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# **AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL BTAP3105**

## **POULTRY, PIGGERY & SHEEP HOUSING**

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# POULTRY HOUSING





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# NEED FOR POULTRY FARMING

To protect birds from adverse climatic conditions

To ensure easy and economic operation

To ensure scientific feeding in a controlled manner

To facilitate proper micro-climatic conditions in a  
near vicinity of bird

For effective disease control measures

To ensure proper supervision



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# CRITERIAS FOR SELECTION OF SITE

Poultry house should be located away from residential and industrial area.

It should have proper road facilities.

It should have the basic amenities like water and electricity.

Availability of farm labourers at relatively cheaper wages.

Poultry house should be located in an elevated area and there should not be any water-logging.

It should have proper ventilation.





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# LAYOUT OF POULTRY FARM

The basic principles to be observed for layout are

Layout should not allow visitors or outside vehicles near the birds.

The sheds should be so located that the fresh air first passes through the brooder shed, followed by grower and layer sheds. This prevents the spread of diseases from layer houses to brooder house.

There should be a minimum distance of 50-100 feet between chick and grower shed and the distance between grower and layer sheds should be of minimum 100 metre.

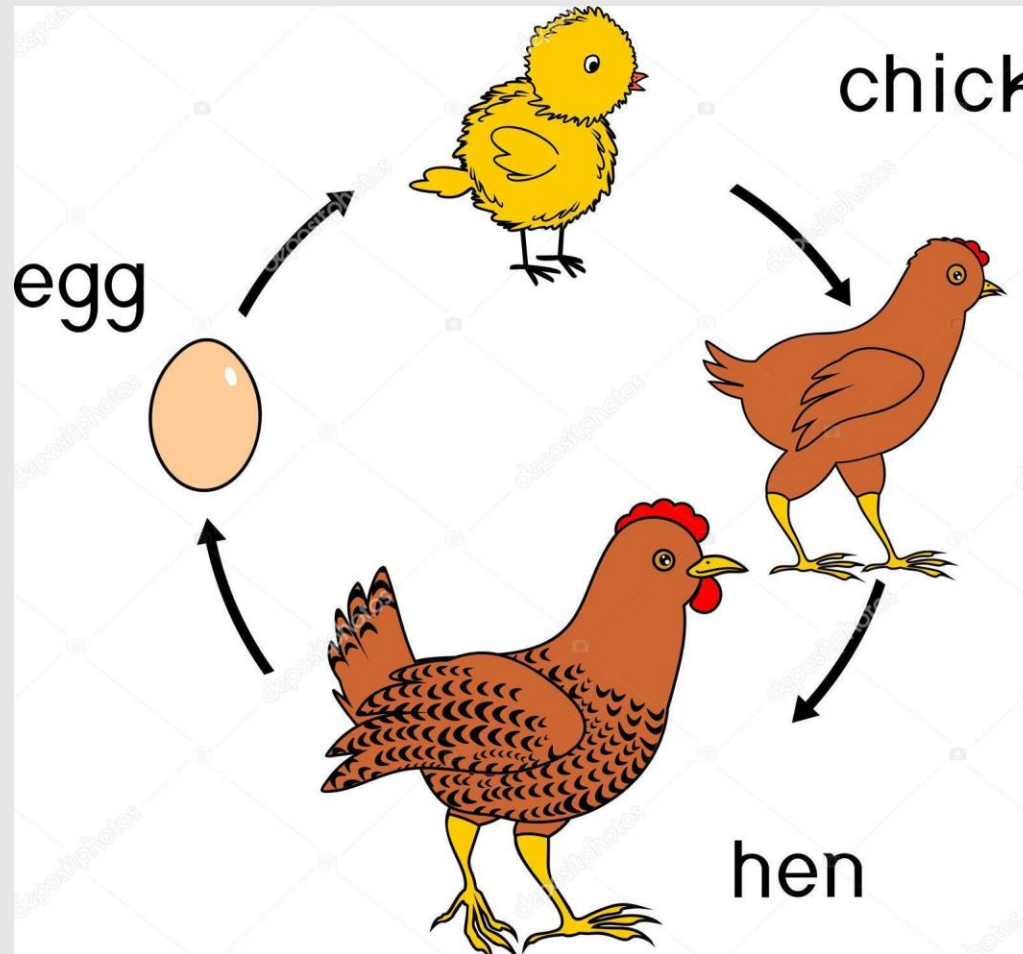
The egg store room, office room and the feed store room should be located near entrance to minimize the movement of people around the poultry sheds.

The disposal pit and sick room should be constructed only at the extreme end of the site.



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# STAGES OF GROWTH





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# SALIENT POINTS

Brooding and growing of chicks either for laying or meat purposes to a marketable size requires good housing.

During the first few weeks care is needed to prevent infection and enable proper growth by maintaining the proper sanitary conditions.

The chicks are not able to produce heat on their own so artificial heat should be given.

For year round production uniform temp of  $21^{\circ}\text{C}$  is required for growing stage.

It is our necessity to keep the birds in a confined state i.e. higher bird density, management of litters to have less disease problems.



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# DIFFERENT TYPES OF POULTRY HOUSE

***Brooder / chick house***-It is used to brood and rear egg-type chicks from 0 to 8 weeks of age.

***Grower house***-It is used to grow egg-type birds from 9 to 18 weeks of age.

***Brooders cum grower house***-Here, the birds are reared from 0 to 18 weeks of age (entire brooding and growing period of egg-type chicken).

***Layer house***-In which birds over 18 weeks of age are reared, usually up to 72 weeks of age.

***Broiler house***-In which broilers are reared up to 6 weeks of age.

***Breeder house***-In which both male and female breeders are maintained at appropriate sex ratio.

***Environmentally controlled (EC) house***-In which, entire environment is manipulated in such a way that is optimum for the birds growth.





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# ENVIRONMENTAL REQUIREMENTS OF POULTRY HOUSING

The parameters to be considered for proper environment are:-

Temperature

Humidity

Air Movement

Light

Heat and moisture production inside poultry

Proper environment is maintained through proper ventilation and insulation inside the house.



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# 1) Temperature

## **Optimal environmental conditions for rearing broilers**

Temperature	- 22-30 <sup>0</sup> C (70-85 <sup>0</sup> F)
Relative Humidity	- 30-60 %
Ammonia level	- Less than 25 ppm
Litter moisture	- 15-25%
Air flow	- 10-30 metres/minute

The optimum temperature for suitable growth is 21-40<sup>0</sup>c.

Older chickens both layer and meat birds exhibit their feed conversion efficiency between this range.

After 25<sup>0</sup>c egg production drops and above 30<sup>0</sup>c it is fatal for survival.

The optional temperature range for egg production lies in the range of 50-55°F.

Any rise in temperature affects the water intake capacity of birds acc to age, breed etc.



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## 2) Humidity

When the temperature is between 32 and 45°F, the humidity should be kept below 85%.

For higher temperatures the humidity should be kept below 75%.

High humidities at high temperatures create undesirable conditions for the hens and result in excessive condensation in the building.

## 3) Air and its movement

Properly ventilated house to provide adequate supply of air and remove the products of respiration, the excess heat produced and the moisture from the breath and litter, all without causing undesirable drafts.

A laying hen will produce 40-50 BTU total heat per hour of which 25-30 BTU will be sensible heat.



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## 4) Light

Natural light well distributed throughout the house provides the necessary lighting for chores and for the hens to feed.

The recommended window area ranges from 6-25% of the floor area for ordinary window glass. This area can be considerably increased in solar-oriented houses with insulating glass.

The windows should be so distributed that 75% of the window area extends continuously across the front of the house.

Artificial lighting is now commercially used during the winter season to extend the length of day for increased egg production.

A 12-14 hours length of day is recommended. The light requirement is the equivalent of the 40 watt lamp hung at 6 feet above each 200 sq. feet of floor area.



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#### 4) Heat and moisture production inside poultry

Excessive moisture collects on walls and leaves stains, considerable damage can result from rotting of wood members by moisture; moisture in walls reduces insulation value.

One of the primary sources of moisture in a building for housing poultry is that which has been given off to the air in the form of vapour by the birds.

The inside surface of walls of buildings are cooler than the inside air whenever the outside of the wall is exposed to a lower outside temperature.

To determine whether the condensation will occur, the inside surface temperature must be computed to determine whether it is below the dew point of the inside air.

The temperature of the inside surface may be computed by the formula.

$$t_s = t_i - \frac{u}{f_i}(t_i - t_o)$$

Where  $t_s$  = inside surface temperature

$t_i, t_o$  = inside and outside temperature respectively.



# DESIGN CONSIDERATIONS FOR POULTRY HOUSE



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## **House Orientation (Direction)**

The poultry house should be located in such a way that long axis is in east-west direction. This will prevent the direct sunshine over the birds.

## **Size**

Each broiler require one square foot of floor space while a layer requires two square feet of floor space under deep-litter system of rearing. So the size of the house depends on the number of birds to be reared.

## **Length**

The length of the house can be of any extent. The number of birds reared and availability of the land determines the length of poultry house.

# DESIGN CONSIDERATIONS FOR POULTRY HOUSE



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## Width

The open sided poultry houses in tropical countries should have a width not more than 22 to 25 feet in order to allow ample ventilation and aeration at the mid-portion.

Sheds wider than this will not provide adequate ventilation during the hot weather. If the width of the shed is more than 25 feet, ridge ventilation at the middle line of the roof top with proper overhang is a must.

Hot air and obnoxious gases which are lighter than air move upward and escape through ridge ventilation.

In environmentally controlled poultry houses, the width of the house may be even 40 feet or more since the ventilation is controlled with the help of exhaust fans.



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# DESIGN CONSIDERATIONS FOR POULTRY HOUSE

## **Height**

The height of the sides from foundation to the roof line should be 6 to 7 feet (eaves height) and at the centre 10 to 12 feet. In case of cage houses, the height is decided by the type of cage arrangements (3 tier or 4 tier).

## **Foundation**

Good foundation is essential to prevent seepage of water into the poultry sheds. The foundation of the house should be concrete with 1 to 1.5 feet below the surface and 1 to 1.5 feet above the ground level.

## **Floor**

The floor should be made of concrete with rat proof device and free from dampness. The floor of the house should be extended 1.5 feet outside the wall on all sides to prevent rat and snake problems.

## **Doors**

The door must be open outside in case of deep-litter poultry houses. The size of door is preferably 6 x 2.5 feet. At the entry, a foot bath should be constructed to fill with a disinfectant.



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## **Side walls**

The side wall should be of 1-1.5 feet height, and generally at the level of bird's back height. This side wall protects the bird during rainy days or chill climate and also provides sufficient ventilation. In case of cage houses, no side wall is needed.

## **Roof**

The roof of the poultry house may be thatched, tiled, asbestos or concrete one depending upon the cost involvement. Different types of roofs are Shed, Gable, half-monitor, full-monitor (Monitor), Flat concrete, Gambrel, Gothic etc. Gable type is mostly preferred in tropical countries like India.

## **Overhang**

The overhang of the roof should not be less than 3.5 feet in order to prevent the entry of rain water into the shed.

## **Lighting**

Light should be provided at 7-8 feet above the ground level and must be hanged from ceiling. If incandescent bulbs are used, the interval between two bulbs is 10 feet. In case of fluorescent lights (tube lights) the interval is 15 feet.



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# CLASSIFICATION OF POULTRY HOUSE

Poultry can be housed under different systems based on following factors,

- Availability of land
- Cost of land
- Type of farming activity
- Climatic condition
- Labour availability

Broadly, poultry housing systems are classified into three systems:

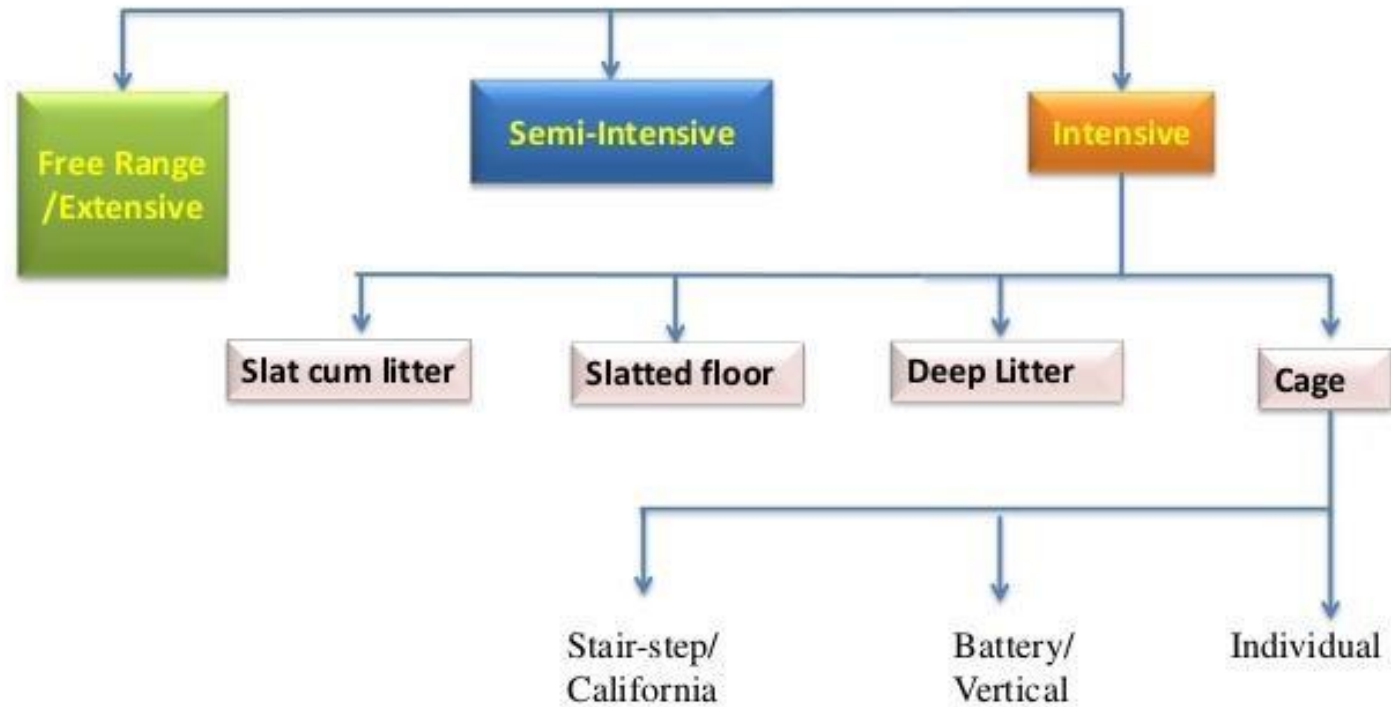
- Free range or extensive system
- Semi-intensive system
- Intensive system
  - Deep-litter system
  - Slatted floor system
  - Slat cum litter system
  - Cage system





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## Type of poultry housing Systems











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# Free range system

This system is adopted only when adequate land is available to ensure desired stocking density by avoiding overcrowding.

We can rear about 250 adult birds per hectare. A range provides shelter, greens, feed, water and shade.

Foraging is the major source of feeding for birds.

Shelter is usually provided by temporary roofing supported by ordinary poles.

The fields are generally used on rotational basis after harvesting of crops by moving of birds from one field to another depending on cropping programme.

All categories of birds can be reared in this system.

This system is most preferred for organic egg production.



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## **Advantages**

Less capital investment

Cost of housing is least.

Feed requirements are less since birds can consume fairly good amount of feed from grass land.

Fertility of soil can be maintained.

## **Disadvantages**

The scientific management practices can not be adopted.

Eggs are lost when laid inside the dense grasses unless special nests are provided.

Losses due to predatory animals are more.

Wild birds may bring diseases unless proper care is taken.









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## Semi intensive system

As the name indicates birds are half-way reared in houses and half-way on ground or range, i.e. birds are confined to houses in night or as per need .

The stocking density rate on an average for adult birds is 750 per hectare. This system is usually adopted for duck rearing. The feeding and watering facilities are provided in the pen.



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## **Advantages**

More economical use of land compared to free range system

Protection of birds from extreme climatic conditions

Control over scientific operation is some extent possible

## **Disadvantages**

High cost for fencing.

Need for routine cleaning and removal of litter material from the pen.



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# Intensive system

Birds are totally confined to houses either on ground / floor or on wire-netting floor in cages or on slats. It is the most efficient, convenient and economical system for modern poultry production with huge numbers.

## Advantages

Minimum land is required for farming.

Farms can be located near market area.

Day-to-day management is easier.

The production performance is higher as more energy is saved due to restricted movements.

Scientific management practices like breeding, feeding, medication, culling etc. can be applied easily and accurately.

The sick birds can be detected, isolated and treated easily.



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## Disadvantages

Birds' welfare is affected. They cannot perform the natural behaviour like roosting, spreading wings, scratching the floor with legs etc.

Since they are not exposed to outside sunlight and feed sources, all the nutrients should be provided in balanced manner to avoid nutritionally deficient diseases.

Chances for spreading of diseases are more.









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# DEEP LITTER SYSTEM

In this system the birds are kept inside the house all the time.

Arrangement for feed, water and nest are made inside the house.

The birds are kept on suitable litter material of about 3” to 5” depth.

The word litter is used for fresh litter material spread on the floor. Usually paddy husk, saw dust, ground nut hulls, chopped paddy straw or wood shavings are used as litter materials.

This arrangement saves labour involved in frequent cleaning of faecal matter (droppings), however it needs periodical stirring.

The litter is spread on the floor in layers of 2” height every fortnightly till the required is achieved.



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## Advantages

Vit B2 and Vit B12 are made available to birds from the litter material by the bacterial action.

The welfare of birds is maintained to some extent

The deep litter manure is a useful fertilizer.

Lesser nuisance from flies when compared to cage system.

## Disadvantages

Because of the direct contact between bird and litter, bacterial and parasitic disease may be a problem.

Respiratory problems may emerge due to dust from the litter.

The cost of litter is an additional expenditure on production cost.

Faults in ventilation can have more serious consequences than in the cage system



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## **SLATTED (SLOTTED) FLOOR SYSTEM**

In a slatted floor, iron rods or wood reapers are used as floor, usually 2-3 feet above the ground level to facilitate fall of droppings through slats.

For housing 400 birds overall dimension of 23x5.5 m<sup>2</sup> and in the middle the service area of 1.83 m is needed.

It is usually desirable to enclose the entire house by wire mesh of 25 mm made of 20 gauge standard.









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## Advantages

Less floor space per bird is needed when compared to solid floor system.

Bedding is eliminated

Manure handling is avoided

Increased sanitation

Saving in labour

Soil borne infection is controlled

## Disadvantages

Higher initial cost than conventional solid floors

Less flexibility in the use of the building

Any spilled feed is lost through the slots

More fly problem.



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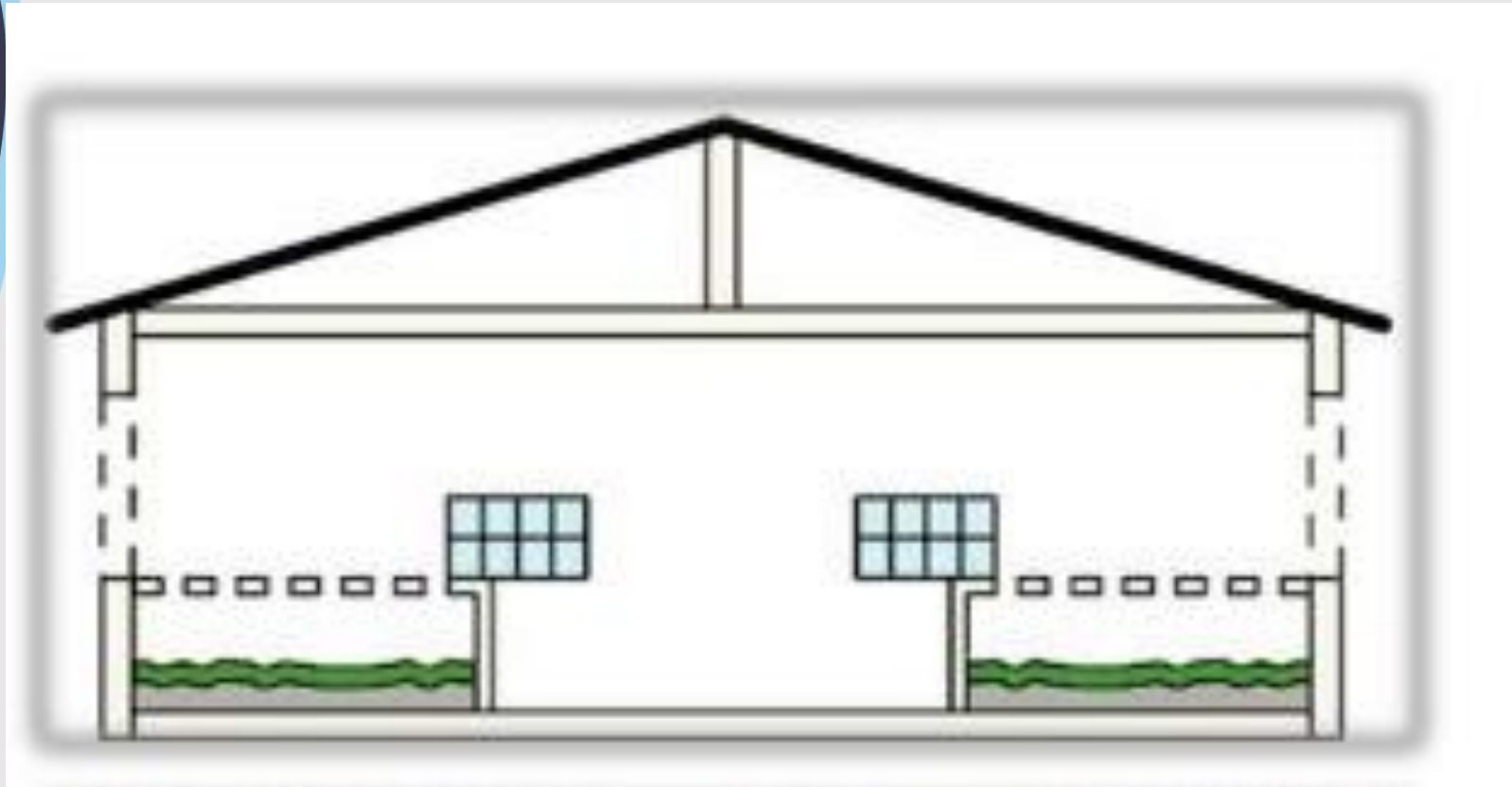
## **SLATTED (SLOTTED) CUM DEEP LITTER FLOOR SYSTEM**

This system is commonly practiced for rearing birds for hatching eggs production, particularly meat-type breeders. Here, a part of the floor area is covered with slats. Usually, 60% of the floor area is covered with slats and rest with litter. Feeders and waterers are arranged in both slat and litter area. In case of breeder flock, nest boxes are usually kept on litter area.



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## **Advantages**

More eggs can be produced per unit of floor space than all solid floors.

Fertility is better with the slat cum litter house than with the all-slat house.

## **Disadvantages**

Housing investment is higher with the slat cum litter house than with the all-litter house.

The separation of birds from the manure beneath the slats commonly results in fly problems.



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# CAGE SYSTEM

This system involves rearing of poultry on raised wire netting floor in smaller compartments, called cages, either fitted with stands on floor of house or hanged from the roof.

It has been proved very efficient for laying operations, right from day-old to till disposal. At present, 75% of commercial layers in the world are kept in cages.

Feeders and waterers are attached to cages from outside for which pipeline is installed through or above cages.

Auto-operated feeding trolleys and egg collection belts can also be used in this rearing system.

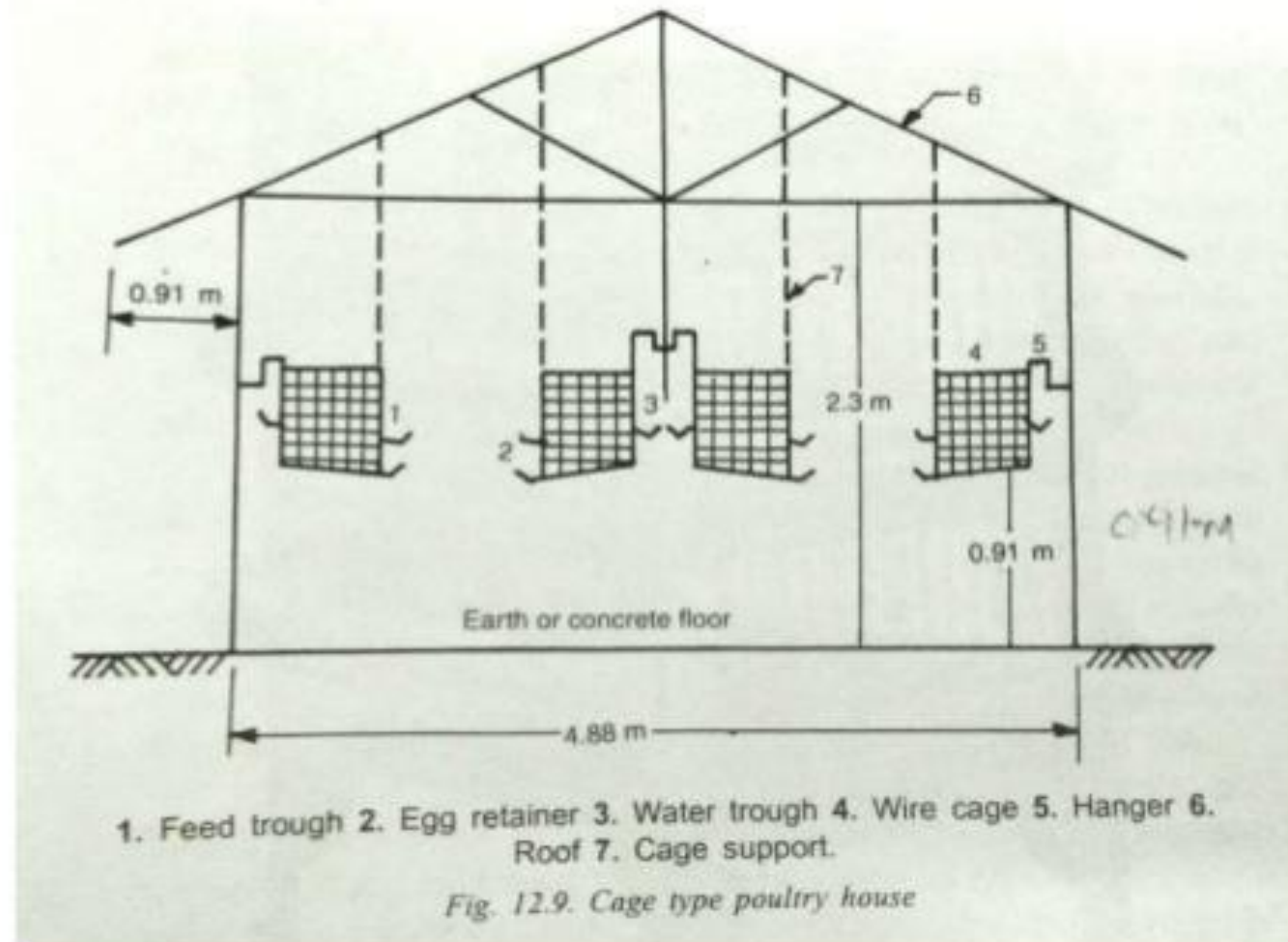
The droppings are either collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages.





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## Advantages

Minimum floor space is needed

More number of eggs per hen can be received

Less feed wastage

Better feed efficiency

Protection from internal parasites and soil borne illnesses

Sick and unproductive birds can be easily identified and eliminated.

Clean eggs production

Vices like egg eating, pecking is minimal.

Broodiness is minimal

No need of litter material

Artificial Insemination (AI) can be adopted.





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## Disadvantages

High initial investment cost.

Handling of manure may be problem. Generally, flies become a greater nuisance.

The incidence of blood spots in egg is more

Problem of cage layer fatigue. (It is a condition, in which laying birds in cages develop lameness. It may be due to Ca and P deficiency but the exact reason is not known)

In case of broilers, incidence of breast blisters is more, especially when the broilers weight is more than 1.5 kg.





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## Cage System

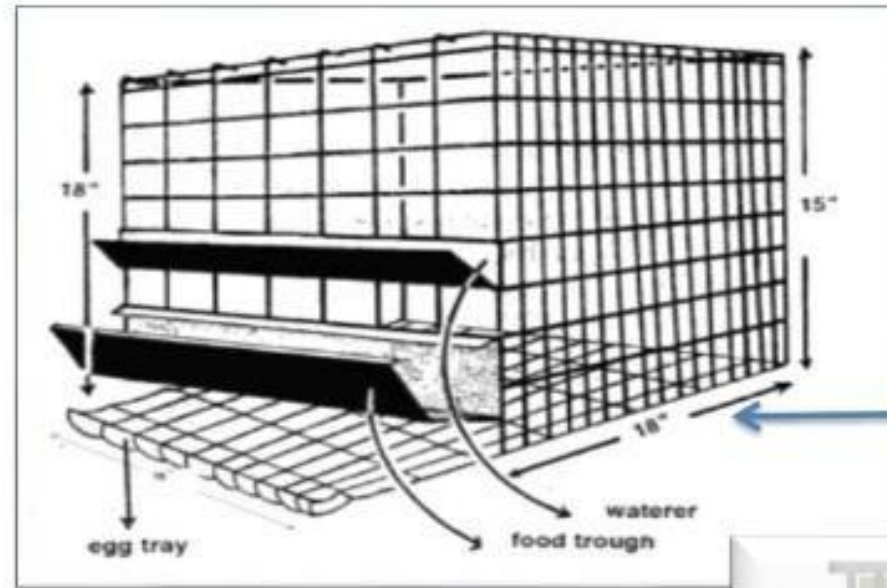
- Rearing of poultry on raised **wire netting floor** in smaller compartments, called cages
- Initially introduced for **individual** egg & pedigree **recording** & culling of poor layers
- At present, 75% of commercial layers in the world are kept in cages
- Suitable for keeping **high density of birds**, when space is limited
- Scientific management practices can be followed
- Feeders and waterers are attached to cages from outside, except nipple waterers, for which pipeline is installed through or above cages
- Auto-operated feeding trolleys and egg collection belts can also be used
- The droppings are either collected in trays underneath cages, on belts or on floor or deep pit under the cages
- **Recommended Floor space**
  - Chick (0 to 8 weeks) = 0.3 Sq.ft
  - Grower (9 to 16 weeks) = 0.5 Sq.ft
  - Layer (Above 17 weeks) = 0.6 Sq.ft



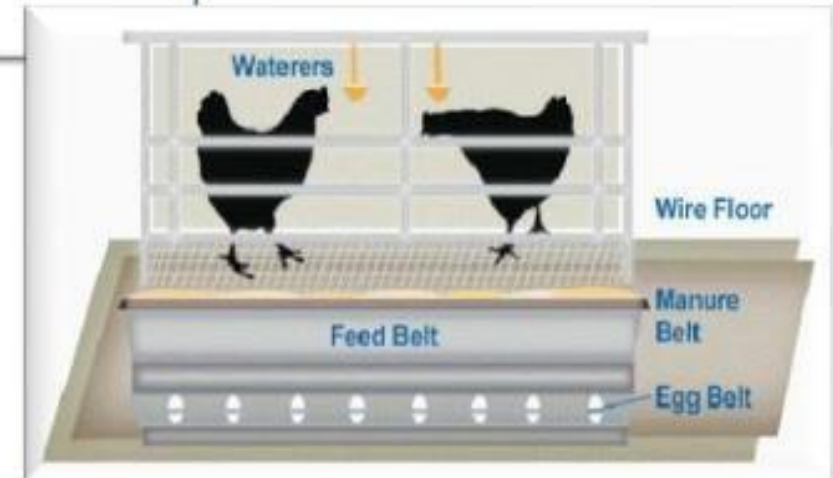
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## Structure of Cage



Floor slope: 1.5 inch per running 12 inch





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# Types of cages

## Based on the bird density

- ❖ Single or individual bird cage  
(Only one bird in a cage)
- ❖ Multiple bird cage  
(From 2 to 10 birds)
- ❖ Colony cages  
(More than 11 birds per cage)

## Based on the number of rows

- ❖ Single-deck
- ❖ Double-deck
- ❖ Triple-deck
- ❖ Four-deck

## Based on arrangement of cages

- ❖ Battery cages (Vertical cages)
- ❖ Stair-step cages
  - a) M-type cages
  - b) L-type cages

## Based on the type of bird reared

- ❖ Brooder / chick cages
- ❖ Grower cages
- ❖ Layer cages
- ❖ Breeder cages



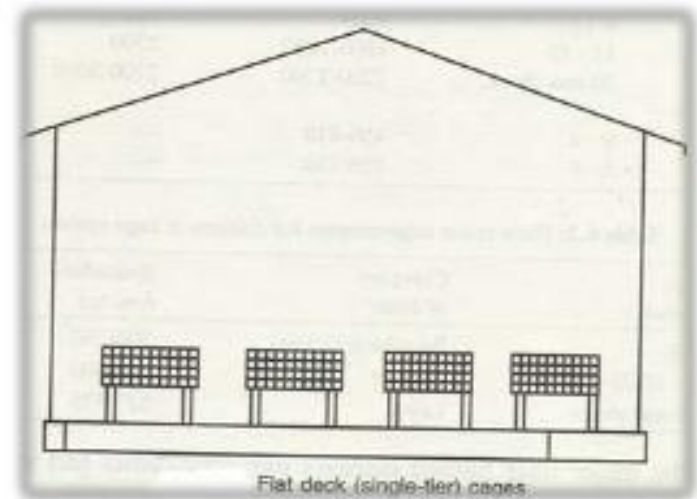


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**Individual cage**



Flat deck (single-tier) cages



**Colony cages**



**Battery cages**





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Type	Age (in weeks)	Deep-litter (ft <sup>2</sup> )	Cages (ft <sup>2</sup> )
Egg-type chicken	0-8	0.60	0.20
	9-18	1.25	0.30
	>18	1.50	0.50
Meat-type chicken	0-4	0.30	-
	4-8	0.75	-



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# PIGGERY HOUSE





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Commercial pig farming in India for meat production is one of the best and profitable business ideas for the Indian people.

Pigs grow faster than any other animals.

They have higher feed conversion efficiency

Pigs can eat and consume almost all types of feed including grains, damaged food, forage, fruits, vegetables, garbage, sugarcane etc. Sometimes they even eat grasses and other green plants or roots.





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Pigs become mature earlier than other animals.

A sow can be bred for first time at their age of 7-8 months.

They can farrow twice a year. And in each farrowing they give birth of 8-12 piglets.

Setting up pig farming business is easy and it requires little capital/investment for building houses and buying equipment.

The ratio of total consumable meat and total body weight is higher in pigs.





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## Feeding

Feeding is the most important part of commercial pig farming in India. Growth, production and animal health depends on feeding high quality and nutritious feed.





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## Housing

Class of animals	Covered floor area per animal (m <sup>2</sup> )	Open-yard area per animal (m <sup>2</sup> )	Water required (litres)
Boar	6.25-7.5	8.8-12.0	45.5
Farrowing	7.5-9.0	8.8-12	18-22
Weaner	0.96-1.8	8.8-12	3.5-4
Dry sow	1.8-2.7	1.4-1.8	4.5-5

## Feeding Amount According to the Body Weight of Pigs

Body Weight of Pigs	Daily Required Food (kg) Per Pig
25	2.0
50	3.2
100	5.3
150	6.8
200	7.5
250	8.3



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Swine – US Pigs

Hog – Male Pigs

Boar – Wild Pig

Sow – Adult Female Pig

Gilts – Young Female Pig

There are three stages of swine production-

Farrowing and nursing baby pigs

Growing upto 20 weeks

Marketing the pigs



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# ENVIRONMENTAL REQUIREMENTS FOR PIG

Pigs thrive well in temperatures of 20-25<sup>0</sup>c.

They resist more summer heat so a temp of 32-40<sup>0</sup>c can be sustained.

Pigs don't eat forage. They feed on concentrated food which provides large amount of heat.

Temperature zone for best pig productivity is known as thermoneutral zone.(ECT - Evaporative critical temp & LCT - Lower critical temp)

Above ECT the pigs cool their bodies and below LCT they warm their bodies.

If temp is 6-8 <sup>0</sup>c more then it is very dangerous.

Most favorable temp for piglets is 27-35 <sup>0</sup>c.





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# HOUSING NEEDS OF PIGS

The house should give adequate protection against direct sunlight and rain. Hogs are sensitive to heat and cold.

The floor and wall should be strong to withstand the rooting habits of pigs. Concrete flooring is durable and easy to clean. The walls may be of bricks, finished smoothly and doors of strong wooden planks or iron.

Feed troughs and water troughs may be placed along the front to facilitate feeding from outside.

Provide shade, wallowing tank, cooling devices such as sprinkling of water, washing etc. to maintain thermal comfort.

Design should be such that all animals are observable easily from outside and the labour requirement is less.

Boars, pregnant and dry sows, gilts and growing pigs are usually kept in open yards with partially sheltered area. Farrowing sows are housed in completely enclosed houses or pens.

Simple low cost houses constructed with locally available materials as per above guidelines are preferred in rural areas. Multipurpose pens, which can be used, for all categories of pigs can also be designed meeting the floor space requirement.

Individual or group housing in cages made up of vertical G.I. pipes/M S rods and also farrowing crates can be adopted in large high-tech farms.

Uncastrated males and females should not be housed together beyond the age of four months.



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## **Housing of Boars**

Boar pen should have covered area of 6.25-7.5 m<sup>2</sup> and open area of 8.8-12 m<sup>2</sup> for exercise. The walls should have a minimum height of 1.5 m.

## **Housing of Female**

Open yard type with partial roofing as in the case of boar may be provided. A total of 10-15 females can be grouped in a pen. An area of 2 m<sup>2</sup> per animal may be provided.

## **Housing of Farrowing sows**

Farrowing sows may be housed individually in a farrowing pen of 2.5 x 4.0 = 10.0 m<sup>2</sup> having guard rails, creep area, feed and water troughs.

## **Housing of growing and finishing pigs**

A covered concrete yard for feeding and resting having feed and water trough arranged in the front side and an open yard in the rear will suffice for fatteners. The total space requirement may be 2 m<sup>2</sup> per grower/fattener pig.



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# SPACE REQUIREMENT OF PIGS

GROWING PERIOD	SPACE(M <sup>2</sup> /PIG)
10 kg	0.14
11-20 kg	0.22
21-40 kg	0.36
41-60 kg	0.47
61-80 kg	0.57
81-100 kg	0.66



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# SHEEP HOUSING



FARMING  
PLAN





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# GENERAL CONSIDERATIONS

For rearing sheep we require low cost structures, and low cost locally available cheap materials.

It must be properly fenced so that they are confined totally.

Sometimes they are allowed for grazing and sometimes stall feeding is done.

About, 2kg of roughage and 200 g of concentrate is fed to the animals.

1-1.1 m<sup>2</sup> per animal space is allowed.

For large no of sheeps efficient drafting yards are required to keep the lambs and ewes separately.

Holding pens,sheds are also a part.