Hatchery

Hatchery is an industry where day old offspring of poultry are hatched artificially.
In other words, Hatcheries are modern buildings that provide separate rooms for each hatchery operation.

Types of Hatchery

Hatcheries may be classified in many ways-

A. According to size-

1. Small hatchery (experimental hatchery)
2. Medium hatchery (Few thousands capacity)
3. Large hatchery (Many thousands chicks produced weekly)

B. According to type of chick produced-

1. Breeder hatchery
2. Commercial hatchery
3. Broiler chick producing hatchery
4. Commercial pullet chick producing hatchery

C. According to delivery of chicks-

1. Local hatchery
2. Mail-order hatchery

D. According to species-

1. Chick hatchery
2. Duckling hatchery
3. Poult hatchery

Few reputed Hatchery in Bangladesh

Broiler chick producing Hatchery

1. Aftab Farm Ltd.
2. Afil Agro Ltd
3. Aman Poultry Ltd
4. Bay Agro Industries Ltd
5. BRAC poultry project
6. CP Bangladesh co. Ltd
7. Index Agro Industries Ltd.
8. Kazi Farms Ltd.
9. MM AGA Ltd.
10. Nourish Poultry Ltd.
11. Nilsagor Agro Industries Ltd.
12. Paragon Poultry Ltd
13. Reneta Agro Inductries Ltd.

Layer chick producing Hatchery

1. Kazi Farms Ltd.
2. CP Bangladesh co. Ltd
3. Paragon Poultry Ltd
4. Nourish Poultry Ltd.
5. Aftab Bahumukhi Farms Ltd.
6. Nahar Agro Ltd
7. Bangladesh Hatchery Ltd
8. Victor Breeders Ltd.
9. Rafid Poultry Ltd.
10. Peoples Hatchery Ltd.

Incubation

Incubation is the process by which day old offspring of poultry are hatched out by creating artificial environment from fertile eggs.

Incubation refers to the process by which certain oviparous (egg-laying) animals hatch their eggs, and to the development of the embryo within the egg. The most vital factor of incubation is the constant temperature required for its development over a specific period. Especially in domestic fowl, the act of sitting on eggs to incubate them is called brooding. The action or behavioral tendency to sit on a clutch of eggs is also called broodiness, and most egg-laying breeds of poultry have had this behavior selectively bred out of them to increase production.

Types of incubation

- Natural incubation: By a healthy broody hen.
- Artificial incubation: By incubator machine.

In industrial incubation, there are two common used methods of incubation. In single-stage incubation, the incubator contains only eggs of the same embryonic age. The advantage of single-stage incubation is that climate conditions can be adjusted according to the needs of the growing embryo. In multi-stage incubation the setter contains eggs of different embryonic ages. Usually 2 or 6 age groups. Consequently, climate conditions cannot exactly be adjusted according to the needs of all the growing embryos and a compromise has to be sought to best suit the age groups presented in the setter. In a multi-stage incubation procedure, the heat produced by the older embryos is utilized to heat up the warmth demanding younger embryos. For Single-stage and multistage incubation, not necessarily different incubators are needed. Some machines are able to run both methods based on their programming.

Natural incubation

The easiest way to incubate and hatch fertile chicken eggs is to have a broody hen do all the work. A broody hen will take care of ventilating and warming the eggs and will handle all of the turning and chick-rearing duties as well.

The broody hen chosen for natural incubation should be large (to cover and thus keep more eggs warm), healthy and preferably vaccinated, with a good brooding and mothering record. Signs of broodiness are that the hen stops laying, remains sitting on her eggs, ruffles her feathers, spreads her wings and makes a distinctive clucking sound. Brooding may be induced with dummy eggs or even stones.

Eggs usually become fertile about four days after the rooster has been introduced to the hens. A maximum of 14 to 16 eggs may be brooded in one nest, but hatchability often declines with more than ten eggs, depending on the size of the hen. Feed and water provided in close proximity to the hen will keep her in better condition and reduce embryo damage due to the cooling of the eggs if she has to leave the nest to scavenge for food.

The hen keeps the eggs at the correct humidity by splashing water on them from her beak. This is a further reason for providing her with easy access to water. In very dry regions, slightly damp soil can be placed under the nesting material to assist the hen in maintaining the correct

humidity (between 60 and 80 percent). Fertile eggs from other birds are best added under the brooding hen between one and four days after the start of brooding. In Bangladesh, it has been reported that local broody hens will even sit on and hatch a second clutch of eggs, often losing considerable weight in the process (especially if insufficient attention is paid to the provision of food and water).

The incubation period for chicken eggs is 20 to 21 days, and increases up to 30 days for other poultry. After sitting for some days, a broody hen can be given some newly hatched chicks and, if they are accepted, the original eggs can be removed and replaced with more chicks. Thus hens with a better record of mothering can be better utilized for their abilities.

Eggs initially need a very controlled heat input to maintain the optimum temperature of 38°C, because the embryo is microscopic in size. As the embryo grows in size (especially after 18 days), it produces more heat than it requires and may even need cooling. Moisture levels of 60 to 80 percent Relative Humidity (increasing during the incubation period) is important to stop excess moisture loss from the egg contents through the porous egg shell and membranes.

Factors to consider for successful natural incubation include the following:

- Feed and water should be close to the hen.
- The broody hen should be examined to ensure that she has no external parasites.
- Any eggs stored for incubation should be kept at a temperature between 12 and 14 °C, at a high humidity of between 75 to 85 percent, and stored for no longer than seven days.
- Extra fertile eggs introduced under the hen from elsewhere should be introduced at dusk.
- The eggs should be tested for fertility after one week by holding them up to a bright light (a candling box works best. If there is a dark shape inside the egg (the developing embryo), then it is fertile. A completely clear (translucent) egg is infertile.

A hatchability of 80 percent (of eggs set) from natural incubation is normal, but a range of 75 to 80 percent is considered satisfactory.

Artificial Incubation

Artificial incubation goes back thousands of years when the ancient Chinese and Egyptians operated large hatcheries that were quite successful. Up until ten years ago most of the scientific information concerning artificial incubation applied to the poultry industry. Presently large commercial poultry incubators fit tens of thousands of eggs at a time and due to selection, most hatch. Having the right equipment is as important as knowing the process. Temperature, humidity, ventilation, egg turning and sanitation are all important factors in the proper incubation of eggs (Brown, 1979).

Artificial incubation is a way of hatching eggs by putting them in an incubator. An incubator is a machine that imitates a mother hen. Eggs need heat to grow and develop. Ideal incubator temperature is around 100^0F. Depending on what kind of an incubator you have, the temperature should be slightly higher or slightly lower. No matter that the temperature should not rise above 102 degrees or fall below 98 degrees. Too high of a temperature will quickly kill the embryos. Too low of a temperature is not a problem for a short time, but if it goes on for too long, the embryos will become chilled and died.

Eggs need moisture, because without it the insides of an egg will evaporate and shrivel up. To prevent this, you need to add water to your incubator to keep it humid. The incubator should have water rings or a water tray for this purpose. Humidity should start out low, and get higher as the eggs come closer to hatching time. Be especially sure that there is plenty of water in the incubator during the hatch.

Growing embryos need ventilation, because like all living things, they require oxygen. A "still-air" incubator is ventilated by the force of gravity pushing air through small holes. The best temperature for a still-air incubator is 100-102 degrees. A "forced-air" incubator is one that is ventilated with a fan that pushes air through it. The best temperature for a forced-air incubator is 98-100 degrees.

Eggs need to be turned to prevent the embryo from sticking to the shell, and to rotate it to an area with more nutrition. If you do not have an automatic turner in your incubator, you will get to do it by hand.

Most people store their eggs before incubation so they can acquire all the eggs they want and incubate them all at the same time. Eggs should be stored in a cool place such as a basement. Do not store them in a refrigerator - that is too cold. Do not store them for more than two weeks. Store them at an angle with the big end up, and turn them once or twice every day.

To turn the eggs, place one end of the carton on a box. Rotate the carton three times a day so that the other end rests on the box.

Some important things to remember:

- ❖ Be gentle while handling your eggs. Rough handling can break delicate blood vessels and kill the embryos.
- ❖ Only collect clean, normal sized eggs without cracks or dents.
- ❖ Only hatch eggs from healthy hens.
- ❖ Don't keep opening the incubator during the hatch. If you want to watch the hatch, make sure to buy an incubator with plastic viewing windows.

Natural Incubation vs Artificial Incubation

Hatching eggs by putting them under a broody hen is called **natural incubation**.
There are several advantages to natural incubation:
1) The hen does most of the work for you. You don't have to worry about turning the eggs or keeping the temperature stable.
2) A broody hen will usually hatch out a higher percentage of eggs than you will get in an incubator.
3) Once the chicks hatch, she will do much of the work of caring for them.

There are also several problems with natural incubation:
1) With natural incubation is that you cannot tell when a hen will go broody.
2) You can't guarantee that she will be a good mother.
3) You can only fit so many eggs under one hen, so you might not be able to hatch out as many as you want.
4) Sometimes a mother hen will "go wild" when she hatches out chicks, and it will be much harder to tame them.

Hatching eggs by putting them in an incubator is called **artificial incubation**.
Here are the advantages to artificial incubation:
1) With artificial incubation, you can hatch eggs whenever you want - you don't have to wait for a hen to go broody.
2) If you get a big enough incubator, you can hatch out as many eggs as you want.
3) You get the satisfaction of caring for the eggs yourself, and when they hatch, you will be the mother.

Naturally, there are disadvantages to artificial incubation as well:
1) You have to worry about the temperature, ventilation, and humidity.
2) If you do not have an automatic turner, you will have to turn the eggs at least three times a day at evenly spaced intervals.
3) Incubators usually hatch out a lower percentage of eggs than broody hens do.

Fig.: Artificial Incubator

Incubation Procedures: From Egg to Chick

OBTAINING HATCHING EGGS

Obtaining fertile eggs may present a problem, especially if you live in an urban area. Most of the eggs sold in grocery stores are not fertile and cannot be used for incubation. Fertile eggs can usually be obtained from hatcheries or poultry breeding farms. Look in the yellow pages of your telephone directory for names of hatcheries and poultry breeders. Or contact the farm adviser in your county agricultural extension service office for suggestions.

If possible, pick up the eggs yourself rather than have them shipped or mailed. It is difficult for hatcheries, post offices, and transportation companies to handle small orders of eggs properly.

CARE OF EGGS PRIOR TO INCUBATION

The hatchability of eggs can be severely reduced by improper care prior to incubation. Since it may not be practical for you to put the eggs in an incubator as soon as you get them, protect them from extreme variations in temperature. Ideally, eggs should not be more than 7 days old when they are set (placed in incubator). Beyond that point, hatchability declines.

If it is necessary to hold the eggs before you set them, turn them daily and keep them in a room where the temperature is around 50^{o} F (10 C) and the relative humidity is 70 to 80 percent. The vegetable section of your refrigerator could be used for holding the egg until it is time to place them in the incubator. Temperatures below 40^{o} F (4 C) reduce hatchability. Under no circumstances should the eggs be held at room temperature, because temperatures of this level are detrimental to hatchability. Embryos will begin develop at subnormal rates when the temperature reaches about 80^{o} F (27 C)

LOCATION OF INCUBATOR

Locate your incubator in a room in which temperature is between 70^{o} and 75^{o} F (21 and 24 C), and which free from drafts and excessive variations in temperature. Do not place the incubator near windows where it will be exposed to the direct rays of the sun. The sun's rays may raise the temperature so much that all of the embryos will be destroyed.

READYING THE INCUBATOR FOR OPERATION

Before you set the eggs, be sure that the incubator is in good working order. Put some warm water in the water pan, place each thermometer so that the bulb of the thermometer is 1 inch

(2.5 cm) above the screen, cover the incubator with the pane of glass, and then operate the incubator until the temperature inside it holds at 99^{o} to 103^{o}F (37 to 39 C).

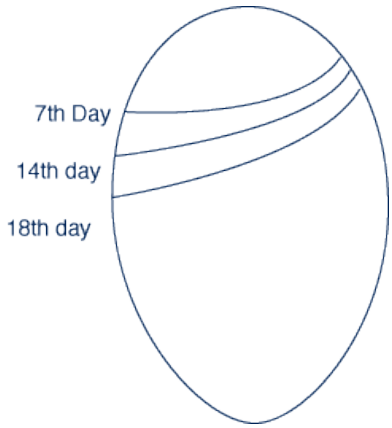
Adjust the thermostat to control temperature in an incubator with a commercial heating unit. In an incubator with a light-bulb unit, control the temperature by adjusting the size of the opening at the top by moving the pane of glass back from the edge of the incubator, unless a thermostat has been installed. If you are using a plywood incubator, adjust the openings as necessary. Or in either incubator you can adjust the heat by using bulbs of different sizes. Forty-watt bulbs will be about the right size for most incubators. Make certain that the sides and top of the incubator fit closely so that no heat is lost. You may need to make many adjustments to reach a proper setting.

PREPARING THE EGGS FOR INCUBATION

Eggs must be turned while in the incubator, so before you put in the eggs mark them with a pencil so you can tell when they have been properly turned. An excellent method is to put an "X" on one side of the egg and an "0" on the opposite side. Then you can always tell when the eggs have been turned, because either all "0" 's or all "X"'s are turned up at the same time.

HUMIDITY

Nature has provided that the eggs shell dry out to some extent during incubation (Fig. 4). This loss should be about 11 percent of the original weight, but more than this is detrimental. Water must be placed in the incubator to avoid excessive moisture loss. Keep a pan of water inside at all times. The surface area of the pan should be about as large as the of eggs.



Size of the air cell in the egg on the 7th, 14th, and 18th days of incubation. (Fig. 4)

The amount of opening in the incubator also influences the level of humidity. When the humidity is too high, open the vents all the way on the plywood incubator or slide the glass further back on the cardboard incubator. When humidity is too low, the openings should be more nearly closed, but never completely so. Weather conditions will affect the relative humidity in the incubator.

The ideal moisture level is about 50 to 55 percent relative humidity (83^{o} - 87^{o} F (28 - 31 C) on a wet bulb thermometer) for the first 18 days and about 65 percent (89^{o} - 90^{o} F (31 - 32 C) wet bulb) for the last 3 days. Excessive drying because of low humidity will cause the chick to stick to the shell and fail to survive. Some variation above or below the ideal level usually will

not affect hatchability drastically. Frequently, school incubators have too much ventilation and, therefore, too little moisture. This results in delayed or reduced hatches.

When you refill the water pan, use warm water. Hot or cold water will affect the temperature of the incubator too much. To increase the humidity level the last three days, set an extra pan of water in the incubator. Or you can put a wet sponge in the incubator to raise the humidity. A word of caution: Do not let the eggs come into direct contact with the water at any time.

TEMPERATURE

Temperature in the still-air incubator can vary from 99^{o} to 103^{o} F. (37 - 39 C) with no harmful effects if the temperature varies between these limits rather than staying at either extreme. If it stays at either extreme for several days, the hatch may be reduced somewhat. Overheating is much more critical than underheating. Overheating will result in abnormal embryos, speed up development, and lower hatchability. A thermometer should be in the center of the incubator if possible, and the bulb of the thermometer should be level with, but not touching, the tops of the eggs. If light bulbs are used to supply the heat they should be distributed as evenly as possible in the incubator.

VENTILATION

Proper ventilation is very important during the incubation process. While the embryo is developing, oxygen enters the egg through the shell, and carbon dioxide escapes in the same manner. As the chicks begin to hatch, it is essential that they receive an increasing supply of oxygen. This means that the air openings need to be opened gradually to increase the flow of air.

LENGTH OF INCUBATION

Chicken eggs require 21 days to hatch, but the incubation period for the eggs of other species of poultry varies. The approximate periods of incubation required for various species of poultry and game birds are:

	Days
Chicken	21
Turkey	28
Duck	28
Muscovy duck	33-35
Goose	29-31
Guinea	26-28
Pigeon	16-18
Ring-neck pheasant	23-24
Mongolian pheasant	24-25

Bobwhite quail	23
Japanese quail	17-18
Chukar partridge	22-23
Peafowl	28

TURNING THE EGGS

When the eggs are put in the incubator, lay them on their sides and turn them at least three times a day. Turning prevents the embryo from sticking to the shell membranes as it will do if it is left in one position too long. Good results can be obtained by turning the eggs the first thing in the morning, again at noon, and the last thing at night. But it is better to turn the eggs more than three times a day. In any case they should be turned an odd number of times so that the side that is up longest will be staggered from day to day. Otherwise the egg will be in the same position every night, which is the longest stretch of time between turns.

When you turn the eggs, move them to a different part of the tray to offset variations in temperature in the different parts of the incubator. Continue to turn the eggs from the first through the 17th days but do not turn them after the 17th day.

FINAL STAGES OF INCUBATION

After the 17th day, eggs should not be turned, and the incubator should not be opened unless it becomes necessary to add water, replace a light bulb, or make some other necessary adjustment. Chicks will start to pip the shell around the 19th day. All chicks which are going to hatch should be out of their shells by the 21st day. If the eggs were chilled or you ran into operational difficulties during the incubation period, the hatch may be delayed. Chicks that hatch beyond the 22nd day are usually not healthy, vigorous ones.

When most of the eggs are hatched, lower the temperature to approximately 95^{o}F (35 C). This permits the newly-hatched chicks to dry off. At this time, all the air vents in the incubator should be opened, and the glass top on the incubator should be opened wider.

REASONS FOR POOR HATCHES

Infertile eggs.
Eggs too old when set.
Parent stock weak, unhealthy, or fed a nutritionally deficient diet.
Improper care of eggs prior to incubation.
Shell contamination.
Eggs not turned often enough.
Temperatures too high, too low, or too variable during incubation.
Too little humidity in the incubator or occasionally too much.
Improper ventilation.
Oxygen starvation.

WHAT TO DO AFTER THE CHICKS HATCH

As soon as the chicks have dried and fluffed up completely, remove them from the incubator and place them in holding quarters where the temperature is approximately 95^{o} F (35 C). Then give them fresh water and feed. Rearing the chicks has certain limitations, but if they are to be kept for a few days, they should be given a chick-starting mash obtainable at any feed or farm supply store. Fresh water is also important.

Cleaning the incubator: When the hatch is completed, disconnect the incubator. Remove all shells and unhatched eggs and wipe the interior clean with a soapy sponge. Permit the incubator to air dry for several days by leaving the door open.

Cleaning can be made easier if you place a layer or two of cheesecloth or crinoline on the rack on the 17th or 18th day of incubation to catch the egg shell and other debris. This will also help to prevent injury to the chicks' navels. After the chicks are removed the cheesecloth can be discarded.

Incubator

Incubator is a machine which helps to produce day old offspring of poultry by creating artificial environment.

An **incubator** is a device simulating avian incubation by keeping eggs warm and in the correct humidity, and if needed to turn them, to hatch them.

Types of incubator

According to capacity-

1. Home type incubator: 50-500 egg
2. Mammoth type incubator-capacity more than 500 eggs

According to fuel-

1. Kerosene incubator
2. Electric incubator
3. Gas incubator
4. Rice husk incubator
5. Charcoal incubator

According to air movement

1. Still air incubator e.g. Kerosene incubator, Not modern incubator
2. Force draft incubator e.g. Modern incubator

According to construction

1. Section type incubator
2. Cabinet type incubator
3. Walk-in or driven in type incubator

Based on heating source

1. Hot air incubator
2. Hot water incubator

Principles and requirement for incubation

1. Temperature: It is essential for cell division and development of embryo or fetus.

Setting temp. 99.5-100.5^{0}F (Setting period: 1-18 days)

Hatching temp. 99-99.5^{0}F (Hatching period: 19-21 days)

2. Humidity: Optimum humidity prevents the evaporation of water from the eggs. Evaporation of water results weak chicks and even death of embryo or fetus.

Setting period: 60-65% RH

Hatching period: 65-70% RH

3. Setting of eggs: Eggs set on setting tray in the position of broader end up at an angle of 45^0 and after 18th days eggs should be transferred on hatching tray.

4. Egg turning: In setting tray eggs should be turned from three to eight times daily.

5. Ventilation: The best hatching results are obtained with 21% O_2 and 0.5% CO_2 in the incubator air.

6. Candling of eggs: 7th days and 14th days to identify rotten eggs and dead embryos.

7. Fumigation: The process of disinfecting the incubator , incubator room and hatching eggs.

Dose: $KMnO_4$ (35g), Formalin 70cc per 100 CFT. This dose will be half when the egg with in the incubator.

Time: Incubator/ incubator Room: 10-12 hours.

Incubator with eggs: 8-10 minutes.