperature, if measured, is at a height of 8 to 10 cm above the litter floor under the brooder in case of reflector brooder and infra-red bulbs and at the edge of the canopy in case of canopy brooding. As the birds grow in size, the height at which temperature is measured should also be increased.

2.3.3 Method of Brooding

Equipments used for brooding has already been dealt in Unit 3, Block 1 of this course. For refreshing your knowledge, the different equipments used for brooding is discussed below:

(i) Canopy brooder

This is an inverted umbrella-like equipment with three bulb-points. To start with, find out why bulbs are to be fixed in a canopy brooder? Bulbs, when put on, heats the air which gives warmth to the birds and the light emitted by the bulbs helps chick in locating feed and water especially during night time (Fig. 2.1)



Fig. 2.1: Canopy Brooder

You have also learnt that if bamboo basket is used, all holes in it must be closed by a paste made of dung and mud. Obviously, you will be curious to know why so. This can be easily understood by your science background. When air is heated it becomes lighter than normal air and tries to go out of the canopy (bamboo basket). If holes are not closed, all the hot air goes out creating a vacuum; cold air enters under the brooder resulting in cooling of chicks instead of warming them! This will lead to huddling of chicks and many may die due to suffocation and trampling.

The next aspect to be known is the number and wattage of the bulbs to be fixed. By common sense, you can tell that depending on the temperature expected at the farm in question, number and wattage of bulbs are decided. For instance, in hot-humid coastal areas during summer months, only one 25 Watts bulb is sufficient; whereas, in an area where severe winter is expected, 3 bulbs each of 60 or 100 Watts are required during peak winter.

(ii) Reflector brooder

You will definitely be surprised that there is no canopy. This brooder reflects downwards heat produced by the heating element (Fig. 2.2); hence, there is no question of hot air and vacuum.



Fig. 2.2: Reflector Brooder



Fig. 2.3: Infra-red Brooder

(iii) Infra-red brooder

Anything that comes in contact with the rays gets heated. In the same way, the infra-red bulbs produce rays which heat by radiation (Fig. 2.3). Obviously, as it does not heat the air, canopy is not required even for infra-red brooders.

2.3.4 Arranging a Brooder

A circular area is marked by arranging the brooder guard in which brooding

equipments are arranged. The area where heat is provided by the brooder is referred to as “brooding area” and the area surrounding the brooding area within the brooder guard is referred to as “run space” (Fig. 2.4). Generally, in case of canopy brooding, the run space will be approximately equal in areas of cold weather and twice in areas of warm weather to that of brooding area. However, there is no hard and fast rule on this.

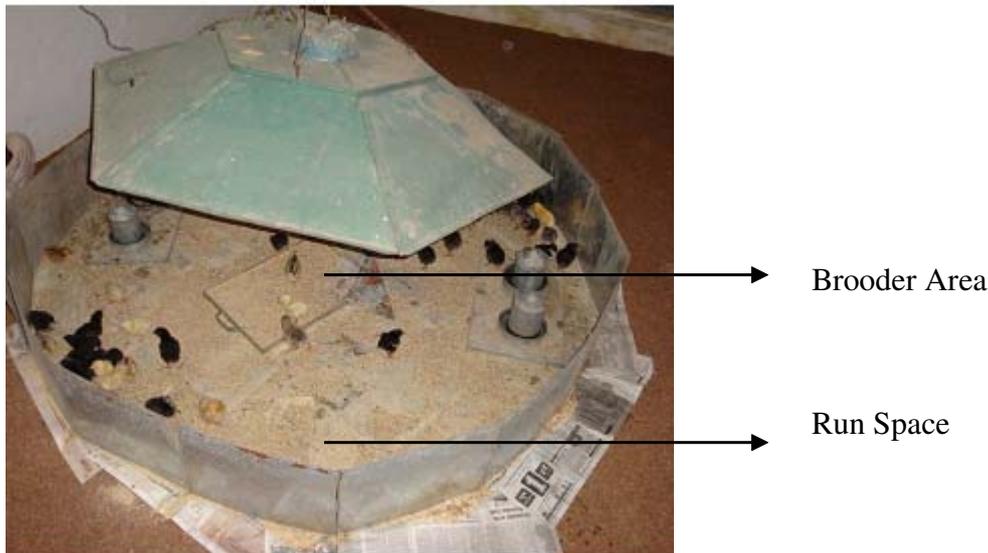


Fig. 2.4: Arranging a brooder

Next step is to estimate the area to be covered by the brooder guard. In fact, space required by the growing chick changes day-by-day and accordingly brooding equipment is raised and brooder guard is spread suitably as the chicks grow in weight and height. Initially, total area required (brooding + run) is about 300 cm^2 ($\frac{1}{3}$ sq. ft.) per chick. Depending on number of chicks under the brooder, the diameter of area to be enclosed by the brooder guard can be calculated.

(i) Height of fixing a brooder

- In case of canopy brooder, since newly hatched chicks will be 8 to 10 cm in height, the edge of the canopy should be 8 to 10 cm above the litter floor to facilitate movement of chicks in and out of it. Canopy must be raised as and when the chicks grow.
- In case of reflector brooder as well as infra-red bulb brooding, brooder should be at least 30 cm (1 ft) above the litter floor. This is particularly important in case of infra-red bulbs. You already know that infra-red bulbs heat anything that comes in contact with it by radiation. Hence, litter material, which is preferred to be as dry as possible to absorb moisture in the faecal matter, will also be continuously heated. Therefore, in very dry areas and under very hot weather conditions, there is a possibility of litter catching fire. Hence, infra-red bulbs are suspended at least 30 cm (1 ft) above the litter floor.

(ii) Number of brooders

For 1000 broilers, 4 to 5 canopy or reflector brooders are required. In case of infra-red brooding, a total wattage of 1000 watts are required (1 watt per chick) which can be supplied by 4 of 250 watts or 7 of 150 watts bulbs. More number of infra-red bulbs is preferred because chicks will be more comfortable with more brooding area than fewer ones.

2.3.5 Arrangement of Equipments

- Generally, linear feeders and manual (circular) drinkers are employed at least during the first week of brooding. This is because brooding area is a restricted area within the house. Therefore, it will be generally difficult to suspend all the feeders and drinkers required within the brooding area. Further, any medication or vaccination through water can be conveniently given through manual drinkers than bell drinkers.
- A linear feeder has to be properly placed on the litter floor so that the chicks can easily get access to the feed and at the same time prevent spilling of feed. In the beginning, the linear feeders are kept on the floor and they have to be raised as and when the birds grow in height so that feed is available at the level of the back of birds. (Fig 2.5).

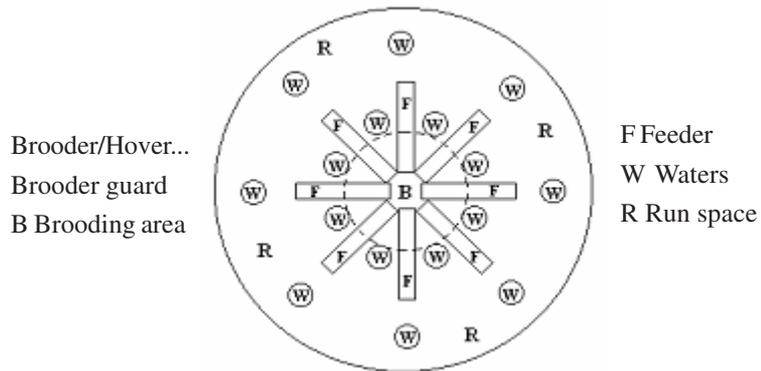


Fig 2.5: Placement of equipment during brooding

Check Your Progress 1

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

- 1) Why chicks need brooding?

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- 2) Give temperature specifications for brooding. Why it is reduced every week?

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- 3) Describe infra-red brooder.

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Activity 2

Visit a nearby brooder house. Gather information on the type of brooder used, temperature of the brooder area, height at which brooder is fixed from ground level, numbers of chicks kept under the brooder and the arrangement of equipments (feeders and drinkers).

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2.4 CARE AFTER ARRIVAL OF CHICKS

With house and equipments kept ready, the chicks upon arrival can be taken into the brooder house. Chicks are generally supplied in chick boxes which are well ventilated. The chicks might have been in travelling for a period which sometimes will be 2 days. You need not have to worry as they have sufficient reserves in the body (yolk) to take care of them. Now, let us know the management of chicks after they have arrived.

2.4.1 Brooding Chicks

As soon as the chicks arrive, they have to be taken out of chick boxes and kept in the brooder house. The following steps are recommended:

- It is advisable to examine a sample of chicks from each of the chick boxes to ascertain the quality of the chicks; it also helps to note mortality, if any, during transit.
- It is a good practice to dip the beaks of the newly hatched chicks in water and leave them into the brooder area. Otherwise, the chick box can be inverted quickly to dump all the chicks nearby the brooding area. It is essential to count the chicks at this time.
- Chicks have to be observed carefully to identify weak ones and also to help those which are not able to reach for feed and water.
- It is equally necessary to observe and ensure that all the chicks are actually eating. You may have to watch out for “starve-outs” by catching few of them randomly and examining at the base of the neck for presence of feed in a pouch like structure called “Crop” under the skin.
- Drinkers have to be cleaned and freshwater to be given at least twice a day. Similarly, feed is also offered at least twice a day.
- Care has to be exercised in placing the drinkers. They have to be kept at horizontal plane and it must be ensured that water is not flowing out onto the litter.
- Standard balanced ration (broiler starter) has to be offered without any restriction (*ad libitum*).
- As the birds advance in age, bell or nipple drinkers and linear or hanging feeders can be introduced; replacing part of the existing feeders and drinkers at a time.
- Floor space and drinker space must be adequate to avoid unnecessary competition, cannibalism (eating one another), poor growth and wastage of feed. Broilers up to 4 weeks require 450 cm² (½ sq ft) and later 900 cm² per chick (1 sq ft); the corresponding drinker space requirements are 1.5 and 2.5 linear cm, respectively.

2.4.2 Comfort of Chicks

The next step is to assess whether the chicks are comfortable or not. It can be done as follows:

If the brooding temperature is comfortable, chicks should move in and out of brooder uniformly. During the morning time, the birds will be continuously disturbed due to routine farm operations such as feeding, watering etc. Hence, observation will not

be accurate. However, during the night time, the farmer can inspect brooder house without disturbing the chicks. He/she can walk all round the shed on the side-walk so that no chick will be disturbed. If chicks are uniformly distributed under the brooder guard (both brooder and run space), the conditions provided are comfortable (Fig 2.6).

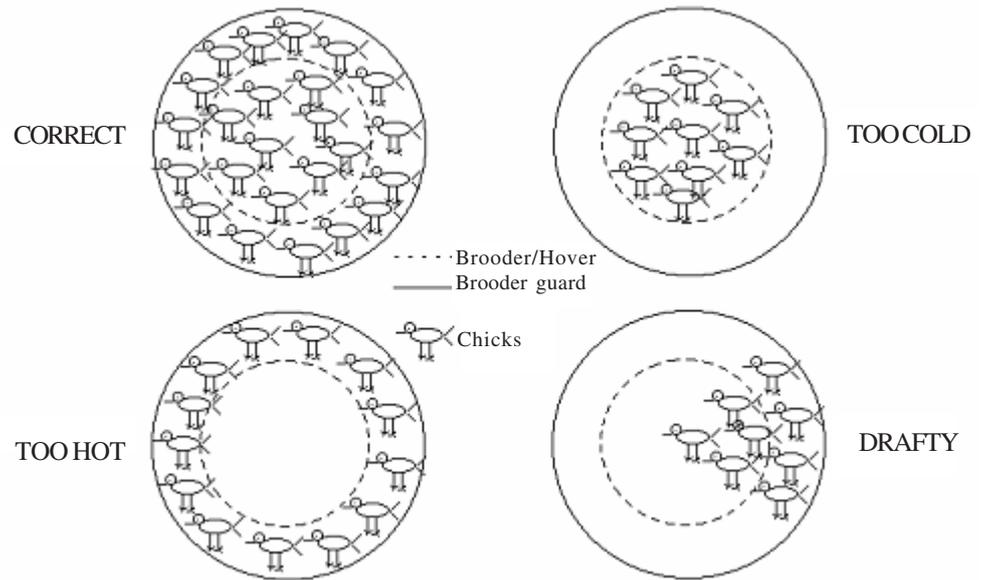


Fig. 2.6: Assessment of brooding comfort

This can also be assessed by noting the distribution of faecal matter on the paper spread on the litter. If faeces (droppings) are uniformly distributed on the paper, the birds were comfortable during the night time. On the contrary, if most of the droppings is seen under the brooder or at the periphery (just close to brooder guard), the brooding temperature is considered too low or too high, respectively. If droppings are seen in a triangular fashion on one side of the brooder area, it indicates blowing of cold air from that direction, it is possible that curtains fixed to the windows have come off in that direction.

2.4.3 Lighting

Light is a basic necessity for all animals, including human beings. For chicks, light is required not only for seeing (visibility), but also as a source of heat, especially in canopy brooders. Hence, details regarding light requirements of broilers are given below:

(i) Duration of light

During brooding 23 hours of light and 1 hour of darkness should be provided. Under canopy brooding, the light serves two purpose of both illumination for visibility and also heating the air by convection to provide the required brooding temperature. Under infra-red brooding, the light primarily serves the purpose of visibility. In all the methods of brooding, one hour darkness at a specified time of the day is provided mainly to acclimatize chicks for power failure; this would help minimize huddling of chicks and subsequent mortality due to sudden power failure.

(ii) Intensity of light

The required intensity of light can be achieved by use of 10 Watts of light bulb per m² of floor space (about 1 Watt per sq ft); the bulb being fixed at about 2.4 m above the floor. This intensity is sufficient enough to brightly illuminate feeders and reflect off from the drinking water to attract the chicks.

After 48 hr of brooding, intensity at the floor level can be reduced by use of 2.70 Watts of light per m² (about 0.27 Watts per sq ft) of floor space; the bulb being fixed at about 2.4 m above the floor.

2.4.4 Feeding

After the first couple of days, when the chicks learn to eat and drink, feed is offered in linear or automatic feeders. Whenever linear feeders are used, care has to be taken to ensure that they are fixed at the level of the back of the birds to prevent the chicks entering into the feeders. In addition, the linear feeders are usually equipped with grills and are filled only to the level of $\frac{1}{2}$ or $\frac{1}{3}$ to minimize wastage of feed.

Feed is generally offered at least twice a day during the brooding period; if need be, more frequently. Frequent feeding stimulates feed consumption and ultimately, weight gain in broilers.

(i) Feeds to be offered

There are actually three different feeds available in the market *viz.* pre-starter, starter and finisher. However, offering pre-starter is not a common practice and hence, it is only optional to the choice of the farmer.

Broiler feeds are available in two forms - Powder or mash and granules or pellets. Your next question will be, which one is better?

Firstly, in mash feeds, stronger birds tend to take away all grains and leave only powdery portion for others; the weaker birds can't consume the left over fine powdery feed properly. Secondly, while searching for grains, birds scratch the feed resulting in spilling of feed on to the litter and feed wastage. All these result in poor utilization of feed. In addition, mash feeds are dusty.

On the other hand, in pellet feed, each of the pellets is balanced and hence, whenever any bird eats, it will get a completely balanced feed. Pellets also appear like grains for birds and hence, they scratch less resulting in less feed wastage. In any case, nowadays, most broiler feeds are pellets of different sizes.

Pre-starter, if offered, is during the first one week of age. Broiler starter is offered till 3 weeks of age followed by broiler finisher till market. The farmer can consult the local feed dealers or Animal Husbandry Department to obtain the best broiler feed source. Many standard feed manufacturers can supply feed at the farm gate. Sometimes, even the hatchery which supplies chicks also provides or recommends a feed source. Farmer can make his own decision.

Broilers are given feed *ad libitum* meaning as much as they want and they are never feed-restricted. If, by any chance, there is no feed, growth will be severely affected. You will now ask a question, is it necessary to feed even a day prior to market?

Theoretically, it is not required. Even this is not practiced because the weight gain due to feeding will fetch more money to the farmer than the value of the feed saved by feed withdrawal. However, the processor or purchaser of the broilers may insist on feed withdrawal due to obvious reasons or may insist on reduction in the total weight due to feeding. In such a case, reduction should not exceed 140, 170 or 185 g per broiler at 6, 7 and 8 weeks of age, respectively (Table 2.1).

(ii) Feed consumption

It is obvious, like other animals, feed requirement depends on age of the broilers. Hence, quantity of feed required changes every day. However, average weekly requirements are tabulated below:

Table 2.1: Feed consumption of broilers (at 21.1°C)

Age (Weeks)	Feed consumption		
	g/bird/day	g/bird/week	Cumulative (g)
1	17	119	-
2	41	287	406
3	65	455	861
4	91	637	1498
5	115	805	2303
6	144	1008	3311
7	171	1197	4508
8	188	1316	5824

Adapted from : North and Bell, 1990

2.4.5 Drinking Water

You should remember that birds can tolerate starvation but not thirst. At 21.1°C, birds consume 2 g water per g of feed consumed; this changes with temperature especially above 29°C. Water consumption increases at the rate of 3 g/day/°C up to 27°C and at a rate of 11 g/day/°C above 29°C. You will be surprised; birds exposed to 37.8°C consume 8.5 g water/g of feed consumed!

On the first day of brooding, addition of sugar or glucose in drinking water is being practiced by many commercial poultry farmers. It may be very useful especially when the chicks were under transport for more than 6 to 8 hours. Generally, 8% sugar solution along with water-soluble vitamins and electrolytes is provided during the first 15 hours after the chicks are placed in the brooders to minimize the effect of stress on chicks. Standard electrolyte combination is available in the Veterinary medical stores.

Chick founts (fountain drinkers) and other watering equipment have to be cleaned thoroughly everyday. Water left-over should be discarded, the equipment cleaned, filled with freshwater and offered. It is also a common practice to add sanitizers in drinking water, especially during first 3 to 4 days of brooding to minimize losses due to diseases; but it is not compulsory. However, water sanitizers should not be used while administering vaccines through water.

(i) Location of drinkers

Drinkers are initially kept on the floor on stands and are raised as the chicks become older. Later on, bell-drinkers are fixed in such a way that the water level is even with the tops of the backs of the birds. This is particularly important because, birds cannot suck water kept at a lower level due to lack of lips.

(ii) Cleaning of bell drinkers

Bell drinkers are connected to water line and hence cannot be dismantled every time they are to be cleaned. As and when required, soap and detergents can be used. Hence, a soft cleaning brush is used to clean the surface without removing from the water-line and the clean-out water is carefully taken into a bucket for disposal. (See Unit 5 Block 2 for details)

Rule of thumb: Surface of clean bell drinkers will be smooth and shining.

Caution: Care must be exercised to minimize spillage of water on to the litter while cleaning bell drinkers.

(iii) Water consumption

Water must be available always and *ad libitum*. Table 2.2 is only a guide, but in practice, bell drinkers ensure continuous supply of water.

Table 2.2: Water Intake by Broilers at 21.1°C

Age (weeks)	Water Intake (ml)	
	Per Bird/day	Cumulative per Bird
1	30	30
2	61	91
3	95	186
4	133	319
5	174	493
6	216	709
7	254	963
8	288	1251

Adapted from : North and Bell, 1990

2.4.6 Vaccination

You will have to always bear in mind that vaccines are not a substitute for proper management. Therefore, appropriate bio-security measures should be followed. However, if there is a breakdown in production management and a disease outbreak occurs, the vaccination program needs to be adequate and effective to limit resulting losses. Thoroughly understanding causes of vaccine failure will help prevent future problems.

Vaccines administered

Broilers are reared only for about 42 to 49 days of age and hence, need to be vaccinated against two important diseases namely, Ranikhet Disease (RD) or New Castle Disease (ND) and Infectious Bursal Disease (IBD). The following table (Table 2.3) gives the recommended vaccination schedule:

Table 2.3: Vaccination Schedule for Broilers

Age (days)	Vaccination Details		
	Disease	Vaccine	Route
5 – 7	RD	LaSota or F ₁	Ocular or Nasal or Water or Spray
14 – 16	IBD	Georgia strain	
28			

2.4.7 Medication

Ideally, broilers do not need any medication. But, under practical conditions, it is not true. In fact, medication starts on the very day chicks arrive because, more often than not, chicks would have been subjected to transport over sufficiently long distance. Therefore, glucose, anti-stress factors, growth promoters etc. are being given by farmers. Of these, anti-stress factors appear to be a reasonable requirement. They consist of B-complex vitamins which are given through water. Usefulness of all these depends on the sanitation and management of the birds. If management is good, the administration of these is only a waste of money. Therefore, there is no replacement for good management.

Several commercial preparations are available containing combinations of B-complex vitamins, minerals, other vitamins, growth promoters etc. and it is not possible to

enlist all of them. Hence, it is advised to consult the local veterinarian or Department of Animal Husbandry for guidelines.

In spite of the above, it is highly recommended that the farmer has a ready stock of vitamins and antibiotics for emergencies.

Check Your Progress 2

Note: a) Use the spaces given below for your answers.

b) Check your answers with those given at the end of the unit.

1) What general rule you can apply to approximate floor, feeder and drinker space?

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2) How do you assess comfort of chicks during brooding?

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3) Why duration of light is important in rearing of broilers?

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4) Give the vaccination schedule of broilers.

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Activity 3

Visit a nearby broiler farm. Note down the distribution of chicks in the brooder area. Also collect information on the vaccination schedule followed in the farm.

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2.5 BROILER PERFORMANCE STANDARDS

The following are some of the practical indicators of the performance of broiler farm which can be calculated only when accurate records are maintained (See Unit 4 Block 2 for details):

Note: Of all the indices, average weight at market, Feed Conversion Ratio (FCR) and livability are by far the most important under commercial conditions.

2.5.1 Average Weight at Market

This is simplest criterion; you will have total number of birds and body weight actually sold for each batch. Average weight can be easily calculated; if sex-wise data are

available, it is well and good, but not compulsory. Although not absolutely essential, when in doubt, weekly weights of the birds chosen at random (about 5% of total birds) can also be compared with the values given below:

Note: When sexes are not separated, such flocks are called “Straight-run” flocks; most broiler farms are straight-run.

Table 2.4: Average Weights at Market of Broilers (sex-wise)

Age (weeks)	Males			Females		
	Av. Weight (kg)	Cumulative		Av. Weight (kg)	Cumulative	
		Feed Intake (kg)	FCR		Feed intake (kg)	FCR
1	0.15	0.12	0.80	0.15	0.12	0.80
2	0.41	0.42	1.05	0.38	0.40	1.05
3	0.72	0.89	1.23	0.67	0.84	1.25
4	1.12	1.56	1.40	1.00	1.43	1.42
5	1.54	2.40	1.56	1.37	2.20	1.60
6	2.01	3.48	1.73	1.75	3.10	1.77
7	2.52	4.79	1.90	2.15	4.17	1.94
8	3.03	6.26	2.07	2.53	5.34	2.11

FCR = kg feed per kg weight gain *Adapted from* : North and Bell, 1990
Note: Weight at hatch will be 0.038 to 0.048 kg; hence, ignored for calculation of FCR

Table 2.5: Average Weight at Market of Broilers (straight-run)

Age (weeks)	Av. Weight (kg)	Feed Intake g/bird/day	FCR at End of Week (Cumulative)
1	0.15	16.8	0.80
2	0.39	41.4	1.05
3	0.70	65.0	1.24
4	1.06	90.5	1.41
5	1.46	115.0	1.58
6	1.89	143.7	1.75
7	2.34	170.9	1.92
8	2.78	188.2	2.09

FCR = kg feed per kg weight gain *Adapted from* : North and Bell, 1990
Note: Weight at hatch will be 0.038 to 0.048 kg; hence, ignored for calculation of FCR

2.5.2 Feed Conversion Ratio (FCR)

As the name suggests, it is the quantity of feed required for a kg weight gain. The standards are also given in tables 2.4 and 2.5 above. Day-old broilers weigh only between 38 to 48 g; hence it is ignored on most occasions to make weight gain and average weight at a specified age synonymous. This is the most popular of all the indices of performance. Lower the FCR, better the performance. A farmer practicing good management can definitely anticipate an FCR of 1.80 or lower.

2.5.3 Livability (%)

This is 100 times the ratio of number of birds marketed to the number of birds started. This is reverse of mortality; hence, higher the better. Generally, $\geq 98\%$ livability (or $\leq 2\%$ mortality) is expected. Hatchery supplies 2% of extra chicks free of cost. Under good management, you must have at least 980 broilers for market out of 1000 (+ 20 extra) broilers reared.

$$\text{Livability \%} = \frac{\text{Number of birds marketed}}{\text{Number of birds started}} \times 100$$

2.5.4 Dressing (%)

This index is not generally available. If you have the data about total edible portion (meat and other edible parts) obtained from the birds sold, dressing % can be calculated as the ratio of total edible portion to the total live weight multiplied by 100. This value will be at least 72% in case of broilers.

$$\text{Dressing \%} = \frac{\text{Weight of total edible portion}}{\text{Live weight of the bird}} \times 100$$

2.5.5 Feed Cost per kg Broiler Produced

This is calculated as the product of FCR and cost per kg of feed. Ideally, should be as low as possible.

2.5.6 Cost-Benefit Ratio (CBR)

This is calculated as the ratio of gross receipts to total recurring expenditure, both on annual basis. Obviously, the ratio can not be < 1 if the farm is under profit. Ideally, CBR of 1.2 is desirable.

Check Your Progress 3

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) What do you understand by feed conversion ratio?

.....
.....

2) How will you calculate dressing percentage?

.....
.....

3) Define cost-benefit ratio.

.....
.....

2.6 LET US SUM UP

Chicks require brooding for an average of 4 weeks because they do not have feathers, are small in size and have higher body temperature. Brooding temperature is started at 35°C and reduce at a rate of 2.8°C per week till it reaches the inside house temperature. Such reduction in temperature stimulates feather growth. Feeders are arranged radially like spokes in a wheel and drinkers interspersed between them so that no chick need move more than 30 cm to get either feed or water. Paper is spread on litter for the first 8 to 10 days of brooding to prevent chicks eating the litter and getting choked. Comfort of the chicks is assessed by observing the movement

of birds within the brooder guard. Broilers are offered *ad libitum* broiler starter and finisher rations, preferably in the pellet form. Continuous supply of drinking water is ensured through fountain and bell drinkers. Vaccinations against Ranikhet and Infectious bursal diseases are commonly undertaken. Performance of broilers is generally assessed by average weight at market and feed conversion ratio.

2.7 GLOSSARY

Ad libitum	: As desired or as required or without restriction.
Brooder	: Equipment used to provide artificial heat.
Brooding	: Providing artificial heat.
Crop	: A pouch- like organ just below the skin at the base of the neck.
Dressing percentage	: Ratio of total edible portion to total weight of bird multiplied by 100.
FCR	: Feed conversion ratio; kg feed consumed per kg weight gain.
Huddle	: A densely packed group.
Indices	: Something that serves to guide, point out, or otherwise facilitate.
Livability	: Ratio of total number of birds sold to total number of chicks purchased multiplied by 100.
Mash Feed	: Type of feed which is powdery in nature.
Mortality	: The ratio of deaths in an area to the population of that area.
Nasal	: Nose.
Ocular	: Eyes.
Pellet	: Type of feed which has uniform sized granules.
Starvation	: A state of extreme hunger resulting from lack of essential nutrients over a prolonged period.
Suffocation	: The condition of being deprived of oxygen.
Tramplng	: To beat down with the feet so as to crush, bruise, or destroy.

2.8 SUGGESTED FURTHER READING

Ensminger, M.B. 1993. *Poultry Science*, 3rd Edition. International Book Distributing Company, Lucknow, India.

North, M.O. and Bell, D.D. 1990. *Commercial Chicken Production Manual*. AVI Publication, Van Nostrand Reinhold, New York, USA.

Sreenivasaiah, P.V. 2006. *Scientific Poultry Production*, 3rd Edition. International Book Distributing Company, Lucknow, India.

2.9 REFERENCES

Sreenivasaiah, P.V. and Venugopal, S. 2008. *Small- Scale Broiler Production*. International Book Distributing Company, Lucknow, India.

Sreenivasaiah, P.V. and Venugopal, S. 2008. *Small- Scale Layer Production*. International Book Distributing Company, Lucknow, India.

2.10 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) Day old chicks require brooding during first few weeks (4 weeks on average) after hatch because:
 - Being smaller in size, chicks lose more heat than adults because they have more surface area per unit weight than adults.
 - Chicks do not have feathers; therefore, they cannot maintain body temperature till the feathers grow.
 - Body temperature of chicken is 42°C which is more than that of other animals and humans (37.8°C). More the difference in temperature between two media, faster is the temperature loss from the hotter object. Hence, this makes it much more difficult for the chicks to hold body temperature.
- 2) Brooding temperature should be 35°C (95°F) which has to reduced at a rate of 2.7°C (5°F) per week till the required brooding temperature is same as that of house temperature. Reduction in temperature is to stimulate feather growth.
- 3) Anything that comes in contact with the rays gets heated. In the same way, the infra-red bulbs produce rays which heat by radiation. Obviously, when it does not heat the air, the canopy is not required even for infra-red brooders.

Check Your Progress 2

- 1) The Rule of thumb for different space requirement is:
 - Drinker space required is about the width of the head.
 - Feeder space required is about the width at shoulders.
 - Floor space required on all-litter system is approximately equal to a square whose side is equal to 1½ times the length of the bird from base of the neck to the tip of hip (pubic) bones.
- 2) If the brooding temperature is comfortable, chicks should move in and out of brooder uniformly. If chicks are uniformly distributed under the brooder guard (both brooder and run space), the conditions provided are comfortable.
- 3) During brooding 23 hours of light and 1 hour of darkness should be provided. Under canopy brooding, the light serves two purpose of both illumination for visibility and also heating the air by convection to provide the required brooding temperature. Under infra-red brooding, the light primarily serves the purpose of visibility. In all the methods of brooding, one hour darkness at a specified time of the day is provided mainly to acclimatize chicks for power failure; this would help minimize huddling of chicks and subsequent mortality due to sudden power failure.

- 4) Broilers are reared only for about 42 to 49 days of age and hence, need to be vaccinated against two important diseases namely, Ranikhet disease (RD) and Infectious Bursal Disease (IBD). The following table gives the recommended vaccination schedule:

Age (days)	Vaccination details		
	Disease	Vaccine	Route
5 – 7	RD	LaSota or F ₁	Ocular or Nasal or Water or Spray
14-16	IBD	Georgia Strain	
18			

Check Your Progress 3

- 1) As the name suggests, the feed conversion ratio (FCR) is the quantity of feed required for a kg weight gain. Day-old broilers weigh only between 38 to 48 g; hence it is ignored on most occasions to make weight gain and average weight at a specified age synonymous. This is the most popular of all the indices of performance; obviously, lower the FCR, better the performance. A farmer practicing good management can definitely anticipate an FCR of 1.80 or lower.
- 2) This index is not generally available. If you have the data about total edible portion (meat and other edible parts) obtained from the birds sold, dressing % can be calculated as the ratio of total edible portion to the total live weight multiplied by 100. This value will be at least 72% in case of broilers.
- 3) Cost-Benefit Ratio (CBR) is calculated as the ratio of gross receipts to total recurring expenditure, both on annual basis. Obviously, the ratio cannot be < 1 if the farm is under profit. Ideally, CBR of 1.2 is desirable.